Application Guide

# iC7 Series Industry

## Software version 26A


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# Contents

# 1 Introduction to the Application Guide

## 1.1 Version History

This guide is regularly reviewed and updated. All suggestions for improvement are welcome.

The original language of this guide is in English.

| Version | Remarks | Software Version |
|---|---|---|
| M00104, document version 10 | Release 26A | 6.0.x |
| M00104, document version 09 | General Release 6 | 5.0.x |
| M00104, document version 08 | General Release 5 | 4.5.x |
| M00104, document version 07 | General Release 4 | 4.3.0 |
| M00104, document version 06 | General Release 3 | 4.2.9 |

## 1.2 Purpose of this Application Guide

This application guide is intended for qualified personnel such as:

- Automation engineers
- Commissioning engineers who have experience operating with parameters and basic knowledge of variable frequency drives

The application guide provides information on the initial configuration of the drive. The purpose of the guide is to provide information on parameters for configuring and controlling the drive, an overview and procedures of the various user interfaces in iC7, typical application examples, and troubleshooting of events in the drive.

## 1.3 Additional Resources

Additional resources are available with related information.

iC7-Automation Frequency Converters Design Guide provides information about the capability and functionality to design motor control systems for Danfoss iC7 series.

iC7 Series Frequency Converters Installation Safety Guide provides important safety information related to iC7 drives.

iC7-Automation Frequency Converters Installation Guides cover the mechanical and electrical installation of drives.

## 1.4 Safety Symbols

The following symbols are used in Danfoss documentation and products.

**DANGER**

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

**WARNING**

Indicates a hazardous situation which, if not avoided, could result in death or serious injury.

**CAUTION**

Indicates a hazardous situation which, if not avoided, could result in minor or moderate injury.

**NOTICE**

Indicates information considered important, but not hazard-related (for example, messages relating to property damage).

| | |
|---|---|
|  | ISO warning symbol for general warnings |
|  | ISO warning symbol for hot surfaces and burn hazard |
|  | ISO warning symbol for high voltage and electric shock |
|  | Symbol for indicating the required discharge time of the capacitors in the product. |
|  | ISO action symbol for referring to the instructions |

# 2 Introduction to iC7-Automation

## 2.1 Overview

The iC7 drives provide precision motor control and are equipped with integrated functional safety, security, and connectivity features.

The 2 application software packages available for iC7-Automation frequency converters are:

- The Industry application is included as standard in iC7-Automation drives, unless another application has been selected when ordering the drive. The Industry application software offers speed and torque control combined with a wide range of features to support various demanding applications.
- The Motion application offers the same range of features as the Industry application software except the process controller, and adds positioning and synchronization capabilities. The Motion application can be selected when ordering the drive, or later as a field upgrade.

The FC300 Series Converter is an additional feature to the iC7-Automation product. To ensure easy replacement without modifying PLC programs, the iC7-Automation supports a licensed **FC 302 PROFINET mode** that:

- Establishes communication using existing legacy configuration files (GSDML, for example).
- Maps user parameters to FC 302 parameters.
- Adjusts functional behavior and response times to match the latest FC 302 firmware.

This guide covers the Industry application. For further information regarding the Motion application, see *iC7 Series Motion Application Guide*.

# 3 Software Tools

## 3.1 Overview

Danfoss offers a suite of desktop software tools which have been designed to provide easy operation and the highest level of customization of variable frequency drives.

The MyDrive® tools support the entire lifecycle of the drive, from system design to service. Some of the tools are available free of charge, and some require a subscription.

For more information about the MyDrive® tools, see MyDrive® documentation and https://suite.mydrive.danfoss.com/.

## 3.2 MyDrive® Select

MyDrive® Select performs frequency converter sizing based on calculated motor load currents, ambient temperature, and current limitations. The sizing results are available in graphical and numerical format, and include calculations of efficiency, power losses, and inverter load currents. The resulting documentation is available in .pdf or .xls format, and can be imported to MyDrive® Harmonics for evaluation of the harmonic distortion, or validation of compliance towards most recognized harmonic norms and recommendations.

MyDrive® Select is available as a web-based tool at select.mydrive.danfoss.com and as a mobile device app that can be downloaded from app stores.

## 3.3 MyDrive® Harmonics

MyDrive® Harmonics estimates the benefits of adding harmonic mitigation solutions to an installation and calculates system harmonic distortion. The evaluation can be done both for new installations and when extending an existing installation.

The free version provides a fast overview of the expected general performance of the system. The expert version of MyDrive® Harmonics requires a subscription, which opens up more features, including the possibility to save and share harmonic projects, import projects from MyDrive® Select, and the possibility to add Danfoss harmonic mitigation products.

MyDrive® is available as a web-based tool at https://harmonics.mydrive.danfoss.com.

## 3.4 MyDrive® Energy

MyDrive® Energy combines drive system energy calculation and efficiency classification functionalities in 1 tool. It uses basic system parameters to generate efficiency metrics and estimate potential energy savings and $CO_2$ reduction for drive systems.

- The Efficiency Calculator (formerly MyDrive® ecoSmart) follows IEC 61800-9-2 standards for IE and IES class definitions, and calculates efficiency class and part load efficiency for Danfoss drives.
- The Energy Calculator enables system-level efficiency assessments, and analyzes energy consumption and savings. Additional parameters such as energy costs, $CO_2$ emissions, and system-specific load profiles can be added to obtain more precise results.

MyDrive® Energy is available as a web-based tool at https://energy.mydrive.danfoss.com/.

## 3.5 MyDrive® Insight

MyDrive® Insight is a software tool for commissioning, engineering, and monitoring drives. MyDrive® Insight can be used to configure parameters, upgrade software, and set up functional safety features and condition-based monitoring.

MyDrive® Insight is available for download at https://suite.mydrive.danfoss.com/.

A microSD card can be used as a storage device for data logging, making backups, and restoring the system from a backup.

### Logic

The Logic feature in MyDrive® Insight enables the customization and control of drives through a graphical user interface without the need for a separate programming tool. It allows for conditional controls, fault detection and diagnostics, and the creation of sequencing and interlocking logic. Programmable function blocks with inputs and outputs can be connected to control the digital or analog outputs of the drive. For more information, see *MyDrive® Insight Logic Feature Application Guide*.

# 4 Security and User Management

## 4.1 Security

The iC7 series offers a secure and tamper-proof operational environment. It is designed for hardware-based security, which underpins every security feature of the iC7 series:

- **Network connectivity:** Communication between the drive and the MyDrive® Insight commissioning tool is end-to-end encrypted by using TLS/SSL cryptographic protocols as used by HTTPS in web browsers.
- **Secure connectivity via OPC UA:** Built-in, robust security features like encryption, authentication, and data integrity(using certificates and digital signatures) to protect sensitive industrial data from cyberattacks, ensuring confidential, authentic, and tamper-proof exchange between devices.
- **Tamper-proof hardware:** The drive hardware prevents unauthorized alteration and protection against physical and side-channel attacks.
- **Trusted firmware:** Firmware and applications are encrypted and only executed if they are genuine.

Drives must be installed by authorized and educated personnel, who are aware of the security risks in networks and can mitigate threats in the network.

For best protection, refer to the Cybersecurity for iC7-Automation Frequency Converters User Guide.

## 4.2 User Management

### 4.2.1 Introduction to User Management

The iC7 drive supports user management with role-based access control. The user management concept is derived from the OPC UA specification. For more information on OPC UA, see the iC7 Series OPC UA Operating Guide. Users can be assigned 1 or more roles that determine their permissions and the actions they can perform on the drive.

User management is done in MyDrive® Insight.

NOTE: Logging into MyDrive Insight with a Danfoss account is separate and unrelated to user login and management on the drive itself.

Clients are divided into 2 groups:

- When connecting to the drive, all users are considered ***Anonymous*** until an authentication handshake has been executed.
- When the authentication is completed successfully, the user transitions from ***Anonymous*** to ***AuthenticatedUser*** as shown in Figure 1. All users with the type ***AuthenticatedUser*** are allowed to modify their own password.

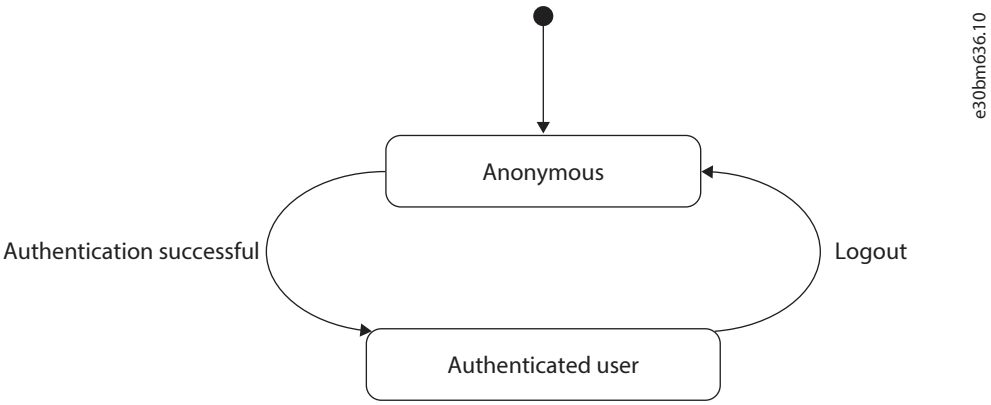



**Figure 1: User Types**

**Table 1: OPC UA User Types**

| User type | Description | Conformance units |
|---|---|---|
| Anonymous | A user that is not yet authenticated. | Security Role Well Known Group 2 |
| AuthenticatedUser | A user that has authenticated and is known to the device. | Security Role Well Known Group 2 |

## Core concepts

| | |
|---|---|
| **Roles** | Roles define the permissions and rights granted to users. Each role allows specific actions on the drive. |
| **Users** | User accounts are created on the drive. A user account requires authentication. Each user must be assigned at least 1 role to define their access level. |
| **Anonymous** | Anonymous represents access to the drive without logging in. Anonymous is not a user account but a special designation for unauthenticated access. Roles can be assigned to or removed from Anonymous to control what can be done without authentication. |

The supported roles are explained in the following table:

**Table 2: User Roles and Accounts**

| Role | Description | Special requirements |
|---|---|---|
| ConfigureAdmin | This role is allowed to change configuration settings that are not related to security or functional safety:<br>• Configure drive parameters<br>• Modify drive settings<br>• Perform standard firmware updates | A user must have this role to be able to:<br>• Perform firmware updates<br>• Modify parameters |
| SafetyAdmin | This role is allowed to modify functional safety-related settings.<br>• Change the functional safety configuration<br>• Perform firmware updates when a safety module is present | If an advanced safety unit is mounted in the drive, only a user with this role can perform firmware updates. |
| SecurityAdmin | This role is allowed to change security-related settings, and manage certificates, user accounts, and access control:<br>• Add new users<br>• Modify existing users<br>• Delete users<br>• Manage user role assignments | – |

**Table 2: User Roles and Accounts** - (continued)

| Role | Description | Special requirements |
|---|---|---|
| Observer | This role is allowed to have read-only access to drive data.<br>Permissions:<br>• View parameters<br>• Read live data<br>• Read historical data and events<br>Restrictions:<br>• Cannot modify any parameters or settings<br>• Cannot perform firmware updates<br>• Cannot change configuration | – |
| Operator | This role has the same features as the observer role, with the following added permissions:<br>• Start and stop the drive<br>• Set references | – |

NOTE: Role assignment rules:

- Regular users: Must have at least 1 role assigned
- Anonymous: Can have all 4 roles removed

These rules allow completely locking down unauthenticated access.

NOTE: Multiple Role Assignment:

- A single user can be assigned multiple roles
- Permissions are cumulative (the user gets all permissions from all assigned roles)

NOTE: Functional Safety Considerations:

- The SafetyAdmin role is specifically designed for safety-critical operations.
- Drives with upgradable Functional Safety (+BEF2) have the Advanced Safety Unit integrated. In this case, proper SafetyAdmin role management is critical for firmware updates.
- Assign the Safety Admin role to a limited number of trusted users!

### Default configuration

When the drive is in its default state (that is, fresh from the factory or after a factory restore), the setting for guest users (Anonymous) includes the ConfigureAdmin and the SecurityAdmin roles, which enables users to configure the drive except for functional safety settings. This is to avoid that a user not requiring security access is affected by security settings.

After the required users have been created, removing the ConfigureAdmin and SecurityAdmin roles for Anonymous users is recommended.

## 4.2.2 User Management Operations

### 4.2.2.1 Accessing User Management

1. Open MyDrive Insight.
2. Connect to the iC7 Drive.
3. Navigate to *Setup & Service* > *User Management* .
4. View and manage users, roles, and Anonymous access.

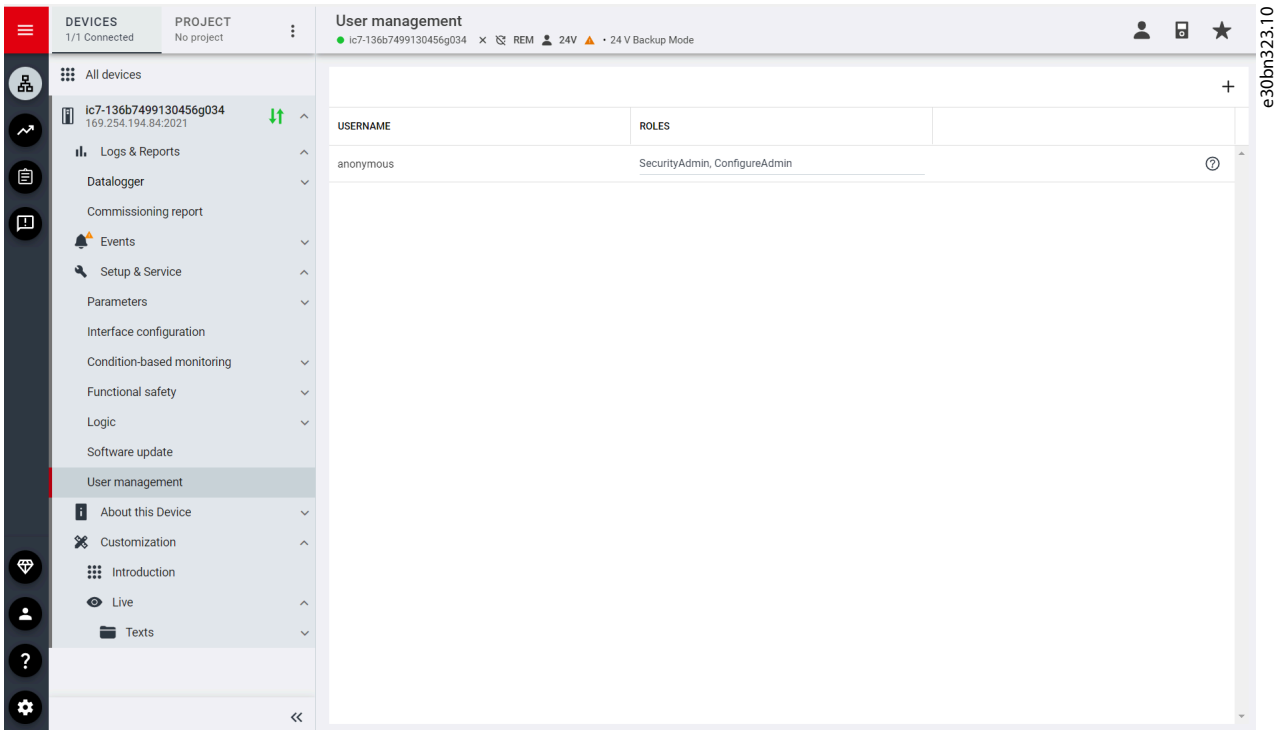



**Figure 2: User Management**

### 4.2.2.2 Adding a New User

At least 1 of the 4 roles must be assigned to a new user (SafetyAdmin, SecurityAdmin, ConfigureAdmin, or Observer).

All users of the type AuthenticatedUser are allowed to modify their own password. To see all users of the device, log in as a user with the SecurityAdmin role.

1. Log in as a user with the SecurityAdmin role.
2. Navigate to *Setup & Service* > *User Management* .
3. To create a new user account, click the + icon in the upper right corner.

   All usernames must meet the following requirements:

   - Use only ASCII characters (Uppercase letters: A–Z, Lowercase letters: a–z, Numbers: 0–9, Symbols, such as: !@#$%^&*()_+-=|;:',.<>?/~‘
   - No spaces are allowed in usernames
   - Usernames are case-insensitive (for example, “Admin”, “admin”, and “ADMIN” are all considered the same username)
4. Set a password.

   All user passwords must meet the following requirements:

   - Must be 10–64 characters long
   - Use only ASCII characters as listed in the previous step

- Whitespace is allowed in the middle, but no spaces are allowed at the beginning or end of the password

There are no password expiration policies or forced password change requirements. Users can keep the same password indefinitely unless they choose to change it.

5. Assign 1 or more roles to the user.
6. Save the user configuration.

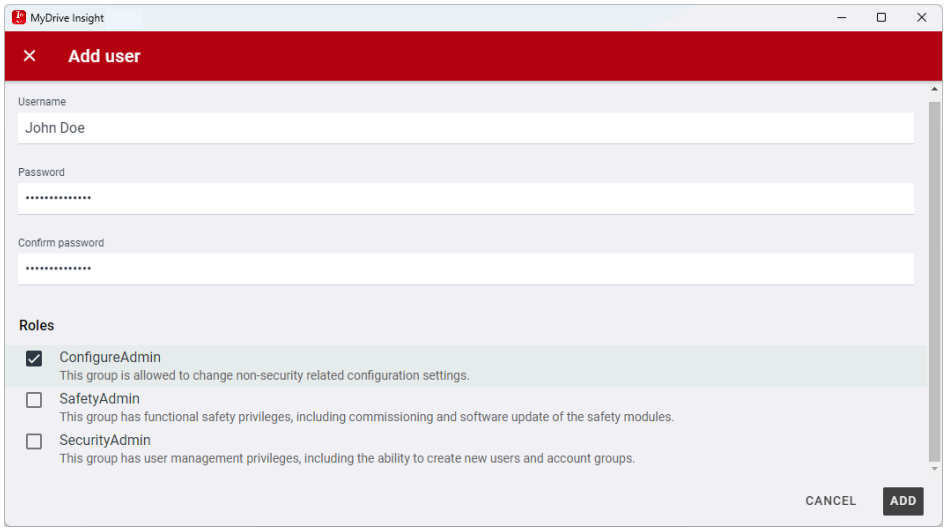



**Figure 3: Adding User Details**

There is no maximum number of users that can be created. However, it is recommended to keep the number of users below 10 for optimal management and performance.

### Changing passwords

Users can change their own password at any time.

Users with the Security Admin role can change passwords for other users.

To change the password for a user, select the key symbol next to the user.

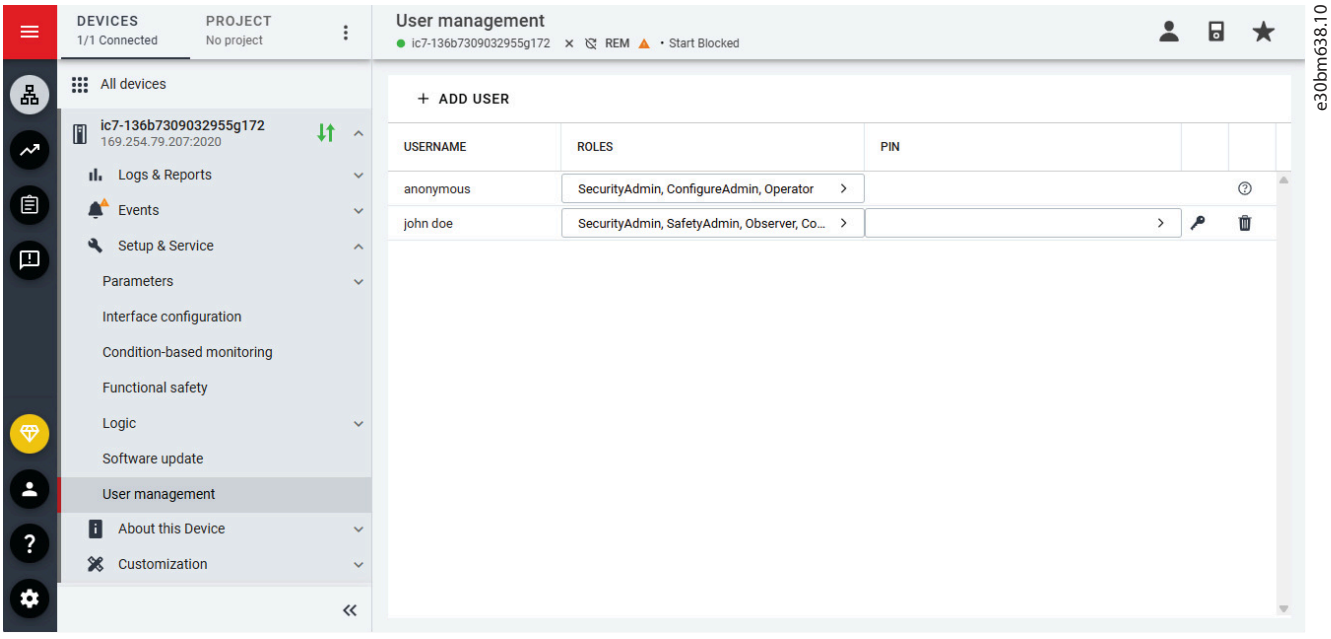



**Figure 4: Accessing User Management as Admin**

Changing the password does not close active connections, and is effective the next time a connection is established.

> IMPORTANT: When restoring factory settings, the preconfigured user accounts are reverted to original settings, and any additional users that have been added to the device during configuration are removed.

**Setting up a PIN code**

To facilitate logging in the drive from the control panel, it is possible to set up a PIN code to a user's account. The PIN code can only be used in the control panel.

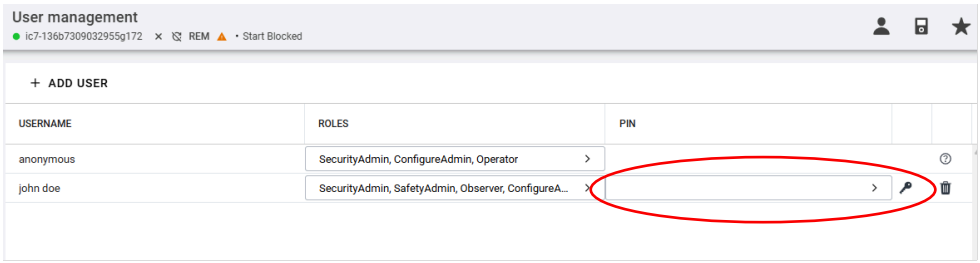



**Figure 5: PIN Code Field**

The PIN code must have 6 digits.

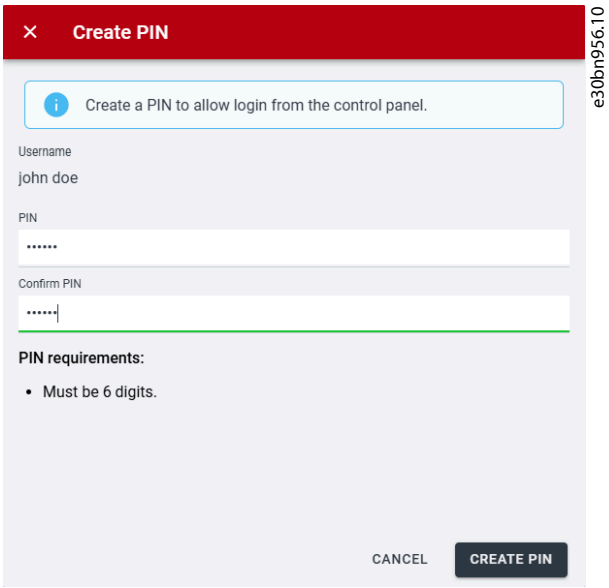



**Figure 6: Creating a PIN Code**

### 4.2.2.3 Modifying and Deleting Users

#### Modifying user roles

The role assignments of users can be modified at any time through the *User Management* interface in MyDrive Insight by a user with the Security Admin role.

#### Deleting users

Users can be deleted through the *User Management* interface in MyDrive Insight, by a user with the Security Admin role.

To delete a user, select the bin icon next to the user (see Figure 4).

### 4.2.2.4 Common User Management Scenarios

#### Initial setup or replacing the drive

The drive is in the default state (no users, Anonymous has ConfigureAdmin + SecurityAdmin)

1. Access MyDrive Insight without logging in.
2. Create the administrator user with Configuration Admin + SecurityAdmin roles.
3. Create additional users as needed with appropriate roles.
4. Remove roles from Anonymous to secure the drive.

### Firmware update of a drive with functional safety “STO, Not Upgradable” (+BEF1)

1. Log in as a user with the ConfigurationAdmin role.
2. Perform the firmware update through MyDrive Insight.

### Firmware update of a drive with upgradable functional safety (+BEF2)

These drives have the integrated Advanced Safety Unit and require configuration of safety parameters. The update must be done by a user with the SafetyAdmin role.

1. Ensure a user with the SafetyAdmin role exists.
2. Log in with that user.
3. Perform the firmware update.

### Read-only access for operators

Allow operators to view data but not modify anything.

1. Create operator user accounts.
2. Assign only the Observer role to these users.
3. Remove the Configuration Admin role from Anonymous.
4. Operators can now log in to view data without modification privileges.

# 5 User Interfaces

## 5.1 Overview of User Interfaces

To interact with a Danfoss iC7 Series drive, use either the control panel as a simple and direct interface, or the software tool MyDrive® Insight for more advanced interaction with the drive. The control panel can be mounted directly on the drive, or close to the drive by using a control panel mounting kit.

With MyDrive® Insight, the drive can be accessed from a remote place, if the infrastructure is in place and the network provides the required access rights.

## 5.2 Control Panel

### 5.2.1 iC7 Control Panel Options

The iC7 series offers a broad range of interfaces which suit different connectivity requirements to support wireless regulations.

The iC7 Series offers the following 2 different control panel options. Refer to the relevant design guide for information on which control panels are available to your product.

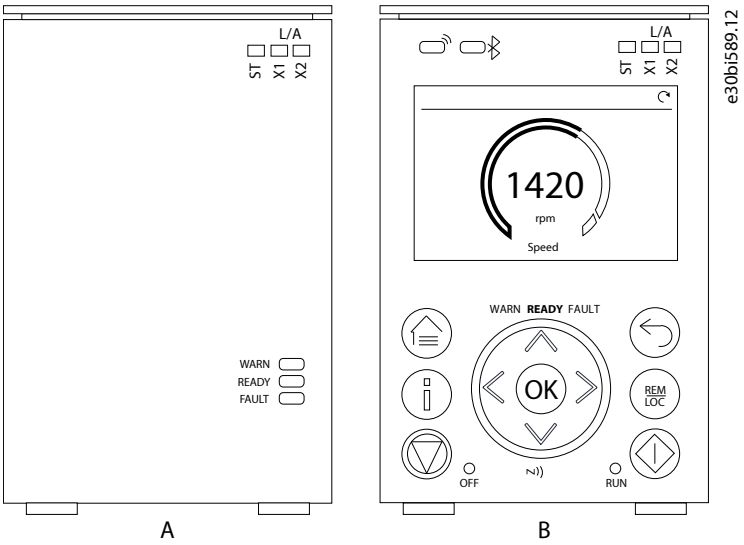



**Figure 7: Control Panel Options**

- **Blind Panel OPX00**: This panel shows the basic status of the drive and fieldbus indicators. The panel is typically used when only limited interaction with the drive is required after installation and commissioning, or when the drives are controlled by fieldbus.
- **Control Panel 2.8 OPX20**: This panel is the standard user interface, and used when frequent interaction with the drive is required. The panel enables easy setup of the drive via parameters, monitoring the drive status, and also shows event notifications.

Control Panel 2.8 0PX20 has the following features:

- 2.8" monochromatic user interface with a display resolution of 240 x 160 pixels.
- Visual LEDs to illustrate drive status and fieldbus communication.
- Halo indicator with 3 colors to illustrate drive status at a glance.
- A display which can be customized to show required or essential information.
- Buttons to control the drive locally, including a toggle button to easily switch between local and remote control.
- Parameter widgets which support alphanumeric and special characters, integers, floating points, date time formats, choice lists, and commands to configure application data.
- Help texts to support operation.

## 5.2.2 Control Panel Elements

The control panel provides an interface for configuring and controlling the converter easily. The section describes the elements for all control panel options.

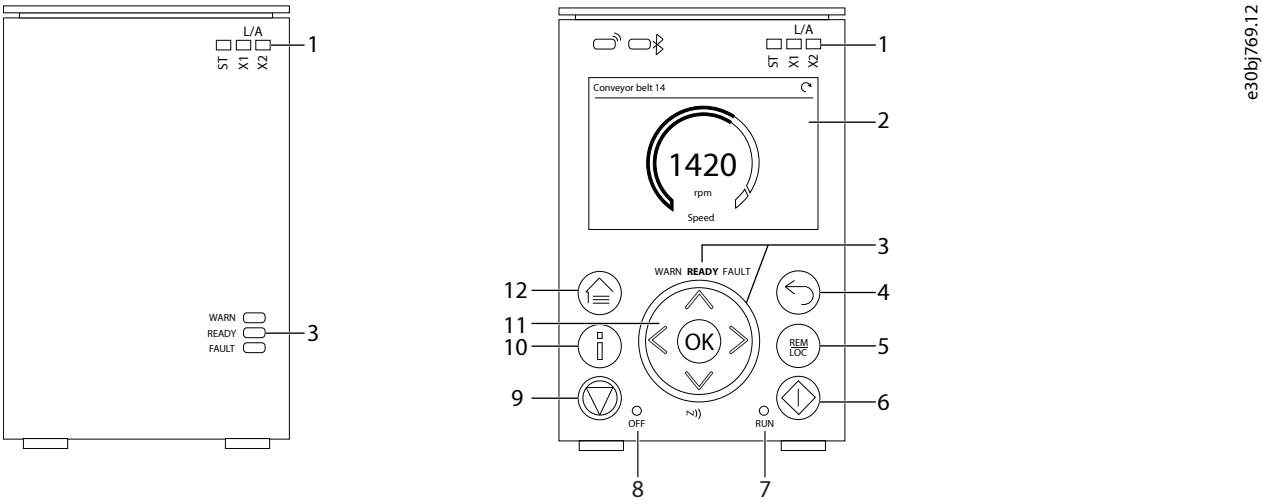



**Figure 8: Control Panel Elements**

The following table describes the control panel elements:

**Table 3: Control Panel Elements Description**

| Legend | Name of Element | Description |
|---|---|---|
| 1 | Fieldbus Indicators | The LEDs indicate the status of the communication interface X1 and X2.<br>• **[ST]**<br>◆ Green blinking LED indicates that the communication interfaces are in normal operating state.<br>◆ Red blinking LED indicates that an error has occurred and communication is not possible.<br>• **[X1]**<br>◆ Green blinking LED indicates data exchange on communication interface X1.<br>◆ Red blinking LED indicates an error during data exchange on communication interface X1.<br>• **[X2]**<br>◆ Green blinking LED indicates data exchange on communication interface X2.<br>◆ Red blinking LED indicates an error during data exchange on communication interface X2. |
| 2 | Display | Enables access to content and settings. The display provides detailed information about the status of the converter. |

**Table 3: Control Panel Elements Description** - (continued)

| Legend | Name of Element | Description |
|---|---|---|
| 3 | Converter Status Indicators | The LEDs indicate the status of the converter.<br>• **[WARN]**<br>◆ When this text is lit in yellow, it indicates a warning-level event.<br>• **[READY]**<br>◆ When this text is lit in white, it indicates that the converter is ready for operation.<br>◆ When this text is blinking white (1 Hz), it indicates that the converter is powered on but is not ready.<br>• **[FAULT]**<br>◆ When this text is lit in red, it indicates a fault.<br>The status of the converter is also indicated by the Halo, which has the same color indicators as the converter status texts on the control panel. |
| 4 | Back button | Navigates to the previously viewed screen or a menu level above the current menu. |
| 5 | REM/LOC | Toggles the converter between remote and local operation. |
| 6 | Run button | Starts the operation of the converter. |
| 7 | RUN LED | The indicator has the following states:<br>• **On**: Start command is applied and the converter is modulating.<br>• **Off**: The converter has stopped and the start command is not applied. |
| 8 | OFF LED | The indicator has the following states:<br>• **Steadily on**: The indicator is in this state because of either of the following 2 reasons:<br>◆ The converter is not modulating and is coasted.<br>◆ The stop signal is applied, output is active, and the converter is ramping down until coast or restart. Ramp times, protections, and stopping functions prolong this state.<br>• **Flashes for 3 s**: The start command is initiated, but the converter is not able to start.<br>• **Off**: The converter is in operation, a start signal is applied, and the output is active. This also includes ramping, running on reference, and AMA.<br>NOTE: When a fault has occurred in the converter, the LED is on though the start command is available. If there is a fault event, and the start command is disabled and reinitiated again, the Off LED blinks. |
| 9 | Stop button | Stops the operation of the converter. |
| 10 | Info button | Provides more detailed information about an event that has occurred in the converter. Pressing [*Info*] also shows a context sensitive help for parameters. |
| 11 | Arrow buttons and OK button | • **Arrow buttons**: Used to navigate within the different screens and menus.<br>• [*OK*]: Primarily used to confirm selections and data in the control panel display. |
| 12 | Home/Menu button | Toggles between Home screen and the current parameter menu to allow quick access to key status information during parameter setup. |

### 5.2.3 Logging In to the Control Panel

If a PIN code has been defined for a user account, the user can log in to the drive in the control panel with the PIN code.

1. Press the [*Home/Menu*] button to enter the main menu.

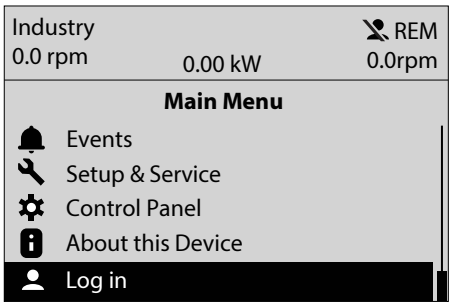



**Figure 9: Main Menu**

2. Navigate to *Log in* and press [*OK*].
3. Select the user account to log in.

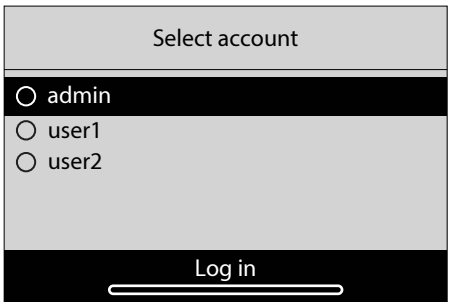



**Figure 10: Select the Account**

4. Enter the PIN code and press [*OK*].

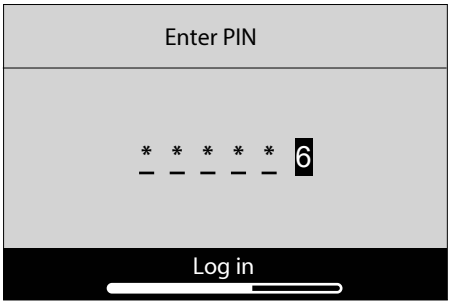



**Figure 11: Enter the PIN Code**

5. The drive confirms the successful login. Press [*OK*].

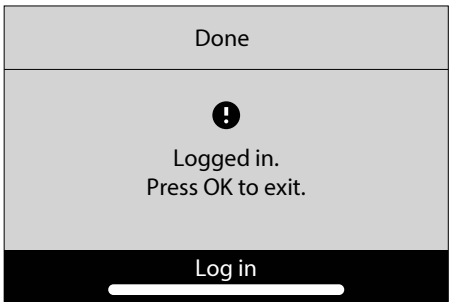



**Figure 12: Login Confirmation**

To maintain cybersecurity, log out after finishing work on the drive.

To log out:

1. In the main menu, navigate to *Log out* and press [*OK*].

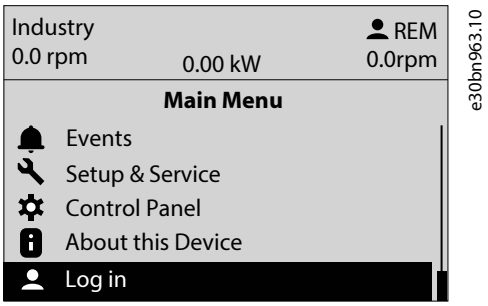



**Figure 13: Navigate to Log Out**

2. Select *Log out* and press [*OK*].

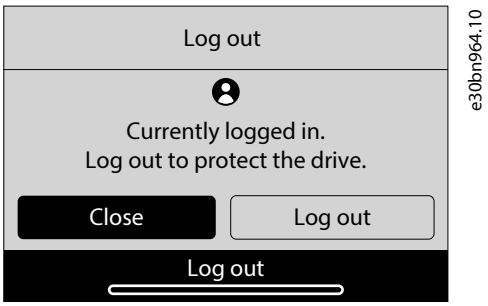



**Figure 14: Log Out**

## 5.2.4 Control Panel Basic Configurations

The basic configurations of the control panel include:

- A readout of the status of the motor and the drive, including warnings and faults.
- Navigable menus, where the parameter settings of the drive can be viewed and changed.

## 5.2.5 Starting the Drive and Control Panel Display

While the drive is powering up until it is ready to operate, the display of the control panel shows the iC7 logo.

NOTE: When the drive is started, it takes 25–30 s. for the drive to be in ready state and for the control panel display to change to the Status screen (default).

## 5.2.6 Understanding Status Screens

When the drive is in ready state, the control panel display shows the *Status* screen. The *Status* screen can be customized.

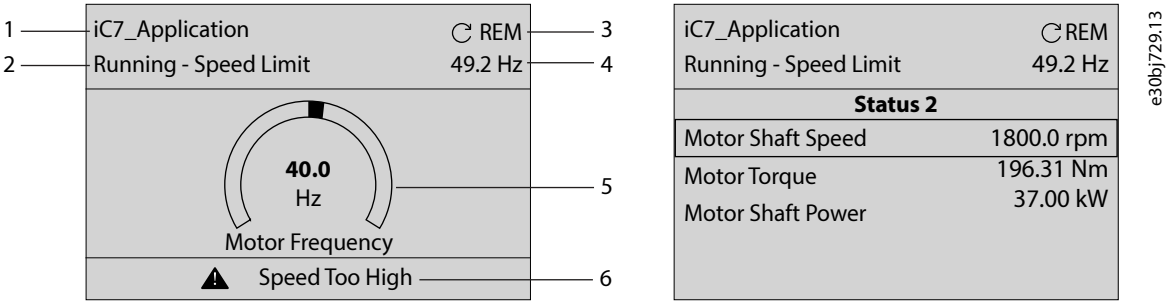



**Figure 15: Status Screen (Donut View vs. Line View)**

| | | | |
|---|---|---|---|
| 1 | The name of the drive, which can be changed with parameter ***8.7.1 Asset Name***. Shows the name of the application software by default. | 2 | The status of the drive (see the following table). |
| 3 | The current control of the drive. REM indicates remote control and LOC indicates local control. The arrow shows the direction of the motor. | 4 | Shows the value selected with parameter ***8.3.2.2 Status Line Right***. |
| 5 | The status signal value as a donut infographic view. It is possible to show only a single signal in a donut view. When more than 1 signal is configured, the screen changes to a line view. A minimum of 2 and a maximum of 5 signals are shown in the line view. | 6 | A warning pops up in the bottom of the screen when a warning event occurs, and disappears automatically when the triggering condition has been removed. |

To navigate between *Status Screen 1* and *Status Screen 2*, press the left and right arrows on the control panel.

The status line of the control panel shows the status of the drive. The status line texts are dynamically generated, based on the configuration of the system. The following are some examples of basic operation:

**Table 4: Drive Status Texts**

| Drive status in the panel | Description |
|---|---|
| Drive Ready | The drive is powered and ready to start. |
| Running at Reference | The drive is running at the selected reference. |
| Running at Standstill | The drive is running with 0 reference. |
| Stopping | The drive is running towards stop. |
| Stopped | The drive is stopped due to an active stop command. |
| Coasted | The drive is coasting due to an active coast command. |
| Quick Stop | The drive is stopped due to an active quick stop command. |
| Start Interlock | The drive is stopped while a start command is active. To restart after the block is removed, the start command must be removed and given again. |
| Start Blocked | The drive is in a state that is preventing start. All start commands are ignored. |
| Disabled Reference | The drive setpoint has been disabled with the PROFIdrive Control Word (see 9.1.2 Control Word). |
| Reversing | The drive is reversing due to an active reverse command. |
| Reversing at Reference | The drive is reversing at the selected reference. |
| Motor Disconnected | The drive has detected a disconnected motor (see parameter ***4.5.3 Disconnected Motor Response*** in 7.6.5 Group 4.5 Protection). |
| Fault ! | The drive has detected a fault. The fault condition is no longer present, and the fault can be reset. |
| Fault Active ! | The drive has detected an active fault. The fault cannot be reset while the fault condition remains present. |
| Protected Fault ! | The drive has detected a fault that requires human interaction. Resetting the fault requires a power cycle before the drive is operational again. |
| Fault ! Stopping | The drive has detected a fault and is running towards stop. |
| Fault ! Derating | The drive is derating its output to thermally protect the Advanced Harmonic Filter (see parameter ***3.4.3 Thermal Switch Response*** in 7.5.5 Group 3.4 Advanced Harmonic Filter). |
| Safe Torque Off (STO) | The drive is coasting due to an active STO command. |

**Table 4: Drive Status Texts** - (continued)

| Drive status in the panel | Description |
|---|---|
| Safe Stop (SS1/SS2) | The drive is stopping on a safe stop command. |
| Jogging | The drive is jogging. |
| Jogging at Standstill | The drive is jogging with 0 reference. |
| Jogging at Reference | The drive is jogging with the selected jogging reference. |
| Running Frozen Reference | The drive is running at frozen reference due to an active frozen reference command. |
| Stopping Frozen Reference | The drive is running towards stop due to an active stop command with a frozen reference command. |
| Running/Stopping/Jogging with:<br>• Power Limit<br>• Undervoltage Limit<br>• Overvoltage Limit<br>• Torque Limit<br>• Current Limit<br>• Speed Limit | The drive is running, stopping, or jogging, and has exceeded the limit that is shown. For example, *Running - Power Limit*.<br>Some possible limits are listed in the cell on the left. |
| AMA Ready | Advanced Motor Adaptation is activated and is waiting for the start command. |
| AMA in Progress | Advanced Motor Adaptation is running, measuring motor data. |
| AMA Finished | Advanced Motor Adaptation is finished. To restart the drive, remove and then reapply the start command. |
| Inertia Est. Ready | Inertia Estimation is activated and is waiting for the start command. |
| Inertia Est. in Progress | Inertia Estimation is running, measuring system inertia. |
| Inertia Est. Finished | Inertia Estimation is finished. To restart the drive, remove and them reapply the start command. |
| 24V Backup Mode | The drive is powered with the 24 V backup supply. The power unit of the drive is disabled. |
| Motor Feedback Test Ready | Motor Feedback Test is activated and is waiting for the start command. |
| Motor Feedback Test Running | Motor Feedback Test is running, checking feedback settings. |
| Auto Tuning in Progress | The Autotuning of the Process Controller is running, measuring the plant characteristics. |

## 5.2.7 Adjusting Display Backlight and Contrast

When in *Status Screen 1* or *Status Screen 2*, it is possible to adjust the backlight intensity and contrast of the display.

To adjust the display backlight and contrast settings, press the [*Info*] button and any of the arrow buttons of the control panel. The settings are shown on the screen:

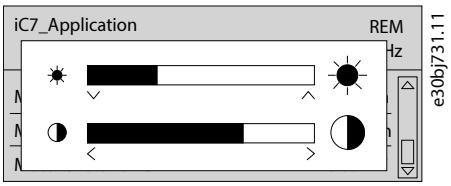



**Figure 16: Intensity Change in Backlight and Contrast**

- To change the intensity of the backlight, keep pressing the [*Info*] button along with either the up or down arrow buttons of the control panel.
- To change the contrast, keep pressing the [*Info*] button along with either the left or right arrow buttons of the control panel.

## 5.2.8 Changing the Content of the Status Screens

The content of the status screens can be changed with parameters in the parameter groups ***8.3.3 Status Screen 1*** and ***8.3.4 Status Screen 2***. Up to 5 status signals can be selected for each screen. By default, *Status Screen 1* shows the actual value of the selected control mode, for example, speed, and *Status Screen 2* shows 3 signals:

- Motor shaft speed
- Motor torque
- Motor shaft power

If the screen shows only 1 signal, it is shown as a donut graph. If the screen shows more than 1 signal, they are shown as a list.

## 5.2.9 Main Menu and Overall Navigation

Pressing the [*Home/Menu*] button toggles between the status screens and the main menu screen.

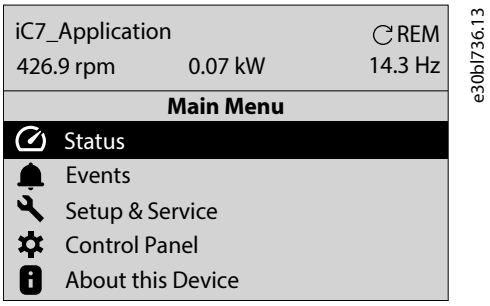



**Figure 17: Main Menu Screen**

### Basic navigation techniques

To navigate through and within the main menu, use the navigation buttons of the control panel.

- To navigate to different entries of the menu, press the up or down arrows of the control panel.
- To navigate to a lower level in the menu press the [*OK*] button, and to navigate to a higher level press the [*Back*] button.

### Contents of the menu

The main menu has 4 selections

**Table 5: Main Menu Contents**

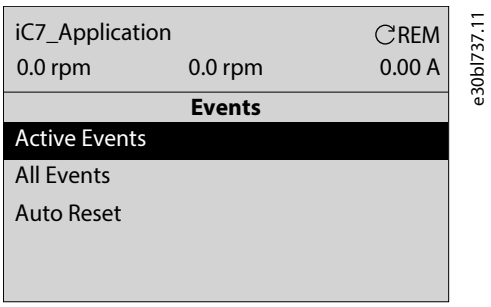
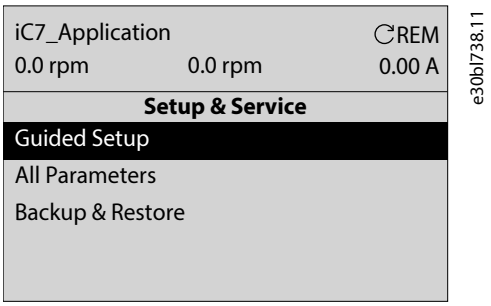
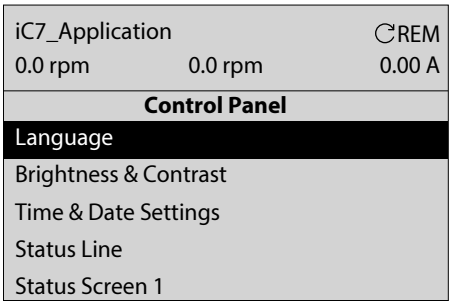
| Selection | Function | |
|---|---|---|
| Status | Returns to *Status Screen 1* | |
| Events | Access event-related content.<br>  <br><br>**Figure 18: Events Screen** | |
| | Active Events | View active events and reset them. |
| | All Events | View all events, including the history of events. |
| | Auto Reset | Configure the automatic reset behavior (see parameter group ***6.4.4 Auto Reset***). |
| Setup & Service | Access parameters, backup and restore, and the motor setup wizard.<br>Setup and Service Screen<br>  <br> | |
| | Guided Setup | Perform a guided setup of the drive. |
| | Smart Setups | Access the Smart Setups of the drive (see ). |
| | All Parameters | Access all the parameters of the drive. |
| | Backup & Restore | Back up the system or restore a previous backup (see 5.2.14.1 Making a System Backup Using the Control Panel, 5.2.14.2 Restoring the System Configuration Using the Control Panel, and 5.2.14.3 Managing Backups with the Control Panel). |

**Table 5: Main Menu Contents** - (continued)

| Selection | Function | |
|---|---|---|
| Control Panel |  | |
| | **Figure 19: Control Panel Screen** | |
| | Language | Select the language of the control panel |
| | Brightness & Contrast | Configure the brightness and contrast settings of the control panel screen. |
| | Time & Date Settings | Configure the time zone and the format in which the time and date are shown. |
| | Status Line | Configure the 3 status values on the status line. |
| | Status Screen 1 | Configure status screen 1 with up to 5 status values. |
| | Status Screen 2 | Configure status screen 2 with up to 5 status values. |
| | NOTE: These settings are also accessible through parameter group ***8.3 Control Panel***. | |
| About this Device | View the device information, including the control panel software version. | |

## 5.2.10 Changing the Selections of a Parameter

When a parameter has selections, the parameter index and name are highlighted in black. The example parameter in this procedure is ***P 5.8.6.2.1 Ramp 1 Type***.

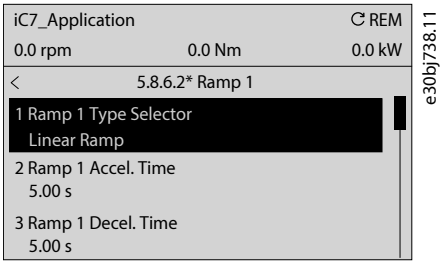



**Figure 20: A Parameter with Selections**

1. Press the [*Home/Menu*] button to enter the main menu.
2. Navigate to *Setup & Service* and press [*OK*].
3. Navigate to *All Parameters* and press [*OK*].
4. To view the selections of a parameter, navigate to the parameter in the parameter structure and press [*OK*] on the control panel. The selections available for the parameter are shown on the screen.

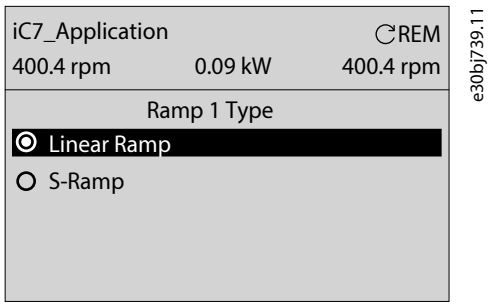



**Figure 21: The Selections of a Parameter**

5. To browse through the selections, press the up or down arrow buttons.
6. To select a selection, press [*OK*].

## 5.2.11 Changing a Parameter Value

The example parameter in this procedure is ***P 5.8.6.2.2 Ramp 1 Accel. Time***.

1. Press the [*Home/Menu*] button to enter the main menu.
2. Navigate to *Setup & Service* and press [*OK*].
3. Navigate to *All Parameters* and press [*OK*].
4. Navigate to parameter ***5.8.6.2.2 Ramp 1 Accel. Time*** and press [*OK*].

   The range of the parameter (minimum to maximum values) is shown at the bottom of the control panel display.
5. To go to the values before or after the decimals, use the left and right arrow buttons. A black highlight on the digit indicates the location where the cursor is active.
6. To increase or decrease the value, press the up and down arrow buttons.
7. Confirm the changes by pressing [*OK*].

   The following illustration shows the process of changing the value of the parameter.

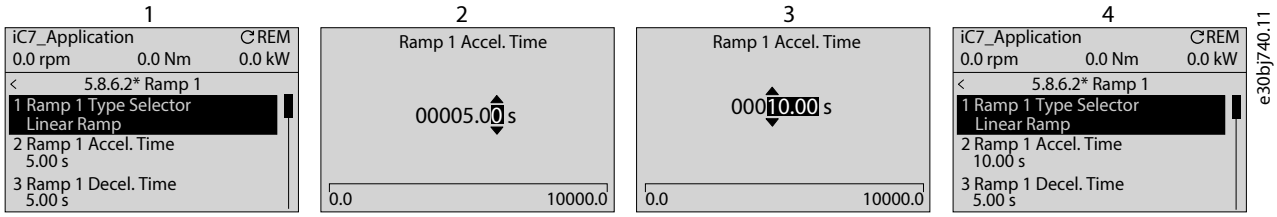



**Figure 22: Changing the Value of a Parameter**

## 5.2.12 Locking the Control Panel Display

To avoid unintended interaction via the control panel, the control panel display can be locked.

To lock the control panel, press the *[Back]* button for 3 s. After 3 s, the following screen is shown.

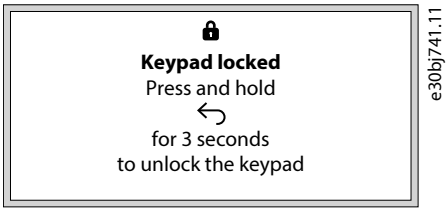



**Figure 23: Control Panel Lock Screen**

When the control panel is locked, pressing the control panel buttons has no effect.

To unlock the control panel, press the *[Back]* button for 3 s.

### 5.2.13 Control Panel Shortcuts

The following table lists the navigation shortcuts in the control panel.

**Table 6: Control Panel Shortcuts**

| Action | Precondition | Buttons | Activation time |
|---|---|---|---|
| Fast scroll | When in a menu or list of choices | Up and down arrows | 1 s to activate |
| Keypad lock | | [*Back*] | 3 s to activate or deactivate |
| Reference set point editing | • *Home* screen is active<br>• LOC mode is active<br>• Control is allowed | [*OK*] | Single press |
| Adjusting screen contrast and brightness | *Home* screen is active | [*Info*] + arrows | Continuous simultaneous press |
| Change the language of the control panel | *Home* screen is active | [*Info*]+[*Back*] | Single press |

### 5.2.14 Backup and Restore

#### 5.2.14.1 Making a System Backup Using the Control Panel

Back up the current system configuration using the control panel

1. Press the [*Home/Menu*] button to enter the main menu.
2. Navigate to *Setup & Service* > *Backup & Restore*.
3. Select *Backup*.

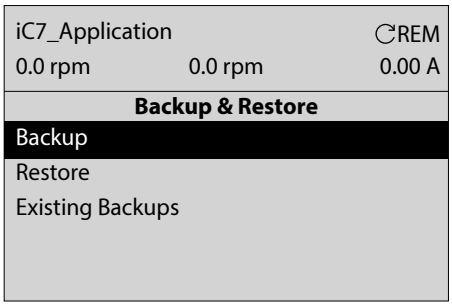



**Figure 24: Backup and Restore Menu**

The backup wizard starts.

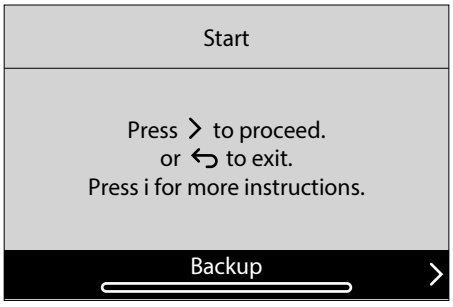



**Figure 25: Start Backup**

4. Press the right arrow button to start the backup process.
5. Select the storage place for the backup file.

The available backup destinations depend on the hardware configuration.

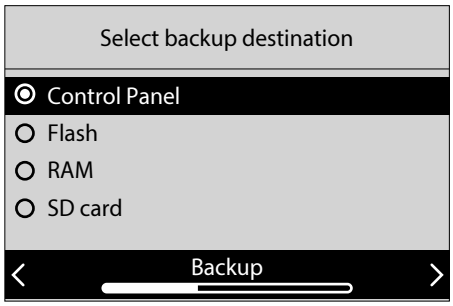



**Figure 26: Select Backup Destination**

NOTE: The selections depend on the hardware configuration.

NOTE: Storing a backup in RAM is intended for temporary use only.

6. Press the right arrow button and wait until the operation is completed.

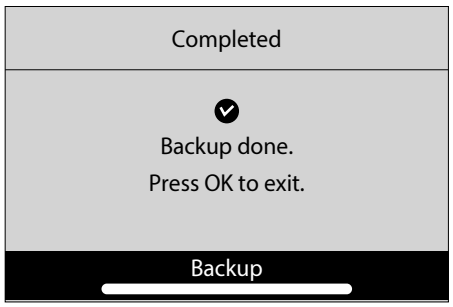



**Figure 27: Backup Completed**

7. To exit press [*OK*].

### 5.2.14.2 Restoring the System Configuration Using the Control Panel

Restore the system configuration from a backup file or to default factory settings using the control panel

1. Press the [*Home/Menu*] button to enter the main menu.
2. Navigate to *Setup & Service* > *Backup & Restore*.
3. Select *Restore*.

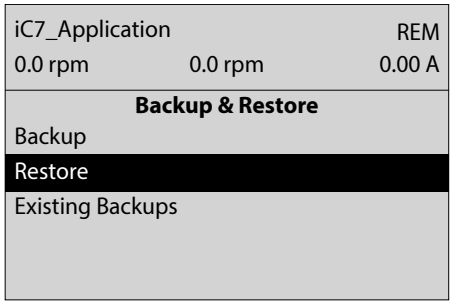



**Figure 28: Backup and Restore Menu**

The backup wizard starts.

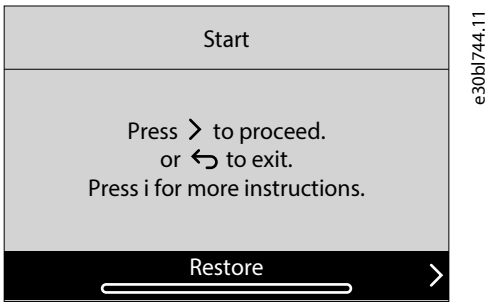



**Figure 29: Start Restore**

4. Press the right arrow button to start the restore process.
5. Select whether to restore the system configuration from a backup file or to return the system to default factory settings.


**Figure 30: Select Restore Type**

6. If *Restore from backup* is selected, select the backup file to restore.


**Figure 31: Select File**

7. If *Restore from backup* is selected, select the content to restore, and the details of the parameter settings to restore.

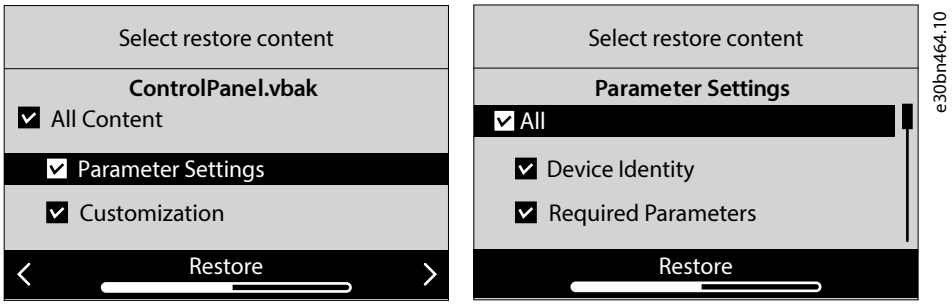



**Figure 32: Select Content and Parameter Details to Restore**

The *Parameter Settings* menu contains the following selections:

- Device Identity
- Required Parameters (cannot be deselected)
- Port X0 Interface

- Port X1/X2 Interface
- Power and Motor Dependent Parameters

For a full list of all the parameters contained in the selections, see 5.3.3.4 Parameter Restore Selections.

8. Press [*OK*] to acknowledge that the current settings will be overridden, and wait until the operation is completed.


**Figure 33: Confirm the Restore Operation**


**Figure 34: Backup Completed**

9. To exit press [*OK*].

### 5.2.14.3 Managing Backups with the Control Panel

In the *Existing Backups* view you can delete or restore a backup that exists on the drive.

1. Press the *[Home/Menu]* button to enter the main menu.
2. Navigate to *Setup & Service* > *Backup & Restore*.
3. Select *Existing Backups*.

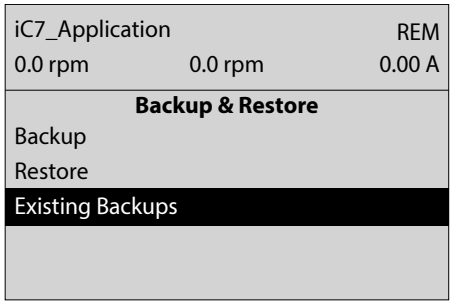



**Figure 35: Backup and Restore Menu**

4. Select a backup from the list.

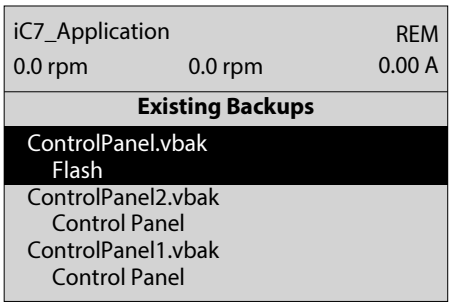



**Figure 36: Existing Backups List**

5. Select to either *Delete* the backup or *Restore* it.

   This view also shows details about the selected backup.

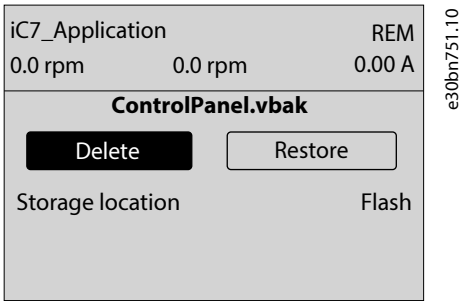



**Figure 37: Backup Details**

## 5.3 MyDrive® Insight

### 5.3.1 Introduction to MyDrive® Insight

MyDrive® Insight is a platform-independent software tool that supports the commissioning, engineering, and monitoring of the iC7 series. Some of the key features include:

- Fast and easy configuration and commissioning
- Monitoring the drives as part of daily operations
- Collecting data and information for troubleshooting, maintenance, and service
- Discovering and accessing multiple drives in a network
- Intuitive user interface with notifications and visualizations on real-time converter information and events
- PC control to perform operations such as starting or stopping the drive, set references, set direction, reset, and coast of the drive
- Performing updates on single or multiple drives
- Backing up and restoring parameter settings
- Data logging and analyzing for troubleshooting

NOTE: The section MyDrive® Insight in the application guide covers basic information for getting started with MyDrive® Insight. For more comprehensive user instructions, see *MyDrive® Insight Application Guide*.

### 5.3.2 Getting Started with MyDrive® Insight

As a prerequisite, ensure that MyDrive® Insight is installed on the device (PC or laptop). MyDrive® Insight can be downloaded and installed from MyDrive® Suite, available here: https://suite.mydrive.danfoss.com/

1. To establish a point-to-point connection between the drive and the device, use the communication interface X0 and the RJ45 Ethernet port on the device by using a standard Ethernet cable.

If the device does not have an RJ45 Ethernet port or it is already in use, a conventional adapter from USB to RJ45 can be used. To connect several drives at the same time, use an Ethernet switch between the PC and the control unit.

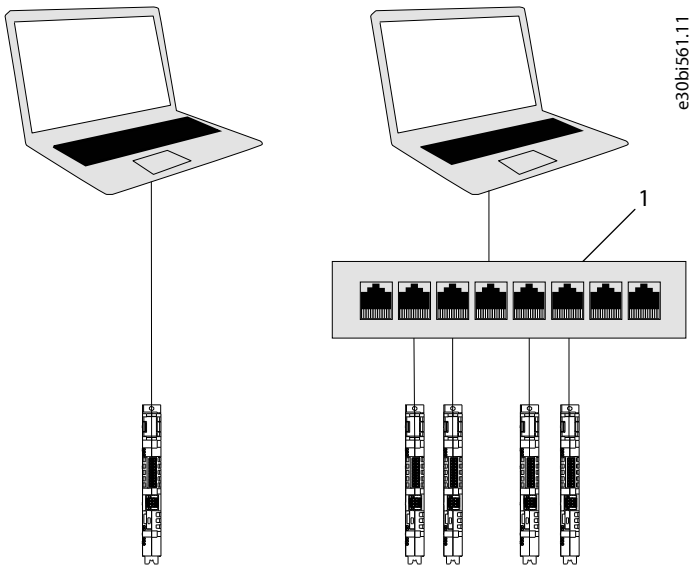



**Figure 38: Connection to the PC**

| | |
|---|---|
| 1 | Ethernet switch |

2. When the drive is powered up and in *Ready* state, open MyDrive® Insight on the device and the drive is recognized.
3. To establish or confirm the connection, click the arrow button.

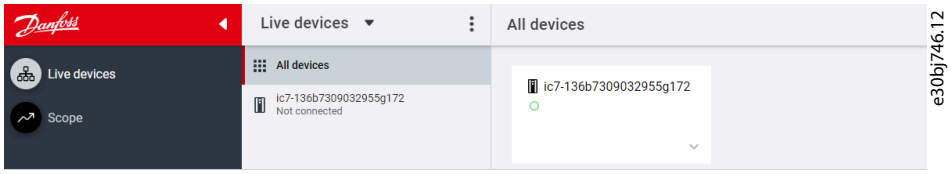



**Figure 39: Confirm Connection**

Once the connection is established, the drive is marked with a green connection symbol in MyDrive® Insight.

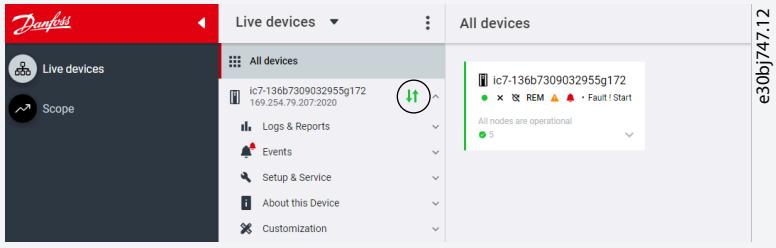



**Figure 40: Connection Established**

4. To interact with the drive, navigate to the required screen in MyDrive® Insight. The example picture shows the *Device Info* screen.

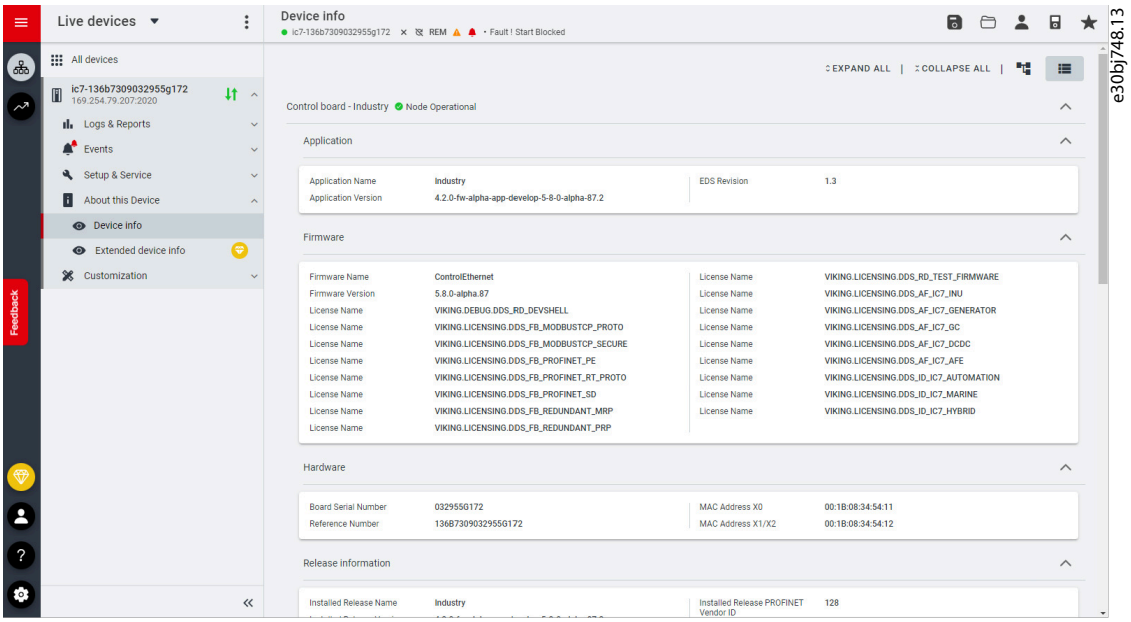



**Figure 41: Device Info**

NOTE: For more comprehensive MyDrive® Insight user instructions, see *MyDrive® Insight Application Guide*.

## 5.3.3 Backup and Restore

### 5.3.3.1 MyDrive® Insight Backup

The Backup feature in MyDrive® Insight allows storing the parameter settings of the drive into a MyDrive® Insight project file or into storage on the drive (control panel, control card Flash memory, or an optional microSD card).

To use the microSD card as a storage device, the microSD card must be inserted in the slot on the interface module located behind the control panel, as shown in the following illustration.

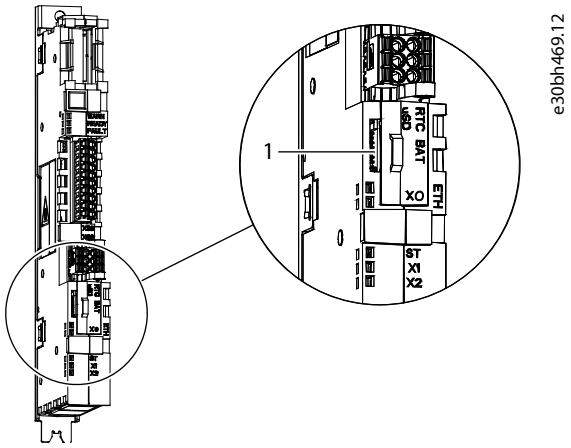



**Figure 42: MicroSD Card Slot**

| | |
|---|---|
| 1 | The microSD card slot |

The following are the types of microSD card supported by the interface module. The card must be formatted for the file system FAT32.

- Secure Digital (SD) card
- Secure Digital High Capacity (SDHC)
- Secure Digital Extended Capacity (SDXC)

NOTE: SDHC cards are recommended as they are delivered preformatted to FAT32.

### 5.3.3.2 Backing up the Drive

1. To back up a drive, select the drive and navegate to *Setup & Service* > *Parameters* > *Live*.
2. Click the *Create Backup* icon shown in the following figure.

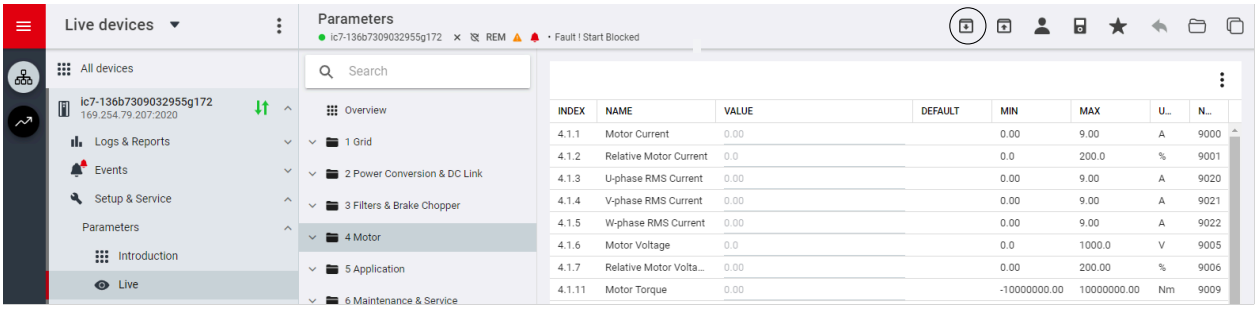



**Figure 43: Create Backup icon**

A screen to select the backup destination opens. The destinations for creting a backup file are:

- **Project:** Back up into an existing project or a new project.
- **Device file system:** Create a backup to 1 of the available memory devices of the drive.

3. Click *Next*.
4. This step depends on the backup destination selection:
   a. If *Project* was selected, give the backup file a name and description.
   b. If *Device file system* was selected, select where to save the backup. The selections are control panel, flash, RAM, or an (optional) microSD card. It is possible to specify a name for the backup file as well.
5. Click *Backup*.

Once backup is completed, a notification screen about it appears. If a *Project* backup was created, the backup is shown in the project menu under *Parameters*.

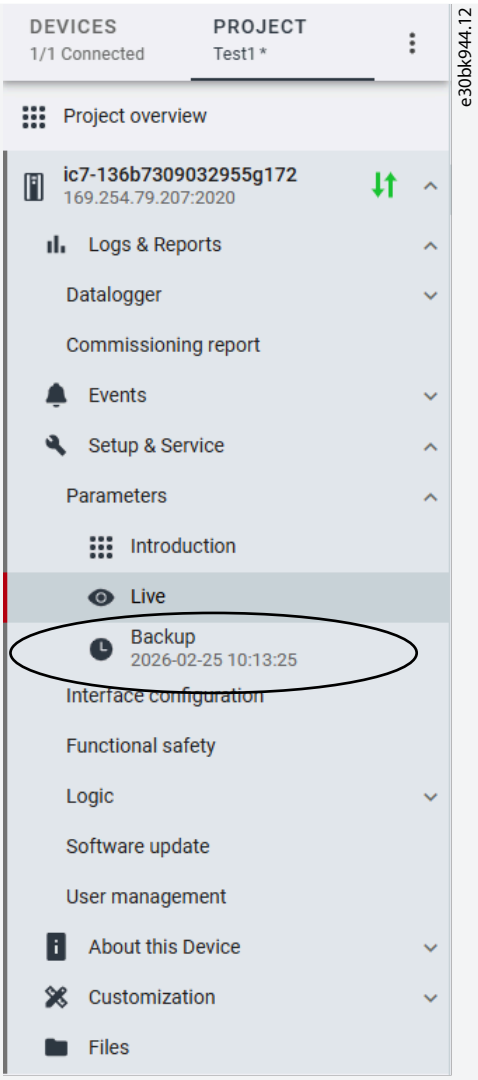



**Figure 44: Backup File in the Menu**

### 5.3.3.3 Restoring the Backup to the Drive

1. To restore backed-up data to a drive, select the drive and navigate to *Setup & Service* > *Parameters* > *Live*.
2. Click the *Restore* icon shown in the following image.

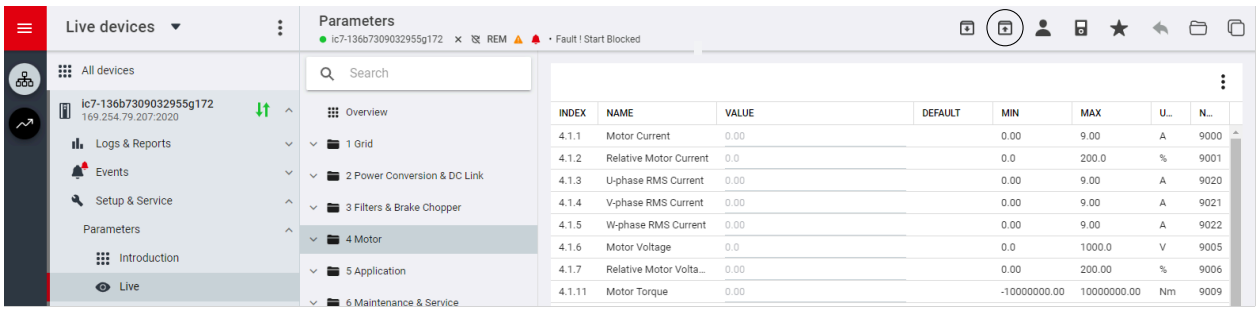



**Figure 45: Restore Data Icon**

3. Select the source of the backup which is to be restored to the drive.

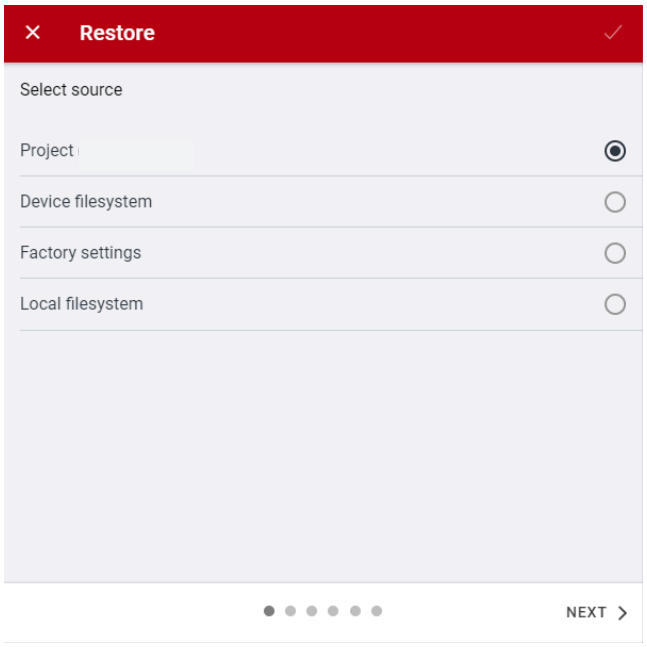



**Figure 46: Source of Backup to Restore**

4. If *Project* is the restore source, select the backup source device and view the available backup files.

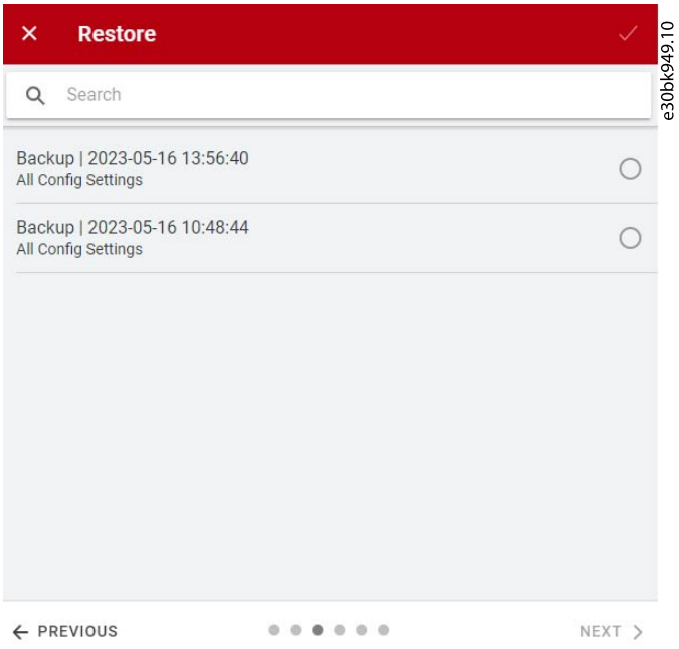



**Figure 47: Select the Backup**

5. Select the correct backup to restore.
6. The system shows a summary of the project to be restored and the device it will be restored to. Click *Compare* to compare contents of the backup to the current data on the target device.

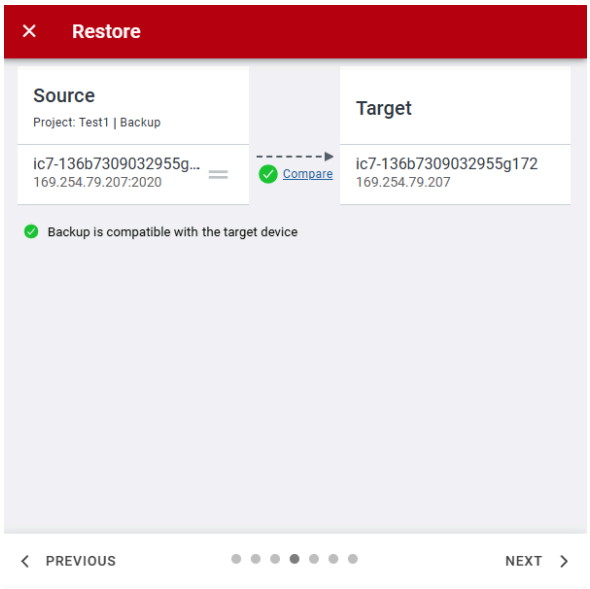



**Figure 48: Restore summary**

Click *Next* to proceed.

7. Restoring drive settings from a back up can be complete or partial. Select the files for restoring data into the drive, as shown in the following image, and click *Next*.

NOTE: To restore functional safety related values, log in as a Safety Admin user.

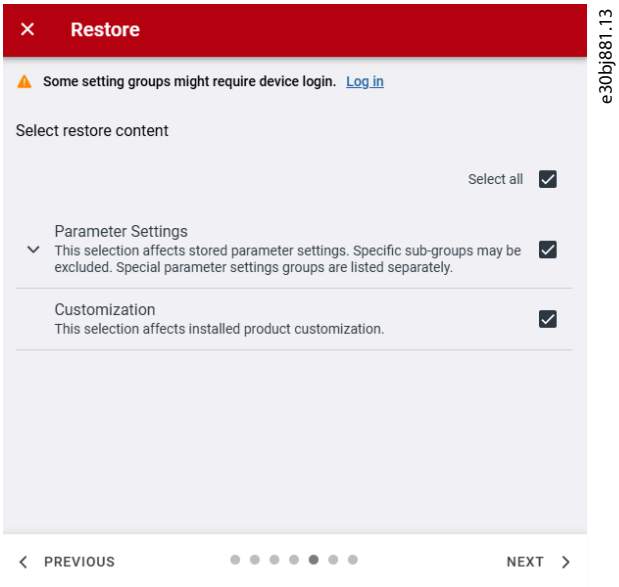



**Figure 49: Restore Data**

It is possible to restore customizations, such as Modbus interface mappings and customized event texts.

Required parameters must be restored, but the other groups of parameters can be deselected. For a full list of all the parameters contained in the selections, see 5.3.3.4 Parameter Restore Selections.

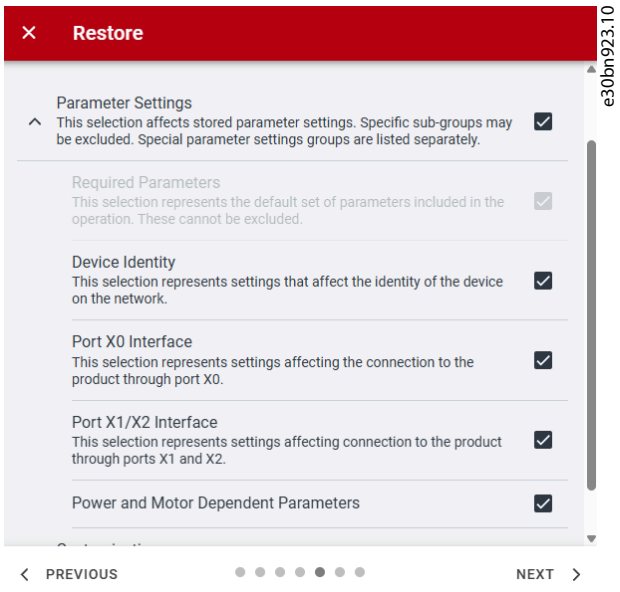



**Figure 50: Parameter Restore Selection**

8. To confirm the restore action, click *Restore*.

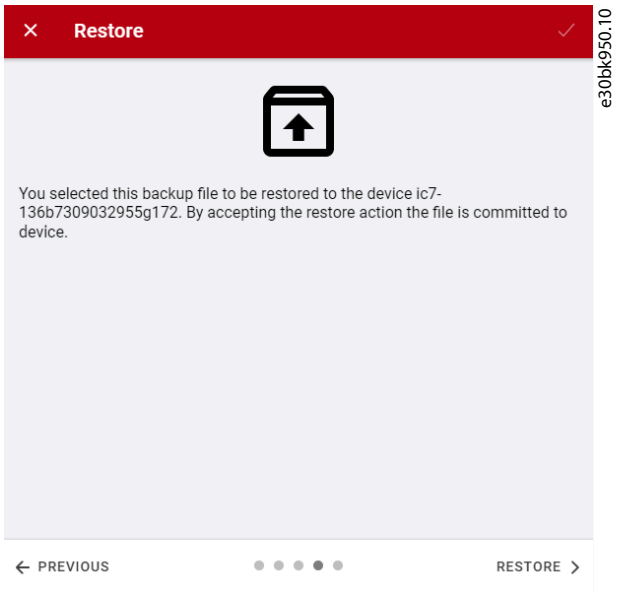



**Figure 51: Confirm the Restore**

After the data restore is successful, the system shows a summary of the results. The restore operation can be successful even if all the data was not restored.

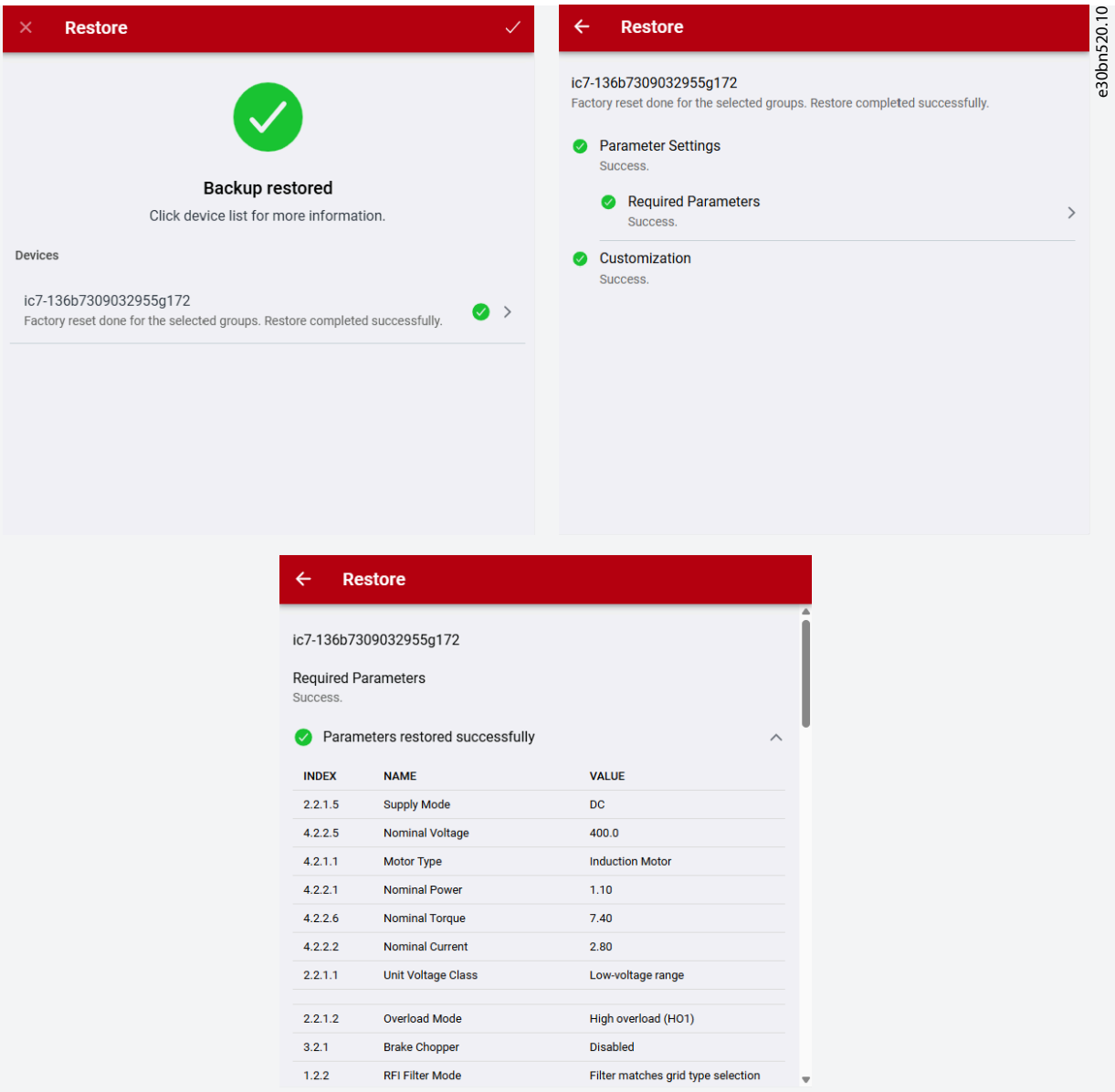



**Figure 52: Data Restore Results**

### 5.3.3.4 Parameter Restore Selections

It is possible to exclude restoring various parameters when restoring data to the drive. Here is a list of parameter restore selections and all the affected parameter groups and individual parameters:

#### Required Parameters

Cannot be deselected. This selection covers all writable parameters not mentioned in the following sections.

#### Drive Identity

***10.2.1.1 Fully Qualified Domain Name***

**Table 7: Drive Identity Parameter**

| Parameter index | Parameter name | Parameter number |
|---|---|---|
| 10.2.1.1 | Fully Qualified Domain Name | 7036 |

#### Port X0 Interface

**Table 8: Port X0 Interface Parameters**

| Parameter index | Parameter name | Parameter number | Parameter index | Parameter name | Parameter number |
|---|---|---|---|---|---|
| 10.2.4.2.5 | Link Configuration X0 | 7047 | 10.2.4.2.6 | Enable Ethernet Port X0 | 7053 |

All X0 IPv4 Settings except the MAC address:

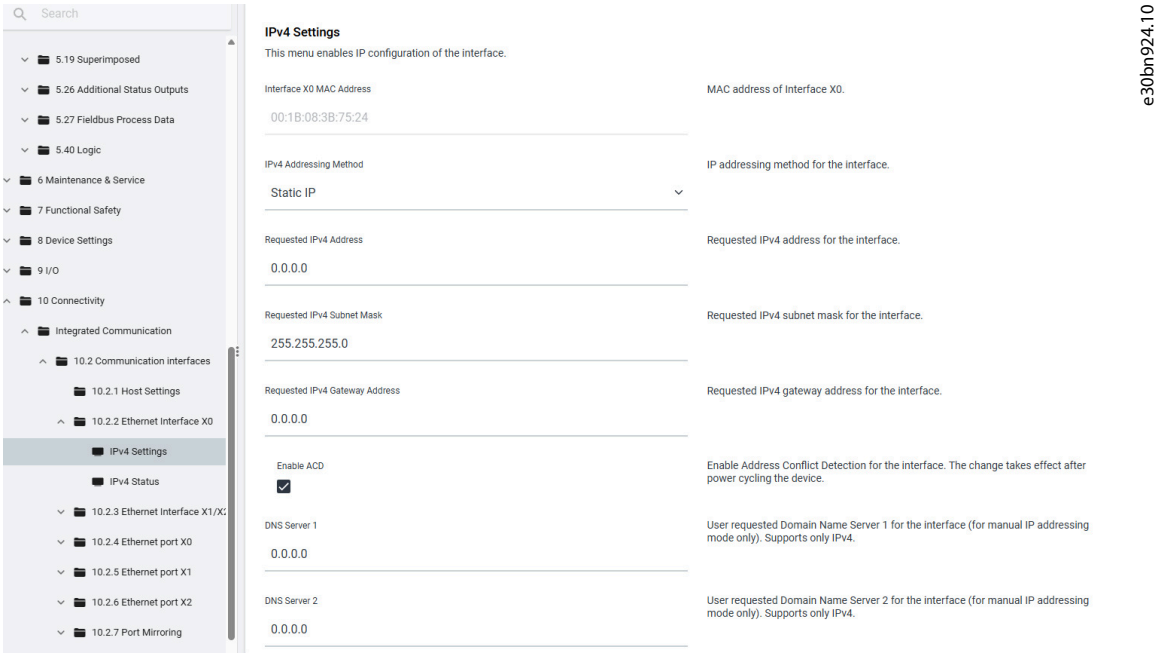



**Figure 53: X0 IPv4 Settings**

## Port X1/X2 Interface

**Table 9: Port X1/X2 Interface Parameters**

| Parameter index | Parameter name | Parameter number | Parameter index | Parameter name | Parameter number |
|---|---|---|---|---|---|
| 10.2.5.2.5 | Link Configuration X1 | 7048 | 10.2.5.2.6 | Enable Ethernet Port X1 | 7054 |
| 10.2.6.2.5 | Link ConfigurationX2 | 7049 | 10.2.6.2.6 | Enable Ethernet Port X2 | 7055 |

All X1/X2 IPv4 Settings except the MAC address:

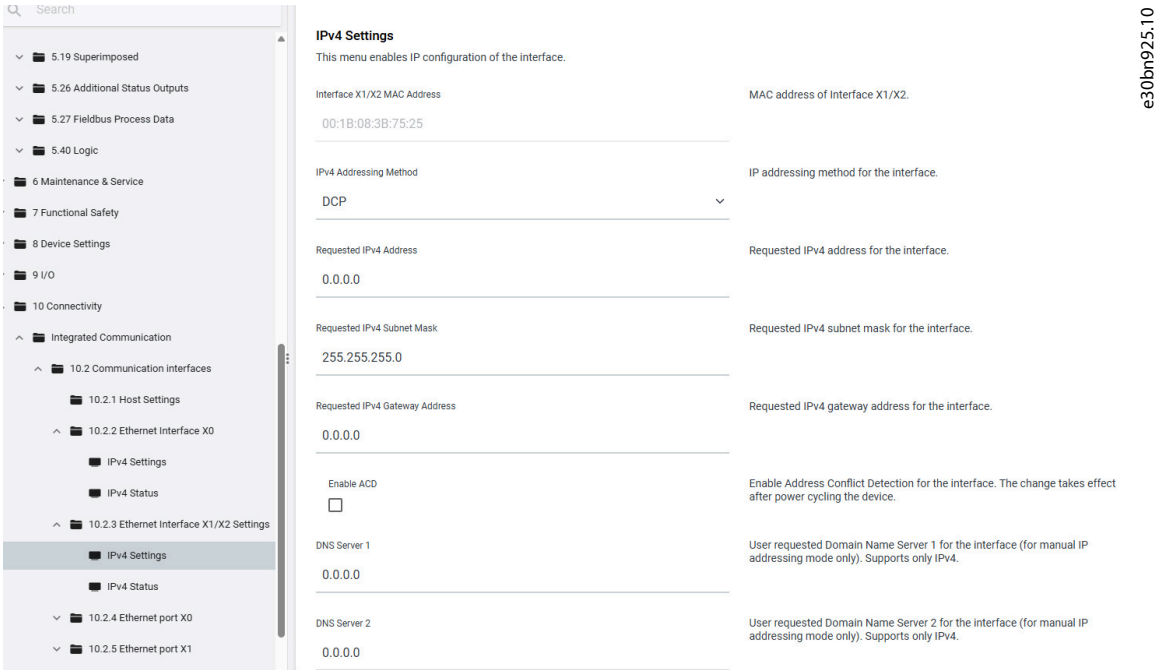



**Figure 54: X1/X2 IPv4 Settings**

## Power and Motor Dependent Parameters

**Table 10: Power and Motor Dependent Parameters**

| Parameter index | Parameter name | Parameter number | Parameter index | Parameter name | Parameter number |
|---|---|---|---|---|---|
| G3.5 | Output Filter | 5501, 5502, 5503, 5499 | 4.3.3.7 | I/f Control Speed Threshold | 2818 |
| G4.2 | Motor Data | 407, 406, 432, 425, 431, 405, 400, 402, 403, 401, 9951, 408, 409, 413, 440, 441, 442, 415, 417, 418, 426, 427, 422, 424 | 4.3.3.8 | I/f Control Slip Compensation | 2885 |
| G4.3.1 | Motor Control General Settings | 2503, 2930, 2502, 421, 5433, 4620 | 4.5.12 | Demagnetization Protection | 2368 |
| G4.3.2 | U/f Settings | 2600, 2601, 2602, 2603, 2604, 2605, 2610, 2611, 2612, 2613, 2614, 2615 | 5.3.3.3 | AEO Minimum Magnetization | 2811 |
| G4.3.4 | VVC+ & U/f Settings | 2804, 2820, 2844, 2845, 3193, 3194, 2805, 2803, 2802, 2806, 2807, 2808, 2819 | 5.6.3.1 | Sync. Motor Start Mode | 2322 |
| G5.3.2 | Inertia | 668, 669, 667 | 5.7.2.3 | DC-brake Speed | 2268 |
| G5.8.2 | Speed Controller | 5005, 4020, 4021, 4022, 4039, 4080, 4081, 4549, 4079, 5434, 5020, 4070, 4071, 4072, 4073, 4074, 4075, 4077, 4078 | 5.8.1.11 | Control Panel Speed Reference | 6153 |

**Table 10: Power and Motor Dependent Parameters** - (continued)

| Parameter index | Parameter name | Parameter number | Parameter index | Parameter name | Parameter number |
|---|---|---|---|---|---|
| G5.8.8 | Speed Bypass | 4520, 4521, 4522, 4523, 4524, 4525, 4526, 4527 | 5.8.3.1 | Positive Speed Limit | 1729 |
| 2.1.1 | Unit Nominal Voltage | 2830 | 5.8.3.2 | Negative Speed Limit | 1728 |
| 2.1.2 | Unit Nominal Current | 2831 | 5.8.3.3 | Minimum Speed Limit | 1722 |
| 2.2.1.1 | Unit Voltage Class | 2832 | 5.8.3.4 | High Speed Warning | 1200 |
| 2.2.1.2 | Overload Mode | 2833 | 5.8.3.9 | Low Speed Monitor Limit | 1205 |
| 2.3.1.2 | Smart Derate Mode | 2345 | 5.8.4.3 | Speed Reference 1 Max. | 1724 |
| 2.3.2.5 | Overvoltage Control Upper limit | 1816 | 5.8.4.4 | Speed Reference 1 Min. | 1725 |
| 2.3.3.5 | Undervoltage Control Kp | 1806 | 5.8.4.5 | Speed Reference 2 Max. | 1726 |
| 2.3.3.6 | Undervoltage Control Ti | 1807 | 5.8.4.6 | Speed Reference 2 Min. | 1727 |
| 2.3.3.8 | Undervoltage Control Activation Level | 1817 | 5.8.7.1 | Speed Feedback Filter Tc | 4544 |
| 2.4.1 | Max. Switching Frequency | 2924 | 5.8.7.2 | Estimated Speed Filter Tc | 4545 |
| 2.4.2 | Min. Switching Frequency | 2925 | 5.8.9.16 | Enhanced Lower Transition Speed | 676 |
| 2.4.3 | Switching Frequency | 2920 | 5.8.9.17 | Enhanced Higher Transition Speed | 677 |
| 2.4.4 | Control Frequency Request | 2921 | 5.9.2.26 | Speed Limit Setpoint | 1336 |
| 3.2.1 | Brake Chopper | 2935 | 5.9.3.3 | Torque Reference 1 Max. | 4530 |
| 3.3.2 | Brake Resistor Resistance | 2936 | 5.9.3.4 | Torque Reference 1 Min. | 4531 |
| 3.3.3 | Brake Resistor Power Limit | 2937 | 5.9.3.5 | Torque Reference 2 Max. | 4532 |
| 4.3.3.11 | Minimum Current Speed Threshold | 2838 | 5.9.3.6 | Torque Reference 2 Min. | 4533 |

## 5.4 Using the Logic Feature in MyDrive® Insight

### Introduction to Logic

Logic is a versatile feature that allows customization and control of the operation of the drive without the need for a separate programming tool or language. With Logic, the operation of the drive can be customized using a limited number of programmable function blocks and a limited number of states.

Logic in MyDrive® Insight extends the features of the drive and provides increased flexibility. Logic enables applying conditional controls, implementing fault detection and diagnostics, creating sequencing, modes, states, and interlocking logic.

Each function block has 3 inputs and 1 output, the functionality of these blocks can be selected from a comprehensive list. These function blocks are executed sequentially on every application cycle.

Any monitoring value or parameter can be connected to the block inputs. The output signal of each programmable function block can be used as an input to another function block or to control the digital or analog outputs of the drive. Moreover, the value of most parameters can be freely set with Logic. The drive can be directly controlled by the function block outputs through setting references and control signals.

Function blocks can initiate state changes; after entering a state, a user-defined list of actions (similar to function block outputs but with fixed values) executes. This allows flexible drive reconfiguration based on the selected state. Function blocks can be assigned to operate within specific states only.

Logic can be easily configured using the graphical configuration tool integrated into MyDrive® Insight.

### Why use Logic?

Logic can be used for a wide range of applications and purposes, providing enhanced flexibility and customization options. Here are some common use cases for Logic:

- Conditional Controls: Logic allows for the implementation of conditional controls based on various inputs or parameters. Logic can adjust system behavior based on specific conditions, such as drive run-time, external events, or other defined criteria.
- Fault Detection and Diagnostics: Logic can be used to implement fault detection and diagnostics algorithms. By monitoring various parameters and inputs, logic can be created that detects abnormal conditions or faults in the system, enabling preventive maintenance and troubleshooting.
- Conditional control modes: Logic can change the motor configuration, enabling multi-motor functionality. Logic can provide a backup operation during service, fieldbus fault, and so on.

These are just a few examples of what Logic can be used for. The versatility and flexibility of Logic make it a powerful tool for implementing customized functionality and adapting the behavior of the system to meet specific requirements.

### Configuration

Logic can be configured inside MyDrive Insight. However, the feature is only accessible if the drive supports Logic and a connection to the drive has been established.

### Running mode

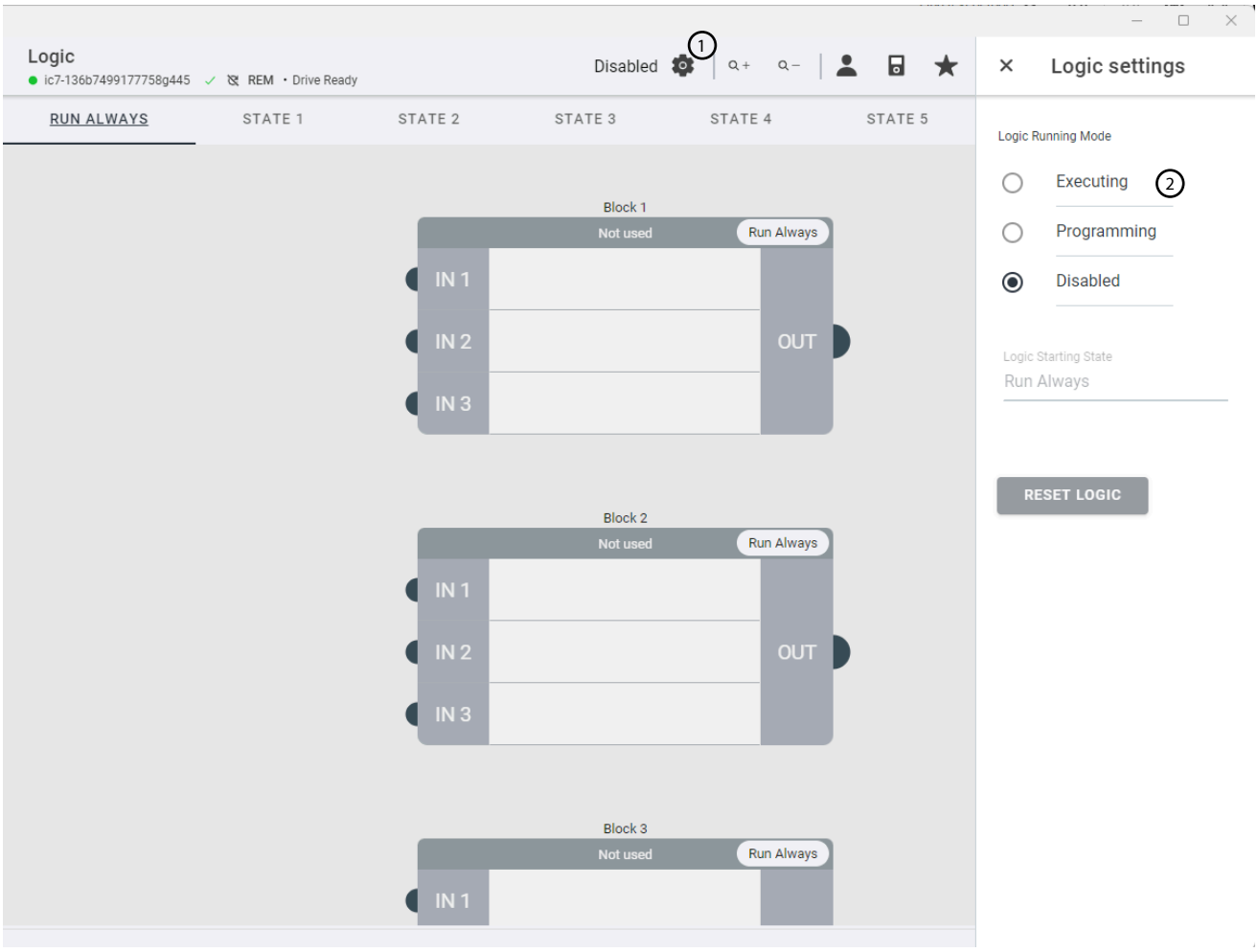
NOTE:

Before using Logic, it is important to evaluate whether the installation is in a suitable state for making changes to parameters, digital outputs, and analog outputs. Logic can be in the following modes:

- *Disabled*: Logic is not executed. Outputs and parameters are not affected by Logic.
- *Programming*: Logic is running in debug mode: function blocks and state handling is executed, but outputs and parameters are not changed by Logic.
- *Executing*: The outputs are actively driven and reflect the configured Logic behavior.

To configure Logic, click the *Logic settings* button and from the *Logic Running Mode* menu select *Programming* mode (stopping execution). To activate the configuration, select *Executing*. To reduce processing load when Logic is unnecessary, select *Disabled*.

Internal data resets to defaults on mode changes and is not retained across power cycles.




| Legend | Definition |
|---|---|
| 1 | Logic settings |
| 2 | Logic Running Mode |

**Figure 55: Running Mode Selection in MyDrive® Insight**

For more information, see *MyDrive® Insight Logic Feature Application Guide*.

# 6 Configuration Set-up Examples

## 6.1 Configuration Prerequisites

The section covers the basic configuration steps of a drive. It is possible that the application requires more steps such as protection settings. Use the following topics as reference during the drive configuration/commissioning process:

- For control panel related configurations, see 5.2.4 Control Panel Basic Configurations.
- For information on using MyDrive Insight, see 5.3.2 Getting Started with MyDrive® Insight.
- For detailed information about the parameters, see *Parameter Descriptions*.

**NOTICE**

Ensure that the drive is mounted safely according to the installation and safety instructions shipped with the drive.

See also the following schematic for the correct wiring:

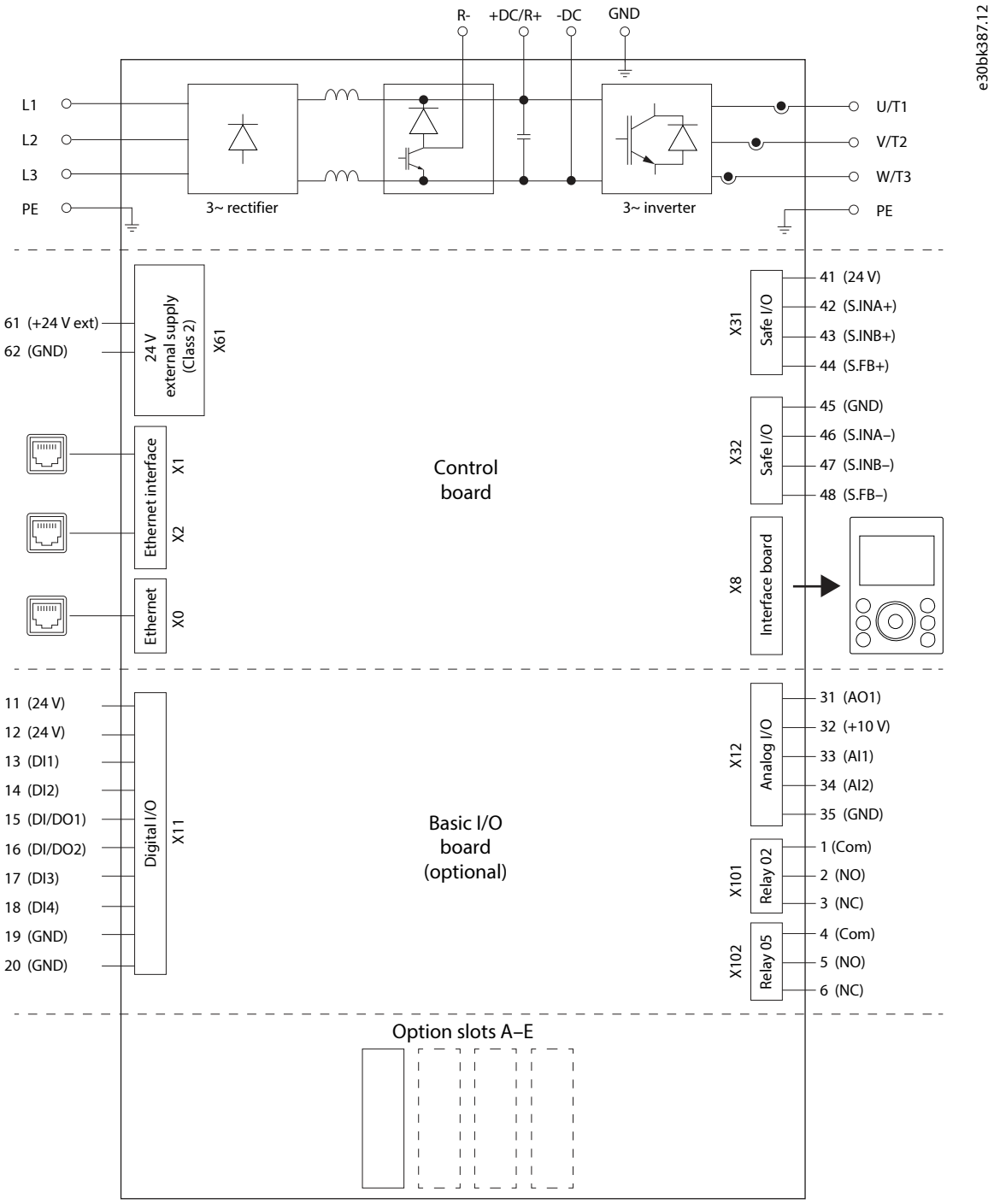



**Figure 56: Wiring Diagram**

NOTE: Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list.

## 6.2 Basic Setup of a Drive

The basic setup of the drive consists of the following configuration steps.

1. Configure the grid settings.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 1.2.1 | Grid Type | TN | 2942 |

2. Configure the power unit settings.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 2.2.1.1 | Unit Voltage Class | Low-voltage range | 2832 |
| 2.2.1.2 | Overload Mode | High overload (HO1) | 2833 |

3. Configure the operating mode.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.4.2.16 | Operation Mode | Speed control | 2500 |
| 4.3.1.5 | Motor Feedback Mode | Open loop | 2502 |

4. Configure the control place settings.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.5.2.1 | Control Place Selection | Advanced control | 114 |
| 5.5.3.1.2 | Local Control Mode | Allow local control | 107 |
| 5.5.6.1.1 | Advanced Start Input | Fieldbus start, Basic I/O T13 | 4722 |
| 5.5.6.1.2 | Advanced Start Logic | Source 1 | 1933 |
| 5.5.6.1.7 | Advanced Coast Inverse Input | Fieldbus coast, Basic I/O T16 | 4724 |
| 5.5.6.1.8 | Advanced Coast Inverse Logic | Source 1 | 1936 |

5. Configure the fieldbus communications (if available). See the relevant fieldbus guide.
6. Configure the readouts in the control panel. See .

## 6.3 Configuring the Motor, Motor Control, and Motor Thermal Protection

The required configuration steps depend on the motor type selected in parameter ***4.2.1.1 Motor Type***.

**NOTICE**

The parameters specified in motor configuration cannot be adjusted when the motor is running.

1. Configure basic motor data. Go to ***Parameter group 4*** and specify the following:

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.2.1.1 | Motor Type | Induction motor, Permanent magnet motor, or Synchronous reluctance motor | 407 |
| 4.2.2.1 | Nominal Power | As on motor product label. | 405 |
| 4.2.2.2 | Nominal Current | As on motor product label. | 400 |

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.2.2.3 | Nominal Speed | As on motor product label. | 402 |
| 4.2.2.4 | Nominal Frequency | As on motor product label. | 403 |
| 4.2.2.5 | Nominal Voltage | As on motor product label. | 401 |

NOTE: Changing the product label data causes a reset of the advanced motor data to default values, and the loss of AMA results.

2. Perform Automatic Motor Adaptation (AMA).

   The advanced motor data, which are needed for optimal motor control performance and which are described in step 3, can be entered manually or measured and calculated based on AMA. The data measurement must be conducted in standstill with the following parameter:

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.2.1.3 | AMA Mode | Motor data | 420 |

NOTE: AMA requires an active start signal for execution. After AMA is performed, the setting of AMA Mode automatically switches to Off, and a notification must be confirmed. A new start signal is required for starting the motor. This is to avoid an unintended start caused by the active start signal. Consult the iC7 Series Frequency Converters Installation Safety Guide for safety information on unintended start.

NOTE: Running AMA for most motors takes a few seconds, but for synchronous reluctance motors of 11 kW or larger, it takes approximately 23 minutes.

3. Configure the advanced motor data if AMA is not performed. Setting these parameters is recommended for optimal motor control performance.

**Table 11: Asynchronous Induction Motors**

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.2.3.1 | Stator Resistance Rs | Result of AMA or as on motor data sheet. | 408 |
| 4.2.3.2 | Rotor Resistance Rr | Result of AMA or as on motor data sheet. | 409 |
| 4.2.3.3 | Iron Loss Resistance Rfe | Result of AMA or as on motor data sheet. | 413 |
| 4.2.3.4 | Stator Leakage Reactance Xls | Result of AMA or as on motor data sheet. | 440 |
| 4.2.3.5 | Rotor Leakage Resistance Xlr | Result of AMA or as on motor data sheet. | 441 |
| 4.2.3.6 | Magnetizing Reactance Xm | Result of AMA or as on motor data sheet. | 442 |

**Table 12: Permanent Magnet Motors and Synchronous Reluctance Motors**

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.2.4.2 | Stator Resistance Rs | Result of AMA or as on motor product label. | 408 |
| 4.2.4.3 | d-axis Inductance Ld | Result of AMA or as on motor product label. | 417 |
| 4.2.4.4 | d-axis Inductance LdSat | Result of AMA or as on motor product label. | 418 |
| 4.2.4.5 | Ld Saturation Point | Result of AMA or as on motor product label. | 426 |
| 4.2.4.6 | q-axis Inductance Lq | Result of AMA or as on motor product label. | 427 |
| 4.2.4.7 | q-axis Inductance LqSat | Result of AMA or as on motor product label. | 422 |
| 4.2.4.8 | Lq Saturation Point | Result of AMA or as on motor product label. | 424 |
| 4.2.4.1 | Back EMF | Only for Permanent Magnet Motors. As stated on motor data sheet, as specified at 1000 RPM. | 415 |

NOTE:

For PM motors, once an AMA has been executed, the drive tries to calculate the back EMF constant for the motor. To improve motor control, it is advisable to replace the calculated value from the AMA with the value from the motor name plate or data sheet.

The back EMF constant must be typed in as line-line RMS voltage at 1000 RPM.

If the value is not available for the motor speed of 1000 RPM, calculate the correct value. For example, if the back EMF is 320 V at 1800 RPM, it can be calculated at 1000 RPM:

Back EMF = (Voltage/RPM)x1000 = (320/1800)x1000 = 178

It is also possible to measure the back EMF constant with the drive by operating the motor faster than 15% of the nominal speed and then applying a coast signal. The value can then be read out in parameter ***4.1.29 Back EMF Measured Coast***. The measured value can then be manually transferred to parameter ***4.2.4.1 Back EMF***.

4. Configure motor control.

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.3.1.1 | Motor Control Principle | FVC+ Control | 2503 |
| 4.3.3.1 | Continuous Rs Estimation | Enabled | 428 |

To configure FVC+ control to a synchronous reluctance motor, additional parameters must be set. Setting ***5.8.7.2 Estimated Speed Filter Tc*** and ***5.8.2.1.2 Speed Controller Kp FVC+*** stabilize the control, and setting ***5.8.2.2.1 Virtual Friction Gain*** dampens the speed response.

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.3.3.5 | Low-speed Mode | Low speed minimum current | 2816 |
| 4.3.3.11 | Minimum Current Speed Threshold | 17700 RPM | 2838 |
| 5.8.7.2 | Estimated Speed Filter Tc | 30 ms | 4545 |
| 5.8.2.1.2 | Speed Controller Kp FVC+ | 2.00 %/Hz | 4020 |
| 5.8.2.2.1 | Virtual Friction Gain | 5.0 | 4549 |

NOTE: For motor control principles VVC+ and U/f, the following applies:

- Configure compensations for slip and different application conditions in parameter group ***4.3.4 VVC+ & U/f Settings***.
- Enable and configure Automatic Energy Optimization (AEO) in parameter group ***5.3.3 Torque & AEO***.
- For U/f, define the voltage and frequency points in parameter group ***4.3.2 U/f Settings*** as required for the application.

5. Configure motor thermal protection.

   The Electronic Thermal Relay (ETR) function protects the motor from thermal overload without connecting an external device, by estimating the motor temperature based on present load and time. The ETR function meets the relevant requirements of UL 61800-5-1, including the Thermal Memory Retention requirement, and ensures a class 20 protection level. ETR can be configured and the motor thermal load can be viewed using the following parameters:

| Index | Parameter name | Parameter setting | Parameter number |
|---|---|---|---|
| 4.5.4 | ETR Overtemperature Response | Fault, ramp to coast | 2825 |
| 4.1.16 | Motor Thermal Load (ETR) | Varies (Readout) | 2951 |

   The fault ***0x7120-4177 Motor Thermal Overload*** is issued when the motor thermal load has reached 100%.

## 6.4 Configuring Speed Control

This section describes the basic configuration for speed control in open loop.

The following procedure describes the additional steps to control the speed according to the following wiring diagram.

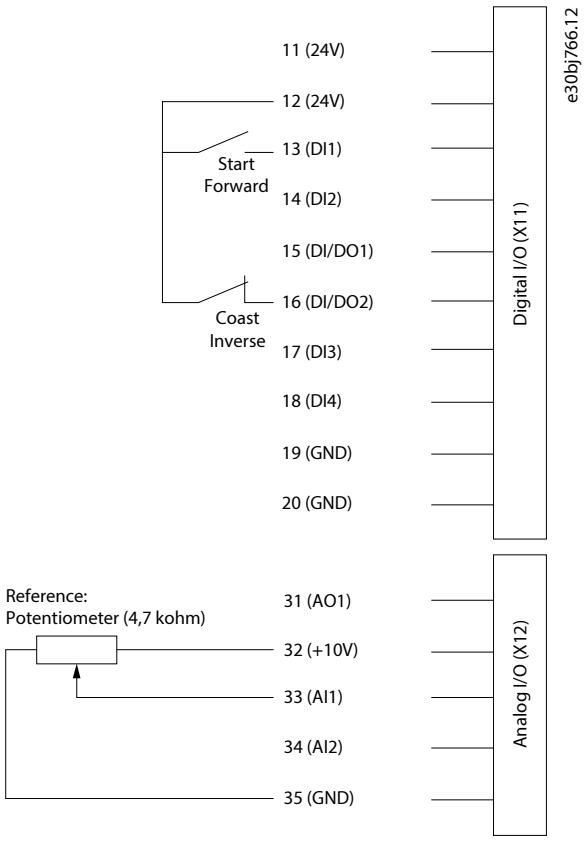



**Figure 57: Wiring Diagram Example - Speed Control with Basic I/O**

1. Perform the steps in 6.2 Basic Setup of a Drive.
2. Perform the steps in 6.3 Configuring the Motor, Motor Control, and Motor Thermal Protection.
3. Configure the operation mode for speed control.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.4.2.16 | Operation Mode | Speed control | 2500 |
| 4.3.1.5 | Motor Feedback Mode | Open loop | 2502 |

4. Configure the type of speed reference used for the Advanced Control Place.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.5.6.2.1 | Adv. Speed Reference | Fieldbus reference, Reference 1 input | 1915 |
| 5.5.6.2.2 | Adv. Speed Reference Logic | Sum | 1916 |

5. Configure speed limit settings.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.8.3.1 | Positive Speed Limit | 1500 RPM | 1729 |
| 5.8.3.2 | Negative Speed Limit | -1500 RPM | 1728 |
| 5.8.3.3 | Minimum Speed Limit | 0 RPM | 1722 |

6. Configure the ramp.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.8.6.1.1 | Ramp Selector | Ramp 1 | 1100 |
| 5.8.6.2.1 | Ramp 1 Type | Linear ramp | 1125 |
| 5.8.6.2.2 | Ramp 1 Accel. Time | 5 s. | 1101 |
| 5.8.6.2.3 | Ramp 1 Decel. Time | 5 s. | 1105 |

7. Configure the reference and input settings according to the selected reference type.

**Table 13: Reference Settings**

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.8.4.1 | Speed Reference 1 Input | Basic I/O T33 | 501 |
| 5.8.4.3 | Speed Reference 1 Maximum | 1500 RPM | 1724 |
| 5.8.4.4 | Speed Reference 1 Minimum | 0 RPM | 1725 |

**Table 14: Basic I/O Settings**

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 9.5.2.1 | T33 Terminal Mode | Analog input | 2020 |
| 9.5.2.2 | T33 Terminal Type | Voltage | 2273 |
| 9.5.2.3 | T33 Minimum Value | 0 V | 2272 |
| 9.5.2.4 | T33 Maximum Value | 10 V | 2271 |

8. Optional: Configure the settings for the Auto Tuning of the speed controller.

   For achieving optimal motor control performance, perform an Inertia Estimation or, if the inertia is known, enter the inertia manually with parameter ***5.3.2.3 System Inertia***.

   Also perform an Auto Tuning of the speed controller settings. Auto tuning requires an inertia estimation value. Besides the settings already described, adjust the following:

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.8.11.1 | Speed Controller Auto Tuning | Enabled | 4546 |
| 5.3.2.1 | Inertia Estimation Mode | Without load profile | 668 |

NOTE: The recommended setting for parameter ***5.3.2.1 Inertia Estimation Mode*** depends on the torque characteristic configured with parameter ***5.3.3.1 Torque Characteristic***. Select ***Without load profile*** if there is a constant torque load, and ***With profile*** for a variable torque load.

9. To start the tuning process, apply a start signal to terminal 13 of the Basic I/O.

## 6.5 Configuring Torque Control

While the drive is in torque control, the motor speed is monitored but not controlled. Therefore, motor speed can reach the speed limits, when the load, application, or upper system are not within the speed limits. For this reason, it is important to set the limits of the output frequency as described in 6.4 Configuring Speed Control. Since speed ramps can also be used as limiting factor, check the ramp settings in step 6 of 6.4 Configuring Speed Control. Torque control is only available with the motor control principle FVC+.

The procedure is described according to the following wiring diagram.

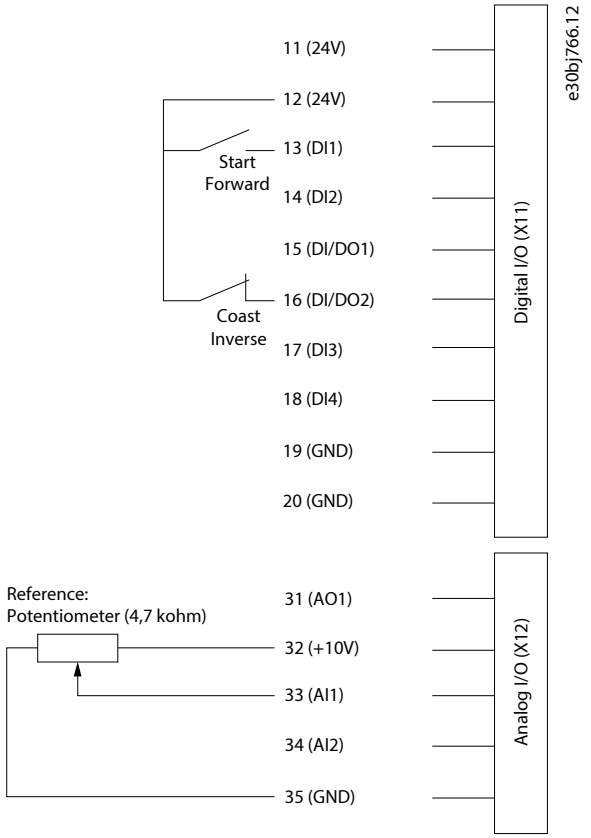



**Figure 58: Wiring Diagram Example - Torque Control with Basic I/O**

1. Perform the steps in 6.2 Basic Setup of a Drive.
2. Perform the steps in 6.3 Configuring the Motor, Motor Control, and Motor Thermal Protection.
3. Configure the operation mode for torque control.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.4.2.16 | Operation Mode | Torque control | 2500 |

4. Configure the type of torque reference used for the Advanced Control Place.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.5.6.2.4 | Adv. Torque Reference | Fieldbus reference, Reference 1 input | 1929 |
| 5.5.6.2.5 | Adv. Torque Reference Logic | Sum | 1919 |

5. Configure the torque limit settings. The torque limits are active in all operation modes.

- For simple torque limit settings regardless of what quadrant is used, set the overall maximum allowed torque.

| Index | Parameter name | Parameter number |
|---|---|---|
| 5.9.2.1 | Maximum Torque Limit | 1823 |

- For more advanced torque limits, set each quadrant individually with the following parameters.

NOTE: If 4 quadrant torque adjustments are needed, the maximum torque limit parameter must be set to the maximum value.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.9.2.2 | Positive Torque Limit | 150% | 1810 |
| 5.9.2.3 | Negative Torque Limit | -150% | 1811 |
| 5.9.2.4 | Motoring Torque Limit | 100% | 1321 |
| 5.9.2.5 | Regenerative Torque Limit | 100% | 1323 |
| 5.9.2.6 | Speed Limit Mode Torque Ctrl. | Pos./Neg. speed limit | 2332 |

See more information about flexible limit modes in 6.6.9.3 Limits (Menu Index 5.9.2).

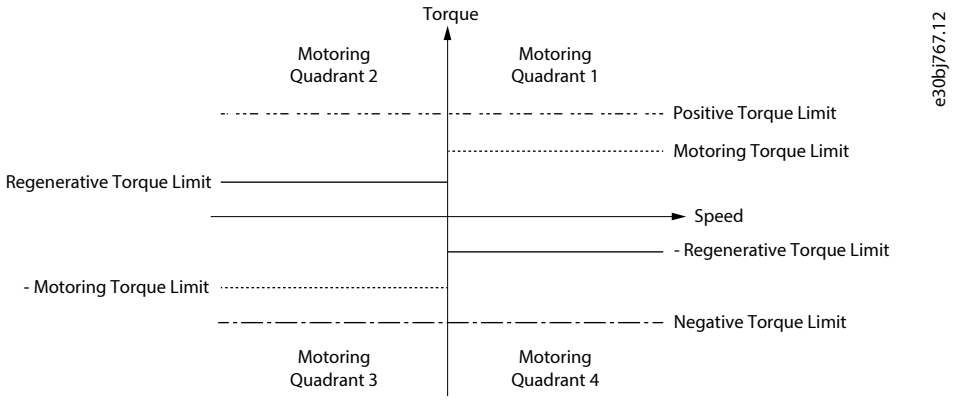



**Figure 59: Torque Control Limits**

6. Configure the reference settings and terminals used for the reference signal.

**Table 15: Reference Settings**

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.9.3.1 | Torque Reference 1 Input | Basic I/O T33 | 4534 |
| 5.9.3.3 | Torque Reference 1 Maximum | 100% | 4530 |
| 5.9.3.4 | Torque Reference 1 Minimum | 0% | 4531 |
| 5.9.3.14 | Torque Reference Ramp Time | 10 s. | 2330 |

**Table 16: Basic I/O Settings**

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 9.5.2.1 | T33 Terminal Mode | Analog input | 2020 |
| 9.5.2.2 | T33 Terminal Type | Voltage | 2273 |
| 9.5.2.3 | T33 Minimum Value | 0 V | 2272 |
| 9.5.2.4 | T33 Maximum Value | 10 V | 2271 |

## 6.6 Configuring Process Control

The built-in process controller is used to control processes based on the feedback sensor signal. Examples of controlled process variables are flow, pressure, and temperature. The process controller is used as a reference source for the speed controller. For this reason, a pre-condition of configuring the process control is to follow the instructions in the basic setup of a drive, configuring motor and motor control, and configuring speed control.

The auto-tuning simplifies the configuration and saves time during commissioning, while ensuring accurate PID control adjustment. In addition, the built-in controller supports inverse control for applications such as level control or the control of a vacuum pump. In such applications, increasing the drive speed decreases the feedback value.

This section describes the extra configurations required to set up a basic pressure control loop according to the following illustration and wiring diagram.

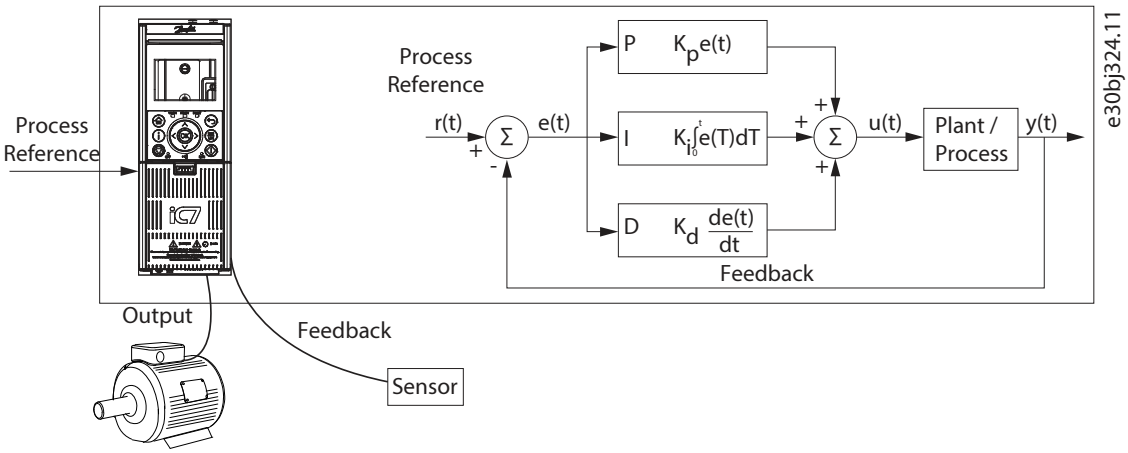



**Figure 60: Process Controller**

This configuration setup contains the following features:

- A pressure transducer to measure the pressure of the system. This data is used as feedback. The sensor is supplied power by the drive's 24 V supply.
- A potentiometer to adjust the setpoint, and a switch for the start signal which is connected to digital input 1 (terminal 13) on the Basic I/O. See the following wiring drawing example.

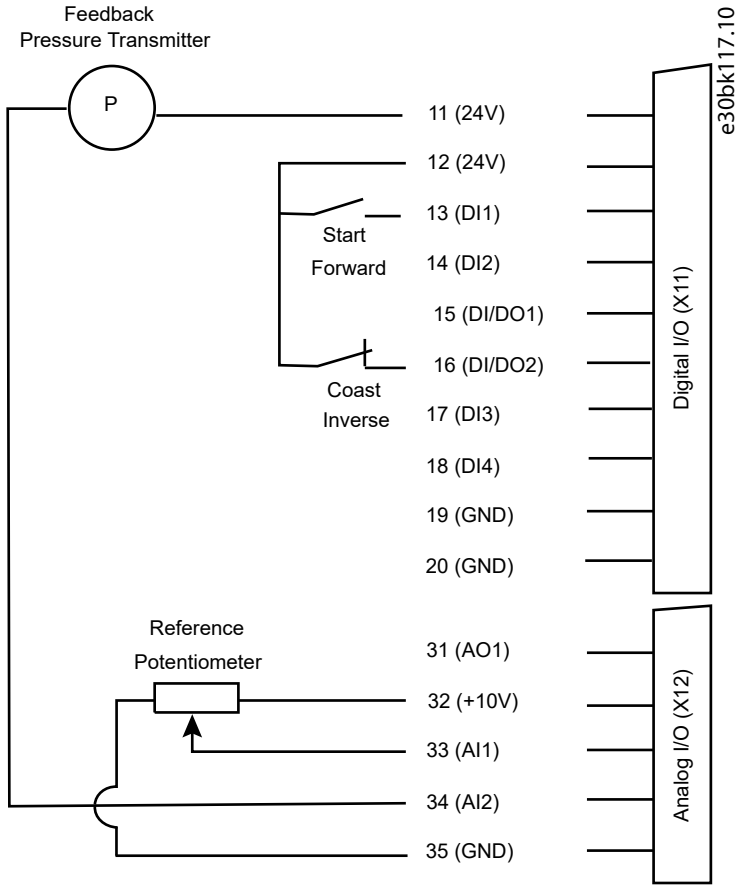



**Figure 61: Wiring diagram example - Process Control with Basic I/O**

1. Perform all the steps in 6.2 Basic Setup of a Drive.
2. Perform all the steps in 6.3 Configuring the Motor, Motor Control, and Motor Thermal Protection.
3. Perform all the steps in 6.4 Configuring Speed Control.
4. Select the process controller as reference in the settings for the control place.

| Index | Parameter name | Recommended settings | Parameter number |
|---|---|---|---|
| 5.5.6.2.6 | Adv. Process Reference | Fieldbus reference/Reference 1 input | 6054 |
| 5.5.6.2.7 | Adv. Process Reference Logic | Source 1 | 6045 |

5. Adjust settings for the process reference and for the feedback according to the application. In this example, the operating range is 0–4 bar.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.10.3.1 | Process Reference Max. | 4 bar | 6013 |
| 5.10.3.2 | Process Reference Min. | 0 bar | 6014 |
| 5.10.3.3 | Process Reference 1 Input | Basic I/O T33 | 6025 |
| 5.10.4.1 | Feedback Mode | Feedback 1 | 6008 |
| 5.10.4.2 | Feedback 1 Type | Analog feedback terminal | 6021 |
| 5.10.4.3 | Feedback 1 Maximum Scaling | 4 bar | 6015 |

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.10.4.4 | Feedback 1 Minimum Scaling | 0 bar | 6016 |
| 5.10.4.5 | Analog Input Feedback 1 | Basic I/O T34 | 6027 |

6. Configure the electrical characteristics of the analog input terminals 33 and 34 for reference and feedback.

**Table 17: Terminal 33 Settings**

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 9.5.2.2 | T33 Terminal Type | Voltage | 2273 |
| 9.5.2.3 | T33 Minimum Value | 0 V | 2272 |
| 9.5.2.4 | T33 Maximum Value | 10 V | 2271 |

**Table 18: Terminal 34 Settings**

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 9.5.3.2 | T34 Terminal Type | Current | 2279 |
| 9.5.3.3 | T34 Minimum Value | 4 mA | 2278 |
| 9.5.3.4 | T34 Maximum Value | 20 mA | 2277 |

7. To ensure optimum control performance for the system, perform auto-tuning of the process controller. The optimization of the settings is for the reference or a typical reference of the system.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.10.7.1 | Process Controller Auto Tuning | Enabled | 6901 |
| 5.10.7.2 | Auto Tuning Reference | 2.3 bar | 6902 |

NOTE: Default settings do not require modification before performing auto tuning.

NOTE: Parameter ***5.10.7.1 Process Controller Auto Tuning*** is disabled automatically after auto tuning is completed.

8. To start auto-tuning, apply a start signal to terminal 13 of the Basic I/O.
9. Enable the process controller.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.10.1.10 | Process Controller Enabled | Enabled | 6053 |

10. In applications like pressure control with centrifugal pumps, additional energy savings can be achieved by using the Automatic Energy Optimization (AEO) function. To use this feature, configure the following parameters:

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.3.3.1 | Torque Characteristic | Automatic Energy Optimization (AEO) | 2809 |
| 5.3.3.2 | AEO Minimum Speed | 10 Hz | 2810 |
| 5.3.3.3 | AEO Minimum Magnetization | 40% | 2811 |

NOTE: To start the application a start signal is required, if the signal has been removed after completing auto-tuning.

## 6.7 Configuring a Hoist Application

If the drive is operating a hoist application or a vertically moving load, it is crucial that the drive is set up correctly to handle the load when the mechanical brake is opened. iC7 supports PM motors and induction motors in hoist applications. Besides the control signals (Start, stop, speed reference, and so on) motor control must be set up correctly. The motor nameplate data must be typed in correctly and an AMA must be executed successfully.

1. Perform the steps in 6.2 Basic Setup of a Drive.
2. Perform the steps in 6.3 Configuring the Motor, Motor Control, and Motor Thermal Protection.
3. Set hoist-specific parameters.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 4.3.1.1 | Motor Control Principle | FVC+ Control | 2503 |
| 2.3.1.1 | Retry After Fault | Disabled | 2927 |

4. Enable the brake resistor and set the correct resistance.

   The overvoltage controller does not work with hoist applications. A brake resistor is required.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 2.3.2.1 | Overvoltage Control | Disabled | 1802 |
| 3.2.1 | Brake Chopper | Enabled in Run and Coast | 2935 |
| 3.3.2 | Brake Resistor Resistance | As on motor data sheet. | 2936 |

   Further settings for the brake chopper and the resistor brake can be set with parameter groups ***3.2*** and ***3.3***.

5. Optional: Set induction motor parameters.

   If induction motors are used in open loop without an encoder feedback, set the following two parameters:

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 4.3.3.5 | Low-speed Mode | Low speed minimum current | 2816 |
| 4.3.3.8 | Low Speed Minimum Current | 100.00 | 2837 |

6. Select the output to activate and open the mechanical brake.

| Index | Parameter name | Example setting | Parameter number |
|---|---|---|---|
| 5.12.2.1 | Brake Output | Basic I/O Relay T2 | 3007 |
| 5.12.2.2 | Brake Priming Torque | 100.0 | 3012 |

When the output for the mechanical brake is selected and a start signal is applied, the motor builds up torque before the mechanical brake is opened.

For further information about adjusting the mechanical brake, see 7.7.13.1 Mechanical Brake Control Overview.

## 6.8 Configuring a Latched Start/Stop with Digital I/O

A latched start/stop is often used in operating panels where the Start and Stop buttons are equipped with a spring return. A latching circuit locks its output once an input signal is applied, and keeps that position even after the input signal is detached.

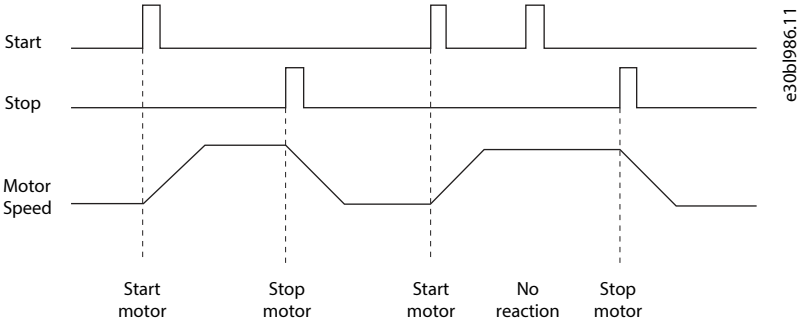



**Figure 62: Latched Start/Stop Behavior**

In this example, the functionality is set up with an analog speed reference with a scale of 0–10 V.

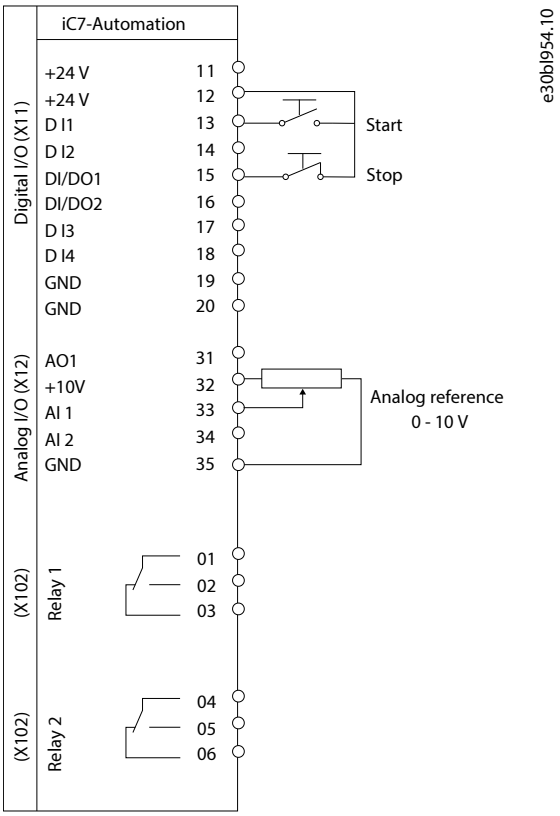



**Figure 63: Latched Start/Stop Connections**

1. Select I/O as the active control place. This selection affects the parameter group that is used to configure the start and stop signals.

| Index | Parameter | Parameter setting | Parameter number |
|---|---|---|---|
| 5.5.2.1 | Control Place Selection | 3 (I/O Control) | 114 |

2. Set the start signal to a latched start by selecting ***High Pulse Start***, and activate input T15 as the stop input.

| Index | Parameter | Parameter setting | Parameter number |
|---|---|---|---|
| 5.5.5.1.1 | Start Input | Basic I/O T13 Digital Input | 200 |
| 5.5.5.1.8 | Start Signal Mode | 2 (High Pulse Start) | 211 |
| 5.5.5.1.3 | Stop Inverse Input | Basic I/O T15 Digital Input | 201 |

3. Set terminal T33 as the reference input with a signal between 0-10 V.

| Index | Parameter | Parameter setting | Parameter number |
|---|---|---|---|
| 9.5.2.2 | T33 Terminal Type | 1 (Voltage) | 2273 |
| 9.5.2.3 | T33 Minimum Value | 0 | 2272 |
| 9.5.2.4 | T33 Maximum Value | 10 | 2271 |

# 7 Parameters

## 7.1 Application Software Structure and Overview

### 7.1.1 Understanding Parameter Structure Principles

The basic design principle of the parameter structure and the related hierarchy in the application software refers to a typical motor drive system with an iC7 drive.

A similar parameter structure is reused across all products within the iC7 series. This means that some of the parameter groups or dedicated parameters may not be visible for all applications. Therefore, the indexes of parameters may not be sequential. This design principle is followed to maintain consistency across all the different application software in the iC7 series. The application software is designed in this manner to have the same look and feel across different iC7 series products, and to enable easier and faster troubleshooting. The presentation here is of the general principle, and does not necessarily reflect all features of the drive.

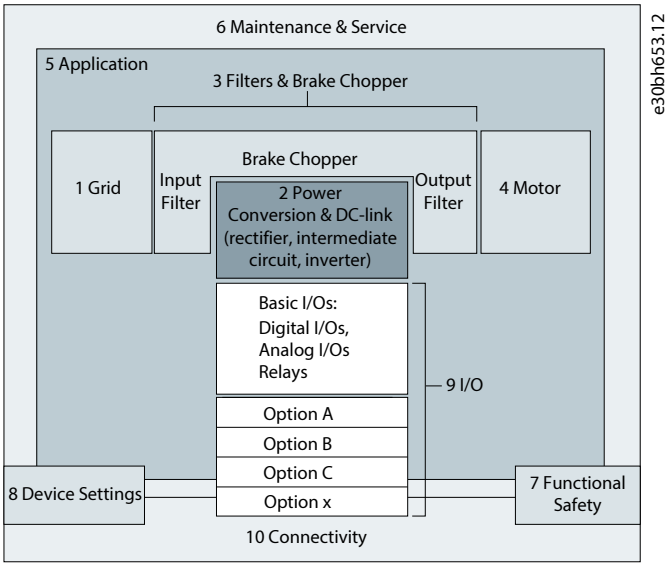



**Figure 64: Application Software Parameter Structure Overview**

### 7.1.2 Parameter Groups and their Content

The detailed structure and hierarchy within the parameter groups can vary, depending on the purpose of the parameter group and the total number of parameters. However, the design principle of the structure is to keep the overall sequence logical while commissioning or setting up the drive. One example is the ***Status*** parameter group, which is embedded into each main group (if applicable) to provide quick and easy access to the real time status information of the parameters within this group.

- All generic settings such as Grid, Power Conversion and DC Link, Filters and Brake Chopper, and Motor are accessed via parameter groups 1–4.
- Most of the application-specific parameters and the configuration of external control signals are accessed via parameter group ***5 Application***.
- Features and functions such as Maintenance and Service, Functional Safety, and Device Settings are accessed via parameter groups ***6, 7, and 8***.
- The hardware setup for the I/O interface, Options, and communication interfaces is done via parameter groups ***9 and 10***.
- The features and related parameters are grouped in individual parameter groups. Each feature has a parameter group of its own.
- Status information for each parameter group is available separately for easy access.
- The visibility of some parameters and parameter groups depends on the hardware used in the drive.

The following table provides information about the parameter groups.

**Table 19: Parameter Groups**

| Index | Parameter group name | Description |
|---|---|---|
| 1 | Grid | Contains parameters for configuring and monitoring the energy source of the drive system. Typically, the energy source is the grid. The menu also makes it possible to configure grid protection settings and view the condition of the grid. |
| 2 | Power Conversion and DC Link | Contains parameters to configure, monitor, and control the power conversion of the drive. The menu makes it possible to configure protection settings of the power unit and settings for the rectifier, DC link, and inverter. |
| 3 | Filters and Brake Chopper | Contains parameters to configure, monitor, and control the input filters, output filters, brake chopper, and brake resistors. |
| 4 | Motor | Contains parameters to configure motor, motor control, and motor protection. |
| 5 | Application | Contains parameters for application specific features such as process control, speed control, torque control, mechanical brake control, and many more. |
| 6 | Maintenance and Service | Contains parameters exclusively related to status, events, and back up and restore. |
| 7 | Functional Safety | Contains non-safety-related parameters for configuring Safe Torque Off and other safety features. |
| 8 | Device Settings | Contains parameters related to the general settings of the drive, such as time, units, and control panel settings. |
| 9 | I/O | Contains hardware-related parameters to configure I/Os and their options. |
| 10 | Connectivity | Contains parameters to configure the built-in and optional communications of the drive system. |

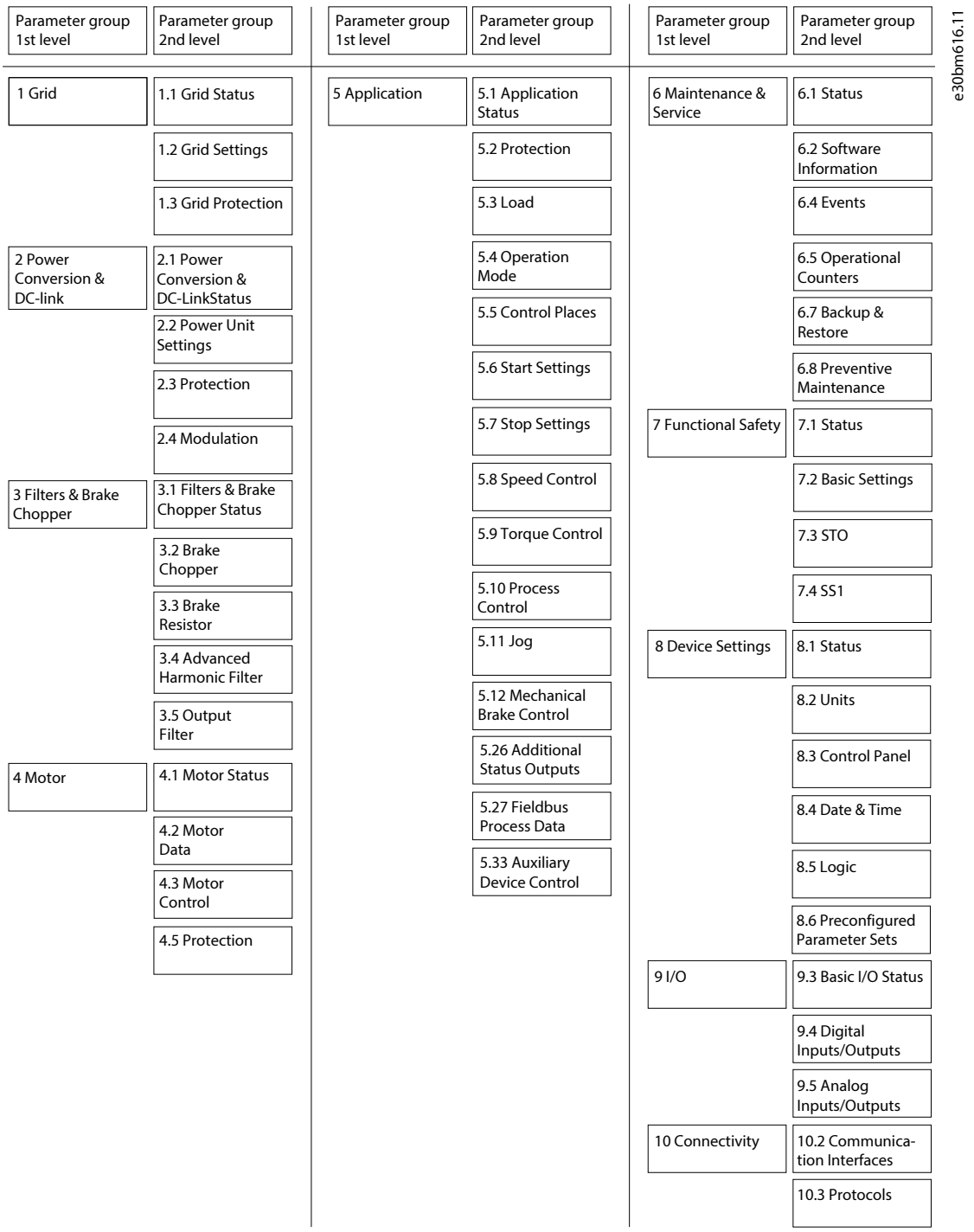



**Figure 65: Parameter Groups**

## 7.2 Parameter Descriptions

### 7.2.1 Reading the Parameter Table

The application guide includes parameter overview tables. The following descriptions explain how to read the parameters.

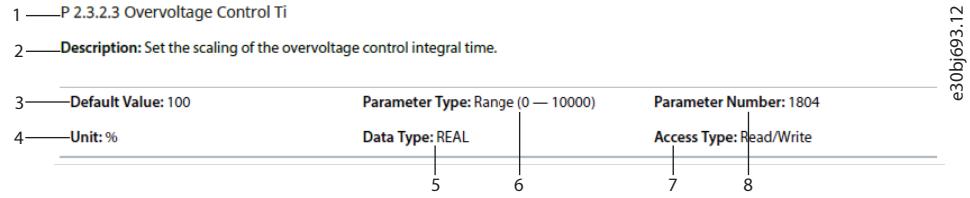



**Figure 66: Reading the Parameter Table**

| | | | |
|---|---|---|---|
| 1 | The parameter index and name. Parameter indices start with a P. Screen indices start with an S. | 2 | The parameter help text which is visible in the control panel and MyDrive® Insight. |
| 3 | The default setting from the factory.<br>If the parameter is a status readout parameter, the default is NA. | 4 | The unit of the parameter. |
| 5 | The data type of the parameter. See 7.2.2 Understanding Data Types. | 6 | The type of parameter. Parameters have either defined ranges of values or selections. See 7.2.3 Understanding Parameter Types. |
| 7 | The access type of the parameter. See 7.2.4 Understanding Access Types. | 8 | The unique parameter number, which is relevant for PLC programming. |

## 7.2.2 Understanding Data Types

The following table is an overview of the data types used in the iC7 application software.

**Table 20: Overview of data types**

| Data type | Description | Size (Bits) | Range |
|---|---|---|---|
| BOOL | Boolean | 1 | 0–1 |
| INT | Integer | 16 | -32 768 … 32 767 |
| DINT | Double integer | 32 | -2 147 483 648 … 2 147 483 647 |
| USINT | Unsigned short integer | 8 | 0–255 |
| UINT | Unsigned integer | 16 | 0–65 535 |
| UDINT | Unsigned double integer | 32 | 0–4 294 967 295 |
| REAL | Real numbers | 32 | -3.402823466 E+38 (approximately 7 digits) … -1.175494351 E-38 (approximately 7 digits) and +1.175494351 E-38 (approximately 7 digits) … +3.402823466 E+38 (approximately 7 digits) |
| WORD | Bit string of length 16 | 16 | 0–65 535 (16#00–16#FFFF) |
| STRING | Sequence of characters | N/A | 1 byte per character |
| ULINT | Unsigned long integer | 64 | 0–18 446 744 073 709 551 615 |
| DATE_AND_TIME | Date and time information | 64 | N/A |

## 7.2.3 Understanding Parameter Types

The following table lists the different types of parameters.

**Table 21: Parameter Types and Descriptions**

| Parameter Type | Description |
|---|---|
| Selection | The parameter provides of a list of value selections.<br>For some parameters, the contents of the list depend on the hardware configuration. In such cases, the selections cannot be shown in the application guide. |
| Range (0–255) | The value of the parameter is within the specified range. In this example, the parameter can have any value between 0 and 255. |
| Range (*–*) | The value of the parameter can be set within the full range of the data type REAL. See 7.2.2 Understanding Data Types. |
| Range (0–*) | The value of the parameter can be set within the upper range of the data type REAL. See 7.2.2 Understanding Data Types. |
| Range (Unit dependent) | The range depends on the selected unit, and is visible in MyDrive Insight and the control panel. |

## 7.2.4 Understanding Access Types

The following table lists the different parameter access types.

**Table 22: Parameter Types and Descriptions**

| Access Type | Description |
|---|---|
| Read/Write | The parameter information can be read or changed. |
| Read only | The parameter information can only be read. |
| Read/Conditional Write | The parameter information can be read and changed. The parameter settings cannot be modified when the drive is running. The drive must be coasted to modify parameter values. |

## 7.2.5 I/O Addressing

The selection numbers for the input/output parameter selection lists consist of the slot number and the terminal number. Basic I/O is in slot 101. For additional I/O options, the slot number is 20X where X depends on the physical placing of the option board in the drive. For details, see the *iC7 Functional Extensions Operating Guide*.

For example, the selection for Basic I/O T13 Digital Input is 10113 (Slot number 101 - Terminal number 13).

The following table shows the selection numbers for all Basic I/O terminals:

**Table 23: Basic I/O Selections**

| Selection | Number |
|---|---|
| Basic I/O T13 Digital Input | 10113 |
| Basic I/O T14 Digital Input | 10114 |
| Basic I/O T15 Digital Input | 10115 |
| Basic I/O T16 Digital Input | 10116 |
| Basic I/O T17 Digital Input | 10117 |
| Basic I/O T18 Digital Input | 10118 |
| Basic I/O Relay T2 | 10102 |
| Basic I/O Relay T5 | 10105 |
| Basic I/O T15 Digital Output | 10115 |
| Basic I/O T16 Digital Output | 10116 |
| Basic I/O T13 Pulse Input | 10113 |

**Table 23: Basic I/O Selections** - (continued)

| Selection | Number |
|---|---|
| Basic I/O T14 Pulse Input | 10114 |
| Basic I/O T15 Pulse Input | 10115 |
| Basic I/O T16 Pulse Input | 10116 |
| Basic I/O T17 Pulse Input | 10117 |
| Basic I/O T18 Pulse Input | 10118 |
| Basic I/O T33 Analog Input | 10133 |
| Basic I/O T34 Analog Input | 10134 |
| Basic I/O T15 Pulse Output | 10115 |
| Basic I/O T16 Pulse Output | 10116 |
| Basic I/O T31 Analog Output | 10131 |

The following table shows the selection numbers for the Relay Option OC7R0:

**Table 24: Relay Selections**

| Selection | Number |
|---|---|
| [20X] Relay T2 | 20X02 |
| [20X] Relay T5 | 20X05 |
| [20X] Relay T8 | 20X08 |

The following table shows the selection number for the General Purpose I/O OC7C0 option:

**Table 25: General Purpose I/O Selections**

| Selection | Number |
|---|---|
| [20X] General Purpose I/O T11 Digital Input | 20X11 |
| [20X] General Purpose I/O T12 Digital Input | 20X12 |
| [20X] General Purpose I/O T13 Digital Input | 20X13 |
| [20X] General Purpose I/O T7 Digital Output | 20X07 |
| [20X] General Purpose I/O T8 Digital Output | 20X08 |
| [20X] General Purpose I/O T2 Analog Input | 20X02 |
| [20X] General Purpose I/O T3 Analog Input | 20X03 |
| [20X] General Purpose I/O T11 Pulse Input | 20X11 |
| [20X] General Purpose I/O T12 Pulse Input | 20X12 |
| [20X] General Purpose I/O T13 Pulse Input | 20X13 |
| [20X] General Purpose I/O T4 Analog Output | 20X04 |
| [20X] General Purpose I/O T7 Pulse Output | 20X07 |
| [20X] General Purpose I/O T8 Pulse Output | 20X08 |

The following table shows the selection numbers for Temperature Measurement OC7T0 option:

**Table 26: Temperature Measurement Selections**

| Selection | Number |
|---|---|
| [20X] Temp. Meas. T4 | 20X04 |
| [20X] Temp. Meas. T8 | 20X08 |
| [20X] Temp. Meas. T12 | 20X12 |
| [20X] Temp. Meas. T16 | 20X16 |
| [20X] Temp. Meas. T20 | 20X20 |

The following table shows the selection numbers for Digital 230 V AC Input OC7D0 option:

**Table 27: Digital 230 V AC Input Selections**

| Selection | Number |
|---|---|
| [20X] Digital 230 V AC T1 Digital Input | 20X01 |
| [20X] Digital 230 V AC T2 Digital Input | 20X02 |
| [20X] Digital 230 V AC T3 Digital Input | 20X03 |
| [20X] Digital 230 V AC T4 Digital Input | 20X04 |
| [20X] Digital 230 V AC T5 Digital Input | 20X05 |

The following table shows the selection numbers for fieldbus control and status word bits:

**Table 28: Control and Status Word Selections**

| Selection | Number |
|---|---|
| CTW1 Bit 12 | 6412 |
| CTW1 Bit 13 | 6413 |
| CTW1 Bit 14 | 6414 |
| CTW1 Bit 15 | 6415 |
| CTW2 Bit 0 | 6501 |
| CTW2 Bit 1 | 6502 |
| CTW2 Bit 2 | 6503 |
| CTW2 Bit 3 | 6504 |
| CTW2 Bit 4 | 6505 |
| CTW2 Bit 5 | 6506 |
| CTW2 Bit 6 | 6507 |
| CTW2 Bit 7 | 6508 |
| CTW2 Bit 8 | 6509 |
| CTW2 Bit 9 | 6510 |
| CTW2 Bit 10 | 6511 |
| CTW2 Bit 11 | 6512 |
| CTW2 Bit 12 | 6513 |
| CTW2 Bit 13 | 6514 |
| CTW2 Bit 14 | 6515 |

**Table 28: Control and Status Word Selections** - (continued)

| Selection | Number |
|---|---|
| CTW2 Bit 15 | 6516 |
| STW1 bit 14 | 6614 |
| STW1 bit 15 | 6615 |
| STW2 bit 0 | 6701 |
| STW2 bit 1 | 6701 |
| STW2 bit 2 | 6701 |
| STW2 bit 3 | 6701 |
| STW2 bit 4 | 6701 |
| STW2 bit 5 | 6701 |
| STW2 bit 6 | 6701 |
| STW2 bit 7 | 6701 |
| STW2 bit 8 | 6701 |
| STW2 bit 9 | 6701 |
| STW2 bit 10 | 6701 |
| STW2 bit 11 | 6701 |
| STW2 bit 12 | 6701 |
| STW2 bit 13 | 6701 |
| STW2 bit 14 | 6701 |
| STW2 bit 15 | 6701 |

The following table shows the selection numbers for Logic virtual digital I/Os:

**Table 29: Logic Virtual Digital I/O Selections**

| Selection | Number |
|---|---|
| Logic Digital I/O 1 | 8101 |
| Logic Digital I/O 2 | 8102 |
| Logic Digital I/O 3 | 8103 |
| Logic Digital I/O 4 | 8104 |

## 7.3 Group 1 Grid

### 7.3.1 Grid Overview

This parameter group contains parameters for configuring and monitoring the energy source of the drive system. Typically, the energy source is the grid. The menu also lets the user configure grid protection settings and view the condition of the grid.

### 7.3.2 Group 1.1 Grid Status

#### P 1.1.1 Grid Frequency

Shows the actual grid frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9041 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.2 Line-To-Line Voltage (RMS)

Shows the average line-to-line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9040 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.3 L1-L2 Line Voltage (RMS)

Shows the L1-L2 line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9048 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.4 L2-L3 Line Voltage (RMS)

Shows the L2-L3 line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9049 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.5 L3-L1 Line Voltage (RMS)

Shows the L3-L1 line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9050 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.6 Grid Voltage Imbalance

Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 9047 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.7 Total Harmonic Distortion Voltage (THDv)

Shows the total harmonic distortion of the grid voltage (THDv) in %.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 9046 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 1.1.12 Grid Active Power

Shows the active power at the point of grid connection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9064 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

## 7.3.3 Group 1.2 Grid Settings

### P 1.2.1 Grid Type

Select the grid type of the supply system. If set to "As grid type", the selection affects the setting of "1.2.2 RFI filter" and "2.2.1.7 HF DC-link Filter Mode".

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (TN) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2942 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | TN | Drive connected to a TN grid. |
| 1 | TT | Drive connected to a TT grid. |
| 2 | IT | Drive connected to a IT grid. |
| 3 | HRG | Drive connected to a High Resistance Grid (HRG). |
| 4 | Grounded Delta | Drive is connected to a grounded delta grid. |

### P 1.2.2 RFI Filter Mode

Select the Radio Frequency Interference (RFI) filter mode.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Selection |
| **Parameter Number:** | 2943 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Filter inactive | The filter is inactive. |
| 1 | Filter active | The filter is active. |
| 2 | Filter matches grid type selection | The filter is set according to the selected grid type. |

## 7.3.4 Group 1.3 Grid Protection

### P 1.3.1 Invalid Frequency Response

Select the response after detecting an invalid grid frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2337 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Fault | The drive issues a fault and stops. |
| 2 | Automatically derate | The drive continues operation with derated performance. |

### P 1.3.2 Missing Grid Phase Response

Select the response after detecting a missing grid phase.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2338 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Fault | The drive issues a fault and stops. |
| 2 | Automatically derate | The drive continues operation with derated performance. |
| 3 | Warning | The drive issues a warning. |

### P 1.3.3 Undervoltage Protection

Enables the undervoltage protection. The drive trips when the grid voltage is 20% below the selected voltage class level. The voltage class is defined with parameter "2.2.1.1 Unit Voltage Class".

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2344 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 1.3.9 Grid Voltage Imbalance Response

Select the mode of grid imbalance protection.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault or Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 9056 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | Disables the protection. |
| 1 | Fault or Warning | Issues a warning or fault if a grid voltage imbalance is detected. |
| 2 | Automatically derate | The drive continues operation with derated performance. |

#### P 1.3.10 Grid Spike Response

Select the response to grid voltage spike monitoring. If large spikes occur, the response protects the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2342 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |

## 7.4 Group 2 Power Conversion & DC Link

### 7.4.1 Power Conversion & DC-Link Overview

This parameter group contains parameters for configuring, monitoring, and controlling the power conversion of the drive. The group lets the user configure protection settings of the power unit and settings for the rectifier, DC link, and inverter.

### 7.4.2 Group 2.1 Power Conversion & DC Link Status

#### P 2.1.1 Unit Nominal Voltage

Shows the nominal voltage setting as a result of the setting of parameter "2.2.1.1 Unit Voltage Class".

| | | | |
|---|---|---|---|
| **Default Value:** | 400 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2830 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 2.1.2 Unit Nominal Current

Shows the nominal current of the unit.

| | | | |
|---|---|---|---|
| **Default Value:** | 23 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2831 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 2.1.3 DC-link Voltage

Shows the actual DC-link voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9044 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.7 DC-link Power

Shows the actual DC-link power.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5117 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.14 Actual Relative Output Current Limit

Shows the actual output current limit relative to the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 300) |
| **Parameter Number:** | 2700 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.15 Heat Sink Temperature

Shows the temperature of the power unit heat sink.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-50 — 200) |
| **Parameter Number:** | 2950 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.16 Main Fan Speed

Shows the speed of the main cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 32767) |
| **Parameter Number:** | 2931 | **Unit:** | rpm |
| **Data Type:** | INT | **Access Type:** | Read Only |

### P 2.1.17 Internal Fan Speed

Shows the speed of the internal cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 32767) |
| **Parameter Number:** | 2926 | **Unit:** | rpm |
| **Data Type:** | INT | **Access Type:** | Read Only |

### P 2.1.18 Power Capacity

Shows the power capacity of the drive as a percentage. The value is derived from the number of active power units compared to the nominal power unit count of the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2836 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.19 Heat Sink Temperature Output

Select the output indicating if the heat sink temperature is within the specified range.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2312 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 2.1.20 Drive DC-link Voltage Output

Select the output indicating if the DC-link voltage is within the specified range.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2311 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 2.1.21 Drive Thermal Load

Shows the estimated thermal load of the inverter.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 6547 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

## 7.4.3 Group 2.2 Power Unit Settings

### 7.4.3.1 Group 2.2.1 General Settings

#### P 2.2.1.1 Unit Voltage Class

Select the unit voltage class to optimize the performance of the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Selection |
| **Parameter Number:** | 2832 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Low-voltage range | Class 1 - Low-voltage range. |
| 2 | Mid-voltage range | Class 2 - Mid-voltage range. |
| 3 | High-voltage range | Class 3 - High-voltage range. |

This parameter specifies a focused voltage range within the input voltage rating of the power unit for optimized drive control. Each power unit is rated for a wide input voltage range within which the drive can operate. This parameter is used to specify a narrower range within the wide range of input voltage to determine optimized values for the nominal voltage and current of the power unit. The following table describes the selections available for the parameter.

**Table 30: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Low Voltage Range | Unit nominal voltage and current are configured according to the lowest voltage of the power unit's voltage range. For example:<br>In 380–500 V (3N05) rated units, the range is 380–440 V AC. |
| Medium Voltage Range | Unit nominal voltage and current are configured according to the medium voltage level of the power unit's voltage range. For example:<br>In 380–500 V (3N05) rated units, the range is 441–480 V AC. |
| High Voltage Range | Unit nominal voltage and current are configured according to the highest voltage level of the power unit's voltage range. For example:<br>In 380–500 V (3N05) rated units, the range is 481–500 V AC. |

### P 2.2.1.2 Overload Mode

Select the overload mode.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Selection |
| **Parameter Number:** | 2833 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Automatic | Combination of high and low overload. Drive will start at high overload, but switches to low overload for a period at too high load. |
| 1 | Low overload (LO) | Low overload (LO) operation. Provides overload current up to 110%. |
| 2 | High overload (HO1) | High overload (HO1) operation. Provides higher overload current up to 160% for acceleration. |
| 3 | High overload increased duty (HO2) | High overload with increaseed duty (HO2) operation. Provides higher overload current with shorter cycle times. |

When configuring a drive, it is important to know the load characteristic and load cycle of the application, so that it is possible to get the most out of the drive. The available output current depends on the application load profile. In addition, derating of the output current may be needed, for example, if operational temperature is increased, or the drive is installed in an altitude above 1000 m (3300 ft).

iC7-Automation drives support 4 different overload modes:

- Low overload (LO): 110% load for a minimum of 1 minute every 10 minutes.
- High overload (HO1): Up to 160% load for 1 minute every 10 minutes, with a breakaway torque of up to 200%.
- High overload with increased duty (HO2): In drive parameters, this mode is called high overload (HO2). Up to 160% load for 1 minute every 5 minutes and with a breakaway torque of up to 200% in the start of the process.

- Automatic: In this mode, the drive automatically switches between LO and HO1 depending on the load conditions.

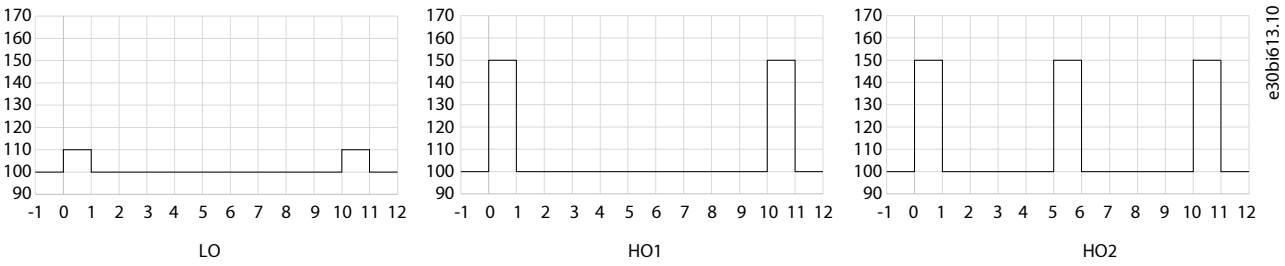



**Figure 67: Overload Modes**

**Table 31: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Automatic Mode | Automatically switches between the modes Low Overload (LO) and High Overload (HO1). |
| Low Overload Mode (LO) | For applications running at a non-varying or slowly varying load, where a limited overload capability is required. This mode is typically used in applications with a variable torque load. The low overload profile allows the drive to run at 110% load for a minimum of 1 minute every 10 minutes. Typical applications where the low overload profile is used are:<br>• Fans<br>• Centrifugal pumps<br>• Blowers and aerators<br>• Screw compressors |
| High Overload Mode (HO1) | For applications which require higher short-term overload and constant torque operations. Typical applications work with continuous motion. With high overload mode HO1, the drive can run with a load of up to 160% for 1 minute every 10 minutes, with a breakaway torque of up to 200%, depending on size. Typical applications where high overload HO1 is used are:<br>• Conveyors<br>• Centrifuges<br>• Decanters<br>• Piston compressors<br>• Piston pumps<br>• Mixers<br>• Stirrers<br>• Escalators<br>• Extruders (continuous running) |
| High Overload Mode (HO2) | Used when the application has intermittent or continuous periodic duty. The resulting cyclic load requires more considerations on the use of the drive to ensure necessary performance and lifetime. Increased short-term starting torque is often also required. To benefit from the increased dynamic performance and not compromising lifetime, the output current is downrated by 1 motor size compared to HO1. With the high-overload profile with increased duty, the drive can run with up to 160% load for 1 minute every 5 minutes, with a breakaway torque of up to 200%, depending on the current rating. Typical applications where the high-overload profile with increased duty is used are:<br>• Extruders<br>• Continuously accelerating conveyors<br>• Lifts and hoists<br>• Cranes<br>• Positioning applications<br>• Dosing pumps |

### P 2.2.1.3 Relative Output Current Limit

Set the output current limit relative to the motor nominal current from the nameplate.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (0 — 999) |
| **Parameter Number:** | 1325 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.2.1.5 Supply Mode

Select the supply mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (AC) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1328 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | AC | Drive is supplied from AC grid. |
| 1 | DC | Drive is supplied from DC terminals. |

### P 2.2.1.6 Power Unit Enable Mask

Select which of the commissioned power units are enabled. The value is given bitwise per each unit. Bit 0 corresponds to the first port in the star coupler board, bit 15 to the 16th port, and so on.

| | | | |
|---|---|---|---|
| **Default Value:** | 65535 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2835 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Conditional Write |

### P 2.2.1.7 HF DC-link Filter Mode

Select the mode of the high-frequency filter in the DC link.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Selection |
| **Parameter Number:** | 2944 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Filter inactive | The filter is inactive. |
| 1 | Filter active | The filter is active. |
| 2 | Filter matches grid type selection | The filter is set according to the selected grid type. |

### P 2.2.1.8 Relative Power Limit Motor

Set the power limit in motor mode in % of nominal motor power.

| | | | |
|---|---|---|---|
| **Default Value:** | 300 | **Parameter Type:** | Range (0 — 1000) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 1814 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.2.1.9 Relative Power Limit Generator

Set the power limit in generator mode in % of nominal motor power.

| | | | |
|---|---|---|---|
| **Default Value:** | 300 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 1815 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.2.1.12 Output Current Limit Scale Input

Select the input for scaling the output current limit between 0% and 100% of the defined current limit. Off equals 100%.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1322 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

### P 2.2.1.13 Output Current Limit Response

Select the response for running at the current limit after the time delay set.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2359 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 2.2.1.14 Output Current Limit Delay

Set the delay before the selected response is triggered after the drive has reached the current limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 65000) |
| **Parameter Number:** | 2360 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.2.1.15 Power Limit Motor Response

Select the response for running at the power limit after the time delay set.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2366 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 2.2.1.16 Power Limit Motor Delay

Set the delay before the selected response is triggered after the drive has reached the power limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 65000) |
| **Parameter Number:** | 2364 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.2.1.17 Power Limit Generator Response

Select the response for running at the power limit after the time delay set.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2367 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 2.2.1.18 Power Limit Generator Delay

Set the delay before the selected response is triggered after the drive has reached the power limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 65000) |
| **Parameter Number:** | 2365 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.4.3.2 Group 2.2.2 Cooling Fan Control

#### P 2.2.2.1 Main Fan Minimum Speed

Set the minimum speed of the main cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2932 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.2.2.2 Internal Fan Minimum Speed

Set the minimum speed of the internal cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2928 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.2.2.3 Main Fan Fail Response

Select the drive response to a main fan fail.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2939 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 2.2.2.4 Internal Fan Fail Response

Select the drive response to an internal fan fail.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2940 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 2.2.2.5 Main Fan Operating Mode

Select the main fan operating mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard Operation) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2949 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard Operation | |
| 1 | Reduced Acoustics | |
| 2 | Cooler Operation | |

## 7.4.4 Group 2.3 Protection

### 7.4.4.1 Group 2.3.1 Settings

#### P 2.3.1.1 Retry after Fault

Enables retry functionality (ride-through) after fault.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2927 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

This parameter enables the retry functionality (fault ride-through) after 1 of the common power conversion protections has activated. The number of retries or the retrying window depends on the power unit type and rating. The protections that can utilize retry are:

- Output current ground leakage fault
- Output overcurrent faults
- DC-link overvoltage and undervoltage faults
- Brake resistor or switching element short circuit faults

#### P 2.3.1.2 Smart Derate Mode

Select the level of derating if the nominal operational limits of the drive have been exceeded.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Maximum derating) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2345 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Maximum derating | Drive derates as much as possible. |
| 1 | Minimum derating | Drive derates as little as possible. |

This parameter selects a level for the derating of the switching frequency whenever it is needed. The drive features multiple protection functions that can derate the switching frequency of the drive, to avoid operating conditions that are harmful for the drive. This parameter can be used to influence the degree of derating. The following table shows the descriptions for the selections available for the parameter:

**Table 32: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Maximum Derating Mode | When switching frequency derating is applied, the drive reduces the switching frequency to the maximum. This depends on the application scenario. |
| Minimum Derating Mode | When switching frequency derating is applied, the drive reduces the switching frequency to the minimum. This depends on the application scenario. |

### P 2.3.1.3 DC-link Voltage Ripple Response

Select the mode of excessive DC-link voltage ripple protection.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2929 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the protection. |
| 1 | Fault | The drive issues a fault if excessive DC-link voltage ripple is detected. |

This parameter selects a response for excessive DC-link voltage ripple protection. Excessive voltage ripples are detected when the peak-to-peak amplitude of the DC voltage exceeds the internal limit of the drive for a long period. Both the limit and time depend on the power unit type and rating. The following table shows the descriptions for the selections available for the parameter:

**Table 33: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Disabled | No action is undertaken when excessive ripple is detected. |
| Fault | After detecting excessive ripples for a long period, the drive issues a fault and stops. |

### P 2.3.1.4 DC-link Imbalance Response

Select a response to an imbalance across the DC-link capacitors' voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2346 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 2.3.1.5 Rectifier Thermal Overload Response

Select the mode of rectifier thermal overload protection.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2340 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Fault | The drive issues a fault and stops. |
| 2 | Automatically derate | The drive continues operation with derated performance. |

This parameter selects a response to the reaction of the drive for rectifier thermal overload protection. Rectifier thermal overload is detected when the drive operates for a long period at a specified rectifier current level. Specific current levels and trip times depend on the power unit type and rating. The following table shows the descriptions for the selections available for the parameter:

**Table 34: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Fault | The drive issues a fault and stops modulation. |
| Automatically derate | The drive derates the rectifier current (DC-link current) to mitigate the cause of rectifier thermal overload. When the drive exits from the overload operation window, derating is stopped. |

### P 2.3.1.6 Inverter Thermal Overload Response

Select the mode of inverter thermal overload protection.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2341 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Fault | The drive issues a fault and stops. |
| 2 | Automatically derate | The drive continues operation with derated performance. |

This parameter selects a response to the reaction of the drive for inverter thermal overload protection. Inverter thermal overload is detected when the drive operates for a long period at a specified output current level. The levels (current and time) depend on the selected output current level. An example is currents exceeding the nominal levels for a longer time (low overload, high overload). The levels can be found in the design guide.

The following table shows the descriptions for the selections available for the parameter:

**Table 35: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Fault | The drive issues a fault and stops. |
| Automatically derate | The drive derates the rectifier current (DC-link current) to mitigate the cause of rectifier thermal overload. When the drive exits from the overload operation window, derating is stopped. |

### P 2.3.1.7 Ground Fault 0 Response

Select a response if a high-impedance ground fault occurs.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2347 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |

#### P 2.3.1.8 Constant Loss Controller

Enables the constant-loss controller. The function maintains a constant temperature in the drive at low-load conditions.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 2355 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.4.4.2 Group 2.3.2 Overvoltage Protection

#### P 2.3.2.1 Overvoltage Control

Enables the DC-link overvoltage controller. It is recommended to disable the overvoltage controller if brake is enabled, or the unit is supplied with a regulated DC.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1802 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

**Table 36: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Disable | • The overvoltage controller does not affect motor speed in any manner.<br>• DC-link voltage is controlled with a brake chopper.<br>NOTE: A DC-link overvoltage fault is usually triggered when the DC-link voltage exceeds acceptable levels. |
| Enable | When the DC-link voltage level exceeds the overvoltage level, motor speed or deceleration is limited by the controller. The overvoltage voltage level is set with parameter ***2.3.2.5 Overvoltage Control Upper Limit***. |

#### P 2.3.2.2 Overvoltage Control Kp

Set the scaling of the overvoltage control proportional gain.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1803 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.2.3 Overvoltage Control Ti

Set the scaling of the overvoltage control integral time.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1804 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.2.4 Overvoltage Control Td

Set the scaling of the overvoltage control derivation time.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1805 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.2.5 Overvoltage Control Upper Limit

Set the upper limit for the overvoltage control. However, the voltage can be limited further due to internal derating.

| | | | |
|---|---|---|---|
| **Default Value:** | 796.5 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1816 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.4.4.3 Group 2.3.3 Power Loss

#### P 2.3.3.3 Power Loss Response

Select the response to an insufficient supply voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Undervoltage control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1818 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | The function is disabled. |
| 1 | Undervoltage control | Drive utilizes the kinetic energy in the system to maintain operation as long as possible. |
| 2 | Controlled ramp down | Drive utilizes the kinetic energy in the system to perform a controlled ramp down. |
| 3 | Coast | Drive coasts the motor. |

This parameter sets the reaction of the drive when the drive has insufficient supply voltage (DC-link voltage). Insufficient voltage is detected when the actual voltage falls below the undervoltage limit.

**Table 37: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| None | During a power loss scenario, the drive takes no action. The undervoltage controlled is disabled. |
| Undervoltage control | • When the voltage falls below the undervoltage level, the undervoltage controller is activated.<br>• The controller decelerates the motor speed to regenerate energy to DC-link.<br>• Use this selection for system module drives. |
| Controlled ramp down | When the voltage falls below the undervoltage level, the drive stops by ramping the motor speed to zero before stopping modulation. |
| Coast | When the voltage falls below the undervoltage level, the drive immediately stops modulating. |

### P 2.3.3.4 Power Recovery Response

Select the action to take when supply voltage returns after a power loss.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Ramp to reference) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1819 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Ramp to reference | Drive ramps to reference. |
| 1 | Ramp fast to reference | Drive ramps as fast as possible to reference. |
| 2 | Ramp to zero | Drive ramps down and coasts. |
| 3 | Flystart and ramp to reference | Drive executes a flystart and ramps to reference. This setting is only active if Power Loss Response is set to coast. |

Sets the reaction of the drive when the supply voltage (DC-link voltage) returns after a power loss event. The reaction occurs when the actual voltage returns and exceeds the undervoltage limit.

**Table 38: Selection Descriptions**

| Selection name | Selection description |
|---|---|
| Ramp to reference | This is the recommended selection for a system drive. The drive ramps from the actual speed to the reference. |
| Ramp fast to reference | The drive bypasses ramping and operates directly with the reference.<br>NOTE: This selection is only available with the flux motor control principle. |
| Ramp to zero | The drive ramps from the actual speed to zero and coasts. |

### P 2.3.3.5 Undervoltage Control Kp

Set the scaling of the undervoltage control proportional gain.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0.001 — 10000) |
| **Parameter Number:** | 1806 | **Unit:** | % |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.3.6 Undervoltage Control Ti

Set the scaling of the undervoltage control integral time.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1807 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.3.7 Undervoltage Control Td

Set the scaling of the undervoltage control derivation time.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1808 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.3.8 Undervoltage Control Activation Level

Set the level at which undervoltage control is activated.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1817 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.3.3.12 Deceleration Time Power Loss

Set the deceleration time from nominal speed to 0 when in power-loss mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.5 | **Parameter Type:** | Range (0.02 — 10000) |
| **Parameter Number:** | 1139 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.4.5 Group 2.4 Modulation

#### P 2.4.1 Max. Switching Frequency

Set the maximum switching frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | 16.00 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2924 | **Unit:** | kHz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 2.4.2 Min. Switching Frequency

Set the minimum switching frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.00 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2925 | **Unit:** | kHz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.4.3 Switching Frequency

Set the switching frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.00 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2920 | **Unit:** | kHz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 2.4.4 Control Frequency Request

Set the requested control frequency. A constant control frequency is enabled by setting this value. If set to 0.0, constant control frequency is disabled.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — *) |
| **Parameter Number:** | 2921 | **Unit:** | kHz |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

### P 2.4.6 Overmodulation

Enables the modulation index to exceed 1.0.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5094 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

## 7.5 Group 3 Filters & Brake Chopper

### 7.5.1 Filters Overview

This parameter group contains parameters for configuring, monitoring, and controlling the input filters and output filters.

### 7.5.2 Group 3.1 Filters & Brake Chopper Status

### P 3.1.1 Brake Power

Shows the power dissipated in the brake resistor.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0.00 — *) |
| **Parameter Number:** | 2933 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 3.1.2 Average Brake Power

Shows the average power dissipated in the brake resistor, calculated over 120 s.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0.00 — *) |
| **Parameter Number:** | 2934 | **Unit:** | kW |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 3.1.3 AHF Capacitor Connected

Shows if the advanced harmonic filter (AHF) capacitor is connected.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 5410 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | False | Fixed value - False. |
| 1 | True | Fixed value - True. |

### 7.5.3 Group 3.2 Brake Chopper

#### P 3.2.1 Brake Chopper

Select the brake chopper operation mode. If enabled, the OVC controller is no longer active.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2935 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | |
| 1 | Enabled in Run and Coast | Enables the brake chopper both while running and at coast. |
| 2 | Enabled in run only | Enables the brake chopper while running. |

#### P 3.2.2 Brake Chopper Voltage Reduce

Lower the activation level of the brake chopper. If set to 0, the value will be the highest one possible for the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 50) |
| **Parameter Number:** | 2938 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.5.4 Group 3.3 Brake Resistor

#### P 3.3.1 Brake Resistor Test

Enables the brake resistor test. The drive conducts a test of brake resistor presence while the drive is coasted. Starting of the drive is prohibited until the test is completed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 430 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | |
| 1 | Enable brake chopper test run | Executes a test of the brake chopper and brake resistor to check if they are operational. |

### P 3.3.2 Brake Resistor Resistance

Set the resistance value of the brake resistor.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2936 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

### P 3.3.3 Brake Resistor Power Limit

Set the power limit for resistor braking.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2937 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The parameter must be configured to set the expected average power dissipated in the brake resistor over a period of 120 s. To calculate the brake resistor power limit, use the following formula.

$$P_{br,\,avg}(W) = \frac{U^2_{br} \times t_{br}(s)}{R_{br}(\Omega) \times T_{br}(s)}$$

The following elements are used in the formula:

- $P_{br,\,avg}$ is the average power dissipated in the brake resistor.
- $R_{br}$ is the resistance of the brake resistor.
- $t_{br}$ is the active breaking time within 120 s. ($T_{br}$).
- $U_{br}$ is the DC link when the brake chopper is active. The correct value depends on the selection of parameter ***2.2.1 Unit Voltage Class*** using the following table.

**Table 39: Power rating and voltage class setting**

| Voltage range | Unit voltage class 380–500 V AC (3N05) |
|---|---|
| Low voltage range | 705 |
| Medium voltage range | 770 |
| High voltage range (low brake level) | 780 |
| High voltage range (high brake level) | 800 |

## 7.5.5 Group 3.4 Advanced Harmonic Filter

### P 3.4.1 Advanced Harmonic Filter

Select if the Advanced Harmonic Filter is connected to the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 3410 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 3.4.2 Capacitor Disconnect Output

Select the output terminal for disconnecting the capacitor.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 3412 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 3.4.3 Thermal Switch Response

Select which function is activated if the thermal input indicates too high a temperature.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 3413 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 2 | Derate | The drive issues a fault, continues operation, and derates to protect the filter. |

### P 3.4.4 Thermal Switch Input

Select the digital input terminal for the thermal switch.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 3414 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 3.4.5 Power Stabilizer Gain

Set the controller gain for power stabilization. The power stabilizer dampens possible resonance with the grid. If set to -1 the value is selected automatically, if set to 0 the controller is disabled.

| | | | |
|---|---|---|---|
| **Default Value:** | -1 | **Parameter Type:** | Range (-1 — 500) |
| **Parameter Number:** | 3415 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 3.4.6 Power Stabilizer Bandwidth

Set the controller bandwidth for power stabilization.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (1 — 10000) |
| **Parameter Number:** | 3416 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.5.6 Group 3.5 Output Filter

### P 3.5.1 Output Filter Type

Select the output filter type.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5501 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No output filter connected. |
| 1 | Sine-wave Filter | When using a sine-wave filter, the maximum output current of the drive might be reduced to protect the filter and drive. Check and correct the values for filter capacitance and inductance. |

### P 3.5.2 Filter Capacitance

Set the capacitance of the output filter.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Range (0.00 — 1000000.00) |
| **Parameter Number:** | 5502 | **Unit:** | µF |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

Set the Cy (capacitance) value of the output filter. See the filter product label for the capacitance value. The value is the equivalent star-connected capacitance of the filter. When the filters are installed in parallel, enter the combined capacitance value of the paralleled filter. The value is the equivalent star-connected capacitance (Cy) of the filter multiplied by the number of installed paralleled filters.

### P 3.5.3 Filter Inductance

Set the inductance of the output filter.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Range (0.00 — 1000.00) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 5503 | **Unit:** | mH |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

Set the inductance of the output filter. See the product label of the filter for the value of inductance. When filters are installed in parallel, enter the combined inductance value of the installed paralleled filters. The inductance value in the parameter is the inductance value of the filter divided by the number of paralleled filters.

#### P 3.5.4 Filter Series Resistance

Set the equivalent resistance for the inductance of the output filter as per filter nameplate.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Range (0 — 1000000) |
| **Parameter Number:** | 5499 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

## 7.6 Group 4 Motor

### 7.6.1 Motor Overview

This parameter group contains parameters for configuring the motor, motor control, and motor protection.

### 7.6.2 Group 4.1 Motor Status

#### P 4.1.1 Motor Current

Shows the actual motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9000 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 4.1.2 Relative Motor Current

Shows the actual motor current in % of the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 200) |
| **Parameter Number:** | 9001 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 4.1.3 U-phase RMS Current

Shows the U-phase RMS current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9020 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 4.1.4 V-phase RMS Current

Shows the V-phase RMS current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9021 | **Unit:** | A |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.5 W-phase RMS Current

Shows the W-phase RMS current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9022 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.6 Motor Voltage

Shows the actual motor voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9005 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.7 Relative Motor Voltage

Shows the actual motor voltage in % of the nominal motor voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 200) |
| **Parameter Number:** | 9006 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.11 Motor Torque

Shows the actual motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-10000000 — 10000000) |
| **Parameter Number:** | 9009 | **Unit:** | Nm |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.12 Relative Motor Torque

Shows the motor torque in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1708 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.13 Motor Shaft Power

Shows the actual power at the motor shaft.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9008 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.14 Relative Motor Shaft Power

Shows the actual motor shaft power in % of the nominal motor shaft power.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 1707 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.15 Motor Electrical Power

Shows the actual motor power.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9043 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.16 Motor Thermal Load (ETR)

Shows the estimated thermal load of the motor calculated by the ETR function.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2951 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.17 Motor Current Output

Select an output for the motor current signal. The scale of the signal is 0–100% of the nominal current.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2302 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.18 Motor Voltage Output

Select an output for the motor voltage signal. The scale of the signal is 0–100% of the nominal voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2303 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.19 Absolute Motor Torque Output

Select an output for the motor torque signal. The scale of the signal is 0–100% of the absolute value of the nominal torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2306 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.20 Extended Motor Torque Output

Select an output for the motor torque signal. The scale of the signal is -200...200% of the nominal torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2310 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.21 Absolute Motor Speed Output

Select an output for the motor speed signal. The scale of the signal is 0–100% of the absolute value of the nominal speed.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2301 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.22 Extended Motor Speed Output

Select an output for the motor speed signal. The scale of the signal is -200...200% of the nominal speed.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2309 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.23 Motor Power Output

Select an output for the motor power signal. The scale of the signal is 0–100% of the nominal power.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2305 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 4.1.24 AMA Progress

Shows the progress of the Automatic Motor Adaptation (AMA).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 429 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 4.1.26 Motor Temperature

Shows the actual temperature of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 1630 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 4.1.28 Rs Measured

When a Rs measurement is stored for use after drive power recycle, the value is shown here; otherwise it is zero.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 433 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 4.1.29 Back EMF Measured Coast

Shows the measured back EMF constant of PM motors. The voltage is measured right after a coast signal has been applied. The value is given as line-line RMS at 1000 RPM. To make use of this measurement, the motor must run above 15 % of the motor nominal speed when the coast signal is applied. This measurement does not work for motors that cannot spin freely after coast.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 1631 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

## 7.6.3 Group 4.2 Motor Data

### 7.6.3.1 Group 4.2.1 General Settings

#### P 4.2.1.1 Motor Type

Select the motor type.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Induction Motor) | **Parameter Type:** | Selection |
| **Parameter Number:** | 407 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Induction Motor | Asynchronous Induction Motor. |
| 1 | Permanent Magnet Motor | Permanent Magnet Synchronous Motor. |
| 2 | Sync. Reluctance Motor | Synchronous reluctance motor. |

NOTE: If the motor type is a PM-assisted synchronous reluctance motor, select ***[1] Permanent Magnet Motor***.

### P 4.2.1.2 Number of Pole Pairs

Set the number of pole pairs. For example, a 4-pole motor is set as 2 pole pairs.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 406 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The synchronous speed of a motor can be calculated when the supply frequency and number of pole pairs are known. The formula to calculate the synchronous speed of the motor (ns) with supply frequency (f) and number of pole pairs (p) is as follows:

$$ns = \frac{60 \times f}{p} \text{ [RPM]}$$

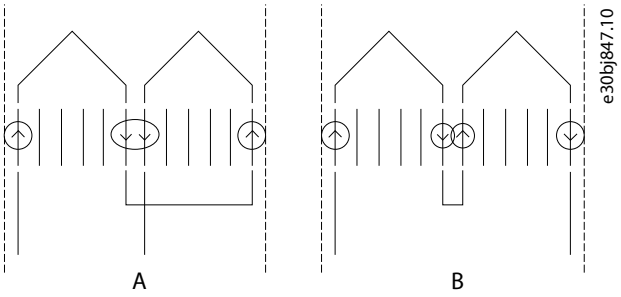



**Figure 68: Two Inductors in 1 Phase Connected in Series to A) 2 Poles B) 4 Poles**

While the frequency is determined by the grid or the drive, the number of poles is determined by the way the stator inductors are connected. Pole pairs (p) or pole number and synchronous motor speed lists the number of poles corresponding to synchronous speed (n0) at 50 Hz and 60 Hz supply.

**Table 40: Number of Pole Pairs (p) and Nominal Speed (~nn) for Motors @ 50 Hz and 60 Hz**

| Number of pole pairs (p) | ~nn @ 50 Hz | ~nn @ 60 Hz |
|---|---|---|
| 1 | 2700–2880 | 3250–3460 |
| 2 | 1350–1450 | 1625–1730 |
| 3 | 700–960 | 840–1153 |

**Table 41: Pole Pairs (p) or Pole Number and Synchronous Motor Speed**

| Number of pole pairs (p) | 1 | 2 | 3 | 4 | 6 |
|---|---|---|---|---|---|
| Number of poles | 2 | 4 | 6 | 8 | 12 |
| 50 Hz supply | 3000 | 1500 | 1000 | 750 | 500 |
| 60 Hz supply | 3600 | 1800 | 1200 | 900 | 600 |

The dependency of the motor's synchronous speed ns in RPM of the frequency f of the power supply in Hz (parameter ***1.1.1 Grid Frequency***) and the number of pole pairs in parameter ***4.2.1.2 Number of Pole Pairs*** is provided by the earlier formula.

For example, for a motor with 2 pole pairs (4 poles) and a frequency of the power supply of 50 Hz, the synchronous speed of the motor is:

$$ns = \frac{60 \times f}{p} \text{ [RPM]} = 1500 \text{ RPM}$$

### P 4.2.1.3 AMA Mode

Select the Automatic Motor Adaptation (AMA) mode. If motor type was set to induction motor, the results of the measurement can be seen under the menu Induction Motor. If motor type was set to either permanent magnet motor or synchronous reluctance motor, the result can be seen under the menu Synchronous Motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Off) | **Parameter Type:** | Selection |
| **Parameter Number:** | 420 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | AMA is disabled for normal operation. |
| 3 | Motor Data | The next start command initiates measurement of the motor data. |
| 4 | Reduced Motor Data (Rs) | The next start command initiates a measurement of the motor stator resistance - Rs. This method also works if a sine-wave filter is connected between the motor and drive. |

Automatic Motor Adaptation (AMA) is an automated test procedure providing an optimization of the motor parameters for improved shaft performance. The measurement is performed based on the motor product label data in parameter group ***4.2.2 Motor Nameplate Data***. The motor-type-specific parameters in parameter group ***4.2.3 Induction Motor*** or parameter group ***4.2.4 Permanent Magnet Motor*** are recalculated and used to fine-tune the motor control algorithm. Running the AMA procedure also maximizes the automatic energy optimization (AEO) feature of the drive. AMA also allows the automatic detection of the motor type based on the product label data.

- The AMA must be run on a cold motor. Running the AMA multiple times also increases the motor temperature.
- The AMA must be conducted with the motor at standstill.
- Avoid generating external torque during AMA.
- The ***Motor Data*** mode (selection 3) cannot be run with a sine-wave filter connected. The ***Reduced Motor Data (Rs)*** mode (selection 4) can be run with a sine-filter connected.
- Uncoupling the load from the motor is not needed.
- The duration of the AMA depends on the power rating of the motor.
- Changing the product label data in parameter group ***4.2.2 Motor Nameplate Data*** also modifies the data in the parameter group ***4.2.3 Induction Motor*** or ***4.2.4 Permanent Magnet Motor***.

NOTE: Running AMA for most motors takes a few seconds, but for synchronous reluctance motors of 11 kW or larger, it takes approximately 23 minutes.

NOTE: The parameter automatically switches back to Off after the AMA has been performed.

### P 4.2.1.4 Rs Measurement at start

Determine when a Rs measurement is performed.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Off) | **Parameter Type:** | Selection |
| **Parameter Number:** | 432 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | Select this setting to disable Rs measurement. To reset the triggering, this setting must be selected in between the other methods. |
| 1 | First start after power on | Select performing a Rs measurement at the first start after the drive is powered on. |
| 2 | Every start | A Rs measurement is performed before every start. |
| 3 | First start with store | Enable performing a Rs measurement at the first start. The measurement is stored. |

Use Rs measurement at start to measure the resistance of the stator (Rs) before motor start, for induction and permanent magnet motors running FVC+. For induction motors, the rotor resistance (Rr) is also provided.

Accurate motor parameters are important for optimum motor performance, and measuring resistances before starting the motor can help compensate for variation caused by changes in motor operating temperature.

It is important that the shaft is not rotating when the measurement is made. If it cannot be guaranteed, use DC hold to stop the shaft before start.

### P 4.2.1.5 Motor Cable Length

Set the motor cable length.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 425 | **Unit:** | m |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

In some products, depending on the EMC configuration, this parameter may adjust the allowable switching frequency automatically to achieve optimum performance of the drive system.

Depending on whether metric or imperial units are in use, give the value for the parameter in either meters (m) or feet (ft). The value range is different with the different units.

### P 4.2.1.6 Output Phase Sequence

Set the output phase sequence. This function virtually swaps the output phases, which can be used to change the direction of motor rotation without having to physically rewire motor cables.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (UVW) | **Parameter Type:** | Selection |
| **Parameter Number:** | 431 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | UVW | Select the normal phase sequence. |
| 1 | WVU | Select the reverse phase sequence. |

### 7.6.3.2 Group 4.2.2 Motor Nameplate Data

These parameters allow the setting of motor nameplate data.

Often, permanent magnet motors have torque but not power given on the motor nameplate. For those motors, set the speed and torque product label settings, then the system calculates the power value. The system also calculates the torque value for induction motors, when the power and speed values are set.

When a higher priority parameter is set, the value of the lower priority parameter is calculated by the system. The parameters have the following priority order:

1. Nominal Power
2. Nominal Speed
3. Nominal Torque

To calculate the nominal torque of the motor, first set nominal power and then nominal speed.

To calculate nominal power of the motor, first set nominal speed and then nominal torque.

#### P 4.2.2.1 Nominal Power

Set the nominal motor shaft power.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.50 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 405 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.2.2 Nominal Current

Set the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 11.5 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 400 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.2.3 Nominal Speed

Set the nominal motor shaft speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 1450 | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 402 | **Unit:** | rpm |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.2.4 Nominal Frequency

Set the nominal motor frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 403 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.2.5 Nominal Voltage

Set the nominal motor voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | 400 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 401 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.2.6 Nominal Torque

Set the nominal torque from the nameplate of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 52521.13 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9951 | **Unit:** | NomTorqueSI |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

### 7.6.3.3 Group 4.2.3 Induction Motor

#### P 4.2.3.1 Stator Resistance Rs

Set the motor stator resistance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.21 | **Parameter Type:** | Range (0 — 1000000) |
| **Parameter Number:** | 408 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.3.2 Rotor Resistance Rr

Set the motor rotor resistance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.79 | **Parameter Type:** | Range (0 — 1000000) |
| **Parameter Number:** | 409 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

Use any of the following methods for setting Rr:

- Run an AMA on a cold motor. The drive measures the value from the motor. All compensations are reset to 100%.
- Enter the Rr value manually. Obtain the value from the motor supplier.
- Use the Rr default setting. The drive establishes the setting based on the motor nameplate data.

#### P 4.2.3.3 Iron Loss Resistance Rfe

Set the motor iron-loss equivalent resistance.

| | | | |
|---|---|---|---|
| **Default Value:** | 874 | **Parameter Type:** | Range (0 — 11000000000) |
| **Parameter Number:** | 413 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

The Rfe value cannot be found by performing an AMA. The Rfe value is especially important in torque control applications. If Rfe is unknown, make sure to keep the default setting of the parameter.

#### P 4.2.3.4 Stator Leakage Reactance Xls

Set the motor stator leakage reactance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.03 | **Parameter Type:** | Range (0.00 — 62.83) |
| **Parameter Number:** | 440 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

Use any of the following methods for setting Xls:

- Run an AMA on a cold motor. The drive measures the value from the motor.
- Enter the Xls value manually. Obtain the value from the motor supplier.
- Use the Xls default setting. The drive establishes the setting based on the motor nameplate data.

#### P 4.2.3.5 Rotor Leakage Reactance Xlr

Set the motor rotor leakage reactance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.03 | **Parameter Type:** | Range (0.00 — 62.83) |
| **Parameter Number:** | 441 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

Use any of the following methods to set Xlr:

- Run an AMA on a cold motor. The drive measures the value from the motor.
- Enter the Xlr value manually. Obtain the value from the motor supplier.
- Use the Xlr default setting. The drive establishes the setting based on the motor nameplate data.

#### P 4.2.3.6 Magnetizing Reactance Xm

Set the motor magnetizing reactance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.94 | **Parameter Type:** | Range (0.00 — 62.83) |
| **Parameter Number:** | 442 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

### 7.6.3.4 Group 4.2.4 Synchronous Motor

#### P 4.2.4.1 Back EMF

Set the stator nominal induced voltage (back-EMF voltage) when running at 1000 RPM (line-to-line RMS). Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 190 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 415 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.2 Stator Resistance Rs

Set the motor stator resistance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.21 | **Parameter Type:** | Range (0 — 1000000) |
| **Parameter Number:** | 408 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.3 d-axis Inductance Ld

Set the motor non-saturated d-axis inductance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 23.00 | **Parameter Type:** | Range (0.00 — 1000.00) |
| **Parameter Number:** | 417 | **Unit:** | mH |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.4 d-axis Inductance Ld-Sat

Set the motor saturated d-axis inductance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 23.00 | **Parameter Type:** | Range (0.00 — 1000.00) |
| **Parameter Number:** | 418 | **Unit:** | mH |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.5 Ld Saturation Point

Set the point (in % of nominal motor current) at which the Ld inductance saturates (average of non-saturated and saturated). Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 300) |
| **Parameter Number:** | 426 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.6 q-axis Inductance Lq

Set the motor non-saturated q-axis inductance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 85.00 | **Parameter Type:** | Range (0.00 — 1000.00) |
| **Parameter Number:** | 427 | **Unit:** | mH |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.7 q-axis Inductance Lq-Sat

Set the motor saturated q-axis inductance. Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 85.00 | **Parameter Type:** | Range (0.00 — 1000.00) |
| **Parameter Number:** | 422 | **Unit:** | mH |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

#### P 4.2.4.8 Lq Saturation Point

Set the point (in % of nominal motor current) at which the Lq inductance saturates (average of non-saturated and saturated). Overwritten by AMA.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 300) |
| **Parameter Number:** | 424 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Conditional Write |

## 7.6.4 Group 4.3 Motor Control

### 7.6.4.1 Compatibility of Motor Control Features for FVC+ and VVC+ Control

The following table outlines the compatibility of motor types and motor control related features with motor control principles.

**Table 42: Motor Control Features and Motor Types**

| Motor type/Feature | | Induction motors | | Permanent magnet motors | | Synchronous reluctance motors | |
|---|---|---|---|---|---|---|---|
| | | FVC+ | VVC+ | FVC+ | VVC+ | FVC+ | VVC+ |
| Motor type | Induction motor (IM) | X | X | - | - | - | - |
| | Surface permanent magnet motor (SPM) | - | - | X | X | - | - |
| | Interior permanent magnet motor (IPM) | - | - | X | X | - | - |
| | Synchronous reluctance motor (SRM) | - | - | - | - | X | - |
| Speed feedback | Open loop | X | X | X | X | X | - |
| | Closed loop (with the Encoder Resolver option) | X | X | X | - | X | - |
| Reference handling | Speed control | X | X | X | X | X | - |
| | Torque control | X | - | X | - | X | - |
| | Linear ramp | X | X | X | X | X | - |
| | S-ramp | X | X | X | X | X | - |
| | Load drooping | X | X | X | X | X | - |
| | Windowing in torque control | X | - | X | - | X | - |
| Limit handling | Speed limit | X | X | X | X | X | - |
| | Torque limit | X | X | X | X | X | - |
| | Current limit | X | X | X | X | X | - |
| | Power limit | X | X | X | X | X | - |
| | Overvoltage control | X | X | X | X | X | - |
| | Undervoltage control | X | X | X | X | X | - |

**Table 42: Motor Control Features and Motor Types** - (continued)

| Motor type/Feature | | Induction motors | | Permanent magnet motors | | Synchronous reluctance motors | |
|---|---|---|---|---|---|---|---|
| | | FVC+ | VVC+ | FVC+ | VVC+ | FVC+ | VVC+ |
| Auxiliary functions | Flying start | X | X | X | X | - | - |
| | Automatic energy optimization (AEO) | X | X | X | X | X | - |
| | Power loss action | X | X | X | X | X | - |
| | AC brake (Flux brake) | X | X | X | - | X | - |
| | Start magnetization | X | X | - | - | - | - |
| | DC brake | X | X | X | X | X | - |
| | DC-injection in stop | X | X | X | X | X | - |
| | Stop state magnetization | X | X | - | - | - | - |
| | Initial position detection | - | - | X | X | X | - |
| | Rotor parking | - | - | X | X | X | - |
| Commissioning functions | AMA standstill | X | X | X | X | X | - |
| | Inertia measurement | X | - | X | - | X | - |
| | Speed control auto-tuning | X | - | X | - | X | - |
| Filters | Sine-wave filter | - | X | - | X | - | - |
| | Advanced harmonic filter | X | X | X | X | X | - |
| Process functionality and protections | Mechanical brake control | X | - | X | - | X | - |
| | Missing motor phase | X | X | X | X | X | - |
| | External motor thermal protection | X | X | X | X | X | - |
| | Electronic thermal relay (ETR) | X | X | X | X | X | - |

### 7.6.4.2 Group 4.3.1 General Settings

#### P 4.3.1.1 Motor Control Principle

Select the motor control principle.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (VVC+ Control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2503 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | U/f Control | Selects U/f control as motor control. |
| 1 | VVC+ Control | Selects Voltage Vector Control (VVC+) as motor control. |
| 2 | FVC+ Control | Selects Flux Vector Control (FVC+) as motor control. |

### P 4.3.1.2 Breakaway Current Boost

Enables the breakaway current boost, which temporarily allows a higher starting current.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 2930 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 4.3.1.5 Motor Feedback Mode

Select the feedback mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Open loop) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2502 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Open loop | The motor is operated without feedback. The motor control estimates the actual speed. |
| 1 | Closed loop with Feedback Device 1 | The motor is operated with feedback, providing speed and position feedback for motor control from feedback device 1. |
| 2 | Closed loop with Feedback Device 2 | The motor is operated with feedback, providing speed and position feedback for motor control from feedback device 2. |
| 3 | Closed loop with Basic I/O Feedback | The motor is operated with feedback, providing speed and position feedback for motor control from basic I/O feedback. |

### P 4.3.1.6 Motor Feedback Test Mode

Select the motor feedback test mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Off) | **Parameter Type:** | Selection |
| **Parameter Number:** | 421 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | Motor feedback test is not enabled. |
| 1 | Enable Motor Feedback Test | The next start command initiates a test of the motor feedback signal. |

#### P 4.3.1.9 Maximum Motor Voltage

Set the maximum output voltage applied to the motor. This can be used to avoid a field-weakening operation when running at speeds above the nominal motor speed, when the drive is supplied with a voltage higher than the nominal motor voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | 400 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 5433 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.1.10 Motor Voltage Limitation Mode

Motor voltage limitation mode selection. The limitation is performed based on the DC-link voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Average DC-link voltage) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4620 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Average DC-link voltage | Motor voltage is limited based on the average DC-link voltage. |
| 1 | Minimum DC-link voltage | Motor voltage is limited based on the minimum DC-link voltage. |

### 7.6.4.3 Running a Motor Feedback Test

The Motor Feedback Test optimizes closed-loop motor operation. During the test, the motor is rotated in open loop and feedback data is gathered. The feedback data is then utilized in closed-loop operation.

The Motor Feedback Test is executed during commissioning.

1. Set parameter ***4.3.1.6 Motor Feedback Test Mode*** to ***Enable Motor Feedback Test***.

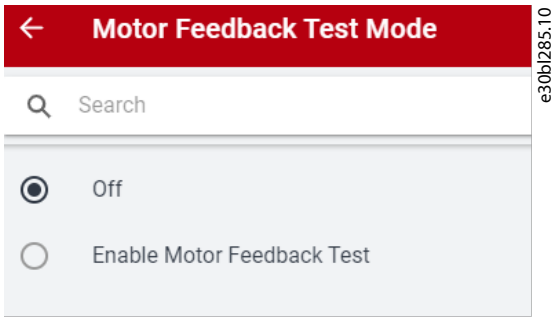



**Figure 69: Motor Feedback Test Mode in MyDrive® Insight**

The warning ***Feedback Test Active (5600)*** is issued, and normal start is suppressed until the test is executed.

2. Give the start command.

The motor accelerates to 60 RPM and runs for 1 s. The test samples the feedback signal. The motor stops after 1 s and the drive reports the test result. Parameter ***4.3.1.6 Motor Feedback Test Mode*** is set to ***Off***.

The outcome of the test can be:

- Success: The drive issues ***Info 5601: Feedback Test Successful*** and a pop-up dialog with the same message.
- Feedback signal was negative running whereas motor was positive: The drive issues ***Fault 5604: Motor Feedback Inversed***.
- Feedback signal was 0 or very low: The drive issues ***Fault 5605: No Motor Feedback***.
- Feedback signal was faster than expected: The drive issues ***Fault 5603: Feedback Resolution/Poles Low***.
- Feedback signal was slower than expected: The drive issues ***Fault 5602: Feedback Resolution/Poles High***.
- Feedback signal was inconsistent: Drive issues ***Fault 5606: Feedback Unstable***.

### 7.6.4.4 Group 4.3.2 U/f Settings

The parameters are used to set the U/f motor control curve manually. Make sure that the parameter ***4.3.1.1 Motor Control Principle*** is set to ***U/f***.

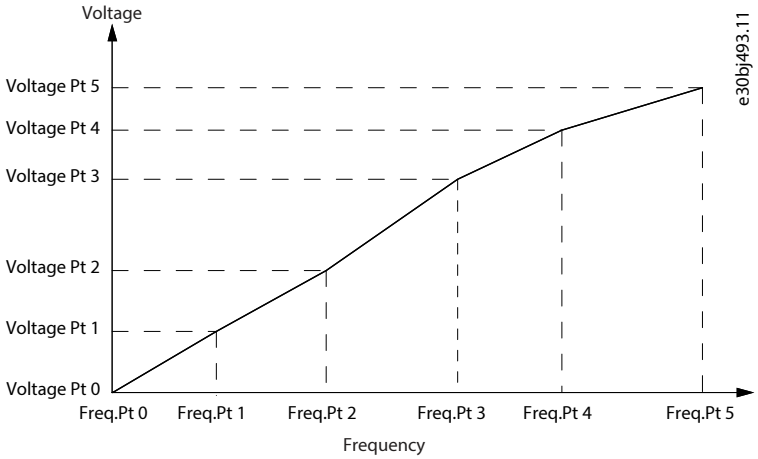



**Figure 70: U/f Settings**

#### P 4.3.2.1 Voltage Point 0

Set the U/f curve voltage point 0.

| | | | |
|---|---|---|---|
| **Default Value:** | 8 | **Parameter Type:** | Range (0 — *) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2600 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.2 Voltage Point 1

Set the U/f curve voltage point 1.

| | | | |
|---|---|---|---|
| **Default Value:** | 80 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2601 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.3 Voltage Point 2

Set the U/f curve voltage point 2.

| | | | |
|---|---|---|---|
| **Default Value:** | 160 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2602 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.4 Voltage Point 3

Set the U/f curve voltage point 3.

| | | | |
|---|---|---|---|
| **Default Value:** | 240 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2603 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.5 Voltage Point 4

Set the U/f curve voltage point 4.

| | | | |
|---|---|---|---|
| **Default Value:** | 320 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2604 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.6 Voltage Point 5

Set the U/f curve voltage point 5.

| | | | |
|---|---|---|---|
| **Default Value:** | 400 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2605 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.7 Frequency Point 0

Set the U/f curve frequency point 0.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2610 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.2.8 Frequency Point 1

Set the U/f curve frequency point 1.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2611 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.2.9 Frequency Point 2

Set the U/f curve frequency point 2.

| | | | |
|---|---|---|---|
| **Default Value:** | 20 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2612 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.2.10 Frequency Point 3

Set the U/f curve frequency point 3.

| | | | |
|---|---|---|---|
| **Default Value:** | 30 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2613 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.2.11 Frequency Point 4

Set the U/f curve frequency point 4.

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2614 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.2.12 Frequency Point 5

Set the U/f curve frequency point 5.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2615 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.6.4.5 Group 4.3.3 FVC+ Settings

#### P 4.3.3.1 Continuous Rs Estimation

Enables Rs estimation while running, to compensate for changing operating conditions.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 428 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 4.3.3.2 Current Controller Kp

Set the scaling of the current controller nominal proportional gain.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 8021 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.3 Current Controller Ti

Set the scaling of the current controller nominal integral time.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0.1 — 100000) |
| **Parameter Number:** | 8022 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.5 Low-speed Mode

Select the motor control mode used at low speeds.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Selected motor control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2816 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Selected motor control | Uses the selected motor control at low speed. |
| 1 | Forced current mode (I/f Control) | Selects robust I/f current control at low speed. |
| 2 | HF injection | Adds HF injection to improve speed estimation performance at low speed. |
| 3 | Low speed minimum current | Ensures a minimum current in FVC+ speed mode at low speed. |
| 4 | Saliency Tracking | Adds saliency tracking at low speed. |

### P 4.3.3.6 I/f Control Current Reference

Set the I/f control current reference in % of nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 2817 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.7 I/f Control Speed Threshold

Set the speed below which the I/f control is used.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (1 — *) |
| **Parameter Number:** | 2818 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.8 I/f Control Slip Compensation

Set the slip compensation in % of the nominal motor slip. This is only active in forced current mode (I/f Control).

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2885 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.9 Low Speed Minimum Current

Set the low-speed minimum current reference in % of nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2837 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.11 Minimum Current Speed Threshold

Set the speed below which the minimum current control is used.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (1 — *) |
| **Parameter Number:** | 2838 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.12 Relative HF Injection Voltage Gain

Set the voltage gain for HF injection relative to the recommended voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (5 — 2000) |
| **Parameter Number:** | 2821 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.13 Relative HF Inject Bandwidth

Set the bandwidth for HF injection relative to the recommended bandwidth.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (1 — 1000) |
| **Parameter Number:** | 2826 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.14 HF Injection Angle Comp. Gain

Set the HF injection angle error compensation gain in degrees per nominal load torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-35 — 35) |
| **Parameter Number:** | 2822 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.15 HF Injection Angle Comp. Offset

Set the HF injection angle error compensation offset in degrees.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-25 — 25) |
| **Parameter Number:** | 2824 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.16 HF Injection Frequency

Set the HF injection frequency. Setting 0 is equal to automatic setting of injection frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2823 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.18 Idlq Reference Ratio

Set the synchronous motor Id/Iq current reference ratio in %. It is used instead of the default MTPA, if it is set to be different from 0.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-100 — 100) |
| **Parameter Number:** | 1219 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.19 Encoder Slip Adjustment

Enables the encoder slip correction function for permanent magnet motors in closed loop FVC+ control.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 4602 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 4.3.3.20 Torque Estimation Bandwidth

Set scaling factor for torque estimation correction bandwidth. 100% = default tuning, 0% = disable. Applies only to permanent magnet motors.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 4612 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.21 Stall Prevention

Enables the stall prevention function that activates when the motor is operated in the field weakening area.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 4625 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 4.3.3.22 Stall Prevention Adjustment Gain

Set the stall prevention adjustment gain. The stall prevention adjustment gain improves stability and avoids stalling when operating at high speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (50 — 150) |
| **Parameter Number:** | 4626 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.3.23 Motor Voltage Reserve FVC+

Set the voltage reserve for FVC+ control. To ensure stable motor control, the maximum motor voltage must be lower than the available DC-link voltage by this margin. Adjusting this value can improve shaft performance for applications running in field weakening mode. Modify the value with caution, as it can affect stability.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4629 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.6.4.6 High Frequency Voltage Injection

For salient-pole synchronous motors under FVC+, High Frequency Voltage Injection (HFVI) is an encoder/resolver alternative for rotor position detection at low speeds. If the motor has sufficient saliency (typically larger than 1.1), HFVI allows applications to run open loop with performance like closed loop.

In a salient-pole motor, the magnetic material of the rotor is not rotationally symmetric, as opposed to a non-salient pole motor where it is. That means that the magnetic path through different diameters of the rotor varies. This variation results in different values of Lq and Ld inductances, which can be used to determine the orientation of the rotor. The saliency ratio (SR) is the ratio between Lq and Ld.

### HFVI parameters

The setup parameters are all located under ***4.3.3 FVC+ Settings***. HFVI is enabled by setting ***4.3.3.5 Low-speed Mode*** (1 in the following picture) to ***HF injection***.

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 4.3.3.4 | Low Speed Mode | Normal Motor Control | Normal Motor Control | 0 | 3 | |
| | 4.3.3.5 | I/f Control Current % | 100 | 100 | 0 | 500 | % |
| | 4.3.3.6 | I/f Control Threshold Speed | 10 | 300 | 1 | 50 | rpm |
| | 4.3.3.7 | Low Speed Minimum Current | 50 | 50 | 0 | 100 | % |
| | 4.3.3.8 | Minimum Current Threshold Speed | 10 | 10 | 1 | 50 | Hz |
| | 4.3.3.9 | Motor Feedback Mode | Open Loop | Open Loop | 0 | 1 | |
| 2 | 4.3.3.10 | HF Inject Voltage Gain % | 100 | 100 | 5 | 2000 | % |
| 3 | 4.3.3.11 | HF Inject Bandwidth % | 100 | 100 | 1 | 1000 | % |
| 4 | 4.3.3.12 | HF Inject Angle Comp Gain | 0 | 0 | -35 | 35 | ° |
| 5 | 4.3.3.13 | HF Inject Angle Comp Offset | 0 | 0 | -25 | 25 | ° |
| 6 | 4.3.3.14 | HF Inject Frequency | 0 | 0 | 0 | 3.4028234663852886e+38 | Hz |
| 7 | 4.3.3.15 | Idlq Reference Ratio Pct | 0 | 0 | -100 | 100 | % |

e30bk407.10

**Figure 71: HFVI parameters**

The basic settings are done with the following 3 parameters:

- ***4.3.3.10 HF Inject Voltage Gain %*** (2): Set the magnitude of the injected voltage as a percentage of the recommended injected voltage.
- ***4.3.3.11 HF Inject Bandwidth %*** (3): Set the bandwidth of the position estimation as a percentage of the recommended bandwidth.
- ***4.3.3.14 HF Inject Frequency*** (6): This is an optional parameter to force the injection frequency to a specific value. If set to 0, the recommended injection frequency is used.

The recommended injected voltage and frequency are calculated based on motor data.

To ensure sufficient saliency levels under all load conditions, more advanced settings can be set with these 3 parameters:

- ***4.3.3.12 HF Inject Angle Comp Gain*** (4): Load-dependent offset to the estimated rotor angle.
- ***4.3.3.13 HF Inject Angle Comp Offset*** (5): Offset to the estimated rotor angle.
- ***4.3.3.15 Idlq Reference Ratio Pct*** (7): Disables the existing magnetization current controlling scheme, like MTPA, and introduces a magnetization current as a percentage of the torque current. This parameter can be used to force the motor to run with elevated magnetization current levels, if it is required to ensure sufficient saliency levels.

These 3 parameters require detailed information about the motor flux at various operating conditions.

### 7.6.4.7 Commissioning HFVI

A typical HFVI commissioning workflow is:

1. Set ***4.3.1.1 Motor Control Principle*** to ***FVC+***.
2. Enter the product label data to ***4.2.4 Permanent Magnet Motor*** and set ***4.2.1.1 Motor Type***.
3. Run full AMA: Set ***4.2.1.3 AMA Mode*** to ***Motor Data*** and start the drive.
4. Enable HVFI by setting ***4.3.3.5 Low-speed Mode*** to ***HF injection***.

While HVFI is enabled, the saliency ratio is validated.

**Table 43: Saliency ratios**

| Saliency ratio (Lq/Ld) | Drive response |
|---|---|
| SR ≤ 1.1 | Motor start prevented. |
| 1.1 < SR < 1.5 | Warning issued in the event log. Tracking capabilities are possibly reduced. |

### 7.6.4.8 Group 4.3.4 VVC+ & U/f Settings

#### P 4.3.4.1 Slip Compensation

Set the slip compensation in % of nominal motor slip.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2804 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.4.2 Slip Compensation Tc

Set the slip compensation time constant.

| | | | |
|---|---|---|---|
| **Default Value:** | 50.00 | **Parameter Type:** | Range (0.00 — 100000.00) |
| **Parameter Number:** | 2805 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.4.3 High-speed Load Comp.

Set the high-speed load compensation in % of the motor voltage drop.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2803 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The parameters ***4.3.4.3 High-speed Load Comp.*** and ***4.3.4.4 Low Speed Load Comp.*** are used to set the % value to compensate voltage in relation to load when the motor is running at high/low speed, and obtain the optimum U/f characteristics. The motor size determines the frequency range within which the parameters are active, as shown in the illustration.

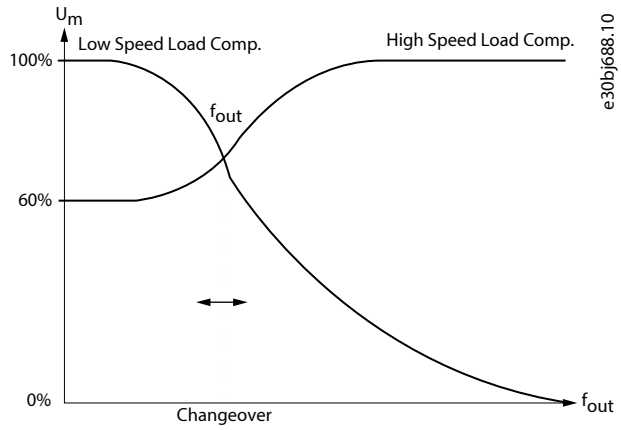



**Figure 72: Changeover from Low-Speed Load Compensation to High-Speed Load Compensation**

### P 4.3.4.4 Low-speed Load Comp.

Set the low-speed load compensation in % of the motor voltage drop.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2802 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.5 Res. Damp. Gain

Set the resonance damping gain in % of nominal slip for induction motors, and 0.1 times the nominal frequency for permanent magnet motors.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 50000) |
| **Parameter Number:** | 2806 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.6 Res. Damp. High Pass Tc

Set the resonance damping high-pass time constant.

| | | | |
|---|---|---|---|
| **Default Value:** | 50.00 | **Parameter Type:** | Range (0.00 — 100000.00) |
| **Parameter Number:** | 2807 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.7 Res. Damp Low Pass Tc

Set the resonance damping low-pass time constant.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.00 | **Parameter Type:** | Range (0.00 — 100000.00) |
| **Parameter Number:** | 2808 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.9 Res. Damp. High Pass Tc (SM)

Set time constant of resonance damping for VVC+ control of synchronous motors (SM).

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1) |
| **Parameter Number:** | 2819 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.10 Motor Model Tc (SM)

Set the time constant of the internal model used for VVC+ control of synchronous motors (SM). A lower value improves the dynamic control performance. A higher value improves the noise reduction.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1) |
| **Parameter Number:** | 2820 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.11 Low Speed Minimum Current

Set the low-speed minimum current reference in % of nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2837 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.12 Nominal Magnetization Speed

Set the minimum speed for nominal motor magnetization. Used by constant torque (CT).

| | | | |
|---|---|---|---|
| **Default Value:** | 0.5 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2844 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.13 Zero Speed Magnetization

Set the % of motor magnetization at 0 speed used by constant torque (CT). The selection of a low value reduces energy loss in the motor, but also reduces load capacity.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2845 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.3.4.14 Current Limiter Kp

Set the proportional gain of the current limit controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 3193 | **Unit:** | % |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.4.15 Current Limiter Ti

Set the integration time of the current limit controller. The value is scaled to % of the nominal setting.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 3194 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.3.4.16 Motor Voltage Reserve

Reduces the maximum output voltage to the motor in VVC+ and U/F control modes. This setting is only active at operating speeds where the drive is already supplying the full motor voltage. Normally, the drive operates with the maximum available voltage at high speeds. However, this can in rare cases cause motor instability or high current ripple. In such cases increasing this value can improve stability.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 3203 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.6.5 Group 4.5 Protection

#### P 4.5.1 Missing Phase Start-up Detection

Enables detection of missing motor phase at start-up.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6070 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 4.5.2 Missing Motor Phase Response

Select the response to a missing motor phase.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2348 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 2 | Warning | The drive issues a warning. |
| 1 | Fault | The drive issues a fault and coasts the motor. |

### P 4.5.3 Disconnected Motor Response

Select the response to a disconnected motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2349 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 2 | Warning | The drive issues a warning. |
| 1 | Fault | The drive issues a fault and coasts the motor. |
| 3 | Motor Check | The drive checks if the motor is reconnected and resumes operation. |

### P 4.5.4 ETR Overtemperature Response

Select the response to motor overtemperature indicated by the electronic thermal relay (ETR).

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2825 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 4.5.5 Motor Thermistor Input

Select an input for the motor thermistor feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2839 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.5.6 Motor Thermistor Response

Select the response to a motor thermistor event.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2846 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 4.5.7 Motor Temperature Input

Select the input for the motor temperature sensor.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2847 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.5.8 Motor Temperature Warning Level

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 2848 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.5.9 Motor Temperature Fault Level

Set the temperature level for issuing a fault. The response is ramp down and coast.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 2919 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 4.5.10 Motor Sync Loss

Select the drive response if the synchronization between motor and drive is lost. This is only relevant when using a permanent magnet or synchronous reluctance motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2922 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disable | Synchronization loss detection is disabled. |
| 1 | Fault | The drive issues a fault if this event happens. |
| 3 | Warning | The drive will issue a warning if this event happens. |

#### P 4.5.11 Motor Check Retry Time

Set the time for the motor check retry. Used in combination with Motor Check as Disconnected Motor response. If the retry check fails, a Disconnected Motor event is given. When set to zero, it keeps checking for a connected motor at regular time intervals.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 5) |
| **Parameter Number:** | 2350 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 4.5.12 Demagnetization Protection

Set the maximum allowed motor current. At this level the drive will disable the inverter to protect the motor. This limit can be used to protect PM motors from demagnetization caused by too high peak currents. The value is given in percentage of motor nominal current. If set to 0, the function is disabled.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2368 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7 Group 5 Application

### 7.7.1 Application Overview

This parameter group contains parameters for application-specific features such as process control, speed control, torque control, mechanical brake control, and many more.

### 7.7.2 Group 5.1 Application Status

#### P 5.1.1 Motor Ctrl. Status Word

Shows the motor control status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1714 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 44: Motor Ctrl. Status Word Bit Descriptions**

| Bit | Description |
|---|---|
| 0 | Ready |
| 1 | Run |
| 2 | Reverse |
| 3 | Fault |
| 4 | Reserved |

**Table 44: Motor Ctrl. Status Word Bit Descriptions** - (continued)

| Bit | Description |
|---|---|
| 5 | At reference |
| 6 | Zero speed |
| 7 | Protection mode active |

### P 5.1.2 Motor Ctrl. Ready Status Word

Shows the motor control ready status word. All status bits must be true before the drive is ready.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1716 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 45: Motor Ctrl. Ready Status Word Bit Descriptions**

| Bit | Description |
|---|---|
| 0 | Run Enable high. |
| 1 | No fault active. |
| 2 | DC-link pre-charging done. |
| 3 | DC Voltage within limits. |
| 4 | Power manager initialized. |
| 5 | Brake test not running. |
| 6 | System software is not blocking start. |
| 7 | Grid voltage within limits. |
| 8 | Temperature within limits. |
| 9 | Valid motor data. |
| 10 | Valid control configuration. |

### P 5.1.3 Motor Regulator Status Word

Shows the current state of the motor regulator status word. The status word indicates if a limit controller is active.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1715 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 46: Motor Regulator Status Word Bit Descriptions**

| Bit | Description |
|---|---|
| 0 | Current limit control active (motoring side). |
| 1 | Current limit control active (generator side). |
| 2 | Torque limit control active (motoring side). |
| 3 | Torque limit control active (generator side). |
| 4 | Overvoltage control active. |

**Table 46: Motor Regulator Status Word Bit Descriptions** - (continued)

| Bit | Description |
|---|---|
| 5 | Undervoltage control active. |
| 6 | Power limit control active (motoring side). |
| 7 | Power limit control active (generator side). |
| 8 | Speed limit control active. |
| 9 | AC-brake control active. |

### P 5.1.5 Fault Status Word 1

Shows the fault status word 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6203 | **Unit:** | – |
| **Data Type:** | DWORD | **Access Type:** | – |

**Table 47: Fault Status Word 1 Bit Descriptions**

| Bit | Description | Event number |
|---|---|---|
| 0 | Overcurrent | 4384, 4373, 5170, 4368, 4369, 4375, 4377, 4380, 4097 |
| 1 | Overvoltage | 4164, 4162, 4144 4145 |
| 2 | Undervoltage | 4165, 4146 |
| 3 | Unit temperature high | 4117, 4118, 4119 |
| 4 | Unit temperature low | 4116 |
| 5 | Control board overtemperature | 4121, 4122, 4123, 4120 |
| 6 | Input phase | 4160, 4163 |
| 7 | Output phase | 4175, 4176 |
| 8 | Ground fault | 4379, 4352, 4353, 4354, 4355 |
| 9 | Fan failure | 4128, 4129, 4133, 4130 |
| 10 | Fieldbus communication | 5162, 4256, 4257, 4258, 4260, 4261, 4263, 4265, 4266 ,4267, 4268, 4269, 4280, 4281, 4270, 4271, 4272, 4273, 4282, 4274, 4275, 4276, 4277, 4283, 4278, 4279 |
| 11 | HMI connection | 5141, 5142 |
| 12 | Feedback connection | 4418 |
| 13 | Thermistor input | 5157 |
| 14 | Auxiliary device (temperature) | 4200, 4201, 4203, 4202 |
| 15 | External temperature measurement | 5132, 5133, 5134, 5135, 5136, 5137, 5158 |

### P 5.1.8 Warning Status Word 1

Shows the warning status word 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6205 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | DWORD | **Access Type:** | – |

**Table 48: Warning Status Word 1 Bit Descriptions**

| Bit | Description | Event number |
|---|---|---|
| 0 | Overcurrent | 4384, 4373, 5170, 4368, 4369, 4375, 4377, 4380, 4097 |
| 1 | Overvoltage | 4164, 4162, 4144 4145 |
| 2 | Undervoltage | 4165, 4146 |
| 3 | Unit temperature high | 4117, 4118, 4119 |
| 4 | Unit temperature low | 4116 |
| 5 | Control board overtemperature | 4121, 4122, 4123, 4120 |
| 6 | Input phase | 4160, 4163 |
| 7 | Output phase | 4175, 4176 |
| 8 | Ground fault | 4379, 4352, 4353, 4354, 4355 |
| 9 | Fan failure | 4128, 4129, 4133, 4130 |
| 10 | Fieldbus communication | 5162, 4256, 4257, 4258, 4260, 4261, 4263, 4265, 4266 ,4267, 4268, 4269, 4280, 4281, 4270, 4271, 4272, 4273, 4282, 4274, 4275, 4276, 4277, 4283, 4278, 4279 |
| 11 | HMI connection | 5141, 5142 |
| 12 | Feedback connection | 4418 |
| 13 | Thermistor input | 5157 |
| 14 | Auxiliary device (temperature) | 4200, 4201, 4203, 4202 |
| 15 | External temperature measurement | 5132, 5133, 5134, 5135, 5136, 5137, 5158 |

## P 5.1.13 Application Status Word

Shows the application-specific status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1608 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 49: Application Status Word Bit Descriptions**

| Bit | Bit = False | Bit = True |
|---|---|---|
| 0 | Local Control | Remote Control |
| 1 | Jogging not Active | Jogging Active |
| 2 | Process Control not Active | Process Control Active |
| 3 | - | Start Interlock |
| 4 | STO Not Active | STO Active |
| 5 | No Warning | Warning Active |
| 6 | No Fault | Fault Active |
| 7 | Reserved | Reserved |

**Table 49: Application Status Word Bit Descriptions** - (continued)

| Bit | Bit = False | Bit = True |
|---|---|---|
| 8 | Reserved | Reserved |
| 9 | Reserved | Reserved |
| 10 | Reserved | Reserved |
| 11 | Reserved | Reserved |
| 12 | Reserved | Reserved |
| 13 | Normal Reference | Freeze Reference |
| 14 | Normal Reference | Reverse Reference |
| 15 | Speed Within Limits | Speed Limit Active |

#### P 5.1.34 Estimated Motor Temperature

Shows the calculated motor temperature based on the thermal model. This value is an estimate and depends on the correct configuration of the motor parameters.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-60 — 250) |
| **Parameter Number:** | 1014 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

## 7.7.3 Group 5.2 Protection

### 7.7.3.1 Group 5.2.1 Cooling Monitor

#### P 5.2.1.1 Cooling Monitor Input

Select the input for the negated cooling monitor signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2400 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.1.2 Cooling Monitor Fault Delay

Set a delay before the cooling monitor issues a fault. Only valid if fault is selected.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2401 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.1.3 Cooling Monitor Response

Select the response to a missing cooling monitor signal. The response is selected for both stopped and running states.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (Warning, Fault after Timeout while running) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2402 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Warning while running | The drive issues a warning if the drive is in running state. |
| 1 | Warning | Drive issues a warning immediately. |
| 2 | Warning, Fault after Timeout while running | Drive issues a warning immediately, and if the drive is running, the warning escalates into a fault after a timeout. |
| 3 | Warning and Fault after Timeout while running | When stopped, no response is given. When running, the drive issues a warning immediately. The warning escalates into a fault after a timeout. |

### 7.7.3.2 Group 5.2.2 External Event

Events can be issued via an external signal with the parameters of the External Event parameter group. The event can be delayed with parameters ***5.2.2.9 External Event 1 Delay*** and ***5.2.2.10 External Event 2 Delay***.

#### P 5.2.2.1 External Event 1 Input

Select an input for the external event.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4557 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.2.3 External Event 1 Response

Select the response to an external event.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4559 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 5.2.2.4 External Event 2 Input

Select an input for the external event.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4560 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.2.2.6 External Event 2 Response

Select the response to an external event.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4562 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 5.2.2.7 External Event Active Output

Select an output indicating an external event.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5184 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.2.2.9 External Event 1 Delay

Set the time delay before external event 1 is raised.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 600) |
| **Parameter Number:** | 4592 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.2.2.10 External Event 2 Delay

Set the time delay before external event 2 is raised.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 600) |
| **Parameter Number:** | 4593 | **Unit:** | s |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.3.3 Group 5.2.3 Measured Temp. Protection

#### 7.7.3.3.1 Group 5.2.3.1 Measured Temp. Protection Status

##### P 5.2.3.1.1 Protection 1 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5200 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

##### P 5.2.3.1.2 Protection 2 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5201 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

##### P 5.2.3.1.3 Protection 3 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5202 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

##### P 5.2.3.1.4 Protection 4 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5203 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

##### P 5.2.3.1.5 Protection 5 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5204 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

##### P 5.2.3.1.6 Protection 6 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5205 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.7.3.3.2 Group 5.2.3.2 Temp. 1 Protection

#### P 5.2.3.2.1 Temp. 1 Input

Select the temperature sensor input for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5206 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.3.2.2 Temp. 1 Limit 1

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5207 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.2.3 Temp. 1 Limit 2

Set the temperature level for issuing a protection response.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5208 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.2.4 Temp. 1 Limit 2 Response

Select the response for exceeding the limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5209 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.3.3 Group 5.2.3.3 Temp. 2 Protection

#### P 5.2.3.3.1 Temp. 2 Input

Select the temperature sensor input for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5210 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.3.3.2 Temp. 2 Limit 1

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5211 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.3.3 Temp. 2 Limit 2

Set the temperature level for issuing a protection response.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5212 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.3.4 Temp. 2 Limit 2 Response

Select the response for exceeding the limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5213 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.3.4 Group 5.2.3.4 Temp. 3 Protection

#### P 5.2.3.4.1 Temp. 3 Input

Select the temperature sensor input for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5214 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.3.4.2 Temp. 3 Limit 1

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5215 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.4.3 Temp. 3 Limit 2

Set the temperature level for issuing a protection response.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5216 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.4.4 Temp. 3 Limit 2 Response

Select the response for exceeding the limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5217 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.3.5 Group 5.2.3.5 Temp. 4 Protection

#### P 5.2.3.5.1 Temp. 4 Input

Select the temperature sensor input for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5218 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.3.5.2 Temp. 4 Limit 1

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5219 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.5.3 Temp. 4 Limit 2

Set the temperature level for issuing a protection response.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5220 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.5.4 Temp. 4 Limit 2 Response

Select the response for exceeding the limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5221 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.3.6 Group 5.2.3.6 Temp. 5 Protection

#### P 5.2.3.6.1 Temp. 5 Input

Select the temperature sensor input for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5222 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.3.6.2 Temp. 5 Limit 1

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5223 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.6.3 Temp. 5 Limit 2

Set the temperature level for issuing a protection response.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5224 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.6.4 Temp. 5 Limit 2 Response

Select the response for exceeding the limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5225 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.3.7 Group 5.2.3.7 Temp. 6 Protection

#### P 5.2.3.7.1 Temp. 6 Input

Select the temperature sensor input for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5226 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.2.3.7.2 Temp. 6 Limit 1

Set the temperature level for issuing a warning.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5227 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.7.3 Temp. 6 Limit 2

Set the temperature level for issuing a protection response.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5228 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.3.7.4 Temp. 6 Limit 2 Response

Select the response for exceeding the limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 9 (Fault, ramp to coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5229 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.4 Group 5.2.4 Motor Temperature Estimation

#### P 5.2.4.1 Motor Temperature Estimate

Enables the estimated motor temperature calculation. The temperature is calculated by the drive's thermal model based on motor current, speed, and the following parameters.

| | | | |
|---|---|---|---|
| **Default Value:** | false | **Parameter Type:** | Selection |
| **Parameter Number:** | 1015 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 5.2.4.2 Motor Ambient Temperature

Set the ambient temperature at the installation location of the motor. This value is used for the motor thermal model calculation.

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (-60 — 80) |
| **Parameter Number:** | 1009 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.4.3 Motor Insulation Class

Set the insulation class of the motor. The insulation class determines the maximum permissible winding temperature of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 4 (Class F) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1010 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Class A | The fault level is set according to the requirements for insulation class A, based on the configured ambient temperature. |
| 2 | Class B | The fault level is set according to the requirements for insulation class B, based on the configured ambient temperature. |
| 3 | Class E | The fault level is set according to the requirements for insulation class E, based on the configured ambient temperature. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 4 | Class F | The fault level is set according to the requirements for insulation class F, based on the configured ambient temperature. |
| 5 | Class H | The fault level is set according to the requirements for insulation class H, based on the configured ambient temperature. |

### P 5.2.4.4 Motor Duty Factor

Set the thermal duty factor of the motor. For example, if set to 130%, the motor reaches its nominal temperature at 130% of the rated motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (5 — 200) |
| **Parameter Number:** | 1011 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.2.4.5 Zero-Speed Cooling Factor

Set the motor cooling factor at zero speed (standstill). The default value corresponds to a motor without external forced cooling. If the motor is equipped with an external cooling fan, this value must be increased accordingly.

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (1 — 150) |
| **Parameter Number:** | 1012 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.2.4.6 Motor Thermal Time Constant

Set the motor thermal time constant. This value represents the time required for the motor temperature to reach approximately 63% of its final steady-state value following a step change in load.

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (1 — 1000) |
| **Parameter Number:** | 1013 | **Unit:** | min |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.2.4.7 Estimated Motor Temperature Response

Set the drive response when the estimated motor temperature reaches the fault level. The fault level is determined by the configured motor insulation class.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1016 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### 7.7.3.5 Group 5.2.6 Blocked Rotor Detection

Use the blocked rotor detection function to detect if the rotor is blocked by the application. This feature can protect the motor or application and identify if something is preventing the drive from ramping up the motor to the desired speed reference. If the motor is running in either torque or current limit for the set detection time, the blocked rotor function triggers an event. The function only is active in the speed range from 0 up to the set blocked rotor maximum speed.

#### P 5.2.6.1 Blocked Rotor Response

Select how the drive responds when detecting a blocked rotor.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2370 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 3 | Warning | The drive issues a warning. |
| 1 | Fault | The drive issues a fault and coasts the motor. |

#### P 5.2.6.2 Blocked Rotor Max. Speed

Set the maximum speed for checking for a blocked rotor.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2371 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.6.3 Blocked Rotor Detection Time

Set the duration that the rotor can be blocked before a response is triggered.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.5 | **Parameter Type:** | Range (0.1 — 100) |
| **Parameter Number:** | 2372 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.3.6 Group 5.2.7 Lost Load Detection

#### P 5.2.7.1 Lost-load Response

Select an action for the lost-load detection. The lost-load detection is active if the motor speed is above 15 Hz.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 9072 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 5.2.7.2 Lost-load Detection Torque Level

Set the minimum allowed torque level in % of nominal motor torque. The lost-load detection can be activated below the set level.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (5 — 100) |
| **Parameter Number:** | 9070 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.2.7.3 Lost-load Detection Delay

Set the minimum duration that the torque has to be below the detection limit before activating the lost-load exception.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 600) |
| **Parameter Number:** | 9071 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.3.7 Group 5.2.9 HMI Connection Loss

#### P 5.2.9.1 HMI Connection Loss Response

Select the response after connection is lost to the control panel or PC tool while they are in control. The response occurs after the timeout defined with 5.2.9.2 HMI Connection Loss Delay. If Fault is selected, then the control place switches to REM when HMI connection loss happens.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5420 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | Event will raise a warning and be added to event history log. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 5.2.9.2 HMI Connection Loss Delay

Set the delay before the selected response is triggered after the drive loses connection to control panel or PC tool.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 120) |
| **Parameter Number:** | 5421 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### 7.7.3.8 Group 5.2.15 Live Zero

##### P 5.2.15.2 Live Zero Response

Select the drive response to a missing input signal (live zero).

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4555 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No Action | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 10 | Fault | The drive issues a fault. |

#### 7.7.3.9 Group 5.2.16 Feedback Handling

##### P 5.2.16.1 Failure Handling Response

Select the drive response to an encoder/resolver failure.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 (Coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4600 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 3 | Switch to Open Loop and Continue | The drive switches to open loop operation and continues running. |
| 9 | Switch to Open Loop and Ramp to Stop | The drive switches to open loop operation and ramps down to stop. |
| 10 | Coast | The drive coasts the motor. |

### 7.7.4 Group 5.3 Load

#### 7.7.4.1 Group 5.3.1 Load Status

##### P 5.3.1.1 Inertia Estimation Status

Shows the status of the inertia estimation routine. 0 = Inactive, 1 = In progress, 2 = Completed successfully, 3 = Completed unsuccessfully.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 666 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 1 | In progress | |
| 2 | Completed successfully | |
| 3 | Completed unsuccessfully | |

### 7.7.4.2 Group 5.3.2 Inertia

#### P 5.3.2.1 Inertia Estimation Mode

Set the mode for the intertia estimation.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Off) | **Parameter Type:** | Selection |
| **Parameter Number:** | 668 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | The feature is disabled. |
| 1 | Without load profile | The next start command intiates a test sequence - Without speed dependent load. |
| 2 | With load profile | The next start command initiates a test sequence - With speed dependent load. |

#### P 5.3.2.2 Inertia Estimation Timeout

Set the time after which an event message is generated if inertia estimation cannot be finalized.

| | | | |
|---|---|---|---|
| **Default Value:** | 900 | **Parameter Type:** | Range (120 — 1800) |
| **Parameter Number:** | 669 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.3.2.3 System Inertia

Set the system inertia.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 667 | **Unit:** | $kgm^2$ |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.4.3 Group 5.3.3 Torque & AEO

#### P 5.3.3.1 Torque Characteristic

Select the torque characteristics matching the application needs.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Constant torque (CT)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2809 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Constant torque (CT) | Typically used for applications where high load is present in the full speed range. |
| 1 | Variable torque (VT) | Typically used with quadratic loads like fans and centrifugal pumps. |
| 2 | Automatic Energy Optimization (AEO) | Motor magnetization is adapted to the current load. This functionality optimizes energy efficiency, but reduces dynamics to torque changes. |

#### P 5.3.3.2 AEO Minimum Speed

Set the speed above which Automatic Energy Optimization (AEO) is active.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 2810 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.3.3.3 AEO Minimum Magnetization

Set the minimum magnetization current used by Automatic Energy Optimization (AEO).

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2811 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.3.3.4 Variable Torque Zero Speed Magnetization

Set the magnetization current level at 0 speed. Used in variable torque (VT) setting.

| | | | |
|---|---|---|---|
| **Default Value:** | 66 | **Parameter Type:** | Range (40 — 90) |
| **Parameter Number:** | 8020 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.5 Group 5.4 Operation Mode

### 7.7.5.1 Group 5.4.1 Operation Mode Status

#### P 5.4.1.1 Active Operation Mode

Shows the active operation mode.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 3460 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Speed Control | |
| 1 | Torque control | The drive controls the motor torque. |
| 21 | Process Control | |

### 7.7.5.2 Group 5.4.2 Settings

#### P 5.4.2.16 Operation Mode

Select the drive operation mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Speed control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2500 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Speed control | The drive controls the motor speed. |
| 1 | Torque control | The drive controls the motor torque. |
| 21 | Process control | The drive controls a process variable based on feedback to the process controller. |

#### P 5.4.2.20 Rotational Direction Limit

Sets the limit for directional rotation of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Both Directions) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2501 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Both Directions | Allow the motor to spin both clockwise and counterclockwise. |
| 1 | Clockwise Only | Allow the motor to only run in clockwise direction with a positive reference. The minimum reference is set to 0. |
| 2 | Counter Clockwise Only | The motor is only allowed to run in counterclockwise direction with a negative reference. Maximum reference is set to 0. |

#### P 5.4.2.22 Alternative Operation Mode Input

Select the digital input terminal for activating the alternative operation mode.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 3469 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.4.2.23 Alternative Operation Mode

Select the alternative operation mode. This mode is used if the alternative operation mode input is active.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Speed control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 3465 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Speed control | The drive controls the motor speed. |
| 1 | Torque control | The drive controls the motor torque. |
| 21 | Process control | The drive controls a process variable based on feedback to the process controller. |

## 7.7.6 Group 5.5 Control Places

### 7.7.6.1 Control Places Overview

The parameters of parameter group ***5.5 Control Places*** are used to configure the source from where the drive receives its commands and references.

Drive commands and references can come from different sources, selected in 5 different control places:

- **PC control** - MyDrive® Insight.
- **Local control** - The control panel.
- **Fieldbus control** - Commands are sent in the control word, reference sources are configured in parameter group ***5.5.4 Fieldbus Control***.
- **I/O control** - Commands and reference sources are configured in parameter group ***5.5.5 I/O Control***. Commands are sent only through digital inputs.
- **Combined control** - Commands and reference sources are configured in parameter group ***5.5.6 Combined Control***. Commands are sent through digital inputs and/or the fieldbus control word. Combined control allows the logical combination of 2 command sources.

The active control place is selected with parameter ***5.5.2.1 Control Place Selection***. An alternative control place, selected with parameter ***5.5.2.9 Alternative Control Place Selection***, can be activated by digital input or a fieldbus control word bit. The following illustration shows how control places function in the iC7 drive. The gray background of a parameter denotes a read-only parameter:

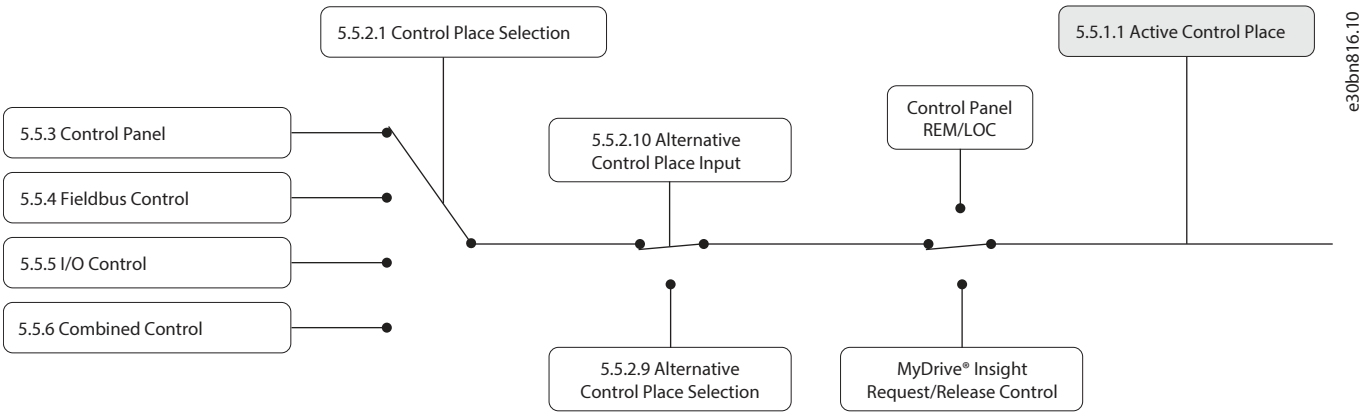



**Figure 73: Control Places**

It is always possible to take control in the control panel (with the *REM/LOC* button) and MyDrive® Insight (by clicking *PC control*) regardless of the control place selection, and they both have same priority: the one activated last has the control. When local or PC control is released, control switches to the control place selected in parameter ***5.5.2.1 Control Place Selection***.

Reference sources are selected for each operation mode separately. Operation mode can be selected with parameter ***5.4.2.16 Operation Mode***. When multiple references are selected, they are summarized into 1 reference. See the description of the respective operation mode for further details.

## 7.7.6.2 Group 5.5.1 Control Places Status

### P 5.5.1.1 Active Control Place

Shows the control place that is currently controlling the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 113 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | PC control | The drive is controlled by a software tool. |
| 1 | Local Control | The drive is controlled by a connected control panel. |
| 2 | Fieldbus control | The drive is controlled via a fieldbus. |
| 3 | I/O control | The drive is controlled via I/O. |
| 4 | Combined control | The drive is controlled via a combination of I/O and fieldbus. |

### P 5.5.1.2 Control Panel Active Output

Select an output terminal for indicating that the drive is controlled by a connected control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5178 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.1.3 Fieldbus Control Active Output

Select an output terminal for indicating that the drive is in fieldbus control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5197 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.1.4 I/O Control Active Output

Select an output terminal for indicating that the drive is in I/O control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5177 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.1.5 Combined Control Active Output

Select an output terminal for indicating that the drive is in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4727 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### 7.7.6.3 Group 5.5.2 Control Place Settings

#### P 5.5.2.1 Control Place Selection

Select the control place. The control places allows multiple definitions of basic commands and reference selections.

| | | | |
|---|---|---|---|
| **Default Value:** | 4 (Combined control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 114 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Local Control | The drive is controlled by a connected control panel. |
| 2 | Fieldbus control | The drive is controlled via a fieldbus. |
| 3 | I/O control | The drive is controlled via I/O. |
| 4 | Combined control | The drive is controlled via a combination of I/O and fieldbus. |

### P 5.5.2.7 Control Place Independent Reset

Enable faults to be reset from all sources - Fieldbus, I/O and Control Panel.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 109 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.5.2.9 Alternative Control Place Selection

Select the alternative control place. The alternative control place can be triggered via a digital input terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 4 (Combined control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 115 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Local Control | The drive is controlled by a connected control panel. |
| 2 | Fieldbus control | The drive is controlled via a fieldbus. |
| 3 | I/O control | The drive is controlled via I/O. |
| 4 | Combined control | The drive is controlled via a combination of I/O and fieldbus. |

### P 5.5.2.10 Alternative Control Place Input

Select the digital input terminal for activating the alternative control place.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 111 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

## 7.7.6.4 Group 5.5.3 Control Panel

### P 5.5.3.1 Allow Control Panel Force Stop

Select whether the control panel stop button always stops the drive, regardless of the selected control place. Pressing the stop button also puts the control panel in control of the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 106 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.5.3.2 Control Panel Mode

Select restrictions to local control by the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Allow Control Panel) | **Parameter Type:** | Selection |
| **Parameter Number:** | 107 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Allow Control Panel | Local control from the control panel is enabled. |
| 1 | Deny Control Panel Start | Start from the control panel is disabled. |
| 2 | Deny Control Panel | Local control from the control panel is disabled. |

### P 5.5.3.3 Continue Operation in Control Panel

When enabled, drive will maintain its running state, when changing to local control.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 108 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.5.3.4 Control Panel Stop Button Action

Select the action of the stop button in the control panel. Selecting 'Stop, Hold to Coast' will stop and coast if the stop button is pressed for 2 s.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (Stop, Hold to Coast) | **Parameter Type:** | Selection |
| **Parameter Number:** | 110 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Stop | Push stop button to stop the motor. |
| 1 | Coast Stop | Push stop button to coast the motor. |
| 2 | Stop, Hold to Coast | Push stop button to stop. If pressed for 2 s, motor coasts. |

### P 5.5.3.10 Control Panel Speed Reference Source

Select the speed reference sources for when the drive is in local control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (Fieldbus reference) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1912 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Control Panel reference | Use the reference from the control panel. |
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### P 5.5.3.11 Control Panel Torque Reference Source

Select the torque reference sources for when the drive is in local control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (Fieldbus reference) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1925 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Control Panel reference | Use the reference from the control panel. |
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

#### P 5.5.3.12 Control Panel Process Reference Source

Select the process control reference sources for when the drive is in local control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (Fieldbus reference) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6051 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Control Panel reference | Use the reference from the control panel. |
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### 7.7.6.5 Group 5.5.4 Fieldbus control

#### P 5.5.4.1 Fieldbus Speed Reference Source

Select the speed reference sources for when the drive operates in fieldbus control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 548 | **Parameter Type:** | Selection |
| **Parameter Number:** | 1914 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

#### P 5.5.4.2 Fieldbus Torque Reference Source

Select the torque reference sources for when the drive operates in fieldbus control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 548 | **Parameter Type:** | Selection |
| **Parameter Number:** | 1928 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

#### P 5.5.4.3 Fieldbus Process Reference Source

Select the process control reference sources for when the drive operates in fieldbus control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 548 | **Parameter Type:** | Selection |
| **Parameter Number:** | 6052 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### 7.7.6.6 Group 5.5.5 I/O Control

#### P 5.5.5.1 Start Input

Select the digital input for the start command.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 200 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.5.2 Start Backward Input

Select the digital input for the start command in the backward direction.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 210 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.5.3 Stop Inverse Input

Select the digital input for the inverted stop command. Command is inverted to ensure stop in case of broken wire.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 201 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.5.4 Coast Inverse Input

Select the digital input for the inverted coast command. Command is inverted to ensure coast in case of broken wire.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 202 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.5.5 Reversing Input

Select the digital input for inverting the reference signal. The reverse command does not provide a start signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 204 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.5.6 Reset Input

Select the digital input for resetting faults.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 203 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.5.7 Start Signal Mode

Select the mode of the start signal. State High Start, will generate a start command as long as terminal is activated. Rising Edge Start, will generate a start command as long as terminal is activated, but if overruled by a deactivating command, like stop or coast, it requires a new rising flank to restart. High Pulse Start, will generate a start command on rising flank, that remains active until a deactivating command like stop or coast is given.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (State High Start) | **Parameter Type:** | Selection |
| **Parameter Number:** | 211 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | State High Start | Start command remains as long as input is true. |
| 1 | Rising Edge Start | Start command is set when input becomes true and remains latched until a stop command is given. |
| 2 | High Pulse Start | Start command is set when input becomes true and remains latched until stop command is given. |

### P 5.5.5.10 I/O Speed Reference Source

Select the speed reference sources for when the drive operates in I/O control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 552 | **Parameter Type:** | Selection |
| **Parameter Number:** | 1913 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### P 5.5.5.11 I/O Torque Reference Source

Select the torque reference sources for when the drive operates in I/O control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 552 | **Parameter Type:** | Selection |
| **Parameter Number:** | 1927 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### P 5.5.5.12 I/O Process Reference Source

Select the process control reference sources for when the drive operates in I/O control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 552 | **Parameter Type:** | Selection |
| **Parameter Number:** | 6055 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### 7.7.6.7 Group 5.5.6 Combined control

#### P 5.5.6.1 Combined Start Input A

Select the inputs for starting in the forward direction when operating in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4722 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.6.2 Combined Start Input B

Select the inputs for starting in the forward direction when operating in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4742 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.6.3 Combined Start Logic

Select the combination logic for the start command of combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (OR) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1933 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 2 | AND | Logically AND source 1 and 2. |
| 3 | OR | Logically OR source 1 and 2. |

#### P 5.5.6.4 Combined Start Backward Input A

Select the inputs for starting in the backward direction when operating in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4725 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.5 Combined Start Backward Input B

Select the inputs for starting in the backward direction when operating in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4745 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.6 Combined Start Backward Logic

Select the combination logic for the start-backward command of combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (OR) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1934 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 2 | AND | Logically AND source 1 and 2. |
| 3 | OR | Logically OR source 1 and 2. |

### P 5.5.6.7 Combined Stop Inverse Input

Select the inputs for stopping when operating in combined control. False means the drive is stopped. Command is inverted to ensure stop in case of broken wire.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4723 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.9 Combined Coast Inverse Input A

Select the inputs for coasting when operating in combined control. False means the drive is coasted. Command is inverted to ensure coast in case of broken wire.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4724 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.10 Combined Coast Inverse Input B

Select the inputs for coasting when operating in combined control. False means the drive is coasted. Command is inverted to ensure coast in case of broken wire.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4744 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.11 Combined Reversing Input

Select the inputs for inverting the reference signal when operating in combined control. The reverse command does not provide a start signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4730 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.13 Combined Reset Input A

Select the inputs for resetting faults when operating in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4731 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.14 Combined Reset Input B

Select the inputs for resetting faults when operating in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4751 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.5.6.15 Combined Start Mode

Select the mode of the start signal. State High Start, will generate a start command as long as terminal is activated. Rising Edge Start, will generate a start command as long as terminal is activated, but if overruled by a deactivating command, like stop or coast, it requires a new rising flank to restart. High Pulse Start, will generate a start command on rising flank, that remains active until a deactivating command like stop or coast is given.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (State High Start) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4726 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | State High Start | Start command remains as long as input is true. |
| 1 | Rising Edge Start | Start command is set when input becomes true and remains latched until a stop command is given. |
| 2 | High Pulse Start | Start command is set when input becomes true and remains latched until stop command is given. |

### P 5.5.6.16 Fieldbus CTW Feature Bits

Enables non-control-place-dependent control word bits to be active in combined control place. In combined control place, commands like Start, Reset and Coast are always used from fieldbus control word. Feature specific bits, like Q-Stop, Jog and Preset selection, can optionally be disabled with this setting.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4627 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.5.6.20 Cmb. Speed Reference Source

Select the speed reference sources for when the drive operates in combined control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 556 | **Parameter Type:** | Selection |
| **Parameter Number:** | 1915 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### P 5.5.6.21 Cmb. Torque Reference Source

Select the torque reference sources for when the drive operates in combined control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 556 | **Parameter Type:** | Selection |
| **Parameter Number:** | 1929 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

### P 5.5.6.22 Cmb. Process Reference Source

Select the process control reference sources for when the drive operates in combined control. Select multiple sources to summarize them into 1 reference value.

| | | | |
|---|---|---|---|
| **Default Value:** | 556 | **Parameter Type:** | Selection |
| **Parameter Number:** | 6054 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Bit Number | Selection Name | Selection Description |
|---|---|---|
| 2 | Fieldbus reference | Use reference from the fieldbus. |
| 3 | Reference 1 input | Use the reference from I/O reference 1. |
| 4 | Reference 2 input | Use the reference from I/O reference 2. |
| 5 | Preset reference | Use reference from the preset reference. |
| 9 | Logic Reference | Use reference from Logic. |

Each bit represents a reference source, and the value represented by the selected bits is used when reading or writing the parameter by fieldbus. An example with Fieldbus Reference (bit 2), Preset Reference (bit 5) and Logic Reference (bit 9) selected: Bin 0000 0010 0010 0100 = Hex 224.

## 7.7.7 Group 5.6 Start Settings

### 7.7.7.1 Start Settings Overview

The application software provides the possibility to configure a DC start before entering normal motor control, for purposes of motor pre-heating, pre-magnetization, DC holding, or a start delay.

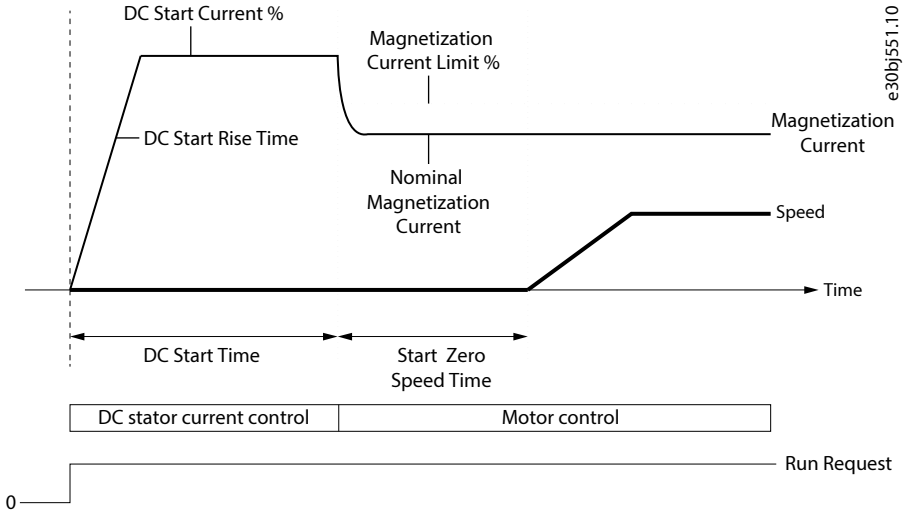



**Figure 74: Induction Motor Start from Zero Speed with DC Start and Start Zero Speed Time > 0**

DC start is configured using 3 parameters, ***5.6.2.3 DC Start Current %***, ***5.6.2.1 DC Start Time***, and ***5.6.2.2 DC Start Rise Time***.

By default, DC start is disabled by setting parameter ***5.6.2.1 DC Start Time*** to 0. The following illustration shows an example of starting an induction at zero speed.

DC start is also used as a start delay by setting parameter ***5.6.2.1 DC Start Time*** to the desired delay time and ***5.6.2.3 DC Start Current %*** to 0.

DC start is only applied when starting at zero speed, or when parameter ***5.6.1.2 Enable Flying Start*** is set to 0 [Disable] and motor back-emf voltage is not detected.

#### Synchronous motor control start settings

DC start is also possible from zero speed with synchronous motor control.

The following illustration shows a zero-speed example with DC start and initial position handling as rotor angle detection. To set the initial position handling to rotor angle detection, set parameter ***5.6.3.1 Sync. Motor Start Mode*** to 0 [Rotor angle detection].

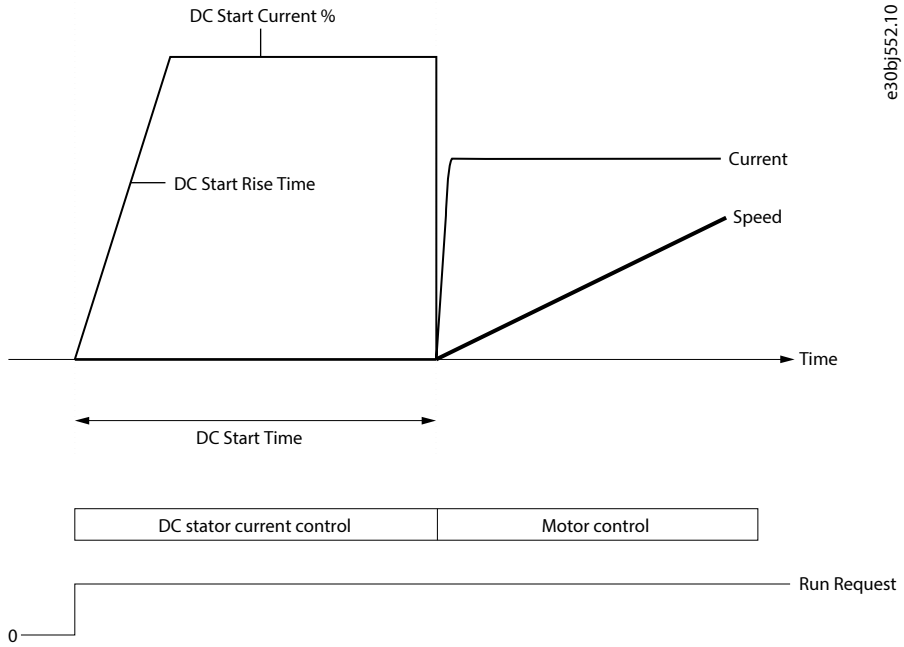



**Figure 75: Synchronous Motor Start from Zero Speed with DC Start**

As an alternative to rotor angle detection for a synchronous motor, it is possible to set the initial position handling as rotor angle parking by setting parameter ***5.6.3.1 Sync. Motor Start Mode*** to 1 [Rotor angle parking]. This option forces the motor shaft to move to a fixed position defined by the parameter ***5.6.3.5 Sync. Motor Parking Angle Reference***, before ramp release.

Synchronous motor start from zero speed with DC-Start and parking is shown in the following illustration.

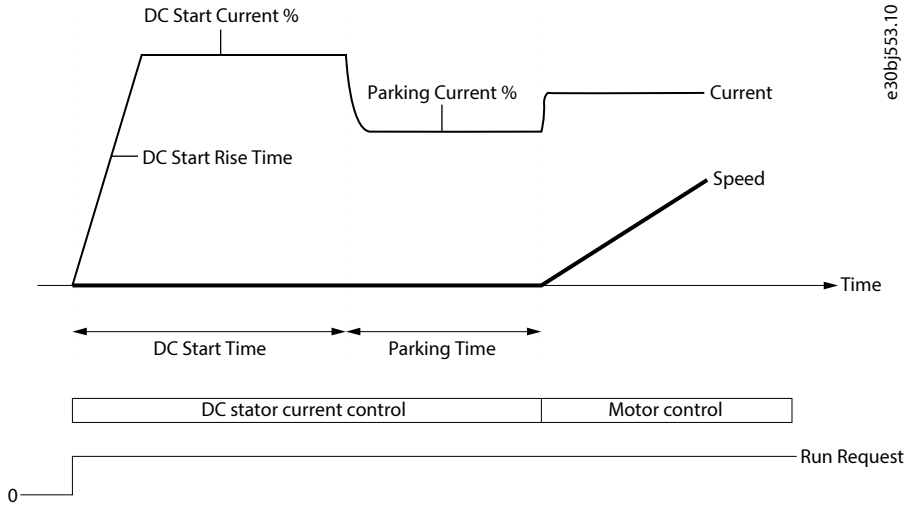



**Figure 76: Synchronous Motor Start from Zero Speed with DC Start and Parking**

## 7.7.7.2 Group 5.6.1 General Settings

### P 5.6.1.1 Magnetization Time

Set a delay to magnetize the motor or synchronize parallel motors before starting ramping. Set to -1 for automatic calculation.

| | | | |
|---|---|---|---|
| **Default Value:** | -1 | **Parameter Type:** | Range (-1 — 10000) |
| **Parameter Number:** | 2328 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.6.1.2 Flying Start

Enables a flying start. The drive will detect its current speed at the moment the start signal is given, and start to ramp towards the given reference.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 4025 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.6.1.5 Run Enable Input

Select an input enabling the drive to run.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 103 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.6.1.8 Enable Start Forward Input

Select the digital input for the Start Enable command with a positive reference. If this parameter is not active, drive is stopped while reference is positive.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1601 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Enable Start Forward and Enable Start Backward make it possible to define end stop switches for the operation of the motor. The motor cannot keep running past the end switch.

This function is not a rotational direction prevention. It applies a stop command if start is given with the reference going the wrong way. Both speed and torque directions can be used.

This function works similarly to Run enable, in the sense that if either parameter is not active, the start command is suppressed in that direction.

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.6.1.9 Enable Start Backward Input

Select the digital input for the Start Enable command with a negative reference. If this parameter is not active, the drive is stopped while reference is negative.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1602 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### 7.7.7.3 Group 5.6.2 DC Start

#### P 5.6.2.1 DC Start Time

Set the duration of the current injection during DC start.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 2264 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.6.2.2 DC Start Current Rise Time

Set the time to ramp the current from 0 to the specified injection level.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2265 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.6.2.3 DC Start Current

Set the DC current in % of nominal motor current. This current is injected during the DC start time.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2263 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.7.4 Group 5.6.3 Synchronous Motor Start

#### P 5.6.3.1 Sync. Motor Start Mode

Set the synchronous motor initial postion handling.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Rotor angle detection) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2322 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Drive will not try to obtain motor angle. |
| 1 | Rotor angle detection | The drive will force the motor to be at the angle set as motor parking angle. |
| 2 | Rotor angle parking | The drive will force the motor to be at the angle set as motor parking angle. |

If a sine-wave filter is connected to the drive, select ***Rotor Angle Parking***.

#### P 5.6.3.2 Sync. Motor Detection Current

Set the rotor angle detection gain in % of the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 150 | **Parameter Type:** | Range (0 — 200) |
| **Parameter Number:** | 2323 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.6.3.3 Sync. Motor Parking Time

Set the duration of the rotor parking.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 2324 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.6.3.4 Sync. Motor Parking Current

Set the rotor angle parking current in % of the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2325 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.6.3.5 Sync. Motor Parking Angle

Set the electrical parking angle for the rotor.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 360) |
| **Parameter Number:** | 2326 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.6.3.6 Sync. Motor Parking Current Rise Time

Sets the ramp-up time of the current applied during the motor parking function. A longer time provides a smoother hold, reducing mechanical stress and audible noise at standstill.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.2 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2327 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.8 Group 5.7 Stop Settings

### 7.7.8.1 Stop Settings Overview

#### DC braking

The application software enables configuration of DC braking for induction motor control.

By default, the DC brake is disabled and parameter ***5.6.2.1 DC Start Time*** is set to 0.

The following settings can be configured:

- Speed at which DC braking starts by setting the required speed with parameter ***5.7.2.3 DC Brake Speed***.
- Percentage of the brake current to be applied to the motor with parameter ***5.7.2.2 DC Brake Current***.

- Duration for which the DC brake is active for a DC-braking current injection with parameter ***5.7.2.1 DC-Brake Time***.

The following illustration shows a DC-braking scenario.

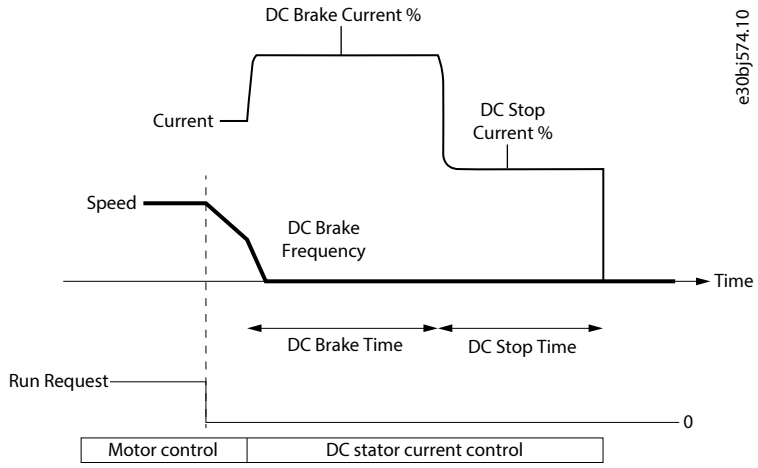



**Figure 77: DC Braking and DC Stop**

## DC stop and stop delay

Besides the DC brake, the application software allows the configuring of DC stop, which can be used for DC hold or magnetization purposes. DC stop is configured with parameters ***5.7.2.5 DC Stop Current %*** and ***5.7.2.4 DC Stop Time***. By default, DC stop is disabled and the parameter ***5.7.2.4 DC Stop Time*** is set to 0.

DC stop is always applied at zero speed and as the last activity before the drive begins to coast.

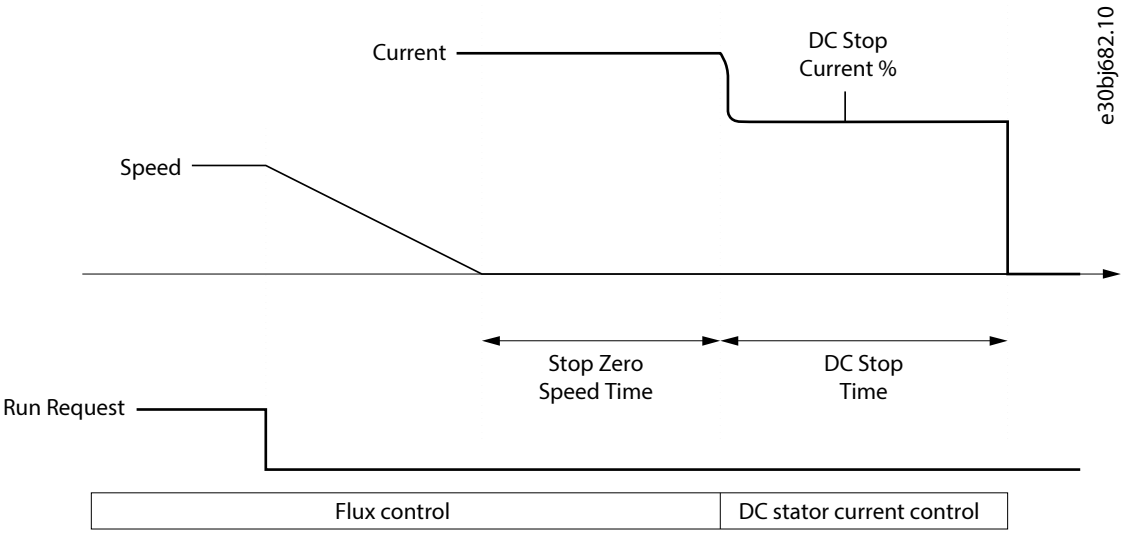



**Figure 78: DC Stop and Stop Delay**

When both parameters ***5.7.1.1 Stop Zero Speed Time*** and ***5.7.2.4 DC Stop Time*** are set to -1, then the parameter ***5.7.1.1 Stop Zero Speed Time*** has priority.

To introduce stop delay, use parameter ***5.7.1.1 Stop Zero Speed Time***. By default, stop delay is disabled and parameter ***5.7.1.1 Stop Zero Speed Time*** is set to 0. The parameter defines the duration from reaching 0 speed to the time when the drive stops modulating or continues with DC stop. During the stop delay duration, the drive remains in run mode, modulates, and reacts to load changes.

NOTE: When the drive is configured for DC braking, the parameter ***5.7.1.1 Stop Zero Speed Time*** has no effect.

### 7.7.8.2 Group 5.7.1 Settings

#### P 5.7.1.1 Stop Zero Speed Time

Set the time that motor control stays active after reaching 0 speed. The value -1 means indefinitely.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1 — 10000) |
| **Parameter Number:** | 2331 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.1.3 Torque Ramp Down Time

Set the time for ramping down the remaining torque after reaching standstill.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 2336 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.1.4 Zero-speed Detection Level

Set the speed that is considered standstill.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.2 | **Parameter Type:** | Range (0 — 2) |
| **Parameter Number:** | 2339 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.1.5 Zero-speed Detection Delay

Set the time that the speed must be below zero-speed detection level before standstill is detected.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.02 | **Parameter Type:** | Range (0 — 2) |
| **Parameter Number:** | 2356 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.8.3 Group 5.7.2 DC Injection

#### P 5.7.2.1 DC-brake Time

Set the duration for a DC braking current injection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 2267 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.2.2 DC-brake Current

Set the DC braking current in % of nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2266 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.2.3 DC-brake Speed

Set the speed below which DC braking is activated.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2268 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.2.4 DC Stop Time

Set the DC stopping injection duration. The value -1 means indefinitely.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1 — 10000) |
| **Parameter Number:** | 2320 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.2.5 DC Stop Current

Set the DC stopping current in % of nominal motor current. Applied after the drive has reached standstill.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 2321 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.8.4 Group 5.7.3 Quick Stop

#### P 5.7.3.1 Quick Stop Inverse Input

Select an input terminal for activating the Quick Stop Inverse function.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 212 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.7.3.2 Quick Stop Ramp Time

Set the deceleration time for the quick stop ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1129 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.3.8 Allow Quick Stop In All Control Places

Allow quick stop in all control places, including local control.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 213 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.7.8.5 Group 5.7.4 AC Brake

#### P 5.7.4.1 AC Brake

Enables the AC Brake.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 4026 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 5.7.4.2 AC-brake Voltage Control Kp

Set the scaling of the proportional gain of the AC-brake controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 4027 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.4.3 AC-brake Voltage Control Ti

Set the scaling of the integral time of the AC-brake controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 4028 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.7.4.4 AC-brake Current

Set the maximum allowed motor current in % of nominal motor current when AC brake is enabled.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 150) |
| **Parameter Number:** | 4057 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.9 Group 5.8 Speed Control

### 7.7.9.1 Speed Control Overview

Parameter group ***5.8 Speed Control***contains the settings and the readout values related to the speed controller.

The gray background of a parameter in the illustration denotes a read-only parameter.

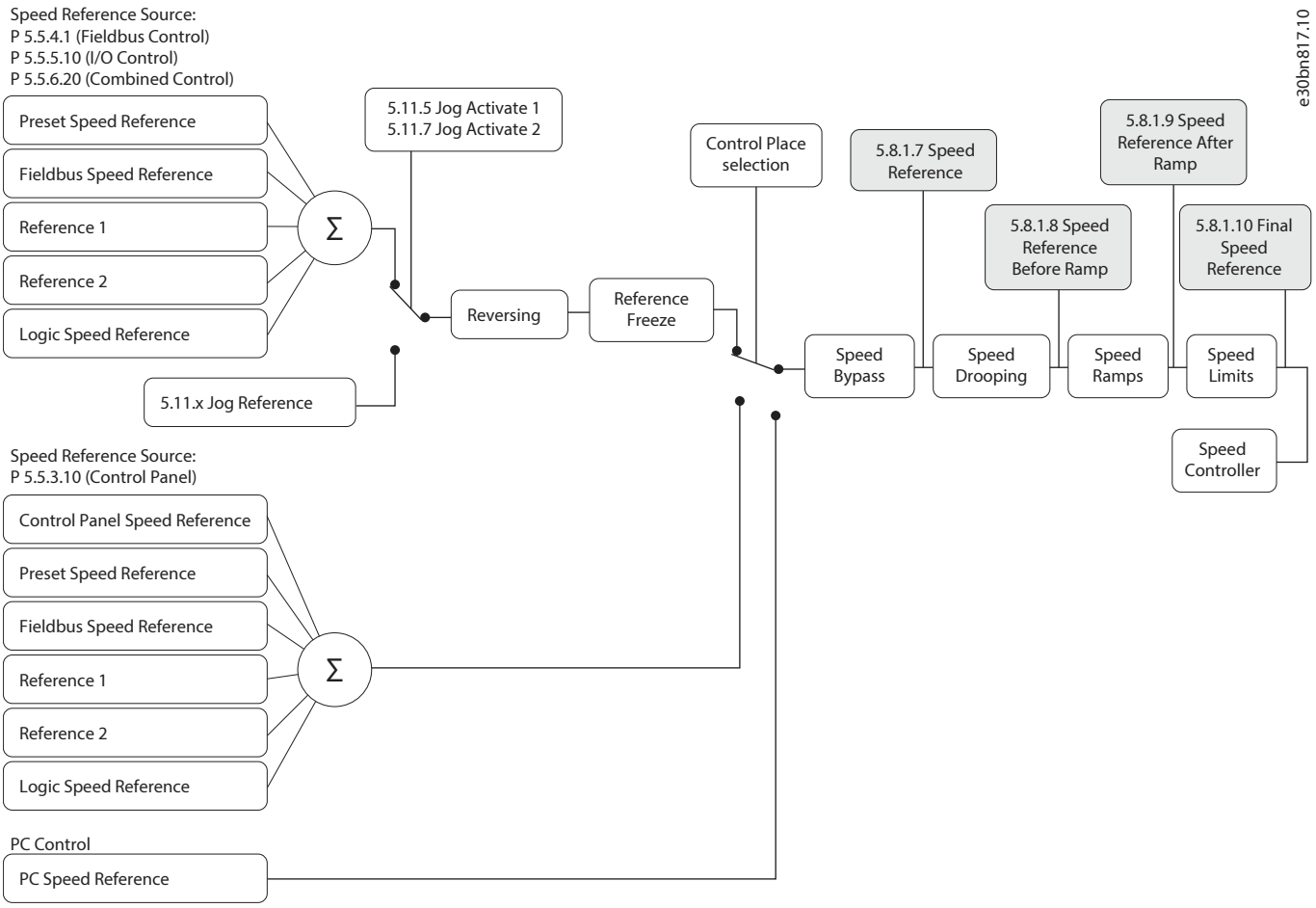



**Figure 79: Reference Handling for Speed Control**

## 7.7.9.2 Group 5.8.1 Speed Control Status

### P 5.8.1.2 Motor Speed

Shows the actual motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9011 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.3 Output Frequency

Shows the output frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9015 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.4 Feedback Speed

Shows the feedback speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-10000 — 10000) |
| **Parameter Number:** | 9007 | **Unit:** | rpm |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.5 Feedback Electrical Angle

Shows the feedback device angle in the electrical domain. Its value is needed for manually tuning the feedback angle offset.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 360) |
| **Parameter Number:** | 9016 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.6 Speed Error

Shows the difference between speed reference after ramp and motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 4023 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.7 Speed Reference

Shows the speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-2000 — 2000) |
| **Parameter Number:** | 1718 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.1.8 Speed Reference Before Ramp

Shows the value of speed reference before the ramp generator.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-2000 — 2000) |
| **Parameter Number:** | 6049 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.9 Speed Reference After Ramp

Shows the value of the speed reference after the ramp generator.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6150 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.10 Final Speed Reference

Shows the value of the speed reference before feeding it to the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6151 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.11 Control Panel Speed Reference

Shows the value of the speed reference given from the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6153 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.1.12 Absolute Output Frequency Output

Select an output terminal for the output frequency scaled between 0 Hz and positive speed limits in Hz.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2300 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.8.1.13 Absolute Speed Reference Output

Select an output terminal for the absolute speed reference, scaled between 0 and positive speed limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2304 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.8.1.14 Output Frequency Output

Select an output terminal for the output frequency scaled between minimum speed limit and positive speed limits in Hz.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2308 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.8.1.16 Load Drooping Speed

Shows the load drooping speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 674 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.17 Logic Speed Reference

Shows Logic speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 21110 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.3 Group 5.8.2 Speed Controller

#### 7.7.9.3.1 Group 5.8.2.1 Basic Settings

##### P 5.8.2.1.1 Speed Controller Type

Select the speed controller type.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (PI-Controller) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5005 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | P-Controller | Select P-controller (proportional control). |
| 1 | PI-Controller | Select PI-controller (proportional and integration control). |

##### P 5.8.2.1.2 Speed Controller Kp FVC+

Set the proportional gain of the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 15 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 4020 | **Unit:** | PercentPerHertz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

##### P 5.8.2.1.3 Speed Controller Ti FVC+

Set the integration time of the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.1 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4021 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

##### P 5.8.2.1.4 Acceleration Feedforward Gain

Set the acceleration feedforward gain. It bypasses the speed controller by adding torque reference based on requested acceleration and system inertia. Improves tracking of speed reference changes.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 4022 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

##### P 5.8.2.1.5 Acceleration Feedforward Filter Tc

Set the acceleration feedforward filter time constant.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 1000000.00) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 4039 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.2.1.7 Speed Controller Kp VVC+

Set the proportional gain of the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.015 | **Parameter Type:** | Range (0 — 1) |
| **Parameter Number:** | 4080 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.2.1.8 Speed Controller Ti VVC+

Set the integration time of the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.008 | **Parameter Type:** | Range (0.001 — 20) |
| **Parameter Number:** | 4081 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.3.2 Group 5.8.2.2 Advanced Settings

#### P 5.8.2.2.1 Virtual Friction Gain

Set the virtual friction gain, adding friction to the speed control loop to increase damping and stability. It is automatically adjusted when the system inertia is changed and parameter "5.8.11.1 Speed Controller Auto Tuning" is enabled.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 4549 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.2.2.2 Low-speed Controller

Enables the low-speed controller. It should be enabled if fast torque reaction at low speed references is needed.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4070 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 5.8.2.2.3 Low-speed Controller Gain

Set the proportional part of the low-speed controller. A higher value leads to higher dynamics.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (* — 1000) |
| **Parameter Number:** | 4071 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.4 Kp Ratio at Low Speed

Set the gain ratio for the proportional part of the speed controller at frequencies below the value set in "5.8.2.2.5 Kp Adaptation Low Speed".

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (1 — 1000) |
| **Parameter Number:** | 4072 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.5 Kp Adaptation Low Speed

Set the speed below which the speed controller proportional gain is fully using the value set in "5.8.2.2.4 Kp Ratio at Low Speed".

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 4073 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.6 Kp Adaptation High Speed

Set the speed above which the speed controller proportional gain is fully using the value set in "5.8.2.1.2 Speed Controller Kp FVC+".

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 4074 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.7 Kp Ratio at Low Torque

Set the gain ratio for the proportional part of the speed controller at a torque level below the lower torque limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (1 — 1000) |
| **Parameter Number:** | 4075 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.8 Kp Adaptation Low Torque

Set the torque level below which the speed controller proportional gain is fully using the value set in "5.8.2.2.7 Kp Ratio at Low Torque".

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 4077 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.9 Kp Adaptation High Torque

Set the torque level above which the speed controller proportional gain is fully using the value set in "5.8.2.1.2 Speed Controller Kp FVC +".

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 4078 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.2.2.10 Kp Adaptation Min at Low Flux

Set the gain ratio for the proportional part, if flux is reduced by field weakening or Automatic Energy Optimization (AEO).

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4079 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.2.2.11 Zero-speed Damping Gain

Set the zero-speed damping gain. It dampens speed fluctuations when the speed reference is 0.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 5434 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.2.2.12 Additional Torque Feedforward

Enables additional torque feedforward using the torque reference chain. An extra torque can be added to the speed controller output by using the normal torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 5020 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.7.9.4 Group 5.8.3 Speed Limits and Monitor

#### P 5.8.3.1 Positive Speed Limit

Set the speed limit for positive direction.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 1729 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.3.2 Negative Speed Limit

Set the speed limit for negative direction.

| | | | |
|---|---|---|---|
| **Default Value:** | -50 | **Parameter Type:** | Range (* — 0) |
| **Parameter Number:** | 1728 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.3.3 Minimum Speed Limit

Set the minimum speed for positive and negative direction.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1722 | **Unit:** | Hz |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.3.4 High Speed Warning

Set the speed value which activates the high speed warning. Activated after 1 s.

| | | | |
|---|---|---|---|
| **Default Value:** | 1100 | **Parameter Type:** | Range (0 — 1100) |
| **Parameter Number:** | 1200 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.3.5 High Speed Fault

Set the speed value which activates the high speed fault after a delay.

| | | | |
|---|---|---|---|
| **Default Value:** | 1100 | **Parameter Type:** | Range (0 — 1100) |
| **Parameter Number:** | 1201 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.3.6 High Speed Fault Delay

Set the delay time after which a fault is issued if the speed set for high speed fault is exceeded.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 360) |
| **Parameter Number:** | 1202 | **Unit:** | s |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

### P 5.8.3.7 Start Speed Fault

Set the speed which must be reached within the delay time after start. Otherwise a fault is issued.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1100) |
| **Parameter Number:** | 1203 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.3.8 Start Speed Fault Delay

Set the time after which a fault is the issued if start speed fault value is not reached.

| | | | |
|---|---|---|---|
| **Default Value:** | 20 | **Parameter Type:** | Range (0 — 360) |
| **Parameter Number:** | 1204 | **Unit:** | s |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

### P 5.8.3.9 Low Speed Monitor Limit

Set the speed value which activates the low speed fault after a delay.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 1100) |
| **Parameter Number:** | 1205 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.3.10 Low Speed Fault Delay

Set the delay after which a fault is issued if speed drops below the level set for low speed monitor limit.

| | | | |
|---|---|---|---|
| **Default Value:** | 20 | **Parameter Type:** | Range (0 — 360) |
| **Parameter Number:** | 1206 | **Unit:** | s |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

### 7.7.9.5 Group 5.8.4 Speed Reference

#### P 5.8.4.1 Speed Reference 1 Input

Select the input terminal or a predefined fixed value for the speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 501 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.4.2 Speed Reference 2 Input

Select the input terminal or a predefined fixed value for the speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 502 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.4.3 Speed Reference 1 Max.

Set the maximum value of the reference. It defines the upper point for the scaling of the reference input.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1724 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.4.4 Speed Reference 1 Min.

Set the minimum value of the reference. It defines the lower point for the scaling of the reference input.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1725 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.4.5 Speed Reference 2 Max.

Set the maximum value of the reference. It defines the upper point for the scaling of the reference input.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1726 | **Unit:** | Hz |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.6 Speed Reference 2 Min.

Set the minimum value of the reference. It defines the lower point for the scaling of the reference input.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1727 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.7 Preset Speed Reference Selector

Select the preset reference. The preset reference can be selected as a fixed value or by 3 digital inputs.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Preset 1) | **Parameter Type:** | Selection |
| **Parameter Number:** | 702 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Bit Selection | Use digital inputs to select the preset reference number. |
| 1 | Preset 1 | Use preset 1. |
| 2 | Preset 2 | Use preset 2. |
| 3 | Preset 3 | Use preset 3. |
| 4 | Preset 4 | Use preset 4. |
| 5 | Preset 5 | Use preset 5. |
| 6 | Preset 6 | Use preset 6. |
| 7 | Preset 7 | Use preset 7. |
| 8 | Preset 8 | Use preset 8. |

### P 5.8.4.8 Preset Speed 1

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 703 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.9 Preset Speed 2

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 20 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 704 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.10 Preset Speed 3

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 30 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 705 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.11 Preset Speed 4

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 40 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 706 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.12 Preset Speed 5

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 707 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.13 Preset Speed 6

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 60 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 708 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.14 Preset Speed 7

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 70 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 709 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.15 Preset Speed 8

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 80 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 710 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.4.16 Preset Speed Reference Bit 0 Input

Select the digital input used as bit 0 addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 711 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.4.17 Preset Speed Reference Bit 1 Input

Select the digital input used as bit 1 for addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 712 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.4.18 Preset Speed Reference Bit 2 Input

Select the digital input used as bit 2 for addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 713 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.4.19 Fieldbus Speed Reference Scale

Set the fieldbus reference scale equal to 100% reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 1723 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.4.21 Speed Ref. Filter Tc

Set the time constant of the reference filter. Set to 0 disables the filter.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 1719 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.6 Group 5.8.5 Reference Freeze

This feature makes it possible to freeze the active reference by a digital input to the actual output speed and to increase/decrease the reference by using 2 other digital inputs. Additionally, independent ramp times, delays, and speed steps can be configured.

When enabling the freeze reference feature, the reference is frozen to the actual output. If this reference is out of the allowed speed range, the frozen reference is set to the closest speed limit. After starting up or after cycling the power of the drive, the reference for the freeze feature is set to either the last freeze reference or to the minimum speed of the drive. See parameter ***5.8.5.7 Freeze Initialization***.

When reaching the upper speed limit or the lower speed limit of the drive, the freeze reference is not further increased or decreased in the limited direction. If the drive is configured for both rotation directions and a minimum speed has been defined, the reference bypasses the area between the positive and the negative minimum speed while Freeze Up or Freeze Down are used.

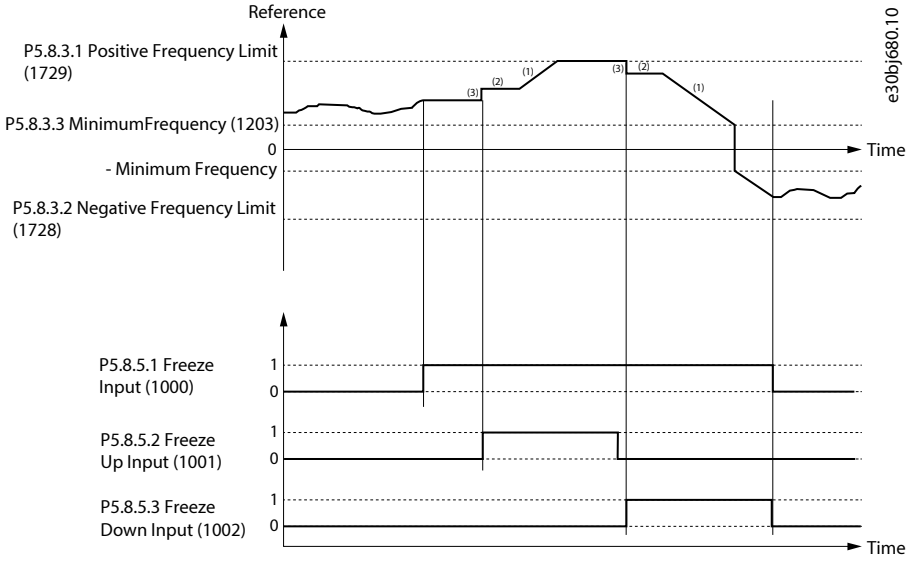



**Figure 80: Reference Freeze Example**

| | | | |
|---|---|---|---|
| 1 | Freeze Up/Down Ramp Time | 2 | Freeze Up/Down Ramp Delay |
| 3 | Freeze Up/Down Step Delta | | |

### P 5.8.5.1 Freeze Input

Select the digital input for freezing the reference. Freezing is used to control the speed reference with 2 digital inputs, 1 increasing the reference and the other decreasing the reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1000 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.8.5.2 Freeze Up Input

Select the digital input for increasing the reference while reference freezing is activated.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1001 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.8.5.3 Freeze Down Input

Select the digital input for decreasing the reference while reference freezing is activated.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1002 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.8.5.4 Freeze Ramp Time

Set the ramp time for increasing/decreasing the reference while reference freeze is active.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 1003 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.5.5 Freeze Ramp Delay

Set the delay before ramping the reference while reference freeze is active.

| | | | |
|---|---|---|---|
| **Default Value:** | 4 | **Parameter Type:** | Range (0 — 3600) |
| **Parameter Number:** | 1004 | **Unit:** | s |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

### P 5.8.5.6 Freeze Step Delta

Set the reference step for increasing/decreasing the reference while reference freeze is active.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 1005 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.5.7 Freeze Initialization

Enable freeze initialization. If enabled, freeze reference is initialized to the minimum speed after start-up or a start signal is applied. If disabled, the latest value is used.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 1006 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.8.5.8 Freeze Ramp/Step Mode

Select how to increase or decrease the reference while reference freeze is active.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Step and Ramp) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 1007 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Step and Ramp | Step increment and ramp thereafter. |
| 1 | Ramp | Ramp increment. |
| 2 | Step | Step increment. |

### 7.7.9.7 Group 5.8.6 Speed Ramps

#### 7.7.9.7.1 Speed Ramps Overview

Ramps are used for reaching the desired speed reference in a controlled manner. The parameters in the Speed Ramps parameter group is used to select the ramp type and to adjust their shapes.

Ramps 1–4 can be configured as linear or S-ramps. A linear ramp provides the motor a constant acceleration. The S-ramp allows the drive to compensate for jerk in the application and/or to reduce sway.

Anti-sway is a ramp type selection for cranes with a hanging load.

The following diagram illustrates how the ramp parameters are used for adjusting the ramp profiles.

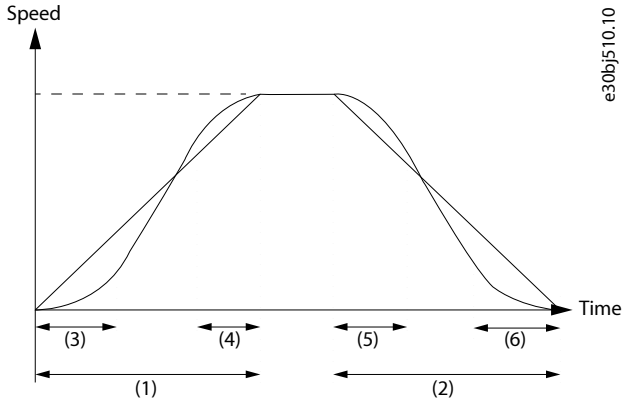



**Figure 81: Speed Ramps**

| | | | |
|---|---|---|---|
| 1 | Ramp acceleration time | 2 | Ramp deceleration time |
| 3 | Ramp acceleration increase time for S-ramps | 4 | Ramp acceleration decrease time for S-ramps |
| 5 | Ramp deceleration increase time for S-ramps | 6 | Ramp deceleration decrease time for S-ramps |

Furthermore, the drive supports a variable ramp profile, which allows the changing of the acceleration and deceleration time dynamically with analog inputs.

##### Anti-sway

The anti-sway ramp enables smooth starting and stopping without causing the load to swing excessively. Anti-sway is only meant to be used on the drive that moves the load horizontally.

Anti-sway can only be used with a linear ramp. If anti-sway is enabled when an S-ramp is selected, a linear ramp is applied instead of the S-ramp.

When anti-sway is enabled, the ramp time calculated in the anti-sway module is used during acceleration and deceleration from the actual speed to the set speed reference.

Anti-sway is enabled with parameter ***5.8.6.1.7 Enable Anti-Sway***, and configured with the parameters in parameter group ***5.8.6.8 Anti-Sway***.

### 7.7.9.7.2 Group 5.8.6.1 Speed Ramp Settings

#### P 5.8.6.1.1 Ramp Selector

Select the speed ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Ramp 1) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1100 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 4 | Bit Selection | Use digital inputs to select ramp. |
| 0 | Ramp 1 | Use ramp 1. |
| 1 | Ramp 2 | Use ramp 2. |
| 2 | Ramp 3 | Use ramp 3. |
| 3 | Ramp 4 | Use ramp 4. |
| 5 | Variable Ramp. | |

#### P 5.8.6.1.2 Ramp Selection Bit 0 Input

Select the digital input used as bit 0 addressing the speed ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1130 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.6.1.3 Ramp Selection Bit 1 Input

Select the digital input used as bit 1 addressing the speed ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1131 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.6.1.7 Enable Anti-Sway

Enable the anti-sway functionality.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1144 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.7.9.7.3 Group 5.8.6.2 Ramp 1

#### P 5.8.6.2.1 Ramp 1 Type

Select the ramp type.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Linear Ramp) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1125 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Linear Ramp | Use linear ramp. |
| 1 | S-Ramp | Use S-ramp ramp reducing torque changes. |

#### P 5.8.6.2.2 Ramp 1 Accel. Time

Set the acceleration time from 0 to nominal motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1101 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.2.3 Ramp 1 Decel. Time

Set the deceleration time from nominal motor speed to 0.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1105 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.2.4 S-Ramp 1 Accel. Increase Time

Set the ramp acceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1109 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.2.5 S-Ramp 1 Accel. Decrease Time

Set the ramp acceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1113 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.2.6 S-Ramp 1 Decel. Increase Time

Set the ramp deceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1117 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.2.7 S-Ramp 1 Decel. Decrease Time

Set the ramp deceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1121 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.7.4 Group 5.8.6.3 Ramp 2

#### P 5.8.6.3.1 Ramp 2 Type

Select the ramp type.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Linear Ramp) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1126 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Linear Ramp | Use linear ramp. |
| 1 | S-Ramp | Use S-ramp ramp reducing torque changes. |

#### P 5.8.6.3.2 Ramp 2 Accel. Time

Set the acceleration time from 0 to nominal motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1106 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.3.3 Ramp 2 Decel. Time

Set the deceleration time from nominal motor speed to 0.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1102 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.3.4 S-Ramp 2 Accel. Increase Time

Set the ramp acceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1110 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.3.5 S-Ramp 2 Accel. Decrease Time

Set the ramp acceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1114 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.3.6 S-Ramp 2 Decel. Increase Time

Set the ramp deceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1118 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.3.7 S-Ramp 2 Decel. Decrease Time

Set the ramp deceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1122 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.7.5 Group 5.8.6.4 Ramp 3

#### P 5.8.6.4.1 Ramp 3 Type

Select the ramp type.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Linear Ramp) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1127 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Linear Ramp | Use linear ramp. |
| 1 | S-Ramp | Use S-ramp ramp reducing torque changes. |

#### P 5.8.6.4.2 Ramp 3 Accel. Time

Set the acceleration time from 0 to nominal motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 1103 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.4.3 Ramp 3 Decel. Time

Set the deceleration time from nominal motor speed to 0.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1107 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.4.4 S-Ramp 3 Accel. Increase Time

Set the ramp acceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1111 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.4.5 S-Ramp 3 Accel. Decrease Time

Set the ramp acceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1115 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.4.6 S-Ramp 3 Decel. Increase Time

Set the ramp deceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1119 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.4.7 S-Ramp 3 Decel. Decrease Time

Set the ramp deceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1123 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.7.6 Group 5.8.6.5 Ramp 4

#### P 5.8.6.5.1 Ramp 4 Type

Select the ramp type.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Linear Ramp) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1128 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Linear Ramp | Use linear ramp. |
| 1 | S-Ramp | Use S-ramp ramp reducing torque changes. |

### P 5.8.6.5.2 Ramp 4 Accel. Time

Set the acceleration time from 0 to nominal motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1104 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.6.5.3 Ramp 4 Decel. Time

Set the deceleration time from nominal motor speed to 0.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1108 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.6.5.4 S-Ramp 4 Accel. Increase Time

Set the ramp acceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1112 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.6.5.5 S-Ramp 4 Accel. Decrease Time

Set the ramp acceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1116 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.6.5.6 S-Ramp 4 Decel. Increase Time

Set the ramp deceleration increase time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1120 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.6.5.7 S-Ramp 4 Decel. Decrease Time

Set the ramp deceleration decrease time for S-ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1124 | **Unit:** | s |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.7.7 Group 5.8.6.6 Variable Ramp

#### P 5.8.6.6.1 Accel. Time Input

Select the input or a fixed value for adjusting the variable ramp acceleration time.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1132 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.6.6.2 Accel. Time Maximum

Set the maximum of the acceleration time for the variable ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1134 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.6.3 Accel. Time Minimum

Set the minimum of the acceleration time for the variable ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1135 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.6.4 Decel. Time Input

Select the input or a fixed value for adjusting the variable ramp deceleration time.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1133 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.6.6.5 Decel. Time Maximum

Set the maximum of the deceleration time for the variable ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | 120 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1136 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.6.6 Decel. Time Minimum

Set the minimum of the deceleration time for the variable ramp.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1137 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.7.8 Group 5.8.6.8 Anti-sway

The anti-sway feature generates a ramping profile that dampens the sway that occurs when a crane moves a load horizontally, and the load is hanging on a rope.

The ramping profile is calculated from the pendulum created by the load. The pendulum can be calculated by the rope length.

Set either parameter ***5.8.6.8.1 Rope Length*** or ***5.8.6.8.2 Swing Period*** as input for the calculation of the ramp profile.

The parameter ***5.8.6.8.3 Reference Change Limit*** defines the size of the reference step that results in this special ramp profile. Reference steps below this value will be handled by a normal ramp.

The actual ramp time is determined by ***Rope Length***/***Swing Period*** and is shown in the readout parameter ***5.8.6.8.4 Actual Ramp Time***.

#### P 5.8.6.8.1 Rope Length

Length of the cable. Used in the calculation of ramps in the anti-sway functionality.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.49 | **Parameter Type:** | Range (0.50 — 24.91) |
| **Parameter Number:** | 1140 | **Unit:** | LengthInMeters |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.8.2 Swing Period

Swing period. Used in the calculation of ramps in the anti-sway functionality.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 | **Parameter Type:** | Range (1 — 50) |
| **Parameter Number:** | 1141 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.8.3 Reference Change Limit

Limit of speed reference change for using the ramps calculated in the anti-sway functionality.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 | **Parameter Type:** | Range (1 — 50) |
| **Parameter Number:** | 1142 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.6.8.4 Actual Ramp Time

Actual ramp time calculated in the anti-sway functionality.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1143 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.7.9.8 Group 5.8.7 Speed Feedback

#### P 5.8.7.1 Speed Feedback Filter Tc

Set the speed feedback filter time constant (when the speed is controlled with speed sensor).

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 1000.00) |
| **Parameter Number:** | 4544 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.7.2 Estimated Speed Filter Tc

Set the filter time constant for the estimated speed (when the speed is controlled without speed sensor).

| | | | |
|---|---|---|---|
| **Default Value:** | 10.00 | **Parameter Type:** | Range (5.00 — 100000.00) |
| **Parameter Number:** | 4545 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.7.3 Feedback Angle Offset

Set the offset between permanent magnet (direct axis) angle and absolute feedback angle in the electrical domain. The offset value is summed with the feedback angle to attain the permanent magnet angle used in the control. Its correct setting is important when running FVC+ with synchronous motors in closed loop.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 360) |
| **Parameter Number:** | 9017 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The feedback angle offset can be identified by running AMA. After it has been identified, it can be fine-tuned.

The offset cannot be identified when a sine-filter is connected. Identify the value before connecting the sine-wave filter.

### 7.7.9.9 Group 5.8.8 Speed Bypass

Some systems call for some output frequencies to be avoided due to, for example, mechanical resonance problems. With the parameters of this group, a definition of the bandwidth around each of these parameters can be provided.

These parameters allow the setting of up to 4 speed bands that are avoided.

#### P 5.8.8.1 Band 1, Low Limit

Set the bypass hysteresis speed band, low limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4520 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.2 Band 1, High Limit

Set the bypass hysteresis speed band, high limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4521 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.3 Band 2, Low Limit

Set the bypass hysteresis speed band, low limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 4522 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.4 Band 2, High Limit

Set the bypass hysteresis speed band, high limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4523 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.5 Band 3, Low Limit

Set the bypass hysteresis speed band, low limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4524 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.6 Band 3, High Limit

Set the bypass hysteresis speed band, high limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4525 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.7 Band 4, Low Limit

Set the bypass hysteresis speed band, low limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4526 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.8.8 Band 4, High Limit

Set the bypass hysteresis speed band, high limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4527 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.10 Group 5.8.9 Load Drooping

#### P 5.8.9.1 Load Drooping Mode

Select the load drooping mode - Only available in FVC+ mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Static) | **Parameter Type:** | Selection |
| **Parameter Number:** | 670 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Static | Simple and robust drooping, but will result in a speed error depending on load. |
| 1 | Dynamic | This will run at correct speed independent of load, but requires syncroniced start stop to avoid torque deviation between drives. |
| 2 | Combined | This will run a mix of static and dynamic drooping at low speed, otherwise identical with dynamic. |

### P 5.8.9.2 Load Drooping %

Set the load drooping amount in % of nominal motor speed at nominal load conditions.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 671 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.9.3 Load Drooping LP Tc

Set the load drooping low pass filter time constant.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 1000.00) |
| **Parameter Number:** | 672 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.9.4 Load Drooping HP Tc

Set the load drooping high pass filter time constant. Only active in dynamic drooping mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 1000.00 | **Parameter Type:** | Range (0.00 — 100000.00) |
| **Parameter Number:** | 673 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.9.5 Drooping Removal Mode

Select the drooping removal mode.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Constant droop) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4581 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Constant droop | If Constant Droop is selected drooping removal functionality is disabled. Speed could be even reduced to opposite speed direction. |
| 1 | Below removal frequency | Drooping gain is reduced from removal frequency to zero. This mode protects from running opposite speed direction. |
| 2 | Linear below nom. speed | Drooping gain is reduced linear from nominal motor frequency to zero. |

#### P 5.8.9.6 Drooping Removal Transition Speed

Set the drooping removal transition speed.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0.001 — 1000) |
| **Parameter Number:** | 4582 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.9.15 Enhanced Static Part

Set the % of static drooping at speeds lower than the value set in "5.8.9.16 Enhanced Lower Transition Speed". 0% means dynamic drooping only and 100% static drooping only.

| | | | |
|---|---|---|---|
| **Default Value:** | 1.5 | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 675 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.9.16 Enhanced Lower Transition Speed

Set the speed at which transition from combined static and dynamic drooping to dynamic drooping only starts.

| | | | |
|---|---|---|---|
| **Default Value:** | 589.999 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 676 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.8.9.17 Enhanced Higher Transition Speed

Set the speed at which the transition from combined static and dynamic drooping to dynamic drooping only is complete.

| | | | |
|---|---|---|---|
| **Default Value:** | 590 | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 677 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.9.11 Group 5.8.11 Auto Tuning

#### P 5.8.11.1 Speed Controller Auto Tuning

Enables the auto tuning of the speed controller. Auto tuning is started when the value of the parameter "5.3.2.4 System Inertia" is changed and unequal to "0".

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 4546 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | BOOL | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.8.11.2 Auto Tuning Bandwidth

Set the auto tuning bandwidth. A higher value leads to a faster response to speed or reference changes.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 4547 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.11.3 System Friction

Set the total system friction in % of the nominal motor torque at nominal motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 4548 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.10 Group 5.9 Torque control

### 7.7.10.1 Torque Control Overview

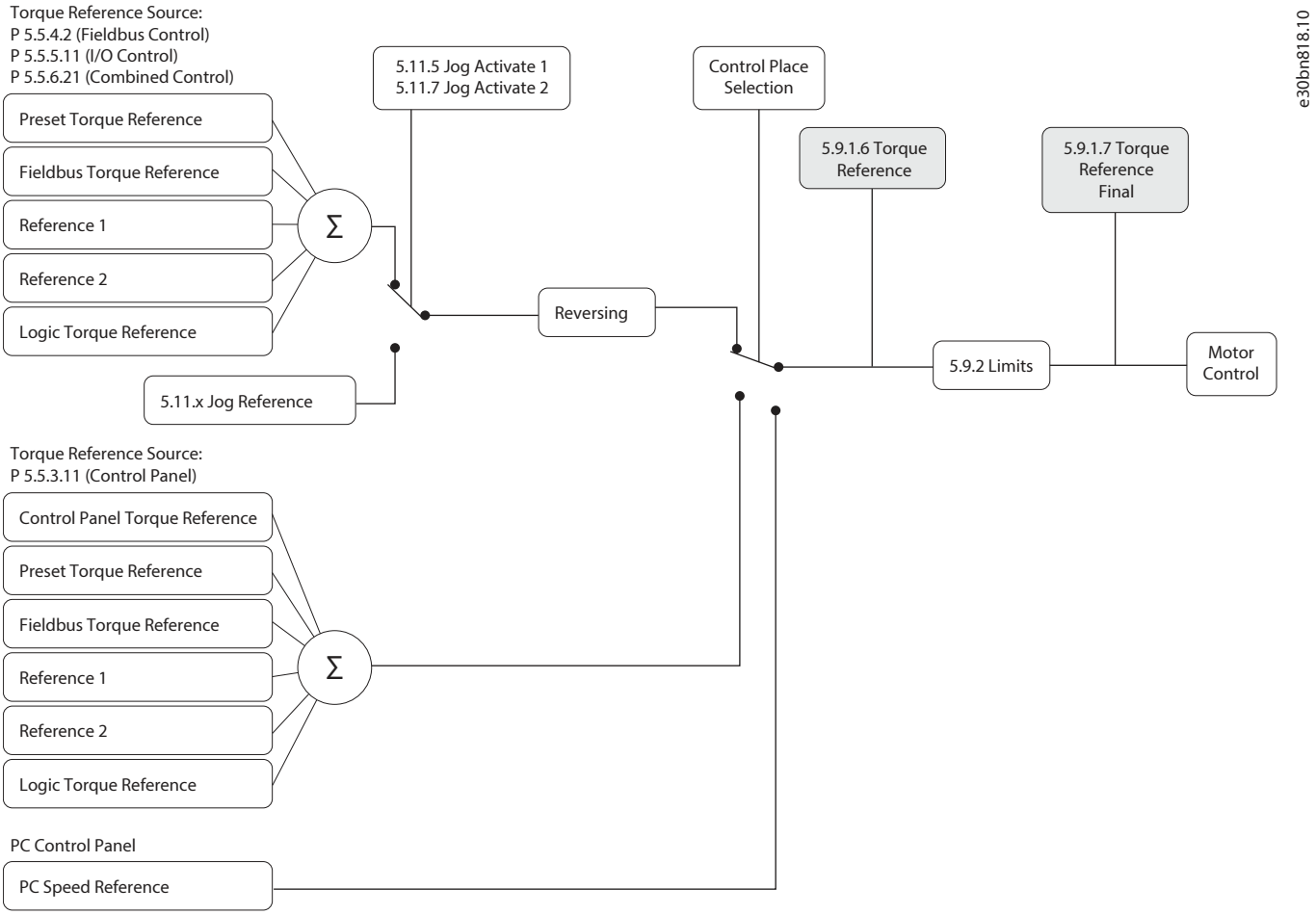



**Figure 82: Reference Handling for Torque Control**

The gray background of a parameter in the illustration denotes a read-only parameter.

While the drive is in torque control, motor speed is not controlled. Motor speed can reach speed limits, when the load application or upper system such as PLC system does not operate within the speed limits. If a speed limit is reached, the drive prevents itself from exceeding the limit depending on the selection in the parameter ***Speed Limit Mode Torque Ctrl.*** Detailed descriptions of the selections available in parameter ***Speed Limit Mode Torque Ctrl.***

#### Pos./neg. frequency limit

By default, the selection for the parameter ***Speed Limit Mode Torque Ctrl.*** is ***Pos./Neg. Frequency Limit***. While the drive is in torque control, the speed is not limited by the speed reference, only by the positive frequency limit and by the negative frequency limit.

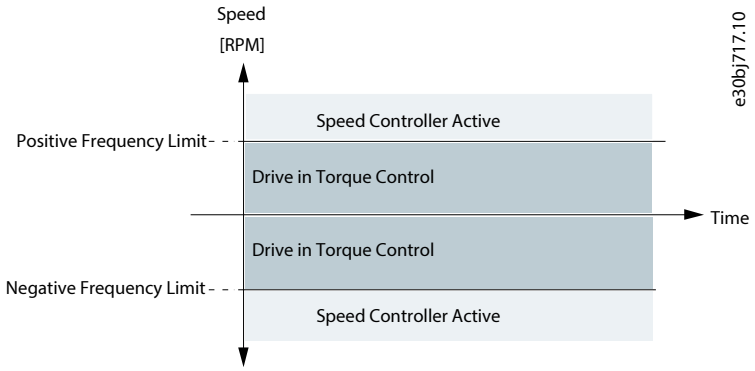



**Figure 83: Pos./Neg. Frequency Limit**

### Limited by ramp

While the drive is in torque control, the speed is limited by the reference (after ramp). The speed increases with the set ramp time until the actual torque is equal to the torque reference. If the speed is below the reference when load is removed from the shaft, the speed increases without ramp.

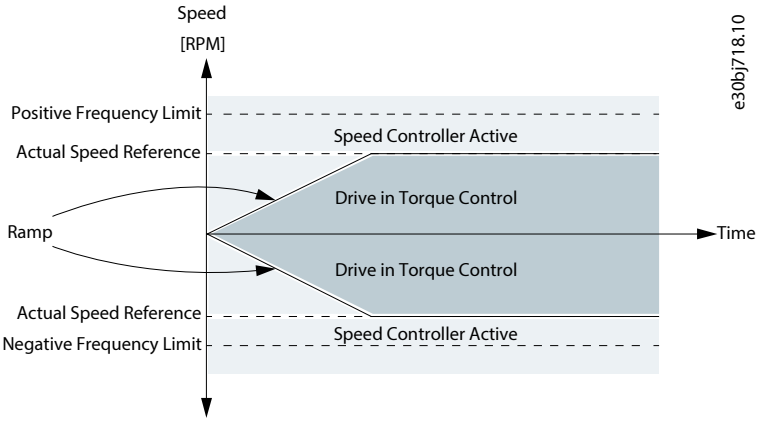



**Figure 84: Limited by Ramp**

### Neg. limit to ramp

The torque controller operates in the range between the frequency limit for the negative direction and the speed limit given by the ramp.

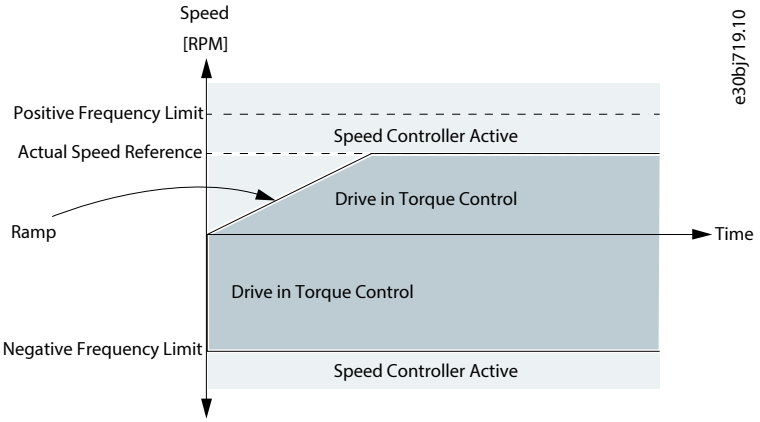



**Figure 85: Neg. Limit to Ramp**

### Ramp to max. limit

The maximum of the speed controller output and the torque reference is selected as final torque reference. The torque controller operates in the range between the frequency limit for the positive direction and the speed limit given by the ramp.

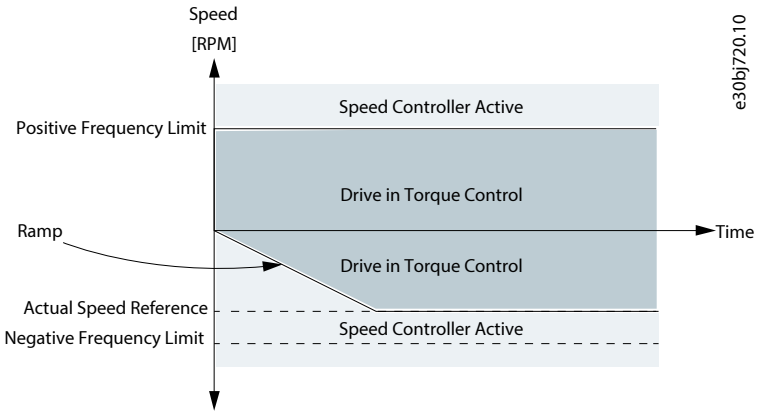



**Figure 86: Ramp to Max. Limit**

### Window

Torque control is active within a speed window around the speed reference. Speed control activation limit is different from the speed limit. Therefore speed is required to reach first to upper or lower window limit before the speed controller activates.

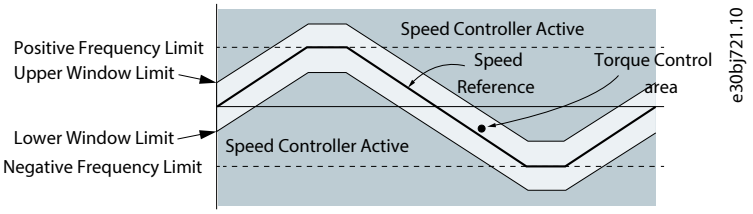



**Figure 87: Window**

## 7.7.10.2 Group 5.9.1 Torque Control Status

### P 5.9.1.1 Motor Torque

Shows the actual motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-10000000 — 10000000) |
| **Parameter Number:** | 9009 | **Unit:** | Nm |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.9.1.2 Relative Motor Torque

Shows the motor torque in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1708 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.9.1.3 Torque Limit Motoring

Shows the torque limit in motoring mode in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1812 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.4 Torque Limit Regenerative

Shows the regenerative torque limit in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1813 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.5 Control Panel Torque Reference

Shows the local torque reference set in the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 6155 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.6 Torque Reference

Shows the value of the current torque reference in the reference chain in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 6152 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.7 Torque Reference Final

Shows the value of the final torque reference given to the motor controller in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 6154 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.9.1.8 Logic Torque Reference

Shows Logic torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 21111 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.10.3 Group 5.9.2 Limits

### P 5.9.2.1 Maximum Torque Limit

Set the overall permissible torque for the motor in % of nominal motor torque (used in all 4 quadrants).

| | | | |
|---|---|---|---|
| **Default Value:** | 300 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1823 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.2 Positive Torque Limit

Set the positive torque limit (quadrants 1 and 2) in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 300 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1810 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.3 Negative Torque Limit

Set the negative torque limit (quadrants 3 and 4) in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | -300 | **Parameter Type:** | Range (-500 — 0) |
| **Parameter Number:** | 1811 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.4 Motoring Torque Limit

Set the torque limit in motoring mode (quadrants 1 and 3) in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 300 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1321 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.5 Regenerative Torque Limit

Set the torque limit in regenerative mode (quadrants 2 and 4) in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 300 | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1323 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.6 Speed Limit Mode Torque Ctrl.

Select the speed limiting mode during torque control.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Pos./Neg. Speed Limit) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2332 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Pos./Neg. Speed Limit | Limit between positive and negative speed limit. |
| 1 | Speed Limit Setpoint | Limit between +/- speed limit setpoint. |
| 2 | Window around Speed Limit Setpoint | Limit window around torque mode speed limit. |

### P 5.9.2.7 Lower Window Limit

Set the window size towards the positive speed direction.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10) |
| **Parameter Number:** | 2333 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.8 Upper Window Limit

Set the window size towards the negative speed direction.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10) |
| **Parameter Number:** | 2334 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.26 Speed Limit Setpoint

Set the variable speed limit setpoint in torque mode. This is used when fixed speed limits are not desired.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 1336 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.27 Speed Limit Setpoint Ramp Time

Set the speed limit setpoint ramp time. When running in speed limit in torque mode, the drive will accelerate/decelerate towards the speed limit setpoint using this ramp time.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 1337 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.2.28 Maximum Torque Limit Scale Input

Select the input for scaling the maximum torque limit between 0% and 100% of the value defined in maximum torque limit. Off equals 100%.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1331 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.9.2.32 Speed Limit setpoint Scale Input

Select the input for scaling speed limit setpoint in torque mode between 0% and 100% of parameter value. Off equals 100%.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1334 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.9.2.33 Motoring Torque Limit Response

Select the response for running in motoring torque limit after the time delay defined.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2361 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 5.9.2.34 Motoring Torque Limit Delay

Set the delay the drive is allowed to be in motoring torque limit before a response is issued.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 65000) |
| **Parameter Number:** | 2358 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.9.2.35 Regenerative Torque Limit Response

Select the response for running in regenerative torque limit after the time delay defined.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2362 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The event is ignored. |
| 1 | Info | The event is logged in the event log. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 5.9.2.36 Regenerative Torque Limit Delay

Set the delay the drive is allowed to be in regenerative torque limit before a response is issued.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 65000) |
| **Parameter Number:** | 2363 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.10.4 Group 5.9.3 Torque Reference

#### P 5.9.3.1 Torque Reference 1 Input

Select the input terminal or a predefined fixed value for the torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4534 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.9.3.2 Torque Reference 2 Input

Select the input terminal or a predefined fixed value for the torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4535 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.9.3.3 Torque Reference 1 Max.

Set the maximum torque reference value in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 4530 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.4 Torque Reference 1 Min.

Set the minimum torque reference value in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 4531 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.5 Torque Reference 2 Max.

Set the maximum torque reference value in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 4532 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.6 Torque Reference 2 Min.

Set the torque minimum reference value in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 4533 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.7 Preset Torque Selector

Select the preset torque number.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Preset 1) | **Parameter Type:** | Selection |
| **Parameter Number:** | 724 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Bit Selection | Use digital inputs to select the preset reference number. |
| 1 | Preset 1 | Use preset 1. |
| 2 | Preset 2 | Use preset 2. |
| 3 | Preset 3 | Use preset 3. |
| 4 | Preset 4 | Use preset 4. |

### P 5.9.3.8 Preset Torque 1

Set the torque preset value in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 725 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.9 Preset Torque 2

Set the torque preset value in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 25 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 726 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.10 Preset Torque 3

Set the torque preset value in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 50 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 727 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.11 Preset Torque 4

Set the torque preset value in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 728 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.3.12 Preset Torque Bit 0 Input

Select the digital input used as bit 0 addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 721 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.9.3.13 Preset Torque Bit 1 Input

Select the digital input used as bit 1 addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 722 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.9.3.14 Torque Reference Ramp Time

Set the ramping time from 0 to nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 2330 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.9.3.15 Torque Ref. Lowpass Filter Tc

Set the time constant of the reference filter. Setting it to 0 disables the filter.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 1000000.00) |
| **Parameter Number:** | 2335 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.11 Group 5.10 Process Control

### 7.7.11.1 Process Control Overview

The process controller enables maintaining process parameters such as temperature, pressure, and flow within a specified range or at a desired value. This is achieved by controlling the output frequency of the drive based on continuous measurement of the actual value of the process parameter (feedback) and the comparison of the process parameter with a setpoint.

The gray background of a parameter in the illustration denotes a read-only parameter.

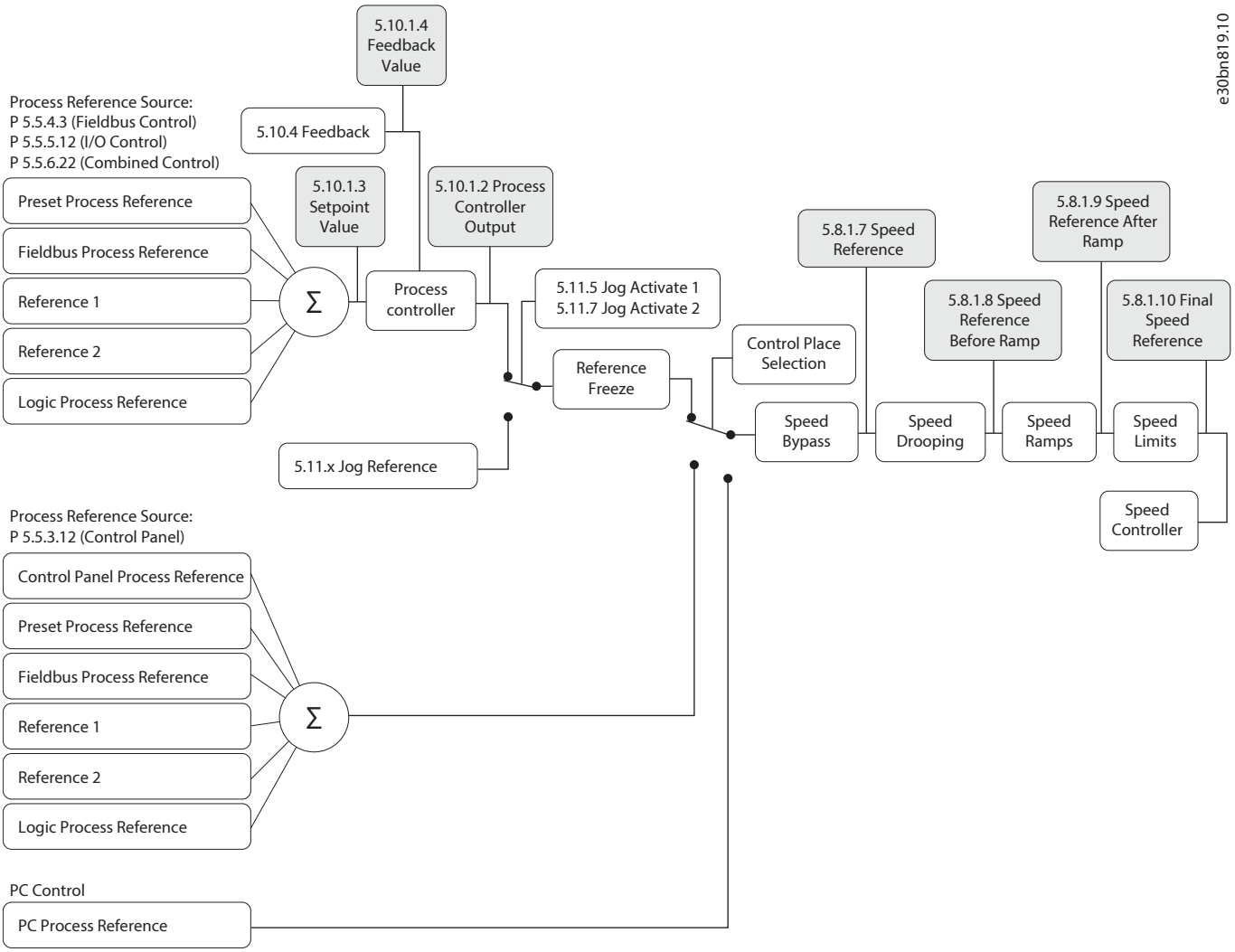



**Figure 88: Process Controller**

The embedded process controller features the following:

- Adjustable proportional gain, integral time, and derivative time
- Auto-tuning of the controller
- Bumpless operation
- 8 preset references
- 2 reference sources which can be combined
- Feedforward control
- Inverse control
- 2 feedback sources (analog inputs and fieldbus)
- Feedback calculations including sum, difference, average, minimum, and maximum
- Anti-windup
- Low-pass filtering of setpoint or feedback
- Status of the most important process parameters

### 7.7.11.2 Group 5.10.1 Process Control Status

P 5.10.1.1 On Reference

Indicates if the controlled process is operating on the current reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 6074 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | False | Fixed value - False. |
| 1 | True | Fixed value - True. |

### P 5.10.1.2 Process Controller Output

Shows the output speed of the process controller, used as the speed reference for the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6075 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.3 Setpoint Value

Shows the actual value of the setpoint.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6092 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.4 Feedback Value

Shows the actual value of the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6090 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.5 Adv. Feedforward Value

Shows the actual value of the advanced feedforward.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6086 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.6 Feedback 1 Value

Shows the actual value of feedback 1.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6080 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.10.1.7 Feedback 2 Value

Shows the actual value of feedback 2.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6085 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.10.1.9 Control Panel Process Reference

Shows the value of the process reference given from the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6094 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.1.10 Process Controller Enabled

Indicates whether the process controller is active or not.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 6053 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | False | Fixed value - False. |
| 1 | True | Fixed value - True. |

#### P 5.10.1.20 Logic Process Reference

Shows Logic process reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 21112 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.11.3 Group 5.10.2 General Settings

#### P 5.10.2.1 On Reference Relative Tolerance

Set the bandwidth for "On Reference" as % of the set point. If the control error is less than the defined percentage of the set point the "On Reference" flag is true. The tolerance used is the highest value of the absolute and relative reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.01 | **Parameter Type:** | Range (0 — 1) |
| **Parameter Number:** | 6050 | **Unit:** | PercentageFromFraction |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.2.2 On Reference Absolute Tolerance

Set the bandwidth for On Reference as an absolute value. If the control error is less than the defined percentage of the set point, the On Reference flag is True. The tolerance used is the highest value of the absolute and relative reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.01 | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 6064 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.2.3 Process Unit

Unit of the process controller references and feedbacks (no automatic conversion is done when changing the value of this parameter).

| | | | |
|---|---|---|---|
| **Default Value:** | 31 (Not Selected) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6628 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 31 | Not Selected | |
| 0 | mbar | Pressure in millibars. |
| 1 | bar | Pressure in bars. |
| 2 | Pa | Pressure in pascals. |
| 3 | kPa | Pressure in kilopascals. |
| 4 | l/s | Liters per second. |
| 5 | l/min | Liters per minute. |
| 6 | l/h | Liters per hour. |
| 7 | $m^3/s$ | Cubic meters per second. |
| 8 | $m^3/min$ | Cubic meters per minute. |
| 9 | $m^3/h$ | Cubic meters per hour. |
| 10 | U.S. gallon/s (GPS) | U.S. gallons per second. |
| 11 | U.S. gallon/min (GPM) | U.S. gallons per minute. |
| 12 | U.S. gallon/h (GPH) | U.S. gallons per hour. |
| 13 | $in^3/s$ | Cubic inches per second. |
| 14 | $in^3/min$ | Cubic inches per minute. |
| 15 | $in^3/h$ | Cubic inches per hour. |
| 16 | $ft^3/s$ | Cubic feet per second. |
| 17 | $ft^3/min$ | Cubic feet per minute. |
| 18 | $ft^3/h$ | Cubic feet per hour. |
| 19 | m WG | Meter water gauge. |
| 20 | mm Hg | Millimeters of mercury. |
| 21 | °C | Degrees Celcius. |
| 22 | °F | Degrees Fahrenheit. |
| 23 | kg/s | Kilograms per second. |
| 24 | kg/min | Kilograms per minute. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 25 | kg/h | Kilograms per hour. |
| 26 | t/min | Tons per minute. |
| 27 | t/h | Tons per hour. |
| 28 | m/s | Meters per second. |
| 29 | m/min | Meters per minute. |
| 30 | m/h | Meters per hour. |
| 32 | psi | lb/in$^2$. |
| 33 | in WG | Inches of water. |
| 34 | in Hg | Inches of mercury. |
| 35 | ft WG | Feet of water. |

#### P 5.10.2.4 Process Input Max. Limit

Set the limit for the maximum value of the reference. This parameter is also used for internal controller normalization.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6013 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.2.5 Process Input Min. Limit

Set the limit for the minimum value of the reference. This parameter is also used for internal controller normalization.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6014 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.11.4 Group 5.10.3 Process Reference

#### P 5.10.3.3 Process Reference 1 Input

Select the input terminal or a predefined fixed value for the process reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6025 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.10.3.4 Process Reference 2 Input

Select the input terminal or a predefined fixed value for the the process reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6026 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.10.3.5 Process Reference 1 Min.

Set the minimum process reference for the input.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6047 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.6 Process Reference 1 Max.

Set the maximum process reference for the input.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6048 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.7 Process Reference 2 Min.

Set the minimum process reference for the input.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6033 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.8 Process Reference 2 Max.

Set the maximum process reference for the input.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6029 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.9 Preset Process Reference Selector

Select the preset reference. The preset reference can be selected as a fixed value or by 3 digital inputs.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Preset 1) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6032 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Bit Selection | Use digital inputs to select the preset reference number. |
| 1 | Preset 1 | Use preset 1. |
| 2 | Preset 2 | Use preset 2. |
| 3 | Preset 3 | Use preset 3. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 4 | Preset 4 | Use preset 4. |
| 5 | Preset 5 | Use preset 5. |
| 6 | Preset 6 | Use preset 6. |
| 7 | Preset 7 | Use preset 7. |
| 8 | Preset 8 | Use preset 8. |

### P 5.10.3.10 Preset Process Ref. Bit 0 Input

Select the digital input used as bit 0 addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6034 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.10.3.11 Preset Process Ref. Bit 1 Input

Select the digital input used as bit 1 addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6035 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.10.3.12 Preset Process Ref. Bit 2 Input

Select the digital input used as bit 2 addressing the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6036 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.10.3.13 Preset Process Ref. 1

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6037 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.14 Preset Process Ref. 2

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6038 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.15 Preset Process Ref. 3

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6039 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.16 Preset Process Ref. 4

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 4 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6040 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.17 Preset Process Ref. 5

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6041 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.18 Preset Process Ref. 6

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 6 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6042 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.19 Preset Process Ref. 7

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 7 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6043 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.3.20 Preset Process Ref. 8

Set the value of the preset reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 8 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6044 | **Unit:** | CustomProcessUnit |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.3.23 Process Ref. Lowpass Filter Tc

Set the time constant of the reference filter. Setting it to 0 disables the filter.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 30000.00) |
| **Parameter Number:** | 6083 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.3.24 Process Controller Start Speed

Set the start speed of the process controller.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 6056 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.3.26 Fieldbus Process Reference Scale

Set the fieldbus reference scale equal to 100% reference.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6030 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.11.5 Group 5.10.4 Feedback

#### P 5.10.4.1 Feedback Mode

Select the function to combine feedback 1 and feedback 2.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Feedback 1) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6008 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Feedback 1 | Use value from feedback source 1 only. |
| 1 | Feedback 2 | Use value from feedback source 2 only. |
| 2 | Sum | Add references from source 1 and 2 together. |
| 3 | Difference | Subtract source 2 from source 1. |
| 4 | Average | Average value of source 1 and 2. |
| 5 | Minimum | Use lowest value of source 1 and source 2. |
| 6 | Maximum | Use highest value of source 1 and source 2. |

#### P 5.10.4.2 Feedback 1 Type

Select the type of feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Analog Feedback Terminal) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6021 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Feedback disabled | |
| 1 | Analog Feedback Terminal | Use feedback value from the analog input. |
| 2 | Fieldbus Feedback | Use feedback value from the fieldbus. |

### P 5.10.4.3 Feedback 1 Maximum Scaling

Set the maximum scaling value of the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6015 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.4.4 Feedback 1 Minimum Scaling

Set the minimum scaling value of the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6016 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.4.5 Analog Input Feedback 1

Select the input or a predefined fixed value for the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6027 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.10.4.6 Feedback 1 Conversion

Select a conversion function for the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Linear) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6009 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Linear | The feedback value is not converted. |
| 1 | Quadratic | The feedback value is converted by the square root of the value. |

### P 5.10.4.7 Feedback 2 Type

Select the type of feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Feedback disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6022 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Feedback disabled | |
| 1 | Analog Feedback Terminal | Use feedback value from the analog input. |
| 2 | Fieldbus Feedback | Use feedback value from the fieldbus. |

### P 5.10.4.8 Feedback 2 Maximum Scaling

Set the maximum scaling value of the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6017 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.4.9 Feedback 2 Minimum Scaling

Set the minimum scaling value of the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6018 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.4.10 Analog Input Feedback 2

Set the input for the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 6028 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.10.4.11 Feedback 2 Conversion

Select a conversion function for the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Linear) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 6010 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Linear | The feedback value is not converted. |
| 1 | Quadratic | The feedback value is converted by the square root of the value. |

#### P 5.10.4.17 Feedback Filter Tc

Set the time constant of the feedback filter. Relevant if the feedback signal is fluctuates or is noisy.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 30000.00) |
| **Parameter Number:** | 6084 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.11.6 Group 5.10.5 PID Controller

#### P 5.10.5.1 Proportional Gain

Set the propoportional gain of the PID controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 6065 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.5.2 Integral Time

Set the integral time of the PID controller. Values above 10000 deactivate the I part of the controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 1000000) |
| **Parameter Number:** | 6058 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.5.3 Integral Reset

Resets the I-part of the PID controller. The selection automatically returns to false. Resetting the I-part makes it possible to start from a well-defined point after changing something in the process.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 6060 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 5.10.5.4 Anti-windup

Enable Anti-windup, which ceases the regulation of an error when the minimum or maximum speed is reached.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6061 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 5.10.5.5 Derivative Time

Set the derivative time of the PID controller. The differentiator does not react to a constant error, but provides a gain only when the error changes. The shorter the PID differentiation time, the stronger the gain from the differentiator. When set to 0 the derivative part is disabled.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 1000) |
| **Parameter Number:** | 6068 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.5.6 Derivative Gain

Set a limit for the differentiator gain. If there is no limit, the differentiator gain increases when there are fast changes. To obtain a pure differentiator gain at slow changes and a constant differentiator gain where fast changes occur, limit the differentiator gain.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (1 — 100) |
| **Parameter Number:** | 6069 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.10.5.7 PID Inverted

Inverts the output of the PID controller.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 6066 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.7.11.7 Group 5.10.6 Feedforward Controller

#### P 5.10.6.1 Feedforward Factor

Set the PID feedforward factor. The factor sends a constant fraction of the reference signal to bypass the PID control. The feedforward factor provides less overshoot and higher dynamics when the reference is changed.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 6063 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

Feedforward is activated when this parameter is set to a value higher than 0. Enter the value in percentage. The factor sends a constant fraction of the reference signal to bypass the PID control. When the feedforward factor is activated, the process control provides less overshoot and improves the control performance (better step response) when the setpoint changes.

### P 5.10.6.2 Adv. Feedforward Maximum

Set the advanced feedforward scaling value that corresponds to the maximum value for its selected reference source.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6011 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.6.3 Adv. Feedforward Minimum

Set the advanced feedforward scaling value that corresponds to the minimum value for its selected reference source.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6012 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.6.4 Adv. Feedforward Ref. Mode

Select the reference source for the advanced feedforward controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6019 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No source selected equals a 0 value. |
| 1 | Reference 1 input | Use the reference from I/O reference 1. |
| 2 | Reference 2 input | Use the reference from I/O reference 2. |
| 3 | Analog Input Reference 1+2 | Use the sum of values from I/O source 1 and 2 as reference source. |
| 4 | Fieldbus Reference | Use the value from the fieldbus as reference source. |

### P 5.10.6.5 Adv. Feedforward AI 1 Ref.

Select the input for the reference number 1 of the advanced feedforward controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 29999) |
| **Parameter Number:** | 6023 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.10.6.6 Adv. Feedforward AI 2 Ref.

Set the input for the reference number 2 of the advanced feedforward controller.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 29999) |
| **Parameter Number:** | 6024 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.10.6.7 Adv. Feedforward Inverted

Inverts the reaction of the advanced feedforward controller.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 6073 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.7.11.8 Group 5.10.7 Auto Tuning

#### P 5.10.7.1 Process Controller Auto Tuning

Enables the auto tuning procedure of the process controller. Requires start signal and returns to false after completion.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 6901 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 5.10.7.2 Auto Tuning Reference

Set the reference point where the auto tuning is executed. Values are entered in process units.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6902 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.7.3 Closed Loop Type

Selects the time constant "tau" of your system. It should be set up like this: <10s - FAST PRESSURE, 10-30s - SLOW PRESSURE, 30-600s - FAST TEMPERATURE, >600s - SLOW TEMPERATURE.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 (Fast Pressure) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7000 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 10 | Fast Pressure | |
| 30 | Slow Pressure | |
| 600 | Fast Temperature | |
| 1800 | Slow Temperature | |

## 7.7.12 Group 5.11 Jog

### P 5.11.3 Jog Ramp Time

Set the ramp time for jog.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0.01 — 3600) |
| **Parameter Number:** | 1083 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.11.4 Jog Reference 1

Set speed reference 1 for jog.

| | | | |
|---|---|---|---|
| **Default Value:** | 15 | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1082 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.11.5 Jog Activate Input 1

Select the terminal for jog activation with reference 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1084 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.11.6 Jog Reference 2

Set speed reference 2 for jog.

| | | | |
|---|---|---|---|
| **Default Value:** | -15 | **Parameter Type:** | Range (-1000 — 1000) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 1085 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.11.7 Jog Activate Input 2

Select the terminal for jog activation with reference 2.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1086 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.11.8 Jogging Active Output

Select the output terminal or status bit indicating that jogging is active.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 1087 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

## 7.7.13 Group 5.12 Mechanical Brake Control

### 7.7.13.1 Mechanical Brake Control Overview

The feature controls opening and closing of the mechanical brake and ensures the smooth transition of load between drive and mechanical brake. The mechanical brake holds the load when the drive is not running. The mechanical brake can be closed or released by controlling the torque, speed, and position. The feature supports the following load types:

- **Unidirectional load:** Typically used in scenarios when the load moves in the same direction such as in conveyors, winches, crane applications.
- **Bidirectional load:** Typically used in scenarios when the direction of the load is not known during startup, such as in elevator applications.

The mechanical brake control supports the following functions:

- 2 channels for mechanical braking feedback to offer further protection against unintended behavior resulting from broken cable.
- Monitoring of mechanical braking feedback throughout the complete cycle. Monitoring helps to protect the mechanical brake, especially if more drives are connected to the same shaft.
- No ramp-up until feedback confirms that mechanical brake is open.
- Improved load control at stop. If the value of the delay is too low, a warning is issued and the torque is not allowed to ramp down.
- The transition when motor takes over the load from the brake can be configured. Parameter ***Release Bandwidth*** can be increased to minimize the movement.

To achieve smooth transition, change the setting from speed control to position control during the changeover.

**Starting with mechanical brake**

- The motor must be primed by gradually applying a holding torque against the brake so that the torque step is minimized when the brake is released.
- When the configured torque is applied and priming time has passed, the brake is released. The torque and priming time is set via parameters ***5.12.2.2 Brake Priming Torque*** and ***5.12.2.4 Brake Priming Time***. After priming, the brake is released.

- There is a physical delay between the electrical release of the brake and the physical release of the brake. This is referred to as brake release time and is set via the parameter ***5.12.2.6 Brake Release Time***. When this happens, the load is shifted from the mechanical brake to the motor instantaneously.

**Stopping with mechanical brake**

- When stopping, the mechanical brake control monitors the motor speed and ramps down to 0 speed to close the brake.
- When closing speed is reached, the brake is activated, and the motor is held at 0 speed while the brake physically closes.
- When the brake is closed, torque is ramped down to 0, gradually shifting the load from motor to brake.

The following images represent the different functions of mechanical brake control.

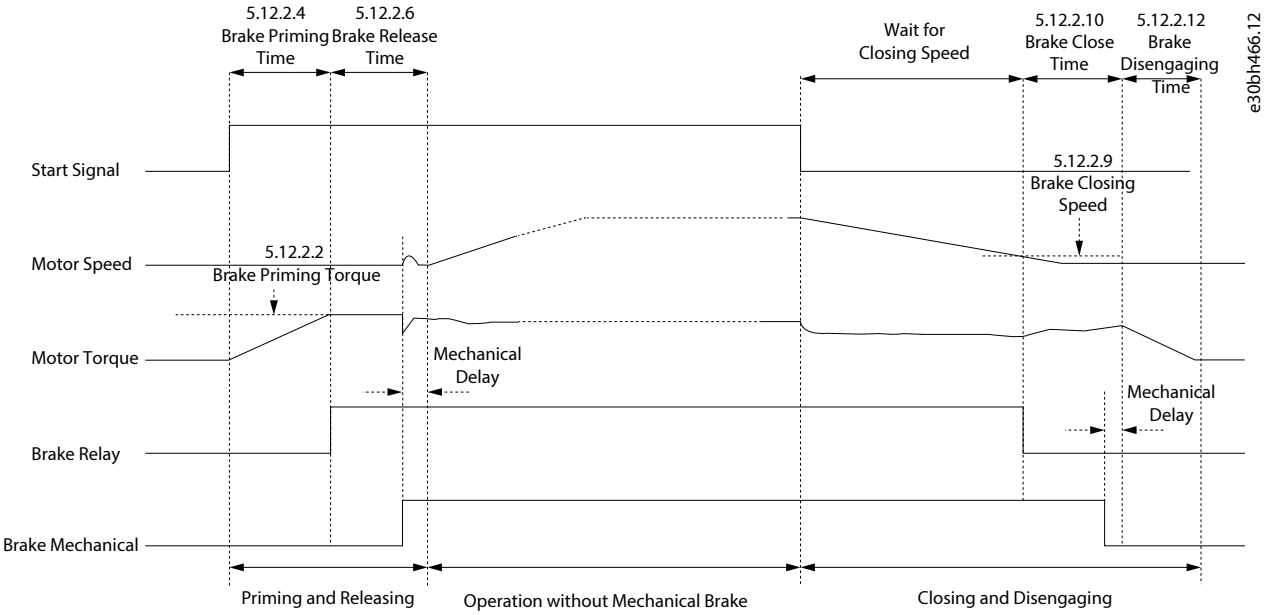



**Figure 89: Mechanical Brake Control without Hovering**

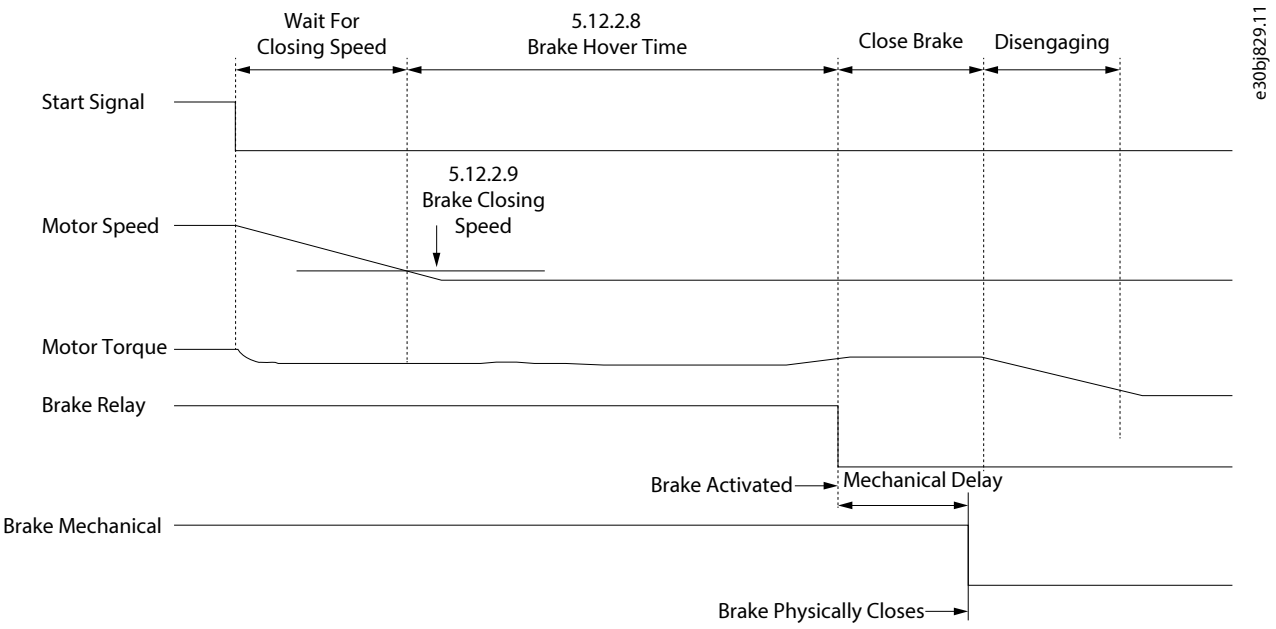



**Figure 90: Mechanical Brake Control with Hovering**

The following features are part of mechanical brake control:

- **Control:** Control brake via digital output and relay.
- **Optimization:** Automatically adapts to motor construction and control principle.

- **Feedback:** Supports digital brake feedback for open and closed loop, which provides faster control and monitoring.
- User configuration of mechanical brake control via parameters.
  - Digital inputs for brake feedback
  - Timeouts for release and close when using brake feedback
  - Digital output/relay for the mechanical brake
  - Timing and direction of applied torque for engaging or disengaging the mechanical brake
  - Mechanical brake release and close time
  - Hover delay
  - Brake close speed
  - Priming timeout

NOTE: Mechanical brake control requires operation in FVC+.

### 7.7.13.2 Group 5.12.1 Mechanical Brake Control Status

#### P 5.12.1.1 Mechanical Brake Status Word

Shows the mechanical brake status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 3016 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 50: Status Word Description**

| Bit number | Bit name | Description |
|---|---|---|
| 0 | Enabled | The mechanical brake is enabled by a parameter. |
| 1 | Start | A start signal is provided to mechanical brake control. |
| 2 | Brake open feedback signal | Brake feedback is enabled and ***brake open*** is active. |
| 3 | Brake close feedback | Brake feedback is enabled and ***brake closed*** is active. |
| 4–8 | N/A | |
| 9 | Brake slip error | A higher slip than the defined limit has been detected in the mechanical brake. |
| 10 | Brake feedback state error | Both ***brake open*** and ***brake closed*** feedback signals are active at the same time. |
| 11 | Priming | The required release torque could not be generated. |
| 12 | Brake release timeout | Feedback is enabled but the ***brake open*** feedback signal was not provided during brake release time. |
| 13 | Brake close timeout | Feedback is enabled but the ***brake closed*** feedback signal was not provided during brake close time. |
| 14 | BrakeCtrl active | Brake control is either opening or closing the brake. |
| 15 | Brake open | Brake control has activated the digital output. |

#### P 5.12.1.2 Mechanical Brake State

Shows the state of the mechanical brake controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 32767) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 3017 | **Unit:** | – |
| **Data Type:** | INT | **Access Type:** | Read Only |

#### P 5.12.1.3 Brake Release Time Detected

Shows the time from brake release until load change is detected, where motor takes over the load from mechanical brake.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 3041 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.7.13.3 Mechanical Brake Slip Control

Mechanical brake slip control detects if the motor shaft moves while the mechanical brake is applied and reacts with a configurable response. The feature is used, for example, for controlling brake slip in crane and hoist applications.

Mechanical brake slip control can only be used in a closed loop with the FVC+ control principle and encoder configuration.

Mechanical brake slip control is configured with the brake settings parameters ***5.12.2.21 Brake Slip Detection Response*** and ***5.12.2.22 Brake Slip Limit***.

### 7.7.13.4 Group 5.12.2 Brake Settings

#### P 5.12.2.1 Brake Output

Select the output terminal for controlling the mechanical brake.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 3007 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

0 Indicates that the mechanical brake is disabled. Use the value 10105 to set a digital output where 1 refers to the control board, 01 refers to the option, and 05 refers to the terminal number.

Additional selections appear based on the hardware of the options connected to the drive and the available fieldbuses. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.12.2.2 Brake Priming Torque

Set the torque to be build up against the mechanical brake during priming before releasing the brake.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 200) |
| **Parameter Number:** | 3012 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The value is set as percent of nominal torque. The value defines the torque applied against the closed mechanical brake before release. The torque/load on a crane is positive and is 10–160%. To obtain the best starting point, set the parameter to approximately 70%. The torque/load on a lift can be both positive and negative and between -160% and +160%. To obtain the best starting point, set the parameter to 0%. The higher the torque error, the more movement during load takeover.

#### P 5.12.2.3 Brake Priming Direction

Select the direction of the applied torque during priming before releasing the brake.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Clockwise) | **Parameter Type:** | Selection |
| **Parameter Number:** | 3001 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Clockwise | Holding torque is applied in clockwise direction prior to opening the brake. |
| 1 | Counter clockwise | Holding torque is applied in counter clockwise direction prior to opening the brake. |
| 2 | Reference Direction | Holding torque is applied in same direction as the reference prior to opening the brake. |

### P 5.12.2.4 Brake Priming Ramp

Set the priming torque ramp up time. The value refers to the time it takes to ramp up to 100% of torque against the mechanical brake.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.2 | **Parameter Type:** | Range (0 — 5) |
| **Parameter Number:** | 3000 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The value in the parameter defines the duration of the torque ramp up in clockwise direction.

### P 5.12.2.5 Brake Priming Timeout

Set the time after which a warning is generated if priming cannot be finalized.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (2 — 10) |
| **Parameter Number:** | 3006 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.12.2.6 Brake Release Time

Set the time it takes for the mechanical brake to open and to release the load.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.5 | **Parameter Type:** | Range (0.1 — 30) |
| **Parameter Number:** | 3003 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The value of the parameter defines the time taken for the mechanical brake to open. The configuration of the parameter acts as a timeout when brake feedback is activated.

### P 5.12.2.7 Brake Open Input

Select the input terminal for an open indication signal from the mechanical brake.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 3010 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.12.2.8 Brake Hover Time

Set the hover time. Hover time is the duration where the drive holds the load before the mechanical brake closes to allow an instant restart.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 60) |
| **Parameter Number:** | 3013 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

Defines the time at 0 speed. The value of the parameter defines the time interval from the moment when the motor is stopped until the brake closes. To adjust the transition of the load to the mechanical brake, set both Brake Close Time and Hover Time parameters. This parameter is a part of the stop function.

### P 5.12.2.9 Brake Closing Speed

Set the speed at which the brake gets active (control terminal goes low).

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 25) |
| **Parameter Number:** | 3002 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.12.2.10 Brake Close Time

Set the time it takes for the mechanical brake to close and to hold the load.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.5 | **Parameter Type:** | Range (0.1 — 30) |
| **Parameter Number:** | 3004 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

Defines the delay from the electrical closing of the brake to when the brake physically closes. When closing, the load is transferred from the motor to the mechanical brake during the disengaging process. Enter the brake close time of the coast after ramp-down time. The shaft is held at 0 speed with full holding torque. Ensure that the mechanical brake has locked the load before the motor enters coast mode. To adjust the transition of the load to the mechanical brake, set parameters ***5.12.2.10 Brake Close Time*** and ***5.12.2.8 Brake Hover Time***. Setting the brake delay parameters does not affect the torque. The drive does not register that the mechanical brake is holding the load. After setting parameter ***5.12.2.10 Brake Close Time***, the torque drops to 0 after a few minutes. The sudden torque change causes movement and noise.

### P 5.12.2.11 Brake Closed Input

Select the input terminal for a closed signal from the mechanical brake.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 3011 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.12.2.12 Brake Disengaging Ramp

Set the ramp down time for the torque after the brake is closed. The value refers to the time it takes to ramp down from 100% of torque.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.2 | **Parameter Type:** | Range (0 — 5) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 3005 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

The value of this parameter defines the torque ramp down time to gradually transition the load from the motor to the brake. After the mechanical brake is closed, the motor still provides a holding torque. During the disengage, the holding torque is ramped to zero, gradually transferring the load to the mechanical brake.

### P 5.12.2.13 Brake Release Bandwidth

Set the release control bandwidth.

| | | | |
|---|---|---|---|
| **Default Value:** | 100 | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 3015 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.12.2.15 Brake Close Immediately On Fault

Enables immediate brake closure in case of a fault. Some faults will ramp to zero - if not set brake will wait for speed to be low enough.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 3040 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 5.12.2.20 Brake Feedback Error Time

Set the monitoring time for the brake feedback error. The error is triggered if brake open or close feedback(s) differ from the command signal for the set time. The monitoring is started when the brake open or close command is sent or the feedback signal(s) change status.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 30) |
| **Parameter Number:** | 3043 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.12.2.21 Brake Slip Detection Response

Select the response to a detected brake slip.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Warning) | **Parameter Type:** | Selection |
| **Parameter Number:** | 3031 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | The feature is disabled. |
| 1 | Warning | The drive issues a warning. |
| 2 | Catch Mode | Catch Mode holds the load in place when a brake slip error is detected. |

#### P 5.12.2.22 Brake Slip Limit

Set the angle for maximum allowed brake slip.

| | | | |
|---|---|---|---|
| **Default Value:** | 60 | **Parameter Type:** | Range (0 — 3600) |
| **Parameter Number:** | 3030 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.14 Group 5.26 Additional Status Outputs

### 7.7.14.1 Group 5.26.1 General Digital Outputs

#### P 5.26.1.1 Ready Output

Select an output to indicate that the unit is in ready mode.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 205 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.26.1.2 Run Output

Select an output to indicate that the unit is in run mode.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 206 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.26.1.3 On Reference Output

Select an output to indicate that the unit is on reference.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 207 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.26.1.4 Fault Event Output

Select an output to indicate that a fault has occurred.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 208 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.26.1.5 Warning Event Output

Select an output to indicate that a warning has occurred.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 209 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.26.1.26 Motor Disconnected Output

Select an output to indicate that the motor is disconnected. Motor check must be enabled in disconnected motor response.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 216 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### 7.7.14.2 Group 5.26.5 Scalable Analog Output

#### 7.7.14.2.1 Group 5.26.5.1 Scalable Analog Signal 1

#### P 5.26.5.1.1 Analog Signal 1 Signal Selection

Select a signal for the analog output with custom scaling.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2380 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9015 | Output Frequency | Shows the output frequency. |
| 1718 | Speed Reference | |

#### P 5.26.5.1.2 Analog Signal 1 Terminal Output

Select an output for analog signal 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2381 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

#### P 5.26.5.1.3 Analog Signal 1 Scale Minimum

Set the minimum value used for the scaling of analog signal 1.

| | | | |
|---|---|---|---|
| **Default Value:** | -1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2382 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.26.5.1.4 Analog Signal 1 Scale Maximum

Set the maximum value used for the scaling of analog signal 1.

| | | | |
|---|---|---|---|
| **Default Value:** | 1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2383 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.26.5.1.5 Analog Signal 1 Filter time

Set the filter time for the scaling of analog signal 1.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.005 | **Parameter Type:** | Range (0 — 50) |
| **Parameter Number:** | 2384 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.14.2.2 Group 5.26.5.2 Scalable Analog Signal 2

#### P 5.26.5.2.1 Analog Signal 2 Signal Selection

Select a signal for the analog output with custom scaling.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2385 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9015 | Output Frequency | Shows the output frequency. |
| 1718 | Speed Reference | |

### P 5.26.5.2.2 Analog Signal 2 Terminal Output

Select an output for analog signal 2.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2386 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 5.26.5.2.3 Analog Signal 2 Scale Minimum

Set the minimum value used for the scaling of analog signal 2.

| | | | |
|---|---|---|---|
| **Default Value:** | -1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2387 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.26.5.2.4 Analog Signal 2 Scale Maximum

Set the maximum value used for the scaling of analog signal 2.

| | | | |
|---|---|---|---|
| **Default Value:** | 1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2388 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.26.5.2.5 Analog Signal 2 Filter time

Set the filter time for the scaling of analog signal 2.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.005 | **Parameter Type:** | Range (0 — 50) |
| **Parameter Number:** | 2389 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### 7.7.14.2.3 Group 5.26.5.3 Scalable Analog Signal 3

##### P 5.26.5.3.1 Analog Signal 3 Signal Selection

Select a signal for the analog output with custom scaling.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2390 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9015 | Output Frequency | Shows the output frequency. |
| 1718 | Speed Reference | |

##### P 5.26.5.3.2 Analog Signal 3 Terminal Output

Select an output for analog signal 3.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2391 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

##### P 5.26.5.3.3 Analog Signal 3 Scale Minimum

Set the minimum value used for the scaling of analog signal 3.

| | | | |
|---|---|---|---|
| **Default Value:** | -1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2392 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

##### P 5.26.5.3.4 Analog Signal 3 Scale Maximum

Set the maximum value used for the scaling of analog signal 3.

| | | | |
|---|---|---|---|
| **Default Value:** | 1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2393 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.26.5.3.5 Analog Signal 3 Filter time

Set the filter time for the scaling of analog signal 3.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.005 | **Parameter Type:** | Range (0 — 50) |
| **Parameter Number:** | 2394 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.14.2.4 Group 5.26.5.4 Scalable Analog Signal 4

#### P 5.26.5.4.1 Analog Signal 4 Signal Selection

Select a signal for the analog output with custom scaling.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2395 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9015 | Output Frequency | Shows the output frequency. |
| 1718 | Speed Reference | |

#### P 5.26.5.4.2 Analog Signal 4 Terminal Output

Select an output for analog signal 4.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2396 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.26.5.4.3 Analog Signal 4 Scale Minimum

Set the minimum value used for the scaling of analog signal 4.

| | | | |
|---|---|---|---|
| **Default Value:** | -1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2397 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.26.5.4.4 Analog Signal 4 Scale Maximum

Set the maximum value used for the scaling of analog signal 4.

| | | | |
|---|---|---|---|
| **Default Value:** | 1500 | **Parameter Type:** | Range (-30000 — 30000) |
| **Parameter Number:** | 2398 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.26.5.4.5 Analog Signal 4 Filter time

Set the filter time for the scaling of analog signal 4.

| | | | |
|---|---|---|---|
| **Default Value:** | 0.005 | **Parameter Type:** | Range (0 — 50) |
| **Parameter Number:** | 2399 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.7.15 Group 5.27 Fieldbus Process Data

### 7.7.15.1 Group 5.27.1 Fieldbus Process Data Status

#### P 5.27.1.42 Fieldbus Control Word

Shows the profile specific fieldbus control word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1335 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The fieldbus control word is either the PROFIdrive control word described in 9.1.2 Control Word or the iC Speed control word described in 9.2.2 Control Word. The fieldbus profile is selected with parameter ***10.3.1.2 Fieldbus Profile***.

#### P 5.27.1.43 Fieldbus Speed Reference 1

Shows the fieldbus speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-32768 — 32767) |
| **Parameter Number:** | 1339 | **Unit:** | – |
| **Data Type:** | INT | **Access Type:** | Read/Write |

#### P 5.27.1.44 Fieldbus Torque Reference

Shows the fieldbus torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-49152.00 — 49152.00) |
| **Parameter Number:** | 1343 | **Unit:** | N2MotorNomTorque |
| **Data Type:** | INT | **Access Type:** | Read/Write |

### P 5.27.1.50 Fieldbus Status Word

Shows the profile specific fieldbus status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1307 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

The fieldbus status word is either the PROFIdrive status word described in 9.1.3 Status Word or the iC Speed status word described in 9.2.3 Status Word. The fieldbus profile is selected with parameter ***10.3.1.2 Fieldbus Profile***.

### P 5.27.1.51 Actual Motor Speed

Shows the actual motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-32768 — 32767) |
| **Parameter Number:** | 1308 | **Unit:** | – |
| **Data Type:** | INT | **Access Type:** | Read Only |

### P 5.27.1.54 Fieldbus Speed Reference

Shows the fieldbus speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1345 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.27.1.73 Fieldbus Torque Main Actual Value

Shows the torque applied by the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-32768 — 32767) |
| **Parameter Number:** | 1346 | **Unit:** | – |
| **Data Type:** | INT | **Access Type:** | Read Only |

### P 5.27.1.89 Fieldbus Control Word 2

Shows the fieldbus control word 2.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1347 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read/Write |

The fieldbus control and status words are freely configurable, and specific features can be assigned to the bits.

### P 5.27.1.90 Fieldbus Status Word 2

Shows the profile specific fieldbus status word 2.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1344 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

The fieldbus control and status words are freely configurable, and specific features can be assigned to the bits.

#### P 5.27.1.100 Fieldbus Process Reference

Shows the fieldbus process reference used in the process controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-32768 — 32767) |
| **Parameter Number:** | 6046 | **Unit:** | – |
| **Data Type:** | INT | **Access Type:** | Read/Write |

### 7.7.16 Group 5.33 Auxiliary Device Control

#### P 5.33.1 Motor and Cabinet Heater Ctrl. Output

Select an output to control the motor and cabinet heaters.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 220 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.33.2 Motor Fan Ctrl. Output

Select an output to control the motor fan.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 221 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.33.3 Cabinet Cooling Fan Ctrl. Output

Select an output to control the cabinet cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 222 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

## 7.7.17 Group 5.40 Logic

### 7.7.17.1 Group 5.40.1 Logic Status

#### P 5.40.1.1 Logic Running Mode

Select the running mode for Logic.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 21091 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Running | Logic is in execution mode. |
| 1 | Programming | Logic is in programming mode. |
| 2 | Disabled | Logic is disabled. |

#### P 5.40.1.2 Logic State

Shows the current active state in Logic.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 21094 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No State | No state active. |
| 1 | State 1 | State 1 active. |
| 2 | State 2 | State 2 active. |
| 3 | State 3 | State 3 active. |
| 4 | State 4 | State 4 active. |
| 5 | State 5 | State 5 active. |

#### P 5.40.1.3 Logic Time In Current State

Shows the time that the current state in Logic has been active.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 36000000) |
| **Parameter Number:** | 21095 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.40.1.10 Logic Speed Reference

Shows Logic speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000 — 1000) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 21110 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.40.1.11 Logic Torque Reference

Shows Logic torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 21111 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.40.1.12 Logic Process Reference

Shows Logic process reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 21112 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.7.17.2 Group 5.40.2 User Parameters

#### P 5.40.2.1 Logic User Parameter 1

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 380 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.40.2.2 Logic User Parameter 2

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 381 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.40.2.3 Logic User Parameter 3

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 382 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 5.40.2.4 Logic User Parameter 4

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 383 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.5 Logic User Parameter 5

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 384 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.6 Logic User Parameter 6

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 385 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.7 Logic User Parameter 7

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 386 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.8 Logic User Parameter 8

User parameter providing user configurability for Logic. The value is retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 387 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.10 Logic Process Input 1

User parameter providing input to Logic from Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 360 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.11 Logic Process Input 2

User parameter providing input to Logic from Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 361 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.40.2.12 Logic Process Input 3

User parameter providing input to Logic from Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 362 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

P 5.40.2.13 Logic Process Input 4

User parameter providing input to Logic from Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 363 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

P 5.40.2.20 Logic Process Output 1

User parameter providing output from Logic to Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 370 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

P 5.40.2.21 Logic Process Output 2

User parameter providing output from Logic to Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 371 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

P 5.40.2.22 Logic Process Output 3

User parameter providing output from Logic to Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 372 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

P 5.40.2.23 Logic Process Output 4

User parameter providing output from Logic to Fieldbus. The value is not retained across power cycles.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-30000000 — 30000000) |
| **Parameter Number:** | 373 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.8 Group 6 Maintenance & Service

### 7.8.1 Maintenance & Service Overview

This parameter group contains parameters exclusively related to status, events, and backup and restore.

## 7.8.2 Group 6.1 Status

### 7.8.2.1 Group 1.1 Grid Status

#### P 1.1.1 Grid Frequency

Shows the actual grid frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9041 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.2 Line-To-Line Voltage (RMS)

Shows the average line-to-line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9040 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.3 L1-L2 Line Voltage (RMS)

Shows the L1-L2 line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9048 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.4 L2-L3 Line Voltage (RMS)

Shows the L2-L3 line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9049 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.5 L3-L1 Line Voltage (RMS)

Shows the L3-L1 line voltage (RMS).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9050 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.6 Grid Voltage Imbalance

Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 9047 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.7 Total Harmonic Distortion Voltage (THDv)

Shows the total harmonic distortion of the grid voltage (THDv) in %.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 9046 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 1.1.12 Grid Active Power

Shows the active power at the point of grid connection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9064 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.8.2.2 Group 2.1 Power Conversion & DC Link Status

#### P 2.1.1 Unit Nominal Voltage

Shows the nominal voltage setting as a result of the setting of parameter "2.2.1.1 Unit Voltage Class".

| | | | |
|---|---|---|---|
| **Default Value:** | 400 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2830 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 2.1.2 Unit Nominal Current

Shows the nominal current of the unit.

| | | | |
|---|---|---|---|
| **Default Value:** | 23 | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 2831 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 2.1.3 DC-link Voltage

Shows the actual DC-link voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9044 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 2.1.7 DC-link Power

Shows the actual DC-link power.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5117 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 2.1.14 Actual Relative Output Current Limit

Shows the actual output current limit relative to the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 300) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2700 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.15 Heat Sink Temperature

Shows the temperature of the power unit heat sink.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-50 — 200) |
| **Parameter Number:** | 2950 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.16 Main Fan Speed

Shows the speed of the main cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 32767) |
| **Parameter Number:** | 2931 | **Unit:** | rpm |
| **Data Type:** | INT | **Access Type:** | Read Only |

### P 2.1.17 Internal Fan Speed

Shows the speed of the internal cooling fan.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 32767) |
| **Parameter Number:** | 2926 | **Unit:** | rpm |
| **Data Type:** | INT | **Access Type:** | Read Only |

### P 2.1.18 Power Capacity

Shows the power capacity of the drive as a percentage. The value is derived from the number of active power units compared to the nominal power unit count of the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2836 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 2.1.19 Heat Sink Temperature Output

Select the output indicating if the heat sink temperature is within the specified range.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2312 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 2.1.20 Drive DC-link Voltage Output

Select the output indicating if the DC-link voltage is within the specified range.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2311 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 2.1.21 Drive Thermal Load

Shows the estimated thermal load of the inverter.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 6547 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.8.2.3 Group 3.1 Filters & Brake Chopper Status

#### P 3.1.1 Brake Power

Shows the power dissipated in the brake resistor.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0.00 — *) |
| **Parameter Number:** | 2933 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 3.1.2 Average Brake Power

Shows the average power dissipated in the brake resistor, calculated over 120 s.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0.00 — *) |
| **Parameter Number:** | 2934 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 3.1.3 AHF Capacitor Connected

Shows if the advanced harmonic filter (AHF) capacitor is connected.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 5410 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | False | Fixed value - False. |
| 1 | True | Fixed value - True. |

### 7.8.2.4 Group 4.1 Motor Status

#### P 4.1.1 Motor Current

Shows the actual motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9000 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.2 Relative Motor Current

Shows the actual motor current in % of the nominal motor current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 200) |
| **Parameter Number:** | 9001 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.3 U-phase RMS Current

Shows the U-phase RMS current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9020 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.4 V-phase RMS Current

Shows the V-phase RMS current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9021 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.5 W-phase RMS Current

Shows the W-phase RMS current.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9022 | **Unit:** | A |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.6 Motor Voltage

Shows the actual motor voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — *) |
| **Parameter Number:** | 9005 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.7 Relative Motor Voltage

Shows the actual motor voltage in % of the nominal motor voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 200) |
| **Parameter Number:** | 9006 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.11 Motor Torque

Shows the actual motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-10000000 — 10000000) |
| **Parameter Number:** | 9009 | **Unit:** | Nm |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.12 Relative Motor Torque

Shows the motor torque in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1708 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.13 Motor Shaft Power

Shows the actual power at the motor shaft.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9008 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.14 Relative Motor Shaft Power

Shows the actual motor shaft power in % of the nominal motor shaft power.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 1707 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.15 Motor Electrical Power

Shows the actual motor power.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9043 | **Unit:** | kW |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.16 Motor Thermal Load (ETR)

Shows the estimated thermal load of the motor calculated by the ETR function.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 2951 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.17 Motor Current Output

Select an output for the motor current signal. The scale of the signal is 0–100% of the nominal current.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2302 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.18 Motor Voltage Output

Select an output for the motor voltage signal. The scale of the signal is 0–100% of the nominal voltage.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2303 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.19 Absolute Motor Torque Output

Select an output for the motor torque signal. The scale of the signal is 0–100% of the absolute value of the nominal torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2306 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.20 Extended Motor Torque Output

Select an output for the motor torque signal. The scale of the signal is -200...200% of the nominal torque.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2310 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.21 Absolute Motor Speed Output

Select an output for the motor speed signal. The scale of the signal is 0–100% of the absolute value of the nominal speed.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2301 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.22 Extended Motor Speed Output

Select an output for the motor speed signal. The scale of the signal is -200...200% of the nominal speed.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2309 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.23 Motor Power Output

Select an output for the motor power signal. The scale of the signal is 0–100% of the nominal power.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2305 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 4.1.24 AMA Progress

Shows the progress of the Automatic Motor Adaptation (AMA).

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100) |
| **Parameter Number:** | 429 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.26 Motor Temperature

Shows the actual temperature of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 1630 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.28 Rs Measured

When a Rs measurement is stored for use after drive power recycle, the value is shown here; otherwise it is zero.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 433 | **Unit:** | Ω |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 4.1.29 Back EMF Measured Coast

Shows the measured back EMF constant of PM motors. The voltage is measured right after a coast signal has been applied. The value is given as line-line RMS at 1000 RPM. To make use of this measurement, the motor must run above 15 % of the motor nominal speed when the coast signal is applied. This measurement does not work for motors that cannot spin freely after coast.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 1631 | **Unit:** | V |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.8.2.5 Group 5.1 Application Status

#### P 5.1.1 Motor Ctrl. Status Word

Shows the motor control status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1714 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 51: Motor Ctrl. Status Word Bit Descriptions**

| Bit | Description |
|---|---|
| 0 | Ready |
| 1 | Run |
| 2 | Reverse |
| 3 | Fault |
| 4 | Reserved |
| 5 | At reference |
| 6 | Zero speed |
| 7 | Protection mode active |

#### P 5.1.2 Motor Ctrl. Ready Status Word

Shows the motor control ready status word. All status bits must be true before the drive is ready.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1716 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 52: Motor Ctrl. Ready Status Word Bit Descriptions**

| Bit | Description |
|---|---|
| 0 | Run Enable high. |
| 1 | No fault active. |
| 2 | DC-link pre-charging done. |
| 3 | DC Voltage within limits. |
| 4 | Power manager initialized. |
| 5 | Brake test not running. |
| 6 | System software is not blocking start. |
| 7 | Grid voltage within limits. |
| 8 | Temperature within limits. |

**Table 52: Motor Ctrl. Ready Status Word Bit Descriptions** - (continued)

| Bit | Description |
|---|---|
| 9 | Valid motor data. |
| 10 | Valid control configuration. |

### P 5.1.3 Motor Regulator Status Word

Shows the current state of the motor regulator status word. The status word indicates if a limit controller is active.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1715 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 53: Motor Regulator Status Word Bit Descriptions**

| Bit | Description |
|---|---|
| 0 | Current limit control active (motoring side). |
| 1 | Current limit control active (generator side). |
| 2 | Torque limit control active (motoring side). |
| 3 | Torque limit control active (generator side). |
| 4 | Overvoltage control active. |
| 5 | Undervoltage control active. |
| 6 | Power limit control active (motoring side). |
| 7 | Power limit control active (generator side). |
| 8 | Speed limit control active. |
| 9 | AC-brake control active. |

### P 5.1.5 Fault Status Word 1

Shows the fault status word 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6203 | **Unit:** | – |
| **Data Type:** | DWORD | **Access Type:** | – |

**Table 54: Fault Status Word 1 Bit Descriptions**

| Bit | Description | Event number |
|---|---|---|
| 0 | Overcurrent | 4384, 4373, 5170, 4368, 4369, 4375, 4377, 4380, 4097 |
| 1 | Overvoltage | 4164, 4162, 4144 4145 |
| 2 | Undervoltage | 4165, 4146 |
| 3 | Unit temperature high | 4117, 4118, 4119 |
| 4 | Unit temperature low | 4116 |
| 5 | Control board overtemperature | 4121, 4122, 4123, 4120 |
| 6 | Input phase | 4160, 4163 |

**Table 54: Fault Status Word 1 Bit Descriptions** - (continued)

| Bit | Description | Event number |
|---|---|---|
| 7 | Output phase | 4175, 4176 |
| 8 | Ground fault | 4379, 4352, 4353, 4354, 4355 |
| 9 | Fan failure | 4128, 4129, 4133, 4130 |
| 10 | Fieldbus communication | 5162, 4256, 4257, 4258, 4260, 4261, 4263, 4265, 4266 ,4267, 4268, 4269, 4280, 4281, 4270, 4271, 4272, 4273, 4282, 4274, 4275, 4276, 4277, 4283, 4278, 4279 |
| 11 | HMI connection | 5141, 5142 |
| 12 | Feedback connection | 4418 |
| 13 | Thermistor input | 5157 |
| 14 | Auxiliary device (temperature) | 4200, 4201, 4203, 4202 |
| 15 | External temperature measurement | 5132, 5133, 5134, 5135, 5136, 5137, 5158 |

### P 5.1.8 Warning Status Word 1

Shows the warning status word 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6205 | **Unit:** | – |
| **Data Type:** | DWORD | **Access Type:** | – |

**Table 55: Warning Status Word 1 Bit Descriptions**

| Bit | Description | Event number |
|---|---|---|
| 0 | Overcurrent | 4384, 4373, 5170, 4368, 4369, 4375, 4377, 4380, 4097 |
| 1 | Overvoltage | 4164, 4162, 4144 4145 |
| 2 | Undervoltage | 4165, 4146 |
| 3 | Unit temperature high | 4117, 4118, 4119 |
| 4 | Unit temperature low | 4116 |
| 5 | Control board overtemperature | 4121, 4122, 4123, 4120 |
| 6 | Input phase | 4160, 4163 |
| 7 | Output phase | 4175, 4176 |
| 8 | Ground fault | 4379, 4352, 4353, 4354, 4355 |
| 9 | Fan failure | 4128, 4129, 4133, 4130 |
| 10 | Fieldbus communication | 5162, 4256, 4257, 4258, 4260, 4261, 4263, 4265, 4266 ,4267, 4268, 4269, 4280, 4281, 4270, 4271, 4272, 4273, 4282, 4274, 4275, 4276, 4277, 4283, 4278, 4279 |
| 11 | HMI connection | 5141, 5142 |
| 12 | Feedback connection | 4418 |
| 13 | Thermistor input | 5157 |
| 14 | Auxiliary device (temperature) | 4200, 4201, 4203, 4202 |
| 15 | External temperature measurement | 5132, 5133, 5134, 5135, 5136, 5137, 5158 |

### P 5.1.13 Application Status Word

Shows the application-specific status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1608 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 56: Application Status Word Bit Descriptions**

| Bit | Bit = False | Bit = True |
|---|---|---|
| 0 | Local Control | Remote Control |
| 1 | Jogging not Active | Jogging Active |
| 2 | Process Control not Active | Process Control Active |
| 3 | - | Start Interlock |
| 4 | STO Not Active | STO Active |
| 5 | No Warning | Warning Active |
| 6 | No Fault | Fault Active |
| 7 | Reserved | Reserved |
| 8 | Reserved | Reserved |
| 9 | Reserved | Reserved |
| 10 | Reserved | Reserved |
| 11 | Reserved | Reserved |
| 12 | Reserved | Reserved |
| 13 | Normal Reference | Freeze Reference |
| 14 | Normal Reference | Reverse Reference |
| 15 | Speed Within Limits | Speed Limit Active |

### P 5.1.34 Estimated Motor Temperature

Shows the calculated motor temperature based on the thermal model. This value is an estimate and depends on the correct configuration of the motor parameters.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-60 — 250) |
| **Parameter Number:** | 1014 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

## 7.8.2.6 Group 5.2.3.1 Measured Temp. Protection Status

### P 5.2.3.1.1 Protection 1 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5200 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.2.3.1.2 Protection 2 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5201 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.2.3.1.3 Protection 3 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5202 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.2.3.1.4 Protection 4 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5203 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.2.3.1.5 Protection 5 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5204 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.2.3.1.6 Protection 6 Temp.

Shows the temperature measured for the temperature protection.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 5205 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.8.2.7 Group 5.3.1 Load Status

#### P 5.3.1.1 Inertia Estimation Status

Shows the status of the inertia estimation routine. 0 = Inactive, 1 = In progress, 2 = Completed successfully, 3 = Completed unsuccessfully.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 666 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 1 | In progress | |
| 2 | Completed successfully | |
| 3 | Completed unsuccessfully | |

### 7.8.2.8 Group 5.5.1 Control Places Status

#### P 5.5.1.1 Active Control Place

Shows the control place that is currently controlling the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 113 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | PC control | The drive is controlled by a software tool. |
| 1 | Local Control | The drive is controlled by a connected control panel. |
| 2 | Fieldbus control | The drive is controlled via a fieldbus. |
| 3 | I/O control | The drive is controlled via I/O. |
| 4 | Combined control | The drive is controlled via a combination of I/O and fieldbus. |

#### P 5.5.1.2 Control Panel Active Output

Select an output terminal for indicating that the drive is controlled by a connected control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5178 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.1.3 Fieldbus Control Active Output

Select an output terminal for indicating that the drive is in fieldbus control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5197 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.1.4 I/O Control Active Output

Select an output terminal for indicating that the drive is in I/O control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 5177 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.5.1.5 Combined Control Active Output

Select an output terminal for indicating that the drive is in combined control.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 4727 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### 7.8.2.9 Group 5.8.1 Speed Control Status

#### P 5.8.1.2 Motor Speed

Shows the actual motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9011 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.8.1.3 Output Frequency

Shows the output frequency.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 9015 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.8.1.4 Feedback Speed

Shows the feedback speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-10000 — 10000) |
| **Parameter Number:** | 9007 | **Unit:** | rpm |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.8.1.5 Feedback Electrical Angle

Shows the feedback device angle in the electrical domain. Its value is needed for manually tuning the feedback angle offset.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 360) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 9016 | **Unit:** | ° |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.6 Speed Error

Shows the difference between speed reference after ramp and motor speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 4023 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.7 Speed Reference

Shows the speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-2000 — 2000) |
| **Parameter Number:** | 1718 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.1.8 Speed Reference Before Ramp

Shows the value of speed reference before the ramp generator.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-2000 — 2000) |
| **Parameter Number:** | 6049 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.9 Speed Reference After Ramp

Shows the value of the speed reference after the ramp generator.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6150 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.10 Final Speed Reference

Shows the value of the speed reference before feeding it to the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6151 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.8.1.11 Control Panel Speed Reference

Shows the value of the speed reference given from the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6153 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.8.1.12 Absolute Output Frequency Output

Select an output terminal for the output frequency scaled between 0 Hz and positive speed limits in Hz.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2300 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.1.13 Absolute Speed Reference Output

Select an output terminal for the absolute speed reference, scaled between 0 and positive speed limit.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2304 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.1.14 Output Frequency Output

Select an output terminal for the output frequency scaled between minimum speed limit and positive speed limits in Hz.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 2308 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 5.8.1.16 Load Drooping Speed

Shows the load drooping speed.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 2000) |
| **Parameter Number:** | 674 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.8.1.17 Logic Speed Reference

Shows Logic speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 21110 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.8.2.10 Group 5.9.1 Torque Control Status

#### P 5.9.1.1 Motor Torque

Shows the actual motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-10000000 — 10000000) |
| **Parameter Number:** | 9009 | **Unit:** | Nm |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.9.1.2 Relative Motor Torque

Shows the motor torque in % of the nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1708 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.9.1.3 Torque Limit Motoring

Shows the torque limit in motoring mode in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1812 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.4 Torque Limit Regenerative

Shows the regenerative torque limit in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 500) |
| **Parameter Number:** | 1813 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.5 Control Panel Torque Reference

Shows the local torque reference set in the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 6155 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.6 Torque Reference

Shows the value of the current torque reference in the reference chain in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 6152 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.9.1.7 Torque Reference Final

Shows the value of the final torque reference given to the motor controller in % of nominal motor torque.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 6154 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.9.1.8 Logic Torque Reference

Shows Logic torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-300 — 300) |
| **Parameter Number:** | 21111 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.8.2.11 Group 5.10.1 Process Control Status

#### P 5.10.1.1 On Reference

Indicates if the controlled process is operating on the current reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 6074 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | False | Fixed value - False. |
| 1 | True | Fixed value - True. |

#### P 5.10.1.2 Process Controller Output

Shows the output speed of the process controller, used as the speed reference for the speed controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6075 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.10.1.3 Setpoint Value

Shows the actual value of the setpoint.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6092 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.10.1.4 Feedback Value

Shows the actual value of the feedback.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6090 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read Only |

#### P 5.10.1.5 Adv. Feedforward Value

Shows the actual value of the advanced feedforward.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 6086 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.6 Feedback 1 Value

Shows the actual value of feedback 1.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6080 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.7 Feedback 2 Value

Shows the actual value of feedback 2.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 6085 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 5.10.1.9 Control Panel Process Reference

Shows the value of the process reference given from the control panel.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6094 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 5.10.1.10 Process Controller Enabled

Indicates whether the process controller is active or not.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |
| **Parameter Number:** | 6053 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read Only |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | False | Fixed value - False. |
| 1 | True | Fixed value - True. |

### P 5.10.1.20 Logic Process Reference

Shows Logic process reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000000 — 1000000) |
| **Parameter Number:** | 21112 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.8.2.12 Group 5.12.1 Mechanical Brake Control Status

### P 5.12.1.1 Mechanical Brake Status Word

Shows the mechanical brake status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 3016 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 57: Status Word Description**

| Bit number | Bit name | Description |
|---|---|---|
| 0 | Enabled | The mechanical brake is enabled by a parameter. |
| 1 | Start | A start signal is provided to mechanical brake control. |
| 2 | Brake open feedback signal | Brake feedback is enabled and ***brake open*** is active. |
| 3 | Brake close feedback | Brake feedback is enabled and ***brake closed*** is active. |
| 4–8 | N/A | |
| 9 | Brake slip error | A higher slip than the defined limit has been detected in the mechanical brake. |
| 10 | Brake feedback state error | Both ***brake open*** and ***brake closed*** feedback signals are active at the same time. |
| 11 | Priming | The required release torque could not be generated. |
| 12 | Brake release timeout | Feedback is enabled but the ***brake open*** feedback signal was not provided during brake release time. |
| 13 | Brake close timeout | Feedback is enabled but the ***brake closed*** feedback signal was not provided during brake close time. |
| 14 | BrakeCtrl active | Brake control is either opening or closing the brake. |
| 15 | Brake open | Brake control has activated the digital output. |

#### P 5.12.1.2 Mechanical Brake State

Shows the state of the mechanical brake controller.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 32767) |
| **Parameter Number:** | 3017 | **Unit:** | – |
| **Data Type:** | INT | **Access Type:** | Read Only |

#### P 5.12.1.3 Brake Release Time Detected

Shows the time from brake release until load change is detected, where motor takes over the load from mechanical brake.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 3041 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.8.2.13 Group 6.1.1 Maintenance & Service

#### P 6.1.1.1 Last Fault Number

Shows the number of the most recent active fault.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 1610 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read Only |

#### P 6.1.1.2 Last Warning Number

Shows the number of the most recent active warning.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 1609 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

#### P 6.1.1.3 Control Unit Temperature

Shows the temperature of the control unit.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-50 — 200) |
| **Parameter Number:** | 2952 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### 7.8.3 Group 6.2 Software Information

#### P 6.2.1 Application Version

Shows the version of the application software.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 151 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | – |

### 7.8.4 Events (Menu Index 6.4)

#### 7.8.4.1 Group 6.4.3 Event Simulation

#### P 6.4.3.1 Simulate Event

Select a response to trigger a simulated event.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No Action) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1400 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No Action | No event is triggered. |
| 1 | Response 1 | Activate event response 1. |
| 2 | Response 2 | Activate event response 2. |
| 3 | Response 3 | Activate event response 3. |
| 4 | Response 4 | Activate event response 4. |
| 5 | Response 5 | Activate event response 5. |
| 6 | Response 6 | Activate event response 6. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 7 | Response 7 | Activate event response 7. |
| 8 | Response 8 | Activate event response 8. |
| 9 | Response 9 | Activate event response 9. |
| 10 | Response 10 | Activate event response 10. |

#### P 6.4.3.2 Simulate Persisting Event

Select a response to trigger a persisting simulated event. Set back to 0 to allow a reset.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No Action) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1401 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No Action | No event is triggered. |
| 1 | Response 1 | Activate event response 1. |
| 2 | Response 2 | Activate event response 2. |
| 3 | Response 3 | Activate event response 3. |
| 4 | Response 4 | Activate event response 4. |
| 5 | Response 5 | Activate event response 5. |
| 6 | Response 6 | Activate event response 6. |
| 7 | Response 7 | Activate event response 7. |
| 8 | Response 8 | Activate event response 8. |
| 9 | Response 9 | Activate event response 9. |
| 10 | Response 10 | Activate event response 10. |

#### P 6.4.3.3 Simulate Event Number

Set the number of the event to be simulated.

| | | | |
|---|---|---|---|
| **Default Value:** | 5260 | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 1402 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

### 7.8.4.2 Group 6.4.4 Auto Reset

The automatic reset function enables the resetting of events without the need for a manual reset operation. This function is enabled with parameter ***6.4.4.1 Auto Reset***.

When the function is enabled, a timer starts when an event requiring a reset is first triggered. An automatic reset is attempted at the end of each time interval. If any event requiring a reset is still active, the automatic reset attempt does not succeed, and the timer continues running. Once the maximum number of automatic reset attempts is reached, the automatic reset function stops, and a manual reset is required to clear the events.

If all events are reset (through either an automatic or manual reset), the function resets the number of attempts and stops the timer. The next event to trigger will begin a new cycle.

**NOTICE**

Before activating any automatic fault reset functions or changing limit values, make sure that no dangerous situations can occur after restart. If the auto reset function is activated, the device connected to the drive output starts automatically after an automatic fault reset.

**NOTICE**

A small set of events cannot be reset by the auto reset functionality, either because of safety reasons or because the events are critical for the lifetime of the drive.

### P 6.4.4.1 Auto Reset

Enable the automatic resetting of faults.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 1405 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### P 6.4.4.2 Auto Reset Max Attempts

Set the maximum number of automatic resets that is allowed before a manual reset is required. 0 means the drive will auto reset infinite times. Some events can not be auto reset due to hardware protection or for safety reasons.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 | **Parameter Type:** | Range (0 — 20) |
| **Parameter Number:** | 1406 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

### P 6.4.4.3 Auto Reset Time Interval

Set the time interval from when an event happens to when it is automatically reset.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (1 — 600) |
| **Parameter Number:** | 1407 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.8.5 Group 6.5 Operational Counters

### P 6.5.1 Control Unit On Time

Shows the total operating time for the control unit.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 4294967295) |
| **Parameter Number:** | 2000 | **Unit:** | h |

| | | | |
|---|---|---|---|
| **Data Type:** | UDINT | **Access Type:** | Read Only |

### P 6.5.2 Power Unit On Time

Shows the total operating time for the power unit. The counter only increments if the DC link is powered.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 4294967295) |
| **Parameter Number:** | 2001 | **Unit:** | h |
| **Data Type:** | UDINT | **Access Type:** | Read Only |

### P 6.5.3 Energy Consumption

Shows the energy consumed.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 4294967295) |
| **Parameter Number:** | 2002 | **Unit:** | kWh |
| **Data Type:** | UDINT | **Access Type:** | Read Only |

### P 6.5.4 Ground Faults

Shows the total number of ground faults.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 50000) |
| **Parameter Number:** | 2004 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

### P 6.5.5 Overvoltage Faults

Shows the total number of overvoltage faults.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 50000) |
| **Parameter Number:** | 2005 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

### P 6.5.6 Overcurrent Faults

Shows the total number of overcurrent faults.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 50000) |
| **Parameter Number:** | 2006 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

### P 6.5.7 Short Circuit Faults

Shows the total number of short-circuit faults.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 50000) |
| **Parameter Number:** | 2007 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

#### P 6.5.8 Number Of Starts

Shows the number of starts of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 4294967295) |
| **Parameter Number:** | 2008 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read Only |

#### P 6.5.9 Active Running Hours

Shows the total number of active running hours of the motor.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 4294967295) |
| **Parameter Number:** | 2009 | **Unit:** | h |
| **Data Type:** | UDINT | **Access Type:** | Read Only |

#### P 6.5.10 Motor Operation Below 10 Hz

Shows the number of hours of running below 10 Hz output frequency. Low speed operation with full load may decrease motor lifetime.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 4294967295) |
| **Parameter Number:** | 2010 | **Unit:** | h |
| **Data Type:** | UDINT | **Access Type:** | Read Only |

### 7.8.6 Group 6.7 Backup & Restore

#### S 6.7.1 Backup

Create a backup of parameters.

For instructions on how to create a backup using MyDrive® Insight, see the *MyDrive Insight Application Guide*.

#### S 6.7.2 Restore

Restore parameters from a backup or to factory settings.

For instructions on how to restore the system configuration using MyDrive® Insight, see the *MyDrive Insight Application Guide*.

#### S 6.7.3 Existing Backups

Shows the existing backups of the parameters.

### 7.8.7 Group 6.8 Preventive Maintenance

#### 7.8.7.1 Setting Up Preventive Maintenance

When setting up the parameters with the control panel or MyDrive Insight, the parameters are grouped in screens as shown in the following picture.

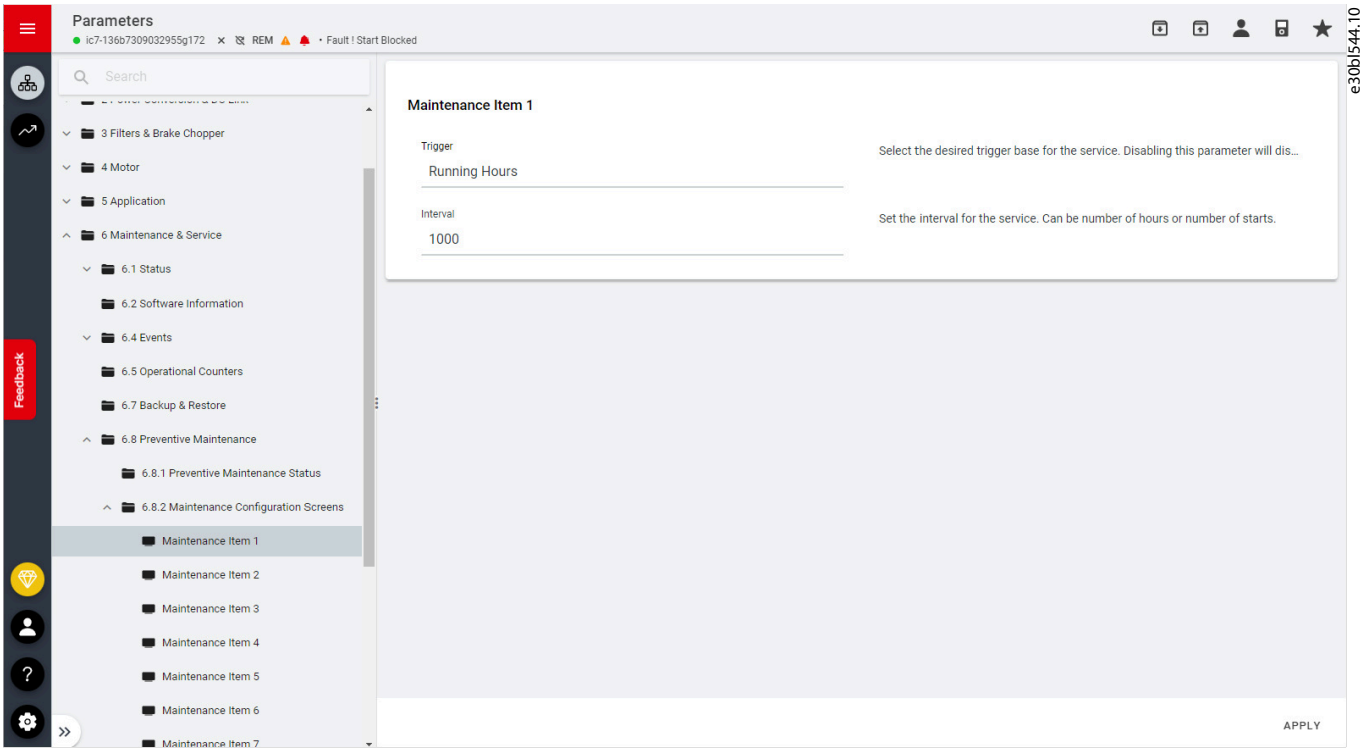



**Figure 91: Preventive Maintenance Parameters in MyDrive Insight**

1. Define the maintenance *Trigger Type*.

   Select how the need for maintenance is determined. There are 4 trigger types:

   - Disabled (default)
   - Running Hours (the running hours of the motor)
   - Operation Hours (the running hours of the drive)
   - Number of Starts

2. Define the maintenance *Interval*. The interval is the number of hours or number of motor starts after which maintenance is called for.
3. Press *Apply* to finish setting the parameters.

When a need for maintenance is triggered, the drive issues a warning and shows the maintenance request in MyDrive Insight and on the control panel.

To remove the maintenance request, the notification must be acknowledged by clicking *OK* in MyDrive Insight or pressing the [*OK*] button on the control panel. Acknowledging removes the warning and schedules a new service trigger with the same values (for example, 1000 running hours).

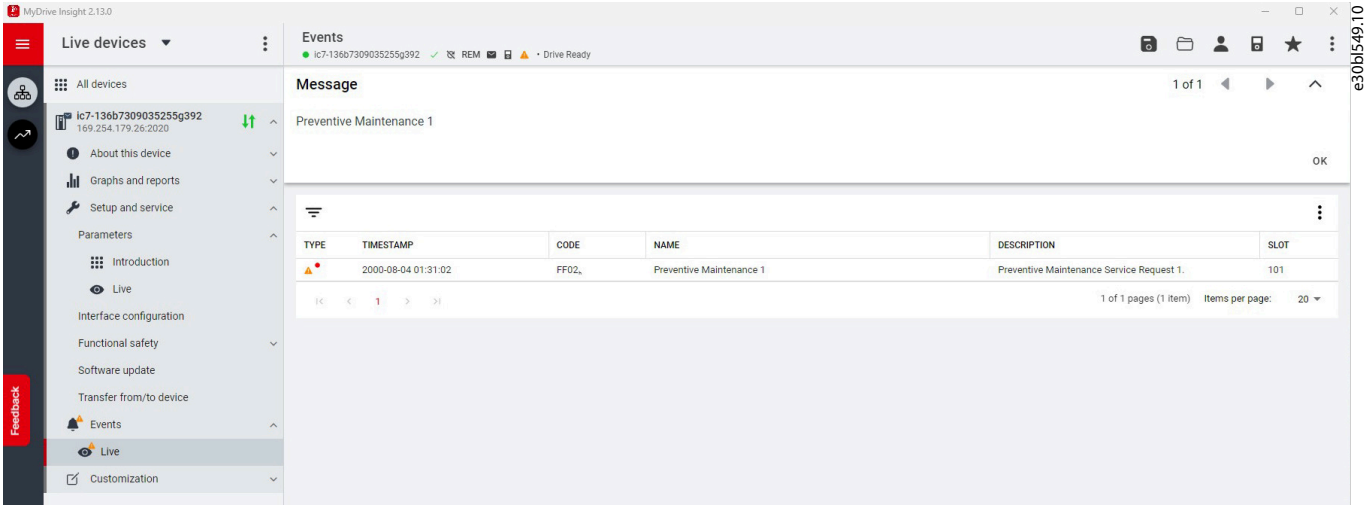



**Figure 92: Maintenance Warning in MyDrive Insight**

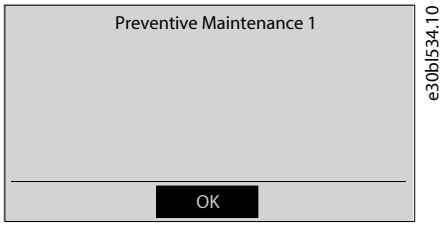



**Figure 93: Maintenance Warning on the Control Panel**

### 7.8.7.2 Group 6.8.1 Preventive Maintenance Status

#### P 6.8.1.1 Preventive Maintenance status word

Shows the current status of the preventive maintenance services. Bit 0 represents item 1, bit 1 represents item 2, and so on.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 7042 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read Only |

#### P 6.8.1.2 Preventive Maintenance acknowledge word

Acknowledge a preventive maintenance service request. To acknowledge request 1, set bit 0, for request 2, set bit 1, and so on. The bits are automatically reset.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 7043 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

### 7.8.7.3 Maintenance Request Notification and Acknowledging by Fieldbus

Preventive maintenance triggers and maintenance interval parameters can be set via the fieldbus with these parameters:

**Table 58: Fieldbus Trigger Parameters**

| Parameter name | Parameter number |
|---|---|
| Preventive Maintenance Trigger 1 | 7002 |
| Preventive Maintenance Trigger 2 | 7026 |

**Table 58: Fieldbus Trigger Parameters** - (continued)

| Parameter name | Parameter number |
|---|---|
| Preventive Maintenance Trigger 3 | 7013 |
| Preventive Maintenance Trigger 4 | 7014 |
| Preventive Maintenance Trigger 5 | 7029 |
| Preventive Maintenance Trigger 6 | 7031 |
| Preventive Maintenance Trigger 7 | 7032 |
| Preventive Maintenance Trigger 8 | 7033 |
| Preventive Maintenance Trigger 9 | 7034 |
| Preventive Maintenance Trigger 10 | 7035 |

**Table 59: Fieldbus Maintenance Interval Parameters**

| Parameter name | Parameter number |
|---|---|
| Preventive Maintenance Interval 1 | 7003 |
| Preventive Maintenance Interval 2 | 7025 |
| Preventive Maintenance Interval 3 | 7017 |
| Preventive Maintenance Interval 4 | 7018 |
| Preventive Maintenance Interval 5 | 7019 |
| Preventive Maintenance Interval 6 | 7037 |
| Preventive Maintenance Interval 7 | 7038 |
| Preventive Maintenance Interval 8 | 7039 |
| Preventive Maintenance Interval 9 | 7040 |
| Preventive Maintenance Interval 10 | 7041 |

The maintenance request can also be read via the fieldbus with the ***Preventive Maintenance Status Word (No. 7042)*** parameter. The bits of the word represent each of the 10 maintenance items.

**Table 60: Preventive Maintenance Status Word Parameter**

| Bit | Description |
|---|---|
| 0 | Service request item 1 |
| 1 | Service request item 2 |
| 2 | Service request item 3 |
| 3 | Service request item 4 |
| 4 | Service request item 5 |
| 5 | Service request item 6 |
| 6 | Service request item 7 |
| 7 | Service request item 8 |
| 8 | Service request item 9 |
| 9 | Service request item 10 |

The requests can be acknowledged via the fieldbus with the ***Preventive Maintenance Acknowledge Word (No. 7043)*** parameter. The bits of the word in the parameter represent each of the 10 maintenance items in the same way.

## 7.8.8 Group 6.10 Expert Tools

### 7.8.8.1 Group 6.10.2 Cyber Security

#### P 6.10.2.1 Max. Login Attempts

Set the maximum number of failed login attempts before lockout.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 255) |
| **Parameter Number:** | 5900 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

#### P 6.10.2.2 Login Cooldown Time

Set the time period during which all login attempts are blocked after an excessive number of failed attempts.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (1 — 1440) |
| **Parameter Number:** | 5901 | **Unit:** | min |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

#### P 6.10.2.3 Security Event Log IP

Set the IP address of the server to which a security event is logged.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5902 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

#### P 6.10.2.4 Security Event Log Port

Set the server port used for security event log transmissions.

| | | | |
|---|---|---|---|
| **Default Value:** | 6514 | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 5903 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

#### P 6.10.2.5 System Use Notification

Enter the system use notification message that is displayed on the login screen.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5908 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

#### P 6.10.2.6 HMI inactivity time

Set the HMI session inactivity timeout in minutes. If the logged-in HMI session is inactive longer than this value, the user is automatically logged out. 0 disables the timeout.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 | **Parameter Type:** | Range (0 — 1440) |
| **Parameter Number:** | 5909 | **Unit:** | min |

| | | | |
|---|---|---|---|
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

#### 7.8.8.2 Group 6.10.3 Troubleshooting

##### P 6.10.3.2 Save Diagnostic Log

Select whether to save internal logs persistently for debugging. It is important to disable this parameter when troubleshooting is complete.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 5905 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

##### P 6.10.3.3 Service Access

Temporarily enable special debug or service interfaces for maintenance. Automatically disabled after power cycle. Use with care: May expose sensitive functions and information.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5906 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

## 7.9 Group 7 Functional Safety

### 7.9.1 Functional Safety Overview

**NOTICE**

Select and apply the components in the safety control system appropriately to achieve the required level of operational safety. Before integrating and using STO in an installation, carry out a thorough risk analysis on the installation to determine whether the STO functionality and safety levels are appropriate and sufficient.

This parameter group contains non-safety-related parameters. They are used to configure the behavior of the drive after a functional safety event (for example, STO). Refer to the *Functional Safety Operating Guide* for more information.

### 7.9.2 Group 7.1 Status

#### P 7.1.1 Functional Safety Status Word

Shows the functional safety status word.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 4024 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

## 7.9.3 Group 7.2 Basic Settings

### P 7.2.1 Startup Acknowledge Input

Select the input for acknowledging a safe startup.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 9922 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### P 7.2.2 I/O Failure Acknowledge Input

Select the input for acknowledging a safe I/O failure.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 9921 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

## 7.9.4 Safe Torque Off (STO)

The Safe Torque Off (STO) function is a component in a safety control system. STO prevents the unit from generating the power required to rotate the motor. The iC7 drives are available with:

- Safe Torque Off (STO), as defined by EN IEC 61800-5-2.
- Stop category 0, as defined in EN 60204-1.

### STO activation

The STO function is activated by removing the voltages at the STO inputs of the drive. By connecting the frequency converter to external safety devices providing a safe delay, an installation for a Safe Stop 1 can be obtained. External safety devices must fulfill the required Cat./PL or SIL when connected to STO inputs.

With default settings, the drive issues a fault, trips the unit, and coasts the motor to a stop when the STO function is activated. A manual restart is required to continue operation. Use the STO function to stop the drive when a safety function is required. In normal operating mode when STO is not required, use the standard stop function instead.

## 7.9.5 Group 7.3 STO

### P 7.3.1 Safe Torque Off Response

Select the response and the restart behavior of the drive when safe torque off (STO) is activated. In all cases the motor is coasted and an unintended restart is prevented during the STO request.

| | | | |
|---|---|---|---|
| **Default Value:** | 14 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 9910 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 15 | Warning | The drive issues a warning. |
| 14 | Fault | The drive issues a fault and coasts the motor. |

#### P 7.3.2 Safe Torque Off Output

Select an output for signaling the activation of Safe Torque Off.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 9911 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

#### P 7.3.3 Safe Torque Off Acknowledge Input

Select the input for acknowledging Safe Torque Off.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 9920 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

Selection lists with inputs and/or outputs consist of the name of the hardware option and the numbers of the terminals. For example, terminal number 13 of the Basic I/O is called Basic I/O T13 in the selection list. For more information on selecting inputs and outputs, see 7.2.5 I/O Addressing.

### 7.9.6 Terminating STO and Resuming Normal Operation

1. Reapply the 24 V DC supply to safe inputs.
2. Give a reset signal (via fieldbus, digital I/0, or the control panel).

> Set the STO function to restart automatically by setting the value of parameter ***7.3.1 Safe Torque Off Response*** from the default value ***Fault (Manual reset)*** to the value ***Warning (Automatic reset)***. Automatic reset means that STO is terminated and normal operation is resumed when the 24 V DC is applied to STO inputs. No reset signal is required.

### 7.9.7 Group 7.4 SS1

#### P 7.4.1 Safe Stop 1 Response

Select the response if there is a Safe Stop 1 event (Only available with safety module).

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No response) | **Parameter Type:** | Selection |
| **Parameter Number:** | 9901 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No response | The drive detects that Safe Stop is activated, but relies on external action to stop. If no action is taken, a fault is generated. |
| 1 | Stop with Safe Ramp | The drive detects that Safe Stop is activated and ramps down using the configured ramp. If unsuccessful, a fault is generated. |

#### P 7.4.3 Safe Deceleration Ramp

Set Deceleration Ramp if there is a Safe Stop event (Only available with safety module).

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 10000) |
| **Parameter Number:** | 9900 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.10 Group 8 Device Settings

### 7.10.1 Device Settings Overview

This parameter group contains parameters for customizing and adapting the behavior of the drive and user interface design.

### 7.10.2 Group 8.1 Status

#### P 8.1.1 Date & Time

Shows the current system time and date.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2799 | **Unit:** | – |
| **Data Type:** | DATE_AND_TIME | **Access Type:** | Read/Write |

#### P 8.1.2 Active NTP Server

Shows the active network time protocol (NTP) server.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6230 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read Only |

#### P 8.1.3 Last Time Received (NTP)

Shows the last time received from a network time protocol server.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6235 | **Unit:** | – |
| **Data Type:** | DATE_AND_TIME | **Access Type:** | Read Only |

## 7.10.3 Group 8.2 Units

### P 8.2.2 Unit Selection

Select the unit system used.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Selection |
| **Parameter Number:** | 2801 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | SI (metric units) | International system of units. |
| 1 | USCS (United States customary units) | United States customary units. |

### P 8.2.3 Speed Unit

Select the speed unit.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (RPM) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2813 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Hz | Use Hz as speed unit. |
| 1 | RPM | Use RPM as speed unit. |

## 7.10.4 Group 8.3 Control Panel

### S 8.3.1.1 Language

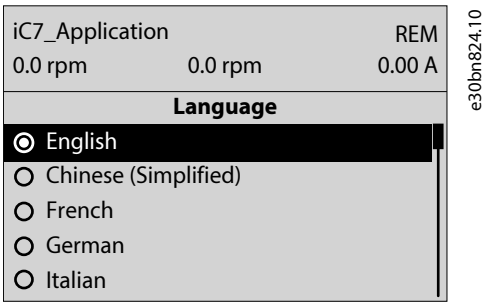



**Figure 94: Language Menu**

### S 8.3.1.2 Brightness & Contrast

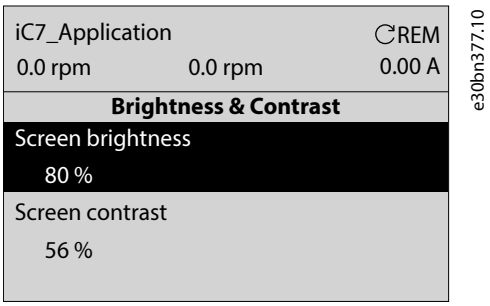



**Figure 95: Brightness and Contrast Menu**

#### S 8.3.1.3 Time & Date Settings

General control panel date and time settings.

Set the system time zone, and select the date and time format to be shown on the control panel.

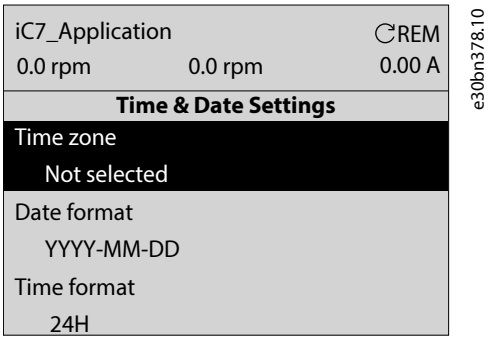



**Figure 96: Time and Date Menu**

### 7.10.4.1 Group 8.3.2 Status Line

#### P 8.3.2.1 Status Line Left

Select the parameter for the left field in the status line.

| | | | |
|---|---|---|---|
| **Default Value:** | 65001 (Actual Output Value) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4332 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 65001 | Actual Output Value | Shows the actual output value depending on the operation mode. |
| 65002 | Actual Reference Value | Shows the actual setpoint value depending on the operation mode. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.2.2 Status Line Right

Select the parameter for the right field in the status line.

| | | | |
|---|---|---|---|
| **Default Value:** | 65002 (Actual Reference Value) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4331 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 65001 | Actual Output Value | Shows the actual output value depending on the operation mode. |
| 65002 | Actual Reference Value | Shows the actual setpoint value depending on the operation mode. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.2.3 Status Line Center

Select the parameter for the center field in the status line.

| | | | |
|---|---|---|---|
| **Default Value:** | 9008 (Motor Shaft Power) | **Parameter Type:** | Selection |
| **Parameter Number:** | 4333 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 65001 | Actual Output Value | Shows the actual output value depending on the operation mode. |
| 65002 | Actual Reference Value | Shows the actual setpoint value depending on the operation mode. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### 7.10.4.2 Group 8.3.3 Status Screen 1

#### P 8.3.3.1 Status Value 1.1

Select the parameter for status value 1.1.

| | | | |
|---|---|---|---|
| **Default Value:** | 65001 (Actual Output Value) | **Parameter Type:** | Selection |
| **Parameter Number:** | 300 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 65001 | Actual Output Value | Shows the actual output value depending on the operation mode. |
| 65002 | Actual Reference Value | Shows the actual setpoint value depending on the operation mode. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.3.2 Status Value 1.2

Select the parameter for status value 1.2.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 301 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.3.3 Status Value 1.3

Select the parameter for status value 1.3.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 302 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

P 8.3.3.4 Status Value 1.4

Select the parameter for status value 1.4.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 303 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.3.5 Status Value 1.5

Select the parameter for status value 1.5.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 304 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### 7.10.4.3 Group 8.3.4 Status Screen 2

#### P 8.3.4.1 Status Value 2.1

Select the parameter for status value 2.1.

| | | | |
|---|---|---|---|
| **Default Value:** | 9010 (Motor Shaft Speed) | **Parameter Type:** | Selection |
| **Parameter Number:** | 310 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.4.2 Status Value 2.2

Select the parameter for status value 2.2.

| | | | |
|---|---|---|---|
| **Default Value:** | 9009 (Motor Torque) | **Parameter Type:** | Selection |
| **Parameter Number:** | 311 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.4.3 Status Value 2.3

Select the parameter for status value 2.3.

| | | | |
|---|---|---|---|
| **Default Value:** | 9008 (Motor Shaft Power) | **Parameter Type:** | Selection |
| **Parameter Number:** | 312 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.4.4 Status Value 2.4

Select the parameter for status value 2.4.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 313 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

### P 8.3.4.5 Status Value 2.5

Select the parameter for status value 2.5.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 314 | **Unit:** | – |
| **Data Type:** | UDINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | Nothing selected. |
| 9011 | Motor Speed | Shows the actual motor speed. |
| 9000 | Motor Current | Shows the actual motor current. |
| 9010 | Motor Shaft Speed | Shows the shaft speed in RPM. |
| 9009 | Motor Torque | Shows the actual motor torque. |
| 1708 | Relative Motor Torque | Shows the motor torque in % of the nominal motor torque. |
| 9005 | Motor Voltage | Shows the actual motor voltage. |
| 9008 | Motor Shaft Power | Shows the actual power at the motor shaft. |
| 674 | Load Drooping Speed | Shows the load drooping speed. |
| 6075 | Process Controller Output | Shows the output speed of the process controller, used as the speed reference for the speed controller. |
| 6090 | Feedback Value | Shows the actual value of the feedback. |
| 1718 | Speed Reference | Shows the speed reference. |
| 6092 | Setpoint Value | Shows the actual value of the setpoint. |
| 6151 | Final Speed Reference | Shows the value of the speed reference before feeding it to the speed controller. |
| 6153 | Control Panel Speed Reference | Shows the value of the speed reference given from the control panel. |
| 6155 | Local Torque Reference | Shows the local torque reference set in the control panel. |
| 9007 | Feedback Speed | Shows the feedback speed. |
| 9044 | DC-link Voltage | Shows the actual DC-link voltage. |
| 9041 | Grid Frequency | Shows the actual grid frequency. |
| 9040 | Line-To-Line Voltage (RMS) | Shows the average line-to-line voltage (RMS). |
| 9048 | L1-L2 Line Voltage (RMS) | Shows the L1-L2 line voltage (RMS). |
| 9049 | L2-L3 Line Voltage (RMS) | Shows the L2-L3 line voltage (RMS). |
| 9050 | L3-L1 Line Voltage (RMS) | Shows the L3-L1 line voltage (RMS). |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 9047 | Grid Voltage Imbalance | Shows the grid voltage imbalance in %. A value greater than 3% may indicate grid problems. |
| 2950 | Heat Sink Temperature | Shows the temperature of the power unit heat sink. |
| 2952 | Control Unit Temperature | Shows the temperature of the control unit. |
| 21091 | Logic Running Mode | Select the running mode for Logic. |
| 21094 | Logic State | Shows the current active state in Logic. |
| 21095 | Logic Time In Current State | Shows the time that the current state in Logic has been active. |
| 9015 | Output Frequency | Shows the output frequency. |
| 2009 | Active Running Hours | Shows the total number of active running hours of the motor. |
| 2002 | Energy Consumption | Shows the energy consumed. |

## 7.10.5 Group 8.4 Date & Time

### P 8.4.1 Time Mode

Select the time mode. Auto enables NTP.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Auto (NTP)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 6232 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Manual | Disables NTP. |
| 1 | Auto (NTP) | |

### P 8.4.2 Date and Time

Set the actual time and date. The format is YYYY-MM-DD and HH:MM:SS.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 2800 | **Unit:** | – |
| **Data Type:** | DATE_AND_TIME | **Access Type:** | Read/Write |

### P 8.4.3 NTP Server 1

Set the IPv4 address of the requested NTP server 1.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 6233 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

### P 8.4.4 NTP Server 2

Set the IPv4 address of the requested NTP server 2.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 6234 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

#### P 8.4.5 RTC Battery Monitor

Disable the battery flat/low warning when the battery is not present. This monitor is automatically enabled when a battery is mounted. To apply the modified setting, power cycle the drive.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 2812 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

## 7.10.6 Logic (Menu Index 8.5)

For more information on the MyDrive Insight Logic feature, see MyDrive Insight Logic Feature Application Guide.

### 7.10.6.1 Status (Menu Index 8.5.1)

#### P 8.5.1.1 Logic Speed Reference

Shows Logic speed reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 21110 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 8.5.1.2 Logic Torque Reference

Shows Logic torque reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 21111 | **Unit:** | % |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 8.5.1.3 Logic Process Reference

Shows Logic process reference.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 21112 | **Unit:** | CustomProcessUnit |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 8.5.1.10 Logic State

Shows the current active state in Logic.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 21094 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No State | No state active. |
| 1 | State 1 | State 1 active. |
| 2 | State 2 | State 2 active. |
| 3 | State 3 | State 3 active. |
| 4 | State 4 | State 4 active. |
| 5 | State 5 | State 5 active. |

#### P 8.5.1.11 Time in current State

Shows the time that the current state in Logic has been active.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 21095 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.10.7 Group 8.6 Preconfigured Parameter Sets

With the preconfigured parameter sets function, a whole set of parameters can be set at once. The function makes it possible, for example, to set all relevant parameters of a motor to the motor manufacturer's specification to get the best performance out of the motor. The parameters are set automatically when the relevant selection is selected for the preconfiguration parameter, in parameter group ***8.6 Preconfigured Parameter Sets***.

If the parameters were set unintentionally, or the settings must be reverted, they can be reset to the factory defaults.

#### P 8.6.1 OGD Selection

Selects a predefined parameter set for the different One Gear Drive motors. The drive is set up according to the specifications of the motor manufacturer to get the best performance.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Selection |
| **Parameter Number:** | 404 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Conditional Write |

### 7.10.8 Group 8.7 Asset Management

#### P 8.7.1 Asset Name

Define a name for this specific asset. If this is empty, the application name is used.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5892 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

#### P 8.7.2 Asset Location

Specify the location of the drive to help identify it.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5889 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

#### P 8.7.3 Asset ID

Assign a unique ID to the drive to help identify it in a larger network.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5891 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

#### P 8.7.4 Contact

Specify the contacts for this asset. Can be a name together with information on how to contact this person.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 5890 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

## 7.11 Group 9 I/O

### 7.11.1 I/O Overview

The ***I/O*** parameter group (***Menu Index 9***) contains the parameters for the hardware configuration of the I/Os, such as terminal modes, filtering of the electrical signals, and signal ranges.

This application guide contains only the parameter descriptions for the Basic I/O. The parameter information for option boards such as the Encoder/Resolver Option OC7M0 can be found in the *iC7 Functional Extensions Operating Guide*.

### 7.11.2 Basic I/O

#### 7.11.2.1 Basic I/O Status (Menu Index 9.3)

##### P 9.3.1 Digital Input Status

Shows the digital input I/O word. Each bit represents the status of a digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1614 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 61: I/O Digital Input Status Bits**

| Bit | Description |
|---|---|
| 00 | DigIn13 |
| 01 | DigIn14 |
| 02 | DigIn15 |
| 03 | DigIn16 |

**Table 61: I/O Digital Input Status Bits** - (continued)

| Bit | Description |
|---|---|
| 04 | DigIn17 |
| 05 | DigIn18 |
| 06–15 | Not used |

### P 9.3.2 Digital Output Status

Shows the digital output I/O word. Each bit represents a requested value assigned to a digital output.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 1615 | **Unit:** | – |
| **Data Type:** | WORD | **Access Type:** | Read Only |

**Table 62: I/O Digital Output Status Bits**

| Bit | Description |
|---|---|
| 00–01 | Not used |
| 02 | DigOut15 |
| 03 | DigOut16 |
| 04–11 | Not used |
| 12 | Relay02 |
| 13 | Relay05 |
| 14–15 | Not used |

### P 9.3.3 T31 Analog Output Value

Shows the requested value assigned to the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (0 — 20) |
| **Parameter Number:** | 1613 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 9.3.4 T33 Analog Input Value

Shows the actual value of the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 1611 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

### P 9.3.5 T34 Analog Input Value

Shows the actual value of the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 1612 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read Only |

P 9.3.6 T34 Temperature Value

Shows the measured temperature of the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | NA | **Parameter Type:** | Range (-1000 — 1000) |
| **Parameter Number:** | 1616 | **Unit:** | °C |
| **Data Type:** | REAL | **Access Type:** | Read Only |

## 7.11.2.2 Digital Inputs/Outputs (Menu Index 9.4)

### 7.11.2.2.1 Pulse Input

A digital input can be configured to be a pulse input with the corresponding mode parameter. The pulse input can be used as a speed reference, similarly to how an analog input signal works. The pulse input can come from a sensor, an HTL encoder, or other devices.

When pulse input is selected as the input type, the only active parameters for that input are the pulse minimum and maximum frequency parameters. The right filter is selected automatically for the incoming signal by the drive, so the parameters for the filters are not active when pulse input is selected.

The set pulse minimum and maximum frequencies correspond to the set minimum and maximum speed references defined in parameter group ***5.8.4 Speed Reference***.

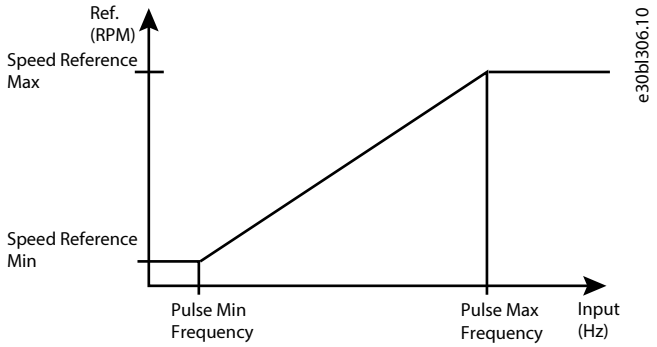



**Figure 97: Pulse Input**

### 7.11.2.2.2 General Settings (Menu Index 9.4.1)

P 9.4.1.1 Digital Input Logic

Set the operating logic for all digital inputs.

| | | | |
|---|---|---|---|
| **Default Value:** | 2 (PNP mode) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2261 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | NPN mode | Open collector sink (NPN). |
| 2 | PNP mode | Open collector source (PNP). |

### 7.11.2.2.3 Input T13 (Menu Index 9.4.2)

P 9.4.2.1 T13 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Digital input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2015 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 3 | Digital input | The terminal is configured as boolean input (true/false). |
| 4 | Pulse input | The terminal is configured as pulse input. The frequency represents an analog value. |
| 8 | Encoder A Input | The terminal is configured as an incremental encoder A track. |
| 9 | Encoder B Input | The terminal is configured as an incremental encoder B track. |

### P 9.4.2.2 T13 Signal Inversion

Select whether the signal of the terminal is inverted.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Non-Inverted) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2291 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Non-Inverted | The signal is not inverted. |
| 1 | Inverted | The signal is logically inverted. |

### P 9.4.2.3 T13 Fast Debounce Filtering Time

Set the fast debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 63.50) |
| **Parameter Number:** | 2285 | **Unit:** | µs |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.2.4 T13 Standard Debounce Filtering Time

Set the standard debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 127.00) |
| **Parameter Number:** | 2024 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.2.5 T13 Reaction Time

Select the reaction time for the debounce filter.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard reaction time (1ms tick)) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2025 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard reaction time (1ms tick) | Use the digital input in the same way as other inputs. |
| 1 | Fast reaction time (0.5µs tick) | Enables a fast reaction time for a certain event via digital input. |

#### P 9.4.2.6 T13 Trigger Mode

Select the trigger mode for the digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2026 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No event trigger. |
| 1 | Rising Edge | Trigger an event at the rising edge. |
| 2 | Falling Edge | Trigger an event at the falling edge. |
| 3 | Both Edges | Trigger an event at both the rising and falling edges. |

#### P 9.4.2.7 T13 Pulse Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2027 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.4.2.8 T13 Pulse Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 110000 | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2028 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.11.2.2.4 Input T14 (Menu Index 9.4.3)

#### P 9.4.3.1 T14 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Digital input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2016 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 3 | Digital input | The terminal is configured as boolean input (true/false). |
| 4 | Pulse input | The terminal is configured as pulse input. The frequency represents an analog value. |
| 8 | Encoder A Input | The terminal is configured as an incremental encoder A track. |
| 9 | Encoder B Input | The terminal is configured as an incremental encoder B track. |

### P 9.4.3.2 T14 Signal Inversion

Select whether the signal of the terminal is inverted.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Non-Inverted) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2292 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Non-Inverted | The signal is not inverted. |
| 1 | Inverted | The signal is logically inverted. |

### P 9.4.3.3 T14 Fast Debounce Filtering Time

Set the fast debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 63.50) |
| **Parameter Number:** | 2286 | **Unit:** | µs |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.3.4 T14 Standard Debounce Filtering Time

Set the standard debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 127.00) |
| **Parameter Number:** | 2029 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.3.5 T14 Reaction Time

Select the reaction time for the debounce filter.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard reaction time (1ms tick)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2030 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard reaction time (1ms tick) | Use the digital input in the same way as other inputs. |
| 1 | Fast reaction time (0.5µs tick) | Enables a fast reaction time for a certain event via digital input. |

#### P 9.4.3.6 T14 Trigger Mode

Select the trigger mode for the digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2031 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No event trigger. |
| 1 | Rising Edge | Trigger an event at the rising edge. |
| 2 | Falling Edge | Trigger an event at the falling edge. |
| 3 | Both Edges | Trigger an event at both the rising and falling edges. |

#### P 9.4.3.7 T14 Pulse Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2032 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.4.3.8 T14 Pulse Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 110000 | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2033 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.11.2.2.5 Input/Output T15 (Menu Index 9.4.4)

#### P 9.4.4.1 T15 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Digital input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2022 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 1 | Digital Output | Configures the terminal as boolean output true/false. |
| 2 | Pulse Output | Configures the terminal as analog output based on pulse frequency. |
| 3 | Digital input | The terminal is configured as boolean input (true/false). |
| 4 | Pulse input | The terminal is configured as pulse input. The frequency represents an analog value. |
| 8 | Encoder A Input | The terminal is configured as an incremental encoder A track. |
| 9 | Encoder B Input | The terminal is configured as an incremental encoder B track. |

### P 9.4.4.2 T15 Signal Inversion

Select whether the signal of the terminal is inverted.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Non-Inverted) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2295 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Non-Inverted | The signal is not inverted. |
| 1 | Inverted | The signal is logically inverted. |

### P 9.4.4.3 T15 Fast Debounce Filtering Time

Set the fast debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 63.50) |
| **Parameter Number:** | 2289 | **Unit:** | µs |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.4.4 T15 Standard Debounce Filtering Time

Set the standard debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 127.00) |
| **Parameter Number:** | 2297 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.4.5 T15 Reaction Time

Select the reaction time for the debounce filter.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard reaction time (1ms tick)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2299 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard reaction time (1ms tick) | Use the digital input in the same way as other inputs. |
| 1 | Fast reaction time (0.5µs tick) | Enables a fast reaction time for a certain event via digital input. |

### P 9.4.4.6 T15 Trigger Mode

Select the trigger mode for the digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2044 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No event trigger. |
| 1 | Rising Edge | Trigger an event at the rising edge. |
| 2 | Falling Edge | Trigger an event at the falling edge. |
| 3 | Both Edges | Trigger an event at both the rising and falling edges. |

### P 9.4.4.7 T15 Pulse Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2045 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.4.8 T15 Pulse Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 110000 | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2046 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.4.9 T15 Digital Output Logic

Select the operating logic for the digital output.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Tri state) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2047 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Tri state | Disable output (high impedance). |
| 1 | Open collector sink (NPN) | Open collector sink (NPN). |
| 2 | Open collector source (PNP) | Open collector source (PNP). |
| 3 | Push pull | Terminal can both sink and source. |

#### P 9.4.4.10 T15 Pulse Out Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 2048 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.4.4.11 T15 Pulse Out Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 100000 | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 2049 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.11.2.2.6 Input/Output T16 (Menu Index 9.4.5)

#### P 9.4.5.1 T16 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Digital input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2298 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 1 | Digital Output | Configures the terminal as boolean output true/false. |
| 2 | Pulse Output | Configures the terminal as analog output based on pulse frequency. |
| 3 | Digital input | The terminal is configured as boolean input (true/false). |
| 4 | Pulse input | The terminal is configured as pulse input. The frequency represents an analog value. |
| 8 | Encoder A Input | The terminal is configured as an incremental encoder A track. |
| 9 | Encoder B Input | The terminal is configured as an incremental encoder B track. |

#### P 9.4.5.2 T16 Signal Inversion

Select whether the signal of the terminal is inverted.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Non-Inverted) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2296 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Non-Inverted | The signal is not inverted. |
| 1 | Inverted | The signal is logically inverted. |

### P 9.4.5.3 T16 Fast Debounce Filtering Time

Set the fast debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 63.50) |
| **Parameter Number:** | 2290 | **Unit:** | µs |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.5.4 T16 Standard Debounce Filtering Time

Set the standard debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 127.00) |
| **Parameter Number:** | 2260 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.5.5 T16 Reaction Time

Select the reaction time for the debounce filter.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard reaction time (1ms tick)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2052 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard reaction time (1ms tick) | Use the digital input in the same way as other inputs. |
| 1 | Fast reaction time (0.5µs tick) | Enables a fast reaction time for a certain event via digital input. |

### P 9.4.5.6 T16 Trigger Mode

Select the trigger mode for the digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2053 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No event trigger. |
| 1 | Rising Edge | Trigger an event at the rising edge. |
| 2 | Falling Edge | Trigger an event at the falling edge. |
| 3 | Both Edges | Trigger an event at both the rising and falling edges. |

### P 9.4.5.7 T16 Pulse Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2054 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.5.8 T16 Pulse Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 110000 | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2055 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.5.9 T16 Digital Output Type

Select the operating logic for the digital output.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Tri state) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2056 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Tri state | Disable output (high impedance). |
| 1 | Open collector sink (NPN) | Open collector sink (NPN). |
| 2 | Open collector source (PNP) | Open collector source (PNP). |
| 3 | Push pull | Terminal can both sink and source. |

### P 9.4.5.10 T16 Pulse Out Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 2051 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.5.11 T16 Pulse Out Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 100000 | **Parameter Type:** | Range (0 — 100000) |
| **Parameter Number:** | 2050 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### 7.11.2.2.7 Input T17 (Menu Index 9.4.6)

##### P 9.4.6.1 T17 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Digital input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2017 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 3 | Digital input | The terminal is configured as boolean input (true/false). |
| 4 | Pulse input | The terminal is configured as pulse input. The frequency represents an analog value. |
| 8 | Encoder A Input | The terminal is configured as an incremental encoder A track. |
| 9 | Encoder B Input | The terminal is configured as an incremental encoder B track. |

##### P 9.4.6.2 T17 Signal Inversion

Select whether the signal of the terminal is inverted.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Non-Inverted) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2293 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Non-Inverted | The signal is not inverted. |
| 1 | Inverted | The signal is logically inverted. |

##### P 9.4.6.3 T17 Fast Debounce Filtering Time

Set the fast debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 63.50) |
| **Parameter Number:** | 2287 | **Unit:** | µs |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

##### P 9.4.6.4 T17 Standard Debounce Filtering Time

Set the standard debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 127.00) |
| **Parameter Number:** | 2034 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.6.5 T17 Reaction Time

Select the reaction time for the debounce filter.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard reaction time (1ms tick)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2035 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard reaction time (1ms tick) | Use the digital input in the same way as other inputs. |
| 1 | Fast reaction time (0.5µs tick) | Enables a fast reaction time for a certain event via digital input. |

### P 9.4.6.6 T17 Trigger Mode

Select the trigger mode for the digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2036 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No event trigger. |
| 1 | Rising Edge | Trigger an event at the rising edge. |
| 2 | Falling Edge | Trigger an event at the falling edge. |
| 3 | Both Edges | Trigger an event at both the rising and falling edges. |

### P 9.4.6.7 T17 Pulse Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2037 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.6.8 T17 Pulse Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 110000 | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2038 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.11.2.2.8 Input T18 (Menu Index 9.4.7)

#### P 9.4.7.1 T18 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 3 (Digital input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2018 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 3 | Digital input | The terminal is configured as boolean input (true/false). |
| 4 | Pulse input | The terminal is configured as pulse input. The frequency represents an analog value. |
| 8 | Encoder A Input | The terminal is configured as an incremental encoder A track. |
| 9 | Encoder B Input | The terminal is configured as an incremental encoder B track. |

#### P 9.4.7.2 T18 Signal Inversion

Select whether the signal of the terminal is inverted.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Non-Inverted) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2294 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Non-Inverted | The signal is not inverted. |
| 1 | Inverted | The signal is logically inverted. |

#### P 9.4.7.3 T18 Fast Debounce Filtering Time

Set the fast debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 63.50) |
| **Parameter Number:** | 2288 | **Unit:** | µs |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.4.7.4 T18 Standard Debounce Filtering Time

Set the standard debounce filtering time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5.00 | **Parameter Type:** | Range (0.00 — 127.00) |
| **Parameter Number:** | 2039 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.4.7.5 T18 Reaction Time

Select the reaction time for the debounce filter.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Standard reaction time (1ms tick)) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2040 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Standard reaction time (1ms tick) | Use the digital input in the same way as other inputs. |
| 1 | Fast reaction time (0.5µs tick) | Enables a fast reaction time for a certain event via digital input. |

### P 9.4.7.6 T18 Trigger Mode

Select the trigger mode for the digital input.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (None) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2041 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No event trigger. |
| 1 | Rising Edge | Trigger an event at the rising edge. |
| 2 | Falling Edge | Trigger an event at the falling edge. |
| 3 | Both Edges | Trigger an event at both the rising and falling edges. |

### P 9.4.7.7 T18 Pulse Min. Frequency

Set the frequency representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2042 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.4.7.8 T18 Pulse Max. Frequency

Set the frequency representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 110000 | **Parameter Type:** | Range (0 — 110000) |
| **Parameter Number:** | 2043 | **Unit:** | Hz |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.11.2.2.9 Encoder Configuration (Menu Index 9.4.8)

### P 9.4.8.1 Encoder Resolution

Set encoder resolution in pulses per rotation.

| | | | |
|---|---|---|---|
| **Default Value:** | 1024 | **Parameter Type:** | Range (0 — 65535) |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 2262 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

#### P 9.4.8.2 Invert Encoder Direction

Encoder direction can be inverted to match the motor direction without modifying the encoder wiring.

| | | | |
|---|---|---|---|
| **Default Value:** | False | **Parameter Type:** | Selection |
| **Parameter Number:** | 2269 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

## 7.11.2.3 Analog Inputs/Outputs (Menu Index 9.5)

### 7.11.2.3.1 Output T31 (Menu Index 9.5.1)

#### P 9.5.1.1 T31 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 5 (Analog Output) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2019 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 5 | Analog Output | Configures the terminal as an analog output. |

#### P 9.5.1.2 T31 Terminal Type

Select the type of the terminal. If voltage is selected, the unit is V. If current is selected, the unit is mA.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Off) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2284 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Off | |
| 1 | Voltage | Terminal set to voltage mode. |
| 2 | Current | Terminal set to current mode. |

### P 9.5.1.3 T31 Minimum Value

Set the voltage or current representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 20) |
| **Parameter Number:** | 2283 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.5.1.4 T31 Maximum Value

Set the voltage or current representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (0 — 20) |
| **Parameter Number:** | 2282 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.11.2.3.2 Input T33 (Menu Index 9.5.2)

### P 9.5.2.1 T33 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 6 (Analog Input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2020 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 6 | Analog Input | Configures the terminal as analog input. |

### P 9.5.2.2 T33 Terminal Type

Select the type of the terminal. If voltage is selected, the unit is V. If current is selected, the unit is mA.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Voltage) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2273 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Voltage | Terminal set to voltage mode. |
| 2 | Current | Terminal set to current mode. |

### P 9.5.2.3 T33 Minimum Value

Set the voltage or current representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 2272 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.5.2.4 T33 Maximum Value

Set the voltage or current representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 2271 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.5.2.5 T33 Filter Time

Set the filter time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 60000.00) |
| **Parameter Number:** | 2270 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.5.2.6 T33 Live Zero Threshold Value

Set the live zero threshold value for the terminal. The response to a live zero event is defined with parameter Live Zero Response, number 4555.

| | | | |
|---|---|---|---|
| **Default Value:** | -10 | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 2274 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

#### P 9.5.2.7 T33 Live Zero Timeout Value

Set the live zero timeout value for the terminal. The response to a live zero event is defined with parameter Live Zero Response, number 4555.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 60) |
| **Parameter Number:** | 2275 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### 7.11.2.3.3 Input T34 (Menu Index 9.5.3)

#### P 9.5.3.1 T34 Terminal Mode

Select the mode for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 6 (Analog Input) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2021 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Inactive | |
| 6 | Analog Input | Configures the terminal as analog input. |
| 7 | Temperature input | Configures the terminal as temperature sensor input. |

### P 9.5.3.2 T34 Terminal Type

Select the type of the terminal. If voltage is selected, the unit is V. If current is selected, the unit is mA.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Voltage) | **Parameter Type:** | Selection |
| **Parameter Number:** | 2279 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Voltage | Terminal set to voltage mode. |
| 2 | Current | Terminal set to current mode. |

### P 9.5.3.3 T34 Minimum Value

Set the voltage or current representing 0% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 2278 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.5.3.4 T34 Maximum Value

Set the voltage or current representing 100% of the signal.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 2277 | **Unit:** | – |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.5.3.5 T34 Filter Time

Set the filter time for the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0.00 — 60000.00) |
| **Parameter Number:** | 2276 | **Unit:** | ms |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.5.3.6 T34 Live Zero Threshold Value

Set the live zero threshold value for the terminal. The response to a live zero event is defined with parameter Live Zero Response, number 4555.

| | | | |
|---|---|---|---|
| **Default Value:** | -10 | **Parameter Type:** | Range (-20 — 20) |
| **Parameter Number:** | 2280 | **Unit:** | – |

| | | | |
|---|---|---|---|
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.5.3.7 T34 Live Zero Timeout Value

Set the live zero timeout value for the terminal. The response to a live zero event is defined with parameter Live Zero Response, number 4555.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (0 — 60) |
| **Parameter Number:** | 2281 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 9.5.3.8 T34 Temperature Sensor Type

Select which type of temperature sensor is connected to the terminal.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (No sensor) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1617 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | No sensor | No sensor selected. |
| 4 | Pt1000 | Pt1000 temperature sensor (1kΩ at 0°C ambient). |
| 5 | Ni1000Tk5000 | Ni1000Tk5000 TC5 standard temperature sensor (1kΩ at 0°C ambient). |
| 6 | Ni1000Tk6180 | Ni1000Tk6180 DIN43760 standard temperature sensor (1kΩ at 0°C ambient). |
| 7 | KTY84-1x0 | KTY84-1x0 temperature sensor (1kΩ at 100°C ambient). |
| 8 | KTY84-151 | KTY84-151 temperature sensor (950-1000 Ω at 100°C ambient). |
| 9 | KTY84-152 | KTY84-152 temperature sensor (1000-1050 Ω at 100°C ambient). |
| 10 | KTY81/82-1x0 | KTY81/82-1x0 temperature sensor (1kΩ at 25°C ambient). |
| 11 | KTY81/82-121 | KTY81/82-121 temperature sensor (980-1000 Ω at 25°C ambient). |
| 12 | KTY81/82-122 | KTY81/82-122 temperature sensor (1000-1020 Ω at 25°C ambient). |
| 13 | KTY81/82-151 | KTY81/82-151 temperature sensor (950-1000 Ω at 25°C ambient). |
| 14 | KTY81/82-152 | KTY81/82-152 temperature sensor (1000-1050 Ω at 25°C ambient). |
| 15 | KTY81/82-2x0 | KTY81/82-2x0 temperature sensor (2kΩ at 25°C ambient). |
| 16 | KTY81/82-221 | KTY81/82-221 temperature sensor (1960-2000 Ω at 25°C ambient). |
| 17 | KTY81/82-222 | KTY81/82-222 temperature sensor (2000-2040 Ω at 25°C ambient). |
| 18 | KTY81/82-251 | KTY81/82-251 temperature sensor (1900-2000 Ω at 25°C ambient). |
| 19 | KTY81/82-252 | KTY81/82-252 temperature sensor (2000-2100 Ω at 25°C ambient). |

#### 7.11.2.4 Group 9.6 Relay Delays

##### 7.11.2.4.1 Group 9.6.1 Relay T2 Delays

###### P 9.6.1.1 Relay T2 Turn-on Delay

Set the turn-on delay for Relay T2. This parameter sets the time the relay takes to turn on after the turn-on signal is sent by switching the Ready Output.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 3600) |
| **Parameter Number:** | 1634 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

###### P 9.6.1.2 Relay T2 Turn-off Delay

Set the turn-off delay for Relay T2. This parameter sets the time the relay takes to turn off after the turn-off signal is sent by switching the Ready Output.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 3600) |
| **Parameter Number:** | 1635 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

##### 7.11.2.4.2 Group 9.6.2 Relay T5 Delays

###### P 9.6.2.1 Relay T5 Turn-on Delay

Set the turn-on delay for Relay T5. This parameter sets the time the relay takes to turn on after the turn-on signal is sent by switching the Ready Output.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 3600) |
| **Parameter Number:** | 1636 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

###### P 9.6.2.2 Relay T5 Turn-off Delay

Set the turn-off delay for Relay T5. This parameter sets the time the relay takes to turn off after the turn-off signal is sent by switching the Ready Output.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 3600) |
| **Parameter Number:** | 1637 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

## 7.12 Group 10 Connectivity

### 7.12.1 Connectivity Overview

This section provides information about configuring and monitoring all types of communication interfaces as well as the communication and fieldbus protocols available. Following are the available interfaces:

- Communication interface X0
- Communication interface X1/X2

The following are the available network management protocol and fieldbus protocols:

- SNMP

- PROFINET
- MODBUS TCP
- EtherNet/IP
- EtherCAT
- OPC UA

For more information, refer to the related fieldbus guide.

## 7.12.2 Group 10.2 Communication interfaces

### 7.12.2.1 Group 10.2.1 Host Settings

#### P 10.2.1.1 Fully Qualified Domain Name

Fully Qualified Domain Name. Consists of a host name label and at least 1 higher-level domain separated by the symbol "." with up to 240 characters in total. Each label contains upto 63 characters and starts with a lowercase letter and ends with alphanumeric lowercase character and have as interior characters only alphanumeric lowercase characters and '-'.

| | | | |
|---|---|---|---|
| **Default Value:** | * | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 7036 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

### 7.12.2.2 Group 10.2.2 Ethernet Interface X0

#### S 10.2.2.1 IPv4 Settings

This menu enables IP configuration of the interface.

The Ethernet Interface X0 IPv4 settings view contains the following fields:

- Interface X0 MAC address
- IPv4 addressing method
- Requested IPv4 address
- Requested IPv4 SUBNET mask
- Requested IPv4 gateway address
- Enable ACD
- DNS server 1
- DNS server 2

> **IMPORTANT:**
>
> To ensure that outgoing IP packets are routed correctly, configure the IP address of the X1/X2 interfaces to a different subnet than the IP address of the X0 interface.

#### S 10.2.2.2 IPv4 Status

This menu contains information about the IP configuration of the interface.

The Ethernet Interface X0 IPv4 status view contains the following fields:

- Interface X0 MAC address
- IPv4 addressing method
- Actual IPv4 address
- Actual IPv4 SUBNET mask

- Actual IPv4 gateway address
- DHCP server
- Actual DNS server 1
- Actual DNS server 2
- ACD activity

### 7.12.2.3 Group 10.2.3 Ethernet Interface X1/X2 Settings

#### S 10.2.3.1 IPv4 Settings

This menu enables IP configuration of the interface.

The Ethernet Interface X0 IPv4 settings view contains the following fields:

- Interface X1/X2 MAC address
- IPv4 addressing method
- Requested IPv4 address
- Requested IPv4 SUBNET mask
- Requested IPv4 gateway address
- Enable ACD
- DNS server 1
- DNS server 2

> **IMPORTANT:**
>
> To ensure that outgoing IP packets are routed correctly, configure the IP address of the X1/X2 interfaces to a different subnet than the IP address of the X0 interface.

#### S 10.2.3.2 IPv4 Status

This menu contains information about the IP configuration of the interface.

The Ethernet Interface X0 IPv4 status view contains the following fields:

- Interface X1/X2 MAC address
- IPv4 addressing method
- Actual IPv4 address
- Actual IPv4 SUBNET mask
- Actual IPv4 gateway address
- DHCP server
- Actual DNS server 1
- Actual DNS server 2
- ACD activity

### 7.12.2.4 Group 10.2.4 Ethernet port X0

### 7.12.2.4.1 Group 10.2.4.2 X0 Settings

#### P 10.2.4.2.5 Link Configuration X0

Select the configuration of the Ethernet link parameters.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Auto negotiation) | **Parameter Type:** | Selection |

| | | | |
|---|---|---|---|
| **Parameter Number:** | 7047 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Auto negotiation | The drive handles the speed and duplex settings. |
| 1 | 10 Mbps full duplex | 10 Mbps with full duplex. |
| 2 | 10 Mbps half duplex | 10 Mbps with half duplex. |
| 3 | 100 Mbps full duplex | 100 Mbps with full duplex. |
| 4 | 100 Mbps half duplex | 100 Mbps with half duplex. |

#### P 10.2.4.2.6 Enable Ethernet Port X0

Enable or disable Ethernet port X0. Disabling Ethernet ports in a product is a best practice for security, network stability, and resource management, particularly when the device is physically accessible to unauthorized individuals or located in a public/unsecured area.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7053 | **Unit:** | – |
| **Data Type:** | DINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Enabled | Enables the function. |
| 2 | Disabled | Disables the function. |

## 7.12.2.5 Group 10.2.5 Ethernet port X1

### 7.12.2.5.1 Group 10.2.5.2 X1 Settings

#### P 10.2.5.2.5 Link Configuration X1

Select the configuration of the Ethernet link parameters.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Auto negotiation) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7048 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Auto negotiation | The drive handles the speed and duplex settings. |
| 1 | 10 Mbps full duplex | 10 Mbps with full duplex. |
| 2 | 10 Mbps half duplex | 10 Mbps with half duplex. |
| 3 | 100 Mbps full duplex | 100 Mbps with full duplex. |
| 4 | 100 Mbps half duplex | 100 Mbps with half duplex. |

#### P 10.2.5.2.6 Enable Ethernet Port X1

Enable or disable Ethernet port X1. Disabling Ethernet ports in a product is a best practice for security, network stability, and resource management, particularly when the device is physically accessible to unauthorized individuals or located in a public/unsecured area.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7054 | **Unit:** | – |
| **Data Type:** | DINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Enabled | Enables the function. |
| 2 | Disabled | Disables the function. |

### 7.12.2.6 Group 10.2.6 Ethernet port X2

#### 7.12.2.6.1 Group 10.2.6.2 X2 Settings

##### P 10.2.6.2.5 Link Configuration X2

Select the configuration of the Ethernet link parameters.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Auto negotiation) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7049 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Auto negotiation | The drive handles the speed and duplex settings. |
| 1 | 10 Mbps full duplex | 10 Mbps with full duplex. |
| 2 | 10 Mbps half duplex | 10 Mbps with half duplex. |
| 3 | 100 Mbps full duplex | 100 Mbps with full duplex. |
| 4 | 100 Mbps half duplex | 100 Mbps with half duplex. |

##### P 10.2.6.2.6 Enable Ethernet Port X2

Enable or disable Ethernet port X2. Disabling Ethernet ports in a product is a best practice for security, network stability, and resource management, particularly when the device is physically accessible to unauthorized individuals or located in a public/unsecured area.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7055 | **Unit:** | – |
| **Data Type:** | DINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Enabled | Enables the function. |
| 2 | Disabled | Disables the function. |

### 7.12.2.7 Group 10.2.7 Port Mirroring

#### S 10.2.7 Port Mirroring

Enable/disable the port-mirroring function for network troubleshooting with a network analyzer tool.

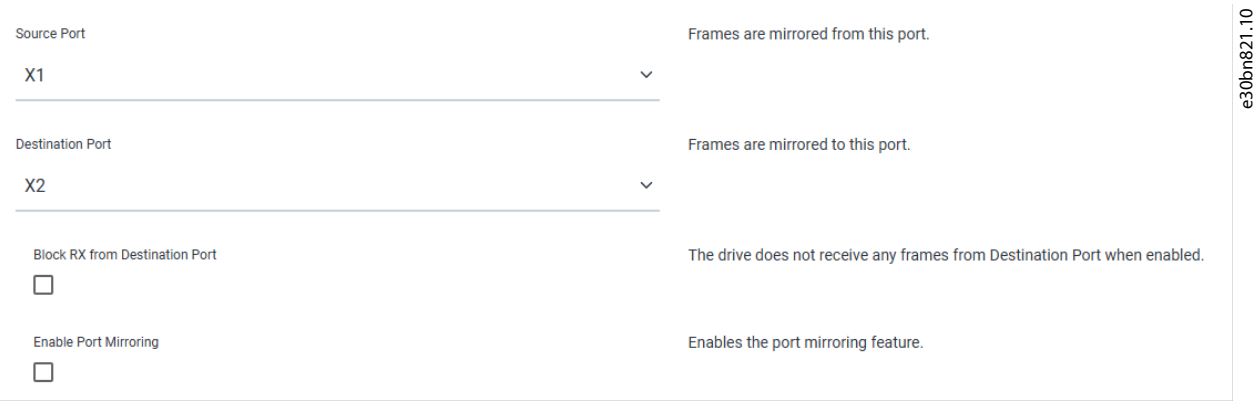



**Figure 98: Port Mirroring**

## 7.12.3 Group 10.3 Protocols

### 7.12.3.1 Group 10.3.1 General Settings

#### P 10.3.1.2 Fieldbus Profile

Select the fieldbus profile. The selection affects the interpretation of the control word and status word.

| | | | |
|---|---|---|---|
| **Default Value:** | 101 (iC Speed Profile) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1301 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 101 | iC Speed Profile | The fieldbus control word and status word are interpretated according the iC Speed Profile definition. |
| 201 | PROFIdrive Standard Telegram 1 | The fieldbus control word and status word are interpretated according to the PROFIdrive Standard Telegram 1 standard. |
| 302 | CiA402 Velocity Mode | The fieldbus control word and status word are interpreted according to the CiA402 Velocity Mode standard. |

#### P 10.3.1.3 Fieldbus Fault Response

Select the behavior when a fieldbus fault occurs.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Info) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1303 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 10.3.1.4 No Fieldbus Connection Response

Select the response in case there is no fieldbus connection.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Info) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1327 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

### P 10.3.1.6 Process Data Timeout Time

Set the timeout time. If process data is not received within the time set, a process data timeout is triggered.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 | **Parameter Type:** | Range (0 — 18000) |
| **Parameter Number:** | 1340 | **Unit:** | s |
| **Data Type:** | REAL | **Access Type:** | Read/Write |

### P 10.3.1.12 Process Data Timeout Response

Select the response to a process data timeout.

| | | | |
|---|---|---|---|
| **Default Value:** | 10 (Fault) | **Parameter Type:** | Selection |
| **Parameter Number:** | 1341 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Info | The event is logged in the event log. |
| 3 | Warning | The drive issues a warning. |
| 5 | Warning - Change Control Place | The drive issues a warning, and the control place changes to the selected alternative while the timeout warning is active. The control place will change back to the original one when the fieldbus process data returns. |

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 6 | Warning - Change Control Place - Persistent | The drive issues a warning, and the control place changes to the selected alternative while the timeout warning is active. The control place requires a reset command to change back to the original one after the fieldbus process data returns. |
| 9 | Fault, ramp to coast | Issues a fault, ramps down, and coast. |
| 10 | Fault | The drive issues a fault and coasts the motor. |

#### P 10.3.1.13 Process Data Timeout Control Place

Select the alternative control place to be used in case of a fieldbus timeout. This setting is only valid in case of timeout warning or info.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Local Control) | **Parameter Type:** | Selection |
| **Parameter Number:** | 112 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 1 | Local Control | The drive is controlled by a connected control panel. |
| 2 | Fieldbus control | The drive is controlled via a fieldbus. |
| 3 | I/O control | The drive is controlled via I/O. |
| 4 | Combined control | The drive is controlled via a combination of I/O and fieldbus. |

#### P 10.3.1.14 SNMP Agent

Activate the local SNMP Agent.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 5907 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

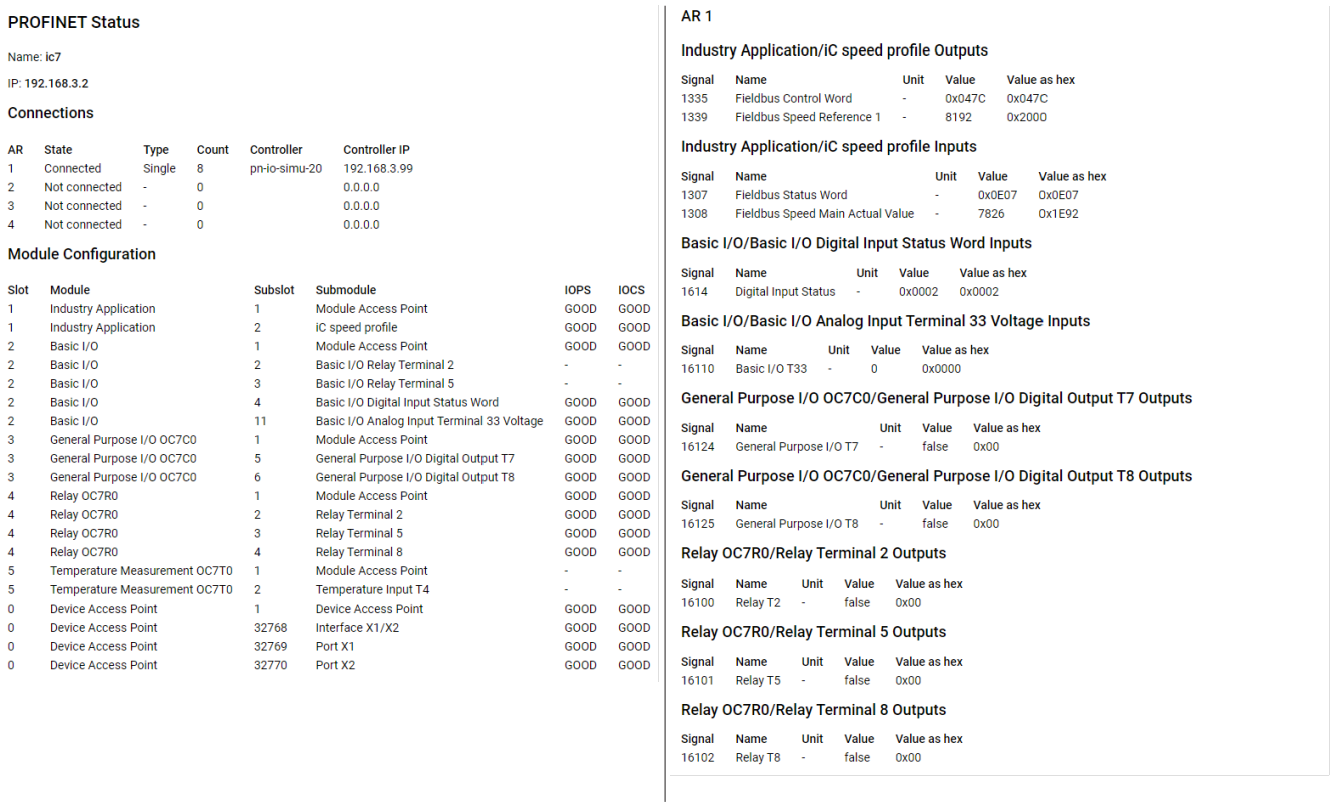
The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

## 7.12.3.2 Group 10.3.2 PROFINET

### 7.12.3.2.1 Group 10.3.2.1 Status

#### S 10.3.2.1.1 PROFINET Report



**PROFINET Status**

Name: **ic7**

IP: **192.168.3.2**

**Connections**

| AR | State | Type | Count | Controller | Controller IP |
|---|---|---|---|---|---|
| 1 | Connected | Single | 8 | pn-io-simu-20 | 192.168.3.99 |
| 2 | Not connected | - | 0 | | 0.0.0.0 |
| 3 | Not connected | - | 0 | | 0.0.0.0 |
| 4 | Not connected | - | 0 | | 0.0.0.0 |

**Module Configuration**

| Slot | Module | Subslot | Submodule | IOPS | IOCS |
|---|---|---|---|---|---|
| 1 | Industry Application | 1 | Module Access Point | GOOD | GOOD |
| 1 | Industry Application | 2 | iC speed profile | GOOD | GOOD |
| 2 | Basic I/O | 1 | Module Access Point | GOOD | GOOD |
| 2 | Basic I/O | 2 | Basic I/O Relay Terminal 2 | - | - |
| 2 | Basic I/O | 3 | Basic I/O Relay Terminal 5 | - | - |
| 2 | Basic I/O | 4 | Basic I/O Digital Input Status Word | GOOD | GOOD |
| 2 | Basic I/O | 11 | Basic I/O Analog Input Terminal 33 Voltage | GOOD | GOOD |
| 3 | General Purpose I/O OC7C0 | 1 | Module Access Point | GOOD | GOOD |
| 3 | General Purpose I/O OC7C0 | 5 | General Purpose I/O Digital Output T7 | GOOD | GOOD |
| 3 | General Purpose I/O OC7C0 | 6 | General Purpose I/O Digital Output T8 | GOOD | GOOD |
| 4 | Relay OC7R0 | 1 | Module Access Point | GOOD | GOOD |
| 4 | Relay OC7R0 | 2 | Relay Terminal 2 | GOOD | GOOD |
| 4 | Relay OC7R0 | 3 | Relay Terminal 5 | GOOD | GOOD |
| 4 | Relay OC7R0 | 4 | Relay Terminal 8 | GOOD | GOOD |
| 5 | Temperature Measurement OC7T0 | 1 | Module Access Point | - | - |
| 5 | Temperature Measurement OC7T0 | 2 | Temperature Input T4 | - | - |
| 0 | Device Access Point | 1 | Device Access Point | GOOD | GOOD |
| 0 | Device Access Point | 32768 | Interface X1/X2 | GOOD | GOOD |
| 0 | Device Access Point | 32769 | Port X1 | GOOD | GOOD |
| 0 | Device Access Point | 32770 | Port X2 | GOOD | GOOD |

AR 1

**Industry Application/iC speed profile Outputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 1335 | Fieldbus Control Word | - | 0x047C | 0x047C |
| 1339 | Fieldbus Speed Reference 1 | - | 8192 | 0x2000 |

**Industry Application/iC speed profile Inputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 1307 | Fieldbus Status Word | - | 0x0E07 | 0x0E07 |
| 1308 | Fieldbus Speed Main Actual Value | - | 7826 | 0x1E92 |

**Basic I/O/Basic I/O Digital Input Status Word Inputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 1614 | Digital Input Status | - | 0x0002 | 0x0002 |

**Basic I/O/Basic I/O Analog Input Terminal 33 Voltage Inputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 16110 | Basic I/O T33 | - | 0 | 0x0000 |

**General Purpose I/O OC7C0/General Purpose I/O Digital Output T7 Outputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 16124 | General Purpose I/O T7 | - | false | 0x00 |

**General Purpose I/O OC7C0/General Purpose I/O Digital Output T8 Outputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 16125 | General Purpose I/O T8 | - | false | 0x00 |

**Relay OC7R0/Relay Terminal 2 Outputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 16100 | Relay T2 | - | false | 0x00 |

**Relay OC7R0/Relay Terminal 5 Outputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 16101 | Relay T5 | - | false | 0x00 |

**Relay OC7R0/Relay Terminal 8 Outputs**

| Signal | Name | Unit | Value | Value as hex |
|---|---|---|---|---|
| 16102 | Relay T8 | - | false | 0x00 |

e30bk437.10

**Figure 99: Report**

For more information, see iC7-Automation PROFINET Operating Guide.

### 7.12.3.2.2 Group 10.3.2.2 Configuration

#### P 10.3.2.2.1 Name of Station

Set the name of station. The PROFINET device is identified by its name of station. Each name must be unique in the network.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 7080 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

### 7.12.3.2.3 Group 10.3.2.3 Diagnosis

#### P 10.3.2.3.1 Diagnostic Fault

Enables diagnostic fault. When disabled the device will not send any PROFINET diagnosis message with severity "Fault" when a fault is present on device.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7081 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

#### P 10.3.2.3.2 Diagnostic Warning

Enables diagnostic warning. When disabled the device will not send any PROFINET diagnosis message with severity "Maintenance required" when a warning is present on device.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Enabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7083 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Disables the function. |
| 1 | Enabled | Enables the function. |

### 7.12.3.3 Group 10.3.3 Modbus

#### 7.12.3.3.1 Group 10.3.3.2 Configuration

##### P 10.3.3.2.1 Persistent Storage

Select if persistent storage is active for Modbus writes.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Disabled) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7061 | **Unit:** | – |
| **Data Type:** | BOOL | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Disabled | Modbus writings are not written to persistent storage. |
| 1 | Enabled | Modbus writings are written to persistent storage. |

##### P 10.3.3.2.3 Byte Order

Select the byte order.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 (Big Endian) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7062 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Big Endian | Byte order is defined as big-endian - The most significant value to the left. |
| 1 | Little Endian | Byte order is defined as little-endian - The least significant value to the left. |

##### P 10.3.3.2.4 Word Order

Select the word order.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (Little Endian) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7063 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | Big Endian | Byte order is defined as big-endian - The most significant value to the left. |
| 1 | Little Endian | Byte order is defined as little-endian - The least significant value to the left. |

### 7.12.3.4 Group 10.3.4 EtherNet/IP

#### 7.12.3.4.1 Group 10.3.4.1 Status

S 10.3.4.1.1 EtherNet/IP Report

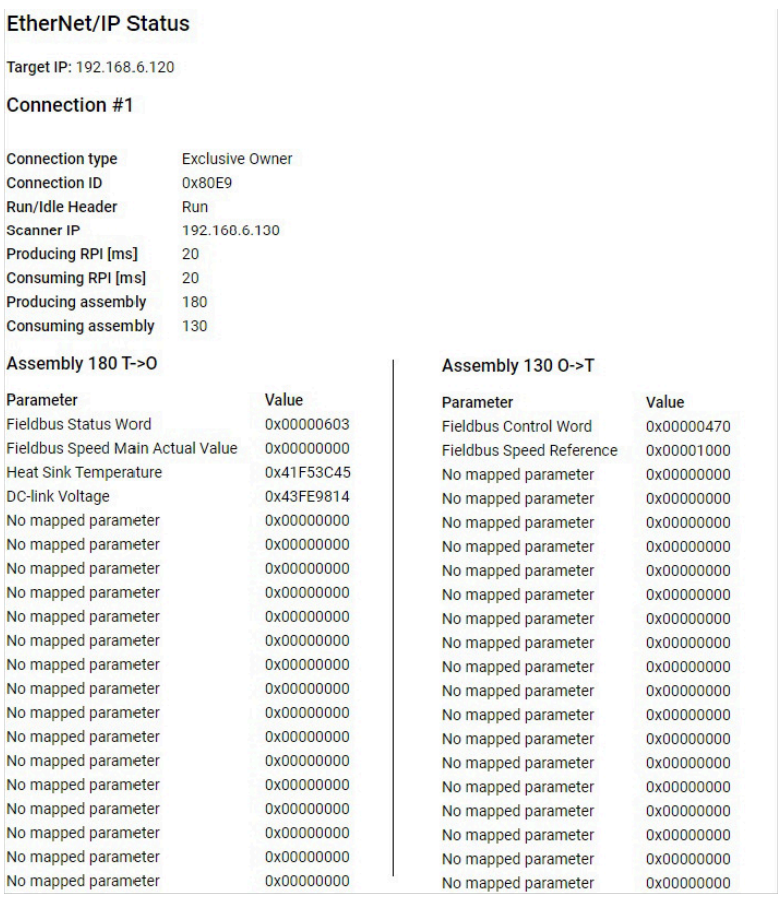



**Figure 100: Report**

For further information, see iC7-Automation EtherNet/IP Operating Guide.

### 7.12.3.5 Group 10.3.5 EtherCAT

#### 7.12.3.5.1 Group 10.3.5.1 Status

S 10.3.5.1 EtherCAT Report

**Figure 101: Report**

For more information, see iC7-Automation EtherCAT Operating Guide.

#### 7.12.3.5.2 Group 10.3.5.2 Configuration

P 10.3.5.2.1 Device ID

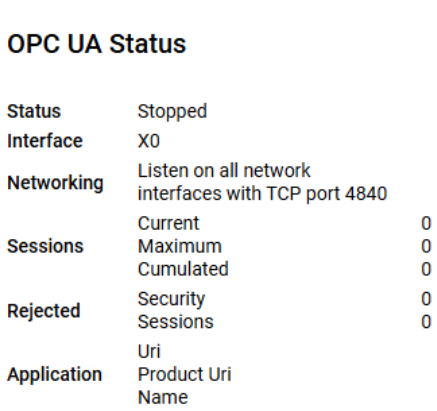
The EtherCAT Explicit Device Identification is an optional feature for identifying an EtherCAT slave explictly. If set, the value must be unique within a network configuration.

| | | | |
|---|---|---|---|
| **Default Value:** | 0 | **Parameter Type:** | Range (0 — 65535) |
| **Parameter Number:** | 7084 | **Unit:** | – |
| **Data Type:** | UINT | **Access Type:** | Read/Write |

### 7.12.3.6 Group 10.3.6 OPC UA

#### 7.12.3.6.1 Group 10.3.6.1 Status

S 10.3.6.1.1 OPC UA Report




e30bn829.10

For further information, see iC7 Series OPC UA Operating Guide.

**Figure 102: Report**

#### 7.12.3.6.2 Group 10.3.6.2 Configuration

P 10.3.6.2.1 Interface Selection

Select Interface for OPC UA.

| | | | |
|---|---|---|---|
| **Default Value:** | 1 (X0) | **Parameter Type:** | Selection |
| **Parameter Number:** | 7086 | **Unit:** | – |
| **Data Type:** | USINT | **Access Type:** | Read/Write |

The following are the selections for the parameter.

| Selection Number | Selection Name | Selection Description |
|---|---|---|
| 0 | None | No Interface for OPC UA. |
| 1 | X0 | X0 Interface for OPC UA. |
| 2 | X1/X2 | X1/X2 Interface for OPC UA. |

### P 10.3.6.2.2 Reverse Connect URL

Set OPC UA reverse connection URL. Clear to remove the reverse connection.

| | | | |
|---|---|---|---|
| **Default Value:** | – | **Parameter Type:** | Range (* — *) |
| **Parameter Number:** | 7085 | **Unit:** | – |
| **Data Type:** | STRING | **Access Type:** | Read/Write |

# 8 Events and Fault Handling

## 8.1 Introduction to Events and Fault Handling

During operation, the drive monitors operational conditions, communication, the changes in certain settings, and other conditions. If a change in settings or operational conditions occurs that requires information or other action from the operator, an event is issued. The event can be just a notification, or it can be a request to act. The event details contain information to help the operator to understand the condition, and if required, take relevant actions to analyze and solve the issue.

## 8.2 Event Categories

The events are categorized in 4 types, with increasing criticality.

### Info

Info events are notifications of a specific situation, or they log an event in the history log. Info events are not highlighted by any indicator LEDs. An active info and related details can be viewed in the active events list and the same information is stored in the event history. An info event is automatically reset once the conditions triggering it are no longer active.

### Warning

Warning events notify and make the operator aware of situations that can influence the operation of the drive. To avoid a more critical situation (fault), attention to the warning is usually required.

When a warning event occurs, status indicators turn yellow, and a triangular warning symbol appears in MyDrive® Insight. An active warning can be viewed in the active events list and the same information is stored in the event history. The drive remains operational while the warning is active. A warning event is reset automatically once the conditions triggering it are no longer active.

### Fault

Fault events are critical to the continuing operation of the drive and require attention and action from the operator. Continuing operation is only possible if the issue causing the event is removed.

When a fault event occurs, status indicators turn red, and a red bell-shaped fault symbol appears in MyDrive® Insight. An active fault can be viewed in the active events list and the same information is stored in the event history. The drive stops operation when a fault occurs. To reset a fault event, the conditions triggering the fault must be removed and a reset command must be given.

### Protected fault

A protected fault is comparable to the fault event, with the exception that it requires a power cycling of the drive to be reset. The event type is used for situations that are critical to continued operation and require extra attention before a reset.

Each event is described by a short descriptive heading and info about the event. If the event is a warning or fault, additional information on the possible cause and mitigation is provided as well.

Further details can be found in the following chapters about events and their causes.

## 8.3 Event Notifications in the Control Panel

Events are shown in the control panel in different ways.

1. Status indicators for warnings and faults

   If a warning or fault becomes active, the status indicators (the Halo and the status LEDs above the Halo) light up.

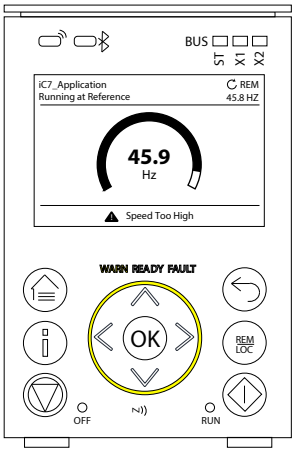
   - The status LED [WARN] and the Halo are yellow when a warning is active.
   - The status LED [FAULT] and the Halo are red when a fault is active.

NOTE: See Chapter 3 for more information about the control panel elements.

2. Overlay for warnings and faults

   a. Toasts for warnings

   A toast notification is shown in the bottom of the status screens for as long as a warning condition is present.




   b. Fault overlays

   If a fault is triggered, a fault overlay is shown.

   The content of the overlay depends on the fault level (fault or protected fault) and on whether automatic reset has been enabled with parameter group ***6.4.4 Auto Reset***. If auto reset is enabled, the number of reset attempts and the time until the next attempt is shown. If resetting has not been successful, a failure notification is also shown.

   Digital buttons are shown when applicable.

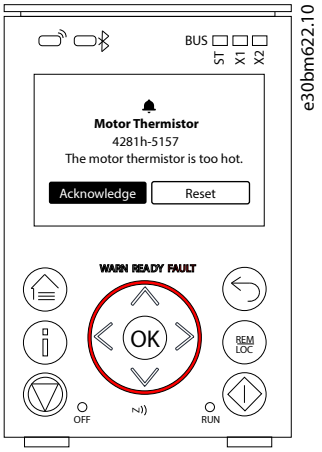



**Figure 103: Fault (Auto Reset not Enabled)**

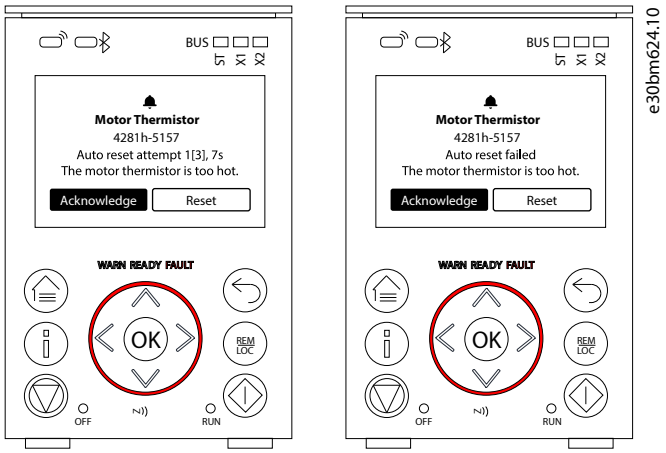



**Figure 104: Fault (Auto Reset Enabled)**

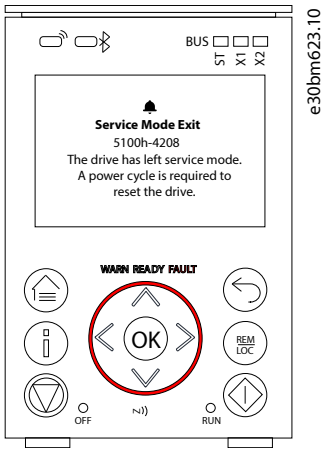



**Figure 105: Protected Fault**

## 8.4 Viewing Events

Events can be viewed from the main menu of the control panel.

1. Select *Events*.

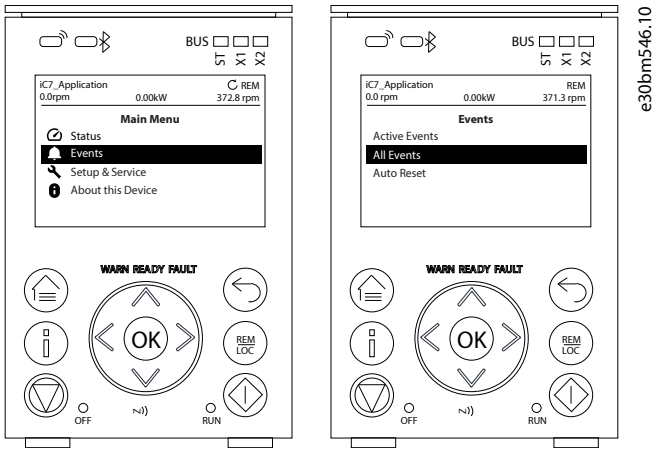



**Figure 106: Navigating to Events in the Control Panel**

2. Select either *Active Events* or *All Events*.
   - Selecting *Active Events* shows the currently active events on the control panel screen.

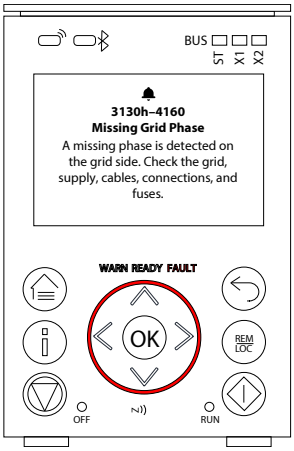



**Figure 107: An Active Event**

   - Selecting *All Events* shows a list of present and past events, their statuses, and time stamps. A strike through the event symbol indicates that the event is no longer active.

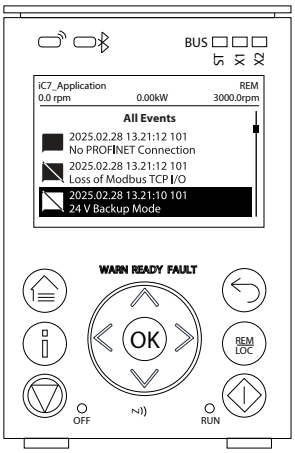



**Figure 108: All Events List**

Pressing the [*Info*] button shows the description of the selected event like in Figure 107. Pressing the [*OK*] button shows additional details of the selected event.

The list of events is also available in MyDrive® Insight. It contains the same information as shown in the control panel. Select the specific drive and expand *Events* to show the active event list under *Live*.

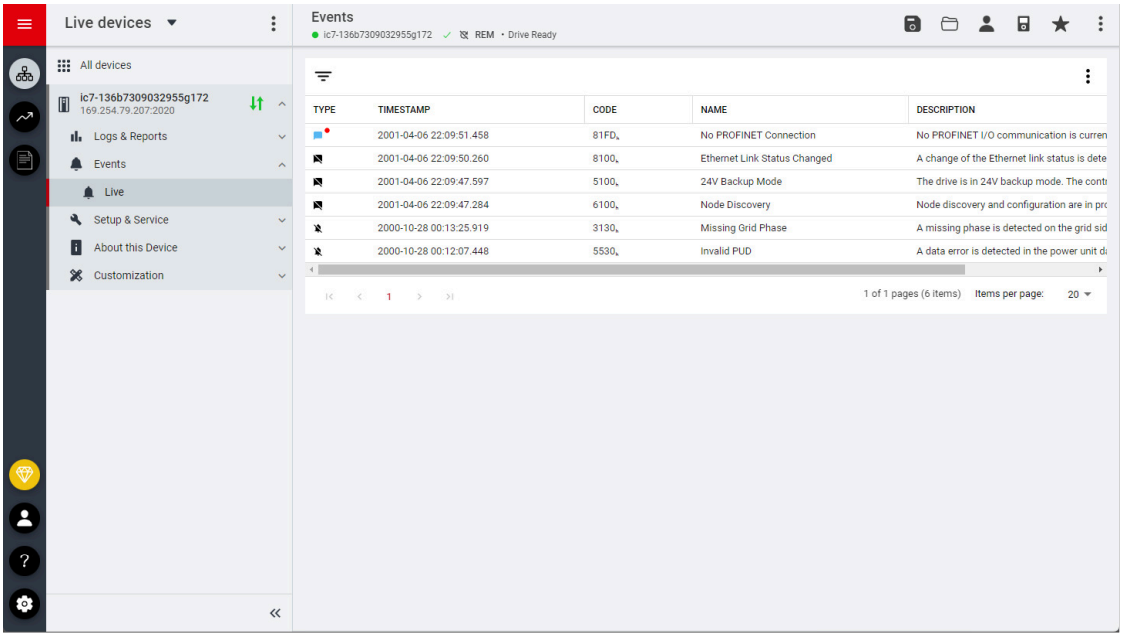



**Figure 109: Events in MyDrive® Insight**

## 8.5 Event Groups

The event group numbers are based on the standardized codes as stated in IEC 61800-7-201 with some additions. The groups cover the following categories:

**Table 63: Event Groups**

| Group number | Category |
|---|---|
| 20FFh | Short-term current injection |
| 2110h | Short circuit/earth leakage |
| 2212h | Short circuit |
| 2221h, 2222h | Overcurrent (mains side) |
| 2310h, 2311h | Overcurrent (motor side) |
| 2330h | Earth leakage (motor side) |
| 2340h | Short circuit (motor side) |
| 23FEh | Current imbalance between units |
| 23FFh | Motor disconnected |
| 3110h | Mains undervoltage |
| 3120h | Mains overvoltage |
| 3130h | Mains phase missing |
| 3140h | Mains frequency |
| 3211h, 3212h | DC-link undervoltage |
| 32FFh | DC-link imbalance |
| 4110h | Temperature - Ambient high |
| 4210h, 4220h | Temperature - Brake chopper |
| 4280h, 4281h, 42FFh | Temperature - External component |

**Table 63: Event Groups** - (continued)

| Group number | Category |
|---|---|
| 4310h | Temperature - Unit - High |
| 4320h | Temperature - Unit - Low |
| 4380h | Temperature - Cooling module |
| 43FEh | Temperature - Control board |
| 43FFh | Temperature - Imbalance |
| 4480h | Temperature - External filter |
| 5100h | External 24 V supply |
| 5112h, 5114h, 5118h | Supply voltage - Low |
| 51FEh, 51FFh | Gate driver fault |
| 5210h | Measurement circuit |
| 5400h | Power section |
| 5480h | AFE fault |
| 54FEh | STO activated or fault |
| 54FFh | DC link fault |
| 5530h | Hardware memory - EEPROM |
| 6100h | Internal software |
| 6180h | Event simulation |
| 6181h | Unknown I/O selection |
| 61F7h | Low storage space |
| 61FBh | Internal communication error |
| 61FCh | High-speed bus fault |
| 61FFh | Functional safety fault |
| 6320h | Parameter error |
| 7012h | Motor feedback |
| 7080h | Mechanical brake |
| 70FFh | Fan fault |
| 7110h | Brake chopper |
| 7113h | Brake chopper - Protection |
| 7120h | Motor |
| 7122h | Motor - Fault |
| 72FFh | Feedback option fault |
| 7310h | Sensor - Speed |
| 7500h | Communication |
| 7580h | Lost connection |
| 8100h | Fieldbus communication |
| 81FDh | Missing fieldbus connection |

**Table 63: Event Groups** - (continued)

| Group number | Category |
|---|---|
| 81FEh | Fieldbus connection lost |
| 81FFh | Fieldbus process data timeout |
| 8331h | Torque fault |
| 8400h | Speed controller |
| 8611h | Positioning controller - Following error |
| 8612h | Positioning controller - Reference limit |
| 9080h | Lost load |
| F004h | Inertia estimation |
| FF01h | External exception |
| FF02h | Preventive maintenance |
| FF06h | Logic |

Multiple fault codes can be assigned in each group. The fault codes are identified with a unique number. More details on each event are found in the events summary table.

## 8.6 Event Details

Each event has a unique event number, a short descriptive name, and a more detailed description. The events are grouped according to error codes defined in IEC 61800-7-201.

Unlike the individual event number, the groups are not unique, since multiple errors can be related to each other. As an example, different motor side ground faults share the same group number 0x2330.

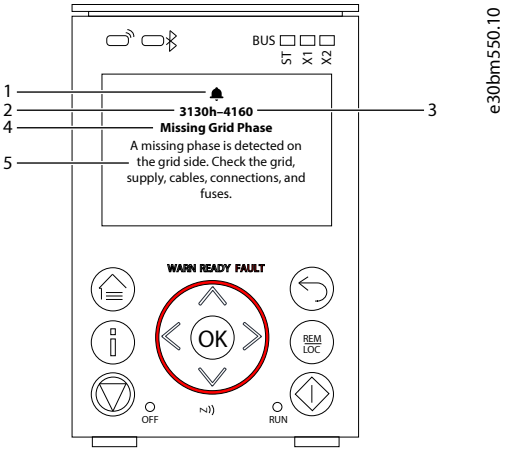



**Figure 110: Parts of the Event Notification in the Control Panel**

| Number | Explanation |
|---|---|
| 1 | An icon indicating the event type. |
| 2 | An event group number (hexadecimal). |
| 3 | A unique event number. |

| Number | Explanation |
|---|---|
| 4 | A short descriptive headline. |
| 5 | A detailed description split in 1–3 elements:<br>• A description of the event.<br>• For warnings and faults:<br>◆ A description of the potential cause of the event.<br>◆ A short description of mitigating actions to avoid or clear the event. |

In the example picture Figure 110:

- The bell icon indicates that the event is a fault.
- The event group is 3130h, and the event number is 4160.
- The event headline is ***Missing Grid Phase***.
- The detailed description indicates that the fault is due to a missing grid phase, and instructs to check the grid supply, cabling, and connections.

## 8.7 Events Summary Table for Industry Application Software

The following tables list the events that can occur in the Industry application software. The events specific to Basic I/O are listed in a separate table after the main table.

The tables are structured in the following columns:

- Group number (Column 1)

  The event group number in hexadecimal format
- Event number (Column 2)

  The unique event number
- Display name (Column 3)

  The short descriptive name of the event
- Description (Column 4)

  A detailed description of the event, and if applicable, potential causes and mitigating actions to eliminate the problem.
- Type of event (Columns 5-8)

  The type of event: I - Info, W - Warning, F - Fault, PF - Protected Fault
- Inverter/brake chopper action (Columns 9-10)

  The reaction of the inverter (drive output) and the brake chopper: C - Coasts the motor, RC - Ramps down and coasts the motor

**Table 64: Summary Table**

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x20FF | 4372 | Short term current injection | Short Term Current Injection has started. The Grid Converter might trip if the time limit is exceeded. | | X | X | | C | |
| 0x2110 | 4379 | CM Current High | An excessive common mode current is detected in the LCL-filter. | | X | X | | C | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x2110 | 4701 | Imax1IntAfe | Inverter input over-current (integrated AFE). | | X | X | | C | |
| 0x2212 | 4374 | DC-link Resonance | A resonance on the DC link with excessive RMS current values is detected. | | X | X | | C | |
| 0x2221 | 4384 | Thermal Overload Rectifier | The rectifier is thermally overloaded. Mission profile is too demanding. | | X | X | | C | |
| 0x2222 | 4373 | DC-link Overcurrent | An overcurrent on the main DC-link capacitors is detected. | | X | X | | C | |
| 0x2310 | 5170 | Current Limit Timeout | The drive has exceeded the allowed time in current limit. | | | X | | C | |
| 0x2311 | 4097 | Inverter Overload | Thermal overload is detected in the inverter of the drive. Reduce the output load. | | X | X | | C | |
| 0x2311 | 4367 | Demagnetization Protection PM Motor | The motor current is higher than the set threshold for the demagnetization protection. | | X | X | | C | |
| 0x2311 | 4368 | Output Current High 0 | The output current of the drive has exceeded its normal range at low speed. Shock load or too fast acceleration with high-inertia loads can cause this fault. Check that the motor size matches the drive and the motor data is correct. Check that the motor shaft can be turned. | | X | X | | C | |
| 0x2311 | 4369 | Output Current High 1 | The output current of the drive has exceeded its normal range. Shock load or too fast acceleration with high-inertia loads can cause this fault. Check that the motor size matches the drive and the motor data is correct. Check that the motor shaft can be turned. | | X | X | | C | |
| 0x2311 | 4375 | Excessive Current Limiting | The output current of the drive has exceeded the current limit multiple times. Check that the motor size matches the drive and the motor data is correct. Check that the motor shaft can be turned. | | X | X | | C | |
| 0x2311 | 4377 | Smart Derating Fault | A Smart Derating fault is detected. The load is too demanding for the current derating level. Lower the switching frequency if possible. | | X | X | | C | |
| 0x2311 | 4380 | Current Limit Setting Fault | The actual current limit setting is too high relative to the selected constant control frequency level. Reduce the control frequency setting or reduce the current limit setting. | | | X | | C | C |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x2330 | 4352 | Ground Fault 0 | A high-impedance ground fault is detected on the output. Check the insulation of motor cable and motor. | | X | X | | C | |
| 0x2330 | 4353 | Ground Fault 1 | A high-impedance ground fault is detected on the output. Check the insulation of motor cable and motor. | | X | X | | C | |
| 0x2330 | 4354 | Ground Fault 2 | A low-impedance ground fault is detected on the output. Check the insulation of motor cable and motor. | | X | | X | C | |
| 0x2330 | 4355 | Ground Fault 21 | A high or low-impedance ground fault is detected on the output. Check the insulation of motor cable and motor. | | X | | X | C | |
| 0x2330 | 4732 | Iearth2Sd | Low-impedance earth fault. | | X | X | | C | C |
| 0x2340 | 4356 | Inverter Short Circuit | A short circuit at the inverter output is detected. Check the motor and motor cable. | | X | | X | C | |
| 0x2340 | 4370 | Output Current High 2 | A critical output overcurrent is detected. Check for short circuits on the output. | | X | | X | C | |
| 0x2340 | 4649 | Desat Gate Driver | The gate driver has detected a desaturation condition. | | | | X | C | C |
| 0x2340 | 4731 | Imax2GateDriver | Inverter output fast overcurrent. | | | X | | C | C |
| 0x23FE | 4371 | Current Imbalance | A current imbalance between paralleled power units is detected. | | X | | | | |
| 0x23FF | 4175 | Motor Disconnected | The motor is disconnected. | | X | X | | C | |
| 0x23FF | 4176 | Missing Motor Phase | A missing motor phase is detected. Check motor, motor cables, and connections. | | X | X | | C | |
| 0x3110 | 4162 | Grid Voltage Spikes | Excessive spikes on the grid voltage have been detected. | | X | X | | C | |
| 0x3110 | 4164 | Grid Voltage High | Grid voltage exceeded the high voltage limit. The limit depends on the voltage class configured in parameter "2.2.1.1 Unit Voltage Class". | | X | X | | C | C |
| 0x3120 | 4165 | Grid Voltage Low | Grid voltage dropped below the low voltage limit. The limit depends on the voltage class configured in parameter "2.2.1.1 Unit Voltage Class". | | X | X | | C | |
| 0x3120 | 4714 | LineRmsUnderVoltageIntAfe | Grid voltage (RMS) below normal operating range (integrated AFE). | | X | X | | C | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x3130 | 4160 | Missing Grid Phase | A missing phase is detected on the grid side. Check the grid supply, cables, connections, and fuses. | | X | X | | C | |
| 0x3130 | 4163 | Grid Imbalance | A large imbalance of the grid voltages is detected. Check for uneven loads on the grid. | | X | X | | C | |
| 0x3140 | 4161 | Grid Frequency Out of Range | Grid frequency is outside of the operating range. | | X | X | | C | |
| 0x3140 | 4166 | Grid Synchronization Error | The converter is unable to maintain the synchronization to the grid voltage. This error is only applicable if the converter is in one of the grid following modes. | | X | X | | C | |
| 0x3140 | 4716 | LinePllLockIntAfe | Unable to maintain PLL lock on grid frequency (integrated AFE). | | X | X | | C | |
| 0x3211 | 4144 | DC-link Voltage High 2 | The voltage of the DC link is above the normal operating range and has reached a critical level. Can be caused by too fast motor braking or grid transients. Increase deceleration time, enable the overvoltage controller, use AC brake, or use a brake resistor while braking. | | X | X | | C | C |
| 0x3211 | 4710 | UdcOverVoltIntAfe | DC-link voltage above normal operating range. Detected by high-speed spike protection method (integrated AFE). | | X | X | | C | C |
| 0x3211 | 4726 | GridDisturbanceDetected | Excessive DC-link voltage at coast. Force integrated front end to run to reduce DC-link voltage. | | X | | | | |
| 0x3212 | 4145 | DC-link Voltage High 1 | The voltage of the DC link is above the normal operating range. Can be caused by too fast motor braking or grid transients. Increase deceleration time, enable the overvoltage controller, use AC brake, or use a brake resistor while braking. | | X | X | | C | |
| 0x3221 | 4146 | DC-link Voltage Low | The DC-link voltage is below the normal operating range. Try to enable undervoltage protection to keep the drive running as long as possible. | | X | X | | C | C |
| 0x32FF | 4147 | DC-link Voltage Ripple | Excessive voltage ripple is detected on the main DC-link capacitors. This can be caused by an imbalance of the grid. Reduce the output power. | | X | X | | C | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x32FF | 4148 | DC-link Imbalance | An imbalance across the DC-link capacitors is detected. The imbalance can be caused by a component fault of the DC link. If the fault remains after resetting the drive, service is required. | | X | X | | C | |
| 0x4110 | 4099 | Ambient Temp. High | The ambient temperature is too high. Check the temperature and cooling conditions. Lower the temperature or improve the cooling conditions. | | X | | | | |
| 0x4210 | 4107 | Brake Chopper Temp. Limit | The temperatute of the brake chopper heat sink is at the upper limit of the normal temperature range. Check cooling and heat sink conditions. Reduce the generated regenerative power. | | X | | | | |
| 0x4210 | 4108 | Brake Chopper Temp. High 1 | The temperature of the brake chopper heat sink has exceeded the normal temperature range. Check cooling and heat sink conditions. Reduce the generated regenerative power. | | X | X | | C | C |
| 0x4210 | 4109 | Brake Chopper Temp. High 2 | The temperature of the brake chopper heat sink has reached a critical level. Check cooling and heat sink conditions. Reduce the generated regenerative power. | | X | X | | C | C |
| 0x4220 | 4106 | Brake Chopper Temp. Low | The temperature of the brake chopper heat sink is too low. Check the ambient temperature. Increase the ambient temperature or consider an external heater to increase the temperature around the drive. | | X | X | | C | C |
| 0x4280 | 5132 | Temp. Protection 1 | Temperature protection 1 is triggered. The temperature has exceeded the configured value. | | X | X | | RC | |
| 0x4280 | 5133 | Temp. Protection 2 | Temperature protection 2 is triggered. The temperature has exceeded the configured value. | | X | X | | RC | |
| 0x4280 | 5134 | Temp. Protection 3 | Temperature protection 3 is triggered. The temperature has exceeded the configured value. | | X | X | | RC | |
| 0x4280 | 5135 | Temp. Protection 4 | Temperature protection 4 is triggered. The temperature has exceeded the configured value. | | X | X | | RC | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x4280 | 5136 | Temp. Protection 5 | Temperature protection 5 is triggered. The temperature has exceeded the configured value. | | X | X | | RC | |
| 0x4280 | 5137 | Temp. Protection 6 | Temperature protection 6 is triggered. The temperature has exceeded the configured value. | | X | X | | RC | |
| 0x4280 | 5158 | Motor Temperature | The analog temperature sensor has exceeded the configured value. | | X | X | | RC | C |
| 0x4281 | 5157 | Motor Thermistor | The motor thermistor is too hot. | | | X | | C | |
| 0x42FE | 4136 | High LCL Temperature | LCL temperature is above the normal operating range. | | X | X | | RC | |
| 0x42FF | 4200 | Power Option Temp. High 1 | The temperature of a power option has exceeded the normal temperature range. Check the cooling conditions. Reduce the load or the ambient temperature. | | X | X | | RC | C |
| 0x42FF | 4201 | Power Option Temp. High 2 | The temperature of a power option has reached a critical level. Check the cooling conditions. Reduce the load or the ambient temperature. | | X | X | | RC | C |
| 0x42FF | 4202 | Power Option Temp. Low | The temperature of a power option component is to low. Check the ambient temperature. Increase the ambient temperature or consider an external heater to increase the temperature around the power option. | | X | X | | RC | C |
| 0x42FF | 4203 | Power Option Temp. Limit | The temperature of a power option component is at the upper limit of the normal temperature. Check the cooling conditions. Reduce the load or the ambient temperature. | | X | | | | |
| 0x42FF | 4204 | Power Option Temp. Imbal. 1 | The thermal imbalance between the power option components exceeds the normal operating range. | | X | X | | RC | C |
| 0x42FF | 4205 | Power Option Temp. Imbal. 2 | An excessive thermal imbalance between power option components is detected. | | X | X | | RC | C |
| 0x42FF | 4206 | Power Option Temp. Imbal. Limit | The thermal imbalance between the power option components is at the upper limit of the normal operating range. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x4310 | 4103 | Inverter Temp. Limit | The temperature of the inverter heat sink is at the upper limit of the normal temperature range. Check cooling and heat sink conditions. Reduce the output current or ambient temperature. The drive may derate if the temperature is not lowered. | | X | | | | |
| 0x4310 | 4104 | Inverter Temp. High 1 | The temperature of the inverter heat sink has exceeded the normal temperature level. Check cooling and heat sink conditions. Reduce the output current or ambient temperature. | | X | X | | C | C |
| 0x4310 | 4105 | Inverter Temp. High 2 | The temperature of the inverter heat sink has reached a critical level. Check cooling and heat sink conditions. Reduce the output current to avoid a protected fault. | | X | X | | C | C |
| 0x4310 | 4110 | IGBT Temp. High | An inverter IGBT overtemperature is detected. Reduce the ambient temperature, the output current and/or the switching frequency. Check the cooling and the condition of the heat sink. | | | X | | C | C |
| 0x4310 | 4113 | Rectifier Temp. Limit | The temperature of the rectifier heat sink is at the upper limit of the normal temperature range. Check cooling and heat sink conditions. Reduce the output power (torque, speed) or the ambient temperature. | | X | | | | |
| 0x4310 | 4114 | Rectifier Temp. High 1 | The temperature of the rectifier heat sink has exceeded the normal temperature range. Check cooling and heat sink conditions. Reduce the output power (torque, speed) or the ambient temperature. | | X | X | | C | C |
| 0x4310 | 4115 | Rectifier Temp. High 2 | The temperature of the rectifier heat sink has reached a critical level. Check cooling and heat sink conditions. Reduce the output power (torque, speed) or the ambient temperature. | | X | X | | C | C |
| 0x4310 | 4117 | Power Unit Temp. Limit | The internal air temperature of the drive is at the upper limit of the normal temperature range. Check cooling and heat sink conditions. Reduce the output power (torque, speed) or the ambient temperature. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x4310 | 4118 | Power Unit Temp. High 1 | The internal air temperature of the drive has exceeded its normal temperature range. Check cooling and heat sink conditions. Reduce the output power (torque, speed) or the ambient temperature. | | X | X | | C | C |
| 0x4310 | 4119 | Power Unit Temp. High 2 | The internal air temperature of the drive has reached a critical value. Check cooling and heat sink conditions. Reduce the output power (torque, speed) or the ambient temperature. | | X | X | | C | C |
| 0x4310 | 4125 | IGBT Temp. High | An inverter IGBT temperature has reached a critical value. Reduce the output current of the drive if possible to avoid a protected fault. | | | X | | C | C |
| 0x4320 | 4102 | Heat Sink Temperature Low | Heat sink temperature is below normal operating range. Check the ambient temperature. Increase the ambient temperature or consider an external heater to increase the temperature around the product. | | X | X | | C | C |
| 0x4320 | 4112 | Rectifier Temp. Low | The temperature of the rectifier heat sink is too low. Check the ambient temperature. Increase the ambient temperature or consider an external heater to increase the temperature around the drive. | | X | X | | C | C |
| 0x4320 | 4116 | Power Unit Temp. Low | The internal air temperature of the drive is below the normal operating range. The drive is operated at a too low ambient temperature. Consider an external heater to avoid this warning or fault. | | X | X | | C | C |
| 0x4380 | 5240 | Cooling Monitor | The cooling signal is missing. | | X | X | | C | C |
| 0x43FE | 4120 | Control Board Temp. Low | The temperature of the control board is below the normal temperature range. The drive is operated at a too low ambient temperature. Check the ambient temperature. Increase the ambient temperature or consider an external heater to increase the temperature at the drive. | | X | X | | C | C |
| 0x43FE | 4121 | Control Board Temp. Limit | The temperature of the control board is at the upper limit of the normal temperature range. Check cooling conditions and load of the control board. Reduce the load on the control board or the ambient temperature. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x43FE | 4122 | Control Board Temp. High 1 | The temperature of the control board has exceeded its normal temperature range. Check cooling conditions and load of the control board. Reduce the load on the control board or the ambient temperature. | | X | X | | C | C |
| 0x43FE | 4123 | Control Board Temp. High 2 | The temperature of the control board has reached a critical level. Check cooling conditions and load of the control board. Reduce the load on the control board or the ambient temperature. | | X | X | | C | C |
| 0x43FF | 4124 | Brake Chopper Temperature Imbalance | There is a temperature imbalance between 1 or more brake chopper IGBTs. | | X | | | | |
| 0x43FF | 4126 | IGBT Temperature Imbalance | There is a temperature imbalance between 1 or more IGBTs. | | X | | | | |
| 0x43FF | 4127 | IGBT Temperature Imbalance | An excessive thermal imbalance between the IGBT modules is detected. Check the condition of IGBT modules their connections the cooling and the driver boards. | | X | | | | |
| 0x43FF | 4131 | Temperature Imbalance Brake IGBT | There is a temperature imbalance between 1 or more brake chopper IGBTs. | | X | X | | C | C |
| 0x43FF | 4132 | IGBT temperature delta | There is a temperature imbalance between 1 or more IGBTs. | | X | X | | C | C |
| 0x43FF | 4840 | Rectifier Temp. Maximum Imbalance | There is an imbalance between one or more of the rectifier power module temperatures. | | X | X | | C | C |
| 0x43FF | 4841 | Rectifier Temp. Imbalance | There is an imbalance between one or more of the rectifier power module temperatures. | | X | | | | |
| 0x4480 | 5400 | AHF High Temp. Derate | A too high temperature is detected in the connected AHF (Advanced Harmonic Filter). Output is derated to 50%. | | | X | | | |
| 0x4480 | 5401 | AHF High Temp. Stop | A too high temperature is detected in the connected AHF (Advanced Harmonic Filter). Operation of the drive is stopped. | | | X | | RC | |
| 0x5100 | 4208 | Service Mode Exit | The drive has left service mode. A power cycle is required to reset the drive. | | | | X | C | C |
| 0x5100 | 4641 | 24V Backup Mode | The drive is in 24V backup mode. The control section (including parameter configurations) and installed options are kept operational. | X | | | | | |
| 0x5100 | 4803 | Service Mode Active | Drive is in service mode. | | X | | | | |
| 0x5112 | 4640 | 24V Supply Fault | The 24V supply is outside its normal operating range. | | | | X | C | C |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x5114 | 4642 | 3.3V Supply Low | The voltage of the internal 3.3V supply is below its normal operating range. | | | X | | C | C |
| 0x5118 | 4643 | 28V Supply Low | The voltage of the internal 28V supply is below its normal operating range. | | | X | | C | C |
| 0x51FE | 4644 | Gate Driver Voltage Fault | The gate driver supply voltage is outside its normal operating range. | | | | X | C | C |
| 0x51FE | 4653 | Gate Driver Fault | A gate driver fault is detected or a link to the gate driver is broken. | | | X | | C | C |
| 0x51FF | 4645 | Power Board Supply Fault | A power supply fault on the power board is detected. | | | | X | C | C |
| 0x51FF | 4646 | Power Supply Voltage | A power supply voltage is outside its normal operating range. | | | | X | C | C |
| 0x5210 | 4378 | Current Sensor Fault | A defective current sensor or an error in the calibration of the current sensors is detected. | | | X | | C | C |
| 0x5400 | 5173 | Power Limit Timeout Regenerative | The drive has exceeded the allowed time in power limit. | | | X | | C | |
| 0x5400 | 5174 | Power Limit Timeout Motoring | The drive has exceeded the allowed time in power limit. | | | X | | C | |
| 0x5480 | 4152 | Shoot Through Fault In Afe | Converter shoot through detected. | | | X | | C | |
| 0x54FD | 4647 | Function Disabled | The protection logic keeps the trip active until the configuration of the power unit protection levels is ready. | | | X | | C | C |
| 0x54FE | 4628 | STO Activated | The Safe Torque-Off (STO) is activated and an unintended restart is prevented until the STO-request is reset. | | X | | | C | |
| 0x54FE | 4629 | STO Fault Ch. A | The Safe Torque-Off (STO) is activated due to a discrepancy fault: Channel A is not activated, while channel B is activated. | | | X | | C | C |
| 0x54FE | 4630 | STO Fault Ch. B | The Safe Torque-Off (STO) is activated due to a discrepancy fault: Channel B is not activated, while channel A is activated. | | | X | | C | C |
| 0x54FF | 4149 | DC-link Short Circuit | An internal short circuit is detected in the DC link. Service is required. | | | | X | C | C |
| 0x54FF | 4150 | DC Capacitor Short Circuit | A short circuit in a DC-link capacitor is detected. Service is required. | | | X | | C | C |
| 0x54FF | 4151 | DC-link Short Circuit 2 | A short circuit in the DC-link capacitor is detected. Service is required. | X | | | X | C | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x5530 | 4790 | Control Data Error | A data error is detected in the control data database EEPROM. | X | | | | | |
| 0x5530 | 4791 | Invalid PUD | A data error is detected in the power unit database EEPROM. | | | X | | C | |
| 0x6100 | 4134 | System Time Adjust | System time is adjusted. | X | | | | | |
| 0x6100 | 4135 | Real Time Clock Hardware Error | A hardware error is detected in the real time clock. | | X | | | | |
| 0x6100 | 4304 | License Missing | A required license is missing. | | X | | | | |
| 0x6100 | 4349 | Authenticity Error | Files authenticity verification error occurred. | | | X | | RC | C |
| 0x6100 | 4351 | System Fault | A system fault is detected. See additional information for details. | | | X | | C | C |
| 0x6100 | 4357 | Firmware Crash | A firmware crash occurred and detailed information is provided. | | | X | | C | C |
| 0x6100 | 4567 | Restore Status | Provides information about the restore operation of a setting. | X | | | | | |
| 0x6100 | 4568 | Automatic Reset | All event conditions have cleared, and the triggered events are automatically reset. | X | | | | | |
| 0x6100 | 4816 | PLC Task Overrun | The high CPU load is inhibiting normal operation of the application (PLC task overrun). | | X | | | | |
| 0x6100 | 4817 | PLC Runtime Error | The PLC runtime has stopped responding. The application is halted. | | | X | | C | C |
| 0x6100 | 4832 | NodeDiscovery | Node discovery and configuration in progress. Modulation is inhibited. | X | | | | RC | C |
| 0x6100 | 4833 | Node Commissioning | Nodes are being commissioned. | | X | | | C | C |
| 0x6100 | 4834 | Node Missing | A previously commissioned node is no longer available. The drive is waiting for the node to be available. If the node has been removed, recommission the drive. | X | | | | | |
| 0x6100 | 4851 | Restart Required | A configuration change requires a soft-cycle or power-cycle to take effect. Modulation is inhibited. | | X | | | C | C |
| 0x6100 | 4853 | StartupOccurrence | This occurrence masks over various occurrences that might be active during startup, that we dont want to show the end user | X | | | | | |
| 0x6100 | 4854 | ResetByDemand | Drive reset is requested by user, and will be performed shortly | X | | | | C | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x6100 | 4855 | Internal Fault | An internal fault is detected. Cycle power, check the wiring if applicable, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | RC | C |
| 0x6100 | 4856 | Internal Fault | An internal fault is detected (connection from controller). Cycle power, check the internal wiring, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x6100 | 4857 | Software Update | The drive is currently performing an update of the software. | X | | | | | |
| 0x6100 | 5100 | Start Disabled in Reference Direction | Start is disabled because 'Enable Start Forward' or 'Enable Start Backward' is not active via input. | | X | | | | |
| 0x6180 | 5260 | Event Simulation | The event with the number 5260 is simulated. | | X | X | | C | C |
| 0x6180 | 5264 | Event Simulation SS2 Inst 1 | Event simulation SS2 Instance 1. | | X | | | C | C |
| 0x6180 | 5265 | Event Simulation SS2 Inst 2 | Event simulation SS2 Instance 2. | | X | | | C | C |
| 0x6181 | 4980 | Invalid Digital Input selection | The selected slot and/or terminal is not valid. | | X | | | | |
| 0x6181 | 4981 | Invalid Digital Output selection | The selected slot and/or terminal is not valid. | | X | | | | |
| 0x6181 | 4982 | Invalid Analog Input selection | The selected slot and/or terminal is not valid. | | X | | | | |
| 0x6181 | 4983 | Invalid Analog Output selection | The selected slot and/or terminal is not valid. | | X | | | | |
| 0x6181 | 4984 | Digital Output occupied | A digital output is in use by an other function or fieldbus. If a fieldbus has taken control of a terminal, it has priority over parameter selection. | | X | | | | |
| 0x6181 | 4985 | Analog Output occupied | An analog output is in use by another function or fieldbus. If a fieldbus has taken control of a terminal, it has priority over parameter selection. | | X | | | | |
| 0x6181 | 4986 | Digital Input missing | The slot and terminal selected by the input are valid, but the value for the terminal is not yet available. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x6181 | 4987 | Digital Output missing | The slot and terminal selected by the input are valid, but the terminal is not yet being controlled. | | X | | | | |
| 0x6181 | 4988 | Analog Input missing | The slot and terminal selected by the input are valid, but the value for the terminal is not yet available. | | X | | | | |
| 0x6181 | 4989 | Analog Output missing | The slot and terminal selected by the input are valid, but the terminal is not yet being controlled. | | X | | | | |
| 0x6181 | 4990 | Digital Input stopped | The slot and terminal selected by the input are valid and the value for the terminal has previously been received, but the terminal value is no longer being reported. The value is frozen at the last known measurement. | | X | | | | |
| 0x6181 | 4991 | Digital Output stopped | The slot and terminal selected by the output are valid, and the terminal was previously functioning, but control has been lost. | | X | | | | |
| 0x6181 | 4992 | Analog Input stopped | The slot and terminal selected by the input are valid and the value for the terminal has previously been received, but the terminal value is no longer being reported. The value is frozen at the last known measurement. | | X | | | | |
| 0x6181 | 4993 | Analog Output stopped | The slot and terminal selected by the output are valid, and the terminal was previously functioning, but control has been lost. | | X | | | | |
| 0x6181 | 4994 | Invalid Temperature Input selection | The selected slot and/or terminal is not valid. | | X | | | | |
| 0x6181 | 4995 | Temperature Input missing | The slot and terminal selected by the input are valid, but the value for the terminal is not yet available. | | X | | | | |
| 0x6181 | 4996 | Temperature Input stopped | The slot and terminal selected by the input are valid and the value for the terminal has previously been received, but the terminal value is no longer being reported. The value is frozen at the last known measurement. | | X | | | | |
| 0x61F7 | 4800 | Low Storage Space | The available storage space for the file system is low. | X | | | | | |
| 0x61F7 | 4801 | Data Logger Storage | Volume restriction limits are preventing additional data logger capture files from being stored. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x61F7 | 4802 | Event Logger Storage | Volume restriction limits are preventing additional event log capture files from being stored. | | X | | | | |
| 0x61FB | 4600 | Option Communication Fault | A fault in the communication with an option is detected. Cycle power, check that the option is properly installed, contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | | X | | RC | C |
| 0x61FB | 4601 | Internal Communication Fault | An internal communication fault is detected. Cycle power, check the wiring if applicable, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | RC | C |
| 0x61FB | 4602 | Option Communication Fault | A fault in the communication with an option is detected. Cycle power, check that the option is properly installed, contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FB | 4607 | Internal Communication Fault | An internal communication fault is detected. Cycle power, check the wiring if applicable, contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FB | 4631 | Internal Communication Fault | An internal communication fault is detected. Cycle power, check the wiring if applicable, contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | | X | | RC | C |
| 0x61FB | 4632 | Internal Communication Fault | An internal communication fault is detected. Cycle power, check the wiring if applicable, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | X | | | | |
| 0x61FB | 4654 | Control Node Disconnected | Internal communication route to one or more control nodes is disconnected. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x61FC | 4605 | Internal Communication Fault | An internal communication fault is detected. Cycle power, check the wiring if applicable, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FC | 4606 | Internal Communication Fault | An internal communication fault is detected. Cycle power, check the wiring if applicable, contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FC | 4639 | High Speed Bus Sync Error | Internal error detected with high-speed bus connection to parallel control unit. | | | X | | C | C |
| 0x61FC | 4648 | High Speed Bus Error | Internal error detected with high-speed bus connection to parallel control unit. | | | X | | C | C |
| 0x61FC | 4858 | Internal Fault | An internal fault is detected. The power system has not received the required reference for modulation. Cycle power, check the wiring if applicable, contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | X | X | | C | |
| 0x61FC | 4859 | Internal Fault | An internal fault (connection from power system) is detected. Cycle power, check the internal wiring, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | X | X | | C | |
| 0x61FC | 4860 | Unexpected Time Adjust | An internal fault (unexpected time adjustment) is detected. Cycle power, check the internal wiring, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FC | 4861 | Synchronization Fault | An internal fault (time synchronization error between controller and power system) is detected. Cycle power, check the internal wiring, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x61FC | 4862 | PDS | An internal communication fault is detected. Cycle power, check the wiring if applicable, and contact the Danfoss supplier or the service department if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FC | 4863 | Internal Fault | An internal fault (connection with power system) is detected. Cycle power, check the internal wiring, contact the service provider if the fault persists. Note the event number for further troubleshooting directions. | | | X | | C | C |
| 0x61FF | 4608 | Internal Failure detected | An Internal Failure was detected. | | | X | | | |
| 0x61FF | 4609 | IO Failure detected | An IO Failure was detected. | | | X | | | |
| 0x6320 | 4350 | Configuration Error | An invalid system configuration is detected. | | X | X | | C | C |
| 0x6320 | 5301 | Invalid Control Config. | An invalid control configuration is preventing operation. | | X | X | | C | |
| 0x6320 | 5302 | Start Blocked | Start of the motor is blocked. Check the Motor Ctrl. Ready Status Word for the cause. | | X | X | | C | |
| 0x7012 | 5604 | Motor Feedback Inversed | The feedback signal was running in the negative direction whereas the motor was running in the positive direction. | | | X | | C | C |
| 0x7012 | 5605 | No Motor Feedback | Feedback signal is 0 or very low. | | | X | | C | C |
| 0x7080 | 5220 | Brake Feedback Wrong State | Mechanical brake feedback is in a wrong state. Feedback state should reflect state of brake, except during opening or closing phases. | | X | | | | |
| 0x7080 | 5221 | Brake Priming Timeout | Brake priming has timed out. The drive could not produce the configured priming torque to open the brake safely. | | X | | | | |
| 0x7080 | 5222 | Brake Feedback Timeout | Brake feedback has timed out. The feedback signal is indicating that the mechanical brake has not opened or closeed within the configured time. | | X | | | | |
| 0x7080 | 5225 | Brake Slip Error | A higher slip than the defined limit is detected in the mechanical brake. Check the condition of the mechanical brake. | | X | | | | |
| 0x70FF | 4128 | Control Fan Failure | The control board cooling fan is not running at the commanded speed. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x70FF | 4129 | Main Fan Failure | The main cooling fan is not following its reference speed. Check the wiring of the fan and whether its blocked or polluted. Replace the fan if necessary. | | X | | | | |
| 0x70FF | 4130 | Internal Fan Failure | The internal fan is running below its reference speed. Check the wiring of the fan and whether its blocked or polluted. Replace the fan if necessary. | | X | | | | |
| 0x70FF | 4133 | LCL Fan Speed Fault | LCL cooling fan not tracking commanded output. | | | X | | C | C |
| 0x7110 | 5204 | Brake Resistor Test Active | The Brake Resistor Test is active. Normal run of the drive is not possible. | | X | | | | |
| 0x7110 | 5205 | Brake Resistor Test Failed | The Brake Resistor Test was unsuccessful. Check the brake resistor and its connections. | | | X | | C | C |
| 0x7110 | 5206 | Brake Resistor Test Successful | The test of the brake resistor is performed successfully. | X | | | | | |
| 0x7111 | 4403 | Brake Ch. Switch Shorted | A short circuit of the brake chopper switch is detected, which can be dangerous. Disconnect power. Service is required. | | X | X | | C | |
| 0x7113 | 4400 | Brake Chopper Overload | A brake chopper overcurrent is detected. Reduce the brake voltage level and check the rating of the brake resistor. | | X | | X | C | C |
| 0x7113 | 4401 | Brake Resistor Temp. High | The brake resistor temperature is too high. Check the rating of the brake resistor and cooling conditions. Reduce the generated regenerative power. | | X | X | | C | C |
| 0x7113 | 4402 | Brake Resistor Missing | The brake resistor or its connection is missing. | | X | X | | C | |
| 0x7113 | 4404 | Brake Failure | A brake failure is detected, further testing will clarify the failure source. Coast first to run the test. | | X | | | C | |
| 0x7120 | 4177 | Motor Thermal Overload | A thermal overload of the motor is detected. Check if the shaft torque is too high. | | X | X | | C | |
| 0x7120 | 4178 | Motor Speed High | The motor speed is above the normal operating range. | | X | X | | C | |
| 0x7120 | 4179 | AMA Current Low | The nominal current of the motor is too low for accurate results of automatic motor adaptation (AMA). | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x7120 | 4180 | Rotor Angle Detection Error | Rotor angle detection has failed. This might be as the motor is not suited to the drive or the motor is missing. | | X | X | | C | |
| 0x7120 | 4181 | Low Motor Saliency For High Frequency Injection Mode | Motor saliency is too low for HF injection mode. | | X | X | | C | |
| 0x7120 | 4184 | Estimated Motor Temperature | The estimated motor temperature has exceeded the limit for the selected insulation class. | | X | X | | C | |
| 0x7120 | 4382 | Blocked Rotor | The rotor is blocked. | | X | X | | C | |
| 0x7120 | 5200 | AMA Active | The AMA (Automatic Motor Adaptation) is active. Normal run of the motor is not possible. Apply a start signal to run the AMA. | | X | | | | |
| 0x7120 | 5201 | AMA Motor Data | The motor data measurement of the AMA (Automatic Motor Adaptation) was unsuccessful. | | | X | | C | C |
| 0x7120 | 5202 | AMA Motor Type | The motor type detection of the AMA (Automatic Motor Adaptation) was unsuccessful. | | | X | | C | C |
| 0x7120 | 5203 | AMA Successful | The AMA (Automatic Motor Adaptation) was performed successfully. | X | | | | | |
| 0x7120 | 5300 | Invalid Motor Data | Invalid motor data is preventing operation. Check the motor data settings. | | X | X | | C | |
| 0x7120 | 5600 | Feedback Test Active | Normal running is suppressed for a motor feedback test run. | | X | | | | |
| 0x7120 | 5601 | Feedback Test Successful | The motor feedback test was able to verify the motor feedback signal. | X | | | | | |
| 0x7120 | 5602 | Feedback Resolution/ Poles High | Feedback signal was slower than expected. | | | X | | C | C |
| 0x7120 | 5603 | Feedback Resolution/ Poles Low | Feedback signal was faster than expected. | | | X | | C | C |
| 0x7120 | 5606 | Feedback Unstable | Feedback signal was inconsistent. | | | X | | C | C |
| 0x7122 | 4182 | Motor Sync Loss | Select the drive response if the synchronization between motor and drive is lost. This is only relevant when using a permanent magnet or synchronous reluctance motor. | | X | X | | C | |
| 0x72FF | 4417 | Feedback Option Fault | The Feedback Option is indicating a fault condition. | | | X | | C | C |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x7300 | 4207 | Sensor Configuration | A sensor configuration error is detected. A sensor is either missing, not expected, or incorrectly connected. | | | X | | RC | |
| 0x7310 | 4418 | Bad Speed Feedback | Speed Feedback value is not reliable. | | | X | | C | |
| 0x7500 | 4638 | Drive to Drive Connection Lost | Drive to drive connection is lost. | | X | X | | C | C |
| 0x7580 | 5141 | Control Panel Connection Lost | The connection to the control panel is lost. Control via control panel is released. | | | | | | |
| 0x7580 | 5142 | PC Connection Lost | The connection to the PC tool is lost. PC control is released. | | | | | | |
| 0x8100 | 4256 | Address Conflict | The fieldbus has identified an Address Conflict on the network which made the device back off. | | X | | | | |
| 0x8100 | 4257 | Ethernet Cable Fault | When no link is present, a measurement is done to measure the distance to the far end of the cable. This warning occurs at measured distances > 4 m. This can occur when the device at the far end is turned off, disconnected, or the cable is broken. Check the cable at the distance provided in the detailed info. | | X | | | | |
| 0x8100 | 4258 | Invalid Fieldbus Configuration | An issue due to an invalid configuration of the fieldbus connection is detected. Features not supported by the device, mismatch between configured and actually available features or modules not available in the device. See additional detail info. | X | X | | | | |
| 0x8100 | 4260 | Redundant Controller Missing | One or more of the expected fieldbus controllers are missing. | | X | | | | |
| 0x8100 | 4261 | Fieldbus Topology Mismatch | The current fieldbus topology does not match the topology provided at commissioning time. | | X | | | | |
| 0x8100 | 4263 | Ethernet Link Status Changed | A change of the Ethernet link status is detected. Additional info has details about which port and state. | X | | | | | |
| 0x8100 | 4265 | Ethernet Redundancy Error | Primary or backup physical path is missing. | | X | | | | |
| 0x8100 | 4266 | X1 Cable Redundancy | Indicates that physical path from X1 interface to the controller is missing or wrongly configured. | | X | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x8100 | 4267 | X2 Cable Redundancy | Indicates that physical path from X2 interface to the controller is missing or wrongly configured. | | X | | | | |
| 0x8100 | 4268 | FieldbusStartUp | Internal occurrence to mask away TopologyMismatch occurrence during startup | X | | | | | |
| 0x8100 | 4269 | Network Time Protocol | Information of Network Time Protocol server. See detailed info. | X | | | | | |
| 0x8100 | 4280 | Controller Not in Run | Controller not in RUN state. | | X | | | | |
| 0x8100 | 4281 | Interface Configuration Change | Interface configuration for an ethernet port has changed. See detailed info. | X | | | | | |
| 0x8100 | 5162 | Alternative Control Place due to Fieldbus Timeout | Fieldbus process data timeout caused a change to the alternative control place. | | X | | | | |
| 0x81FD | 4270 | No Modbus TCP Connection | No Modbus TCP communication is currently established. This happens before the first connection is established, or if all connections have stopped (gracefully or disruptively). | X | | | | | |
| 0x81FD | 4271 | No PROFINET Connection | No PROFINET I/O communication is currently established. This happens before the first connection is established, or if all connections have stopped (gracefully or disruptively ). | X | | | | | |
| 0x81FD | 4272 | No EtherNet/IP Connection | No EtherNet/IP communication is currently established. This happens before the first connection is established, or if all connections have stopped (gracefully or disruptively). | X | | | | | |
| 0x81FD | 4273 | No EtherCAT Connection | No EtherCAT communication is currently established. This happens during start-up before the first connection is established, or if all connections has stopped (gracefully or disruptively). | X | | | | | |
| 0x81FD | 4282 | No Modbus RTU Connection | No Modbus RTU communication is currently established. This event occurs during start-up until the first connection is established, or if all connections have stopped (gracefully or disruptively). | X | | | | | |
| 0x81FD | 4284 | NoBacnetMstpConnection | No BACnet MS/TP communication is currently established. Will happen during startup until first connection is established. Or if all connections has stopped. | X | | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x81FE | 4274 | Loss of Modbus TCP I/O | One or more of the Fieldbus I/O connections has failed. This can happen when an established Fieldbus I/O Connection is disrupted by for example a cable break, or a power cut of the PLC or other infrastructure components. | | X | | | | |
| 0x81FE | 4275 | Loss of PROFINET I/O | One or more of the Fieldbus I/O connections have failed. This can happen when an established Fieldbus I/O connection is disrupted by for example a cable break, or a power cut of the PLC or other infrastructure components. | | X | | | | |
| 0x81FE | 4276 | Loss of EtherNet/IP I/O | One or more of the Fieldbus I/O connections have failed. This can happen when an established Fieldbus I/O Connection is disrupted by for example a cable break, or a power cut of the PLC or other infrastructure components. | | X | | | | |
| 0x81FE | 4277 | Loss of EtherCAT Connection | One or more of the fieldbus I/O connections has failed. This can happen when an established fieldbus I/O connection is disrupted by for example a cable break, or a power cut of the PLC or other infrastructure components. | | X | | | | |
| 0x81FE | 4283 | Loss of Modbus RTU Connection | One or more of the fieldbus I/O connections has failed. This can happen when an established fieldbus I/O connection is disrupted by for example a cable break or a power cut of the PLC or other infrastructure components. | | X | | | | |
| 0x81FE | 4285 | BacnetConnectionTimeout | Drive is not receiving any read/write request from the client within BacnetConnTimeoutValue | X | | | | | |
| 0x81FF | 4278 | Primary Process Data Timeout | The fieldbus I/O data has not been updating any of the process data monitored by the primary process data monitor (Watchdog1). This can happen when the fieldbus has lost control or the current transferred I/O data is not valid. | | | X | | C | C |
| 0x81FF | 4279 | Secondary Process Data Timeout | The fieldbus I/O Data has not been updating any of the process data monitored by the secondary process data monitor (Watchdog2). This can happen when the fieldbus has lost control or the current transferred I/O data is not valid. | | | X | | C | C |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0x8331 | 5171 | Torque Limit Timeout Motoring | The drive exceeded the allowed time in torque limit. | | | X | | C | |
| 0x8331 | 5172 | Torque Limit Timeout Regenerative | The drive exceeded the allowed time in torque limit. | | | X | | C | |
| 0x8400 | 5210 | Below Min. Speed | The Speed Monitor has detected that the speed is below the configured minimum speed. | | | X | | C | C |
| 0x8400 | 5211 | Below Min. Speed | The Speed Monitor has detected that the speed is below the configured minimum speed. | | X | | | | |
| 0x8400 | 5290 | Speed Too High | The speed monitor has detected that the speed is above the configured maximum. | | | X | | C | C |
| 0x8400 | 5291 | Speed Too High | The speed monitor has detected that the speed is above the configured maximum. | | X | | | | |
| 0x8400 | 5292 | Start Below Min. Speed | The start took too long. The speed has not reached the minimum speed within the time frame configured. | | | X | | C | C |
| 0x8611 | 4192 | Position Following Error | The actual position is outside the allowed range of the position error window around a position demand value for longer than the position error delay. | | X | | | | |
| 0x8612 | 4193 | Positive Position Limit | Motor position is outside the allowed positive range (PositionMax). | | X | X | | C | C |
| 0x8612 | 4194 | Position Command Rejected | Position command was rejected because of position software end limit. | | X | | | | |
| 0x8612 | 4195 | Positive Hardware End Limit | The positioning controller detected that the drive is exceeding the positive hardware end limits. | | X | X | | C | C |
| 0x8612 | 4196 | Negative Position Limit | Motor position is outside the allowed negative range (PositionMin). | | X | X | | C | C |
| 0x8612 | 4197 | Negative Hardware End Limit | The positioning controller detected that the drive is exceeding the negative hardware end Limits. | | X | X | | C | C |
| 0x8612 | 4198 | ZeroPulseError | Homing on the zero pulse is not possible with the selected feedback type. | | | X | | C | C |
| 0x8615 | 4385 | AuditLogStopped | This shows that drive is not able to send the Audit logs | | X | | | | |
| 0x9080 | 5230 | Lost Load Detected | Drive is not detecting any load on the motor shaft. | | | | | | |

**Table 64: Summary Table** - (continued)

| Group Number (Hex) | Number (Decimal) | Display Name | Description | Type of Event | | | | Inverter and Brake Chopper Action | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | I | W | F | PF | Inverter | Brake |
| 0xF004 | 5270 | Inertia Estimation Active | The drive is ready for performing the Inertia Estimation. A start command is required. | | X | | | | |
| 0xF004 | 5271 | Inertia Estimation Failed | The Inertia Estimation failed. | | | X | | C | C |
| 0xF004 | 5272 | Inertia Estimation Successful | Inertia Estimation was performed successfully. | X | | | | | |
| 0xFF01 | 5123 | External Exception 1 | External Exception 1. | | | X | | C | |
| 0xFF01 | 5124 | External Exception 2 | External Exception 2. | | | X | | C | |
| 0xFF02 | 5701 | Preventive Maintenance 1 | Preventive Maintenance Service Request 1. | | X | | | | |
| 0xFF02 | 5702 | Preventive Maintenance 2 | Preventive Maintenance Service Request 2. | | X | | | | |
| 0xFF02 | 5703 | Preventive Maintenance 3 | Preventive Maintenance Service Request 3. | | X | | | | |
| 0xFF02 | 5704 | Preventive Maintenance 4 | Preventive Maintenance Service Request 4. | | X | | | | |
| 0xFF02 | 5705 | Preventive Maintenance 5 | Preventive Maintenance Service Request 5. | | X | | | | |
| 0xFF02 | 5706 | Preventive Maintenance 6 | Preventive Maintenance Service Request 6. | | X | | | | |
| 0xFF02 | 5707 | Preventive Maintenance 7 | Preventive Maintenance Service Request 7. | | X | | | | |
| 0xFF02 | 5708 | Preventive Maintenance 8 | Preventive Maintenance Service Request 8. | | X | | | | |
| 0xFF02 | 5709 | Preventive Maintenance 9 | Preventive Maintenance Service Request 9. | | X | | | | |
| 0xFF02 | 5710 | Preventive Maintenance 10 | Preventive Maintenance Service Request 10. | | X | | | | |
| 0xFF06 | 5901 | Logic Input Error | Configured input function reports an error. | | X | | | | |
| 0xFF06 | 5902 | Logic Output Error | Configured output function reports an error. | | X | | | | |
| 0xFF06 | 5903 | Logic Block Configuration Error | Logic block configuration is incorrect. | | X | | | | |
| 0xFF06 | 5904 | Logic State Error | Logic state handling reports an error. | | X | | | | |

* indicates that the event's response can be configured using a parameter.

# 9 Appendix

## 9.1 PROFIdrive - Standard Telegram 1

### 9.1.1 Overview

Standard telegram 1 is implemented according to PROFIdrive Application Class 1 profile as defined in the PROFIdrive standard and state machine diagram. It can be used with iC7 series motor applications.

### 9.1.2 Control Word

**Table 65: Control Word Bits in PROFIdrive Standard Telegram 1**

| Bit number | Name | Description |
|---|---|---|
| 0 | On-Off | 0: Off.<br>1: On. |
| 1 | Coast stop | 0: Coast stop.<br>1: No coast stop. |
| 2 | Quick stop | 0: Quick stop.<br>1: No quick stop. |
| 3 | Operation | 0: Disable operation.<br>1: Enable operation. |
| 4 | Ramp generator | 0: Reset ramp generator. The output of the RFG is set to 0. The drive decelerates along the current limit or along the voltage limit of the DC link.<br>1: Enable ramp generator (RFG). |
| 5 | Freeze | 0: Freeze ramp generator. Freezes the present output frequency (in Hz).<br>1: Unfreeze ramp generator. |
| 6 | Enable setpoint | 0: Disable setpoint.<br>1: Enable setpoint. |
| 7 | Fault acknowledge | 0: No function.<br>0 ⇒ 1: Acknowledge faults.[1] |
| 8 | Jog 1 | 0: Jog 1 off.<br>1: Jog 1 on.<br>Operation is enabled, drive is at standstill, and STW1 bit 4, 5, 6: 0. The drive runs up along the ramp to jogging setpoint 1. |
| 9 | Jog 2 | 0: Jog 2 off.<br>1: Jog 2 on.<br>Operation is enabled, drive is at standstill, and STW1 bit 4, 5, 6: 0. The drive runs up along the ramp to jogging setpoint 2. |
| 10 | Control by PLC | 0: Ignores the current process data. This is linked to a submodule where the CTW is present. If signals are to be covered, the CTW/STW profile (for example, the iC Speed Profile) must be part of the signals list.<br>1: Uses process data (controlled by PLC). |
| 11 | – | Reserved |

**Table 65: Control Word Bits in PROFIdrive Standard Telegram 1** - (continued)

| Bit number | Name | Description |
|---|---|---|
| 12 | User-defined | These bits are reserved for application-specific advanced control. For more information, refer to the *Parameter Descriptions* chapter in the application guide. |
| 13 | User-defined | |
| 14 | User-defined | |
| 15 | User-defined | |

*1) Acknowledging is edge-triggered, when changing from logic 0 to logic 1.*

### 9.1.3 Status Word

**Table 66: Status Word Bits in PROFIdrive Standard Telegram 1**

| Bit number | Name | Description |
|---|---|---|
| 0 | Ready to switch on | 0 = Not ready to switch on.<br>1 = Ready to switch on. |
| 1 | Ready to operate | 0 = Not ready to operate.<br>1 = Ready to operate. |
| 2 | Operation enabled | 0 = Operation disabled.<br>1 = Operation enabled. |
| 3 | Operation fault | 0 = No fault.<br>1 = Fault present. |
| 4 | Coast stop | 0 = Coast stop activated (OFF2).<br>1 = Coast stop not activated (No OFF2). |
| 5 | Quick stop | 0 = Quick stop activated (OFF3).<br>1 = Quick stop not activated (No OFF3). |
| 6 | Switching on inhibited | 0 = Switching on not inhibited.<br>1 = Switching on inhibited. |
| 7 | Warning | 0 = There are no warnings.<br>1 = A warning has occurred. |
| 8 | Speed=reference/Speed<>reference | 0 = The motor runs, but the current speed is different from the current speed reference. This can happen, for example, when the speed ramps up or down during start or stop.<br>1 = The current motor speed matches the current speed reference within a given tolerance. The tolerance is product specific. |
| 9 | Bus control/Local operation | 0 = The device does not react on commands from fieldbus, because of one of the following reasons:<br>• CTW bit 10 = 0.<br>• HMI is in local mode.<br>• MyDrive® Insight has taken control.<br>• Control places do not include fieldbus.<br>1 = The device is controlled and reacting to I/O and process data. |

**Table 66: Status Word Bits in PROFIdrive Standard Telegram 1** - (continued)

| Bit number | Name | Description |
|---|---|---|
| 10 | Frequency limit ok/Out of frequency limit | 0 = The output frequency has exceeded the defined motor limits given by parameters.<br>1 = The output frequency is within the defined motor limits.<br>The speed limits are set with the parameters in parameter group ***5.8.3 Speed Limits and Monitors***. |
| 11 | User-defined | These bits enable the mapping of application functionality of the drive to the status word. Mapping is done through parameters. For more information, refer to the *Parameter Descriptions* chapter in the application guide. |
| 12 | User-defined | |
| 13 | User-defined | |
| 14 | User-defined | |
| 15 | User-defined | |

## 9.1.4 PROFIdrive State Machine

In the PROFIdrive control profile, the control bits perform different functions:

- 0–3 perform the basic startup and power-down functions.
- 4–10 perform application-oriented control.
- 12–15 can be configured for different purposes.

See Figure 111 for the basic state transition diagram, where control bits 0–3 control the transitions and the corresponding status bit indicates the actual state. The black dots indicate the priority of the control signals. Fewer dots indicate lower priority, and more dots indicate higher priority.

The general state diagram is defined in the PROFIdrive standard.

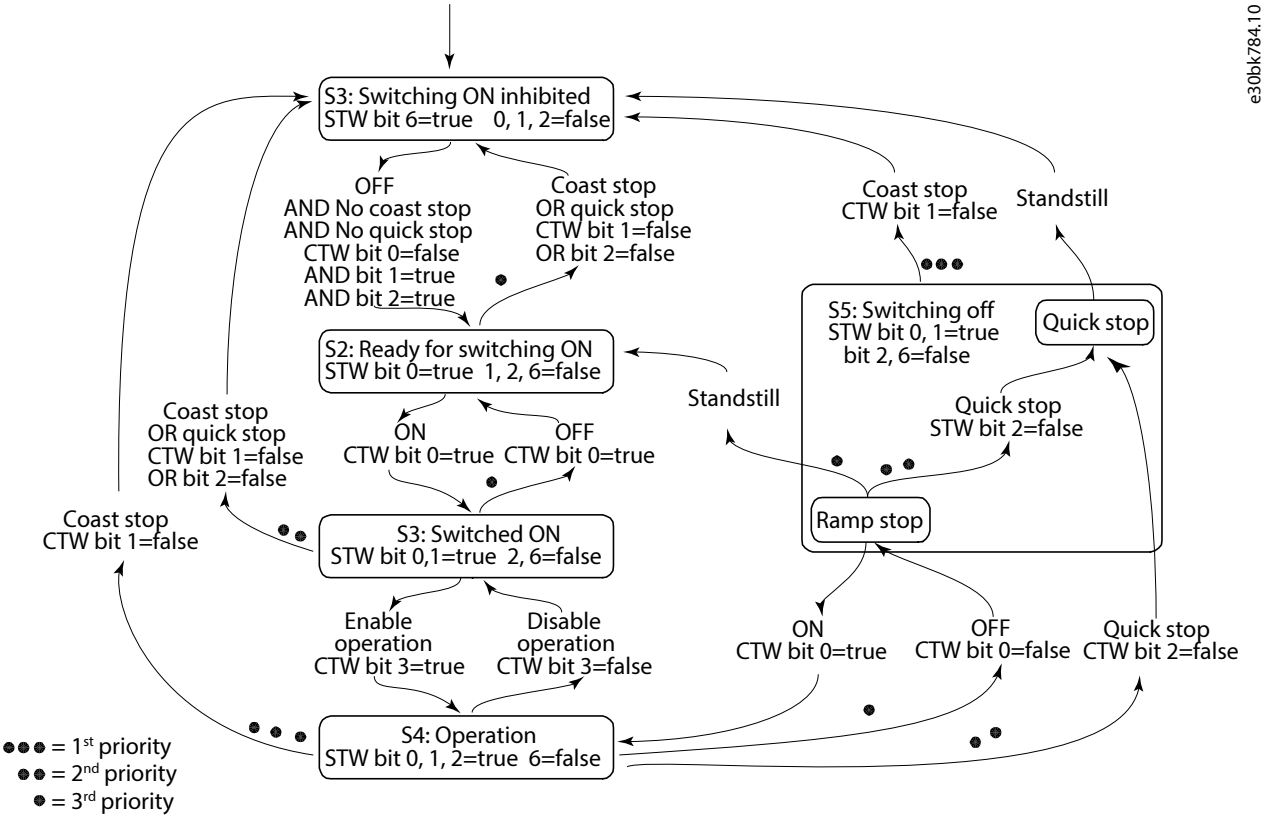



**Figure 111: General State Diagram**

## 9.2 iC Speed Profile

### 9.2.1 Overview

The iC Speed profile is used with the iC7 series motor applications. The iC Speed profile differs from the PROFIdrive profile, because it does not have a state machine. It is only controlled by the actual state 1/0 of the control bits, not the sequence in which they are manipulated.

### 9.2.2 Control Word

**Table 67: iC Speed Profile Control Word Bits**

| Bit number | Name | Description |
|---|---|---|
| 0+1 | Preset reference selector | 00: Preset reference 1<br>01: Preset reference 2<br>10: Preset reference 3<br>11: Preset reference 4 |
| 2 | Reserved | Reserved for future use.<br>Any control words sent to the device should keep this bit at 0 to ensure compatibility with future extensions of the control word. |
| 3 | No coast/Coast | 0: Causes the drive to immediately coast the motor.<br>1: No function. |
| 4 | No quick stop/Quick stop | 0: Quick stops the drive and ramps down the motor speed to stop as defined with the quick stop ramp parameter.<br>1: No function. |
| 5 | No hold/Hold output frequency | 0: Hold the present output frequency (in Hz).<br>1: No function. |
| 6 | Start/No start | 0: Stops the drive and ramps down the motor speed as defined with the ramp-down parameter.<br>1: If the other starting conditions are fulfilled, this selection allows the drive to start the motor. |
| 7 | Reset | 0: No function.<br>0 ⇒ 1: Reset faults.(1) |
| 8 | Jog/No jog | 0: No function.<br>1: Sets the output frequency to the jog speed defined with the jog speed parameter. |
| 9 | Ramp select | 0: Ramp 1 is active.<br>1: Ramp 2 is active. |
| 10 | Data valid | 0: Ignore the current process data. This is linked to the submodule where the CTW is present. If signals are to be covered, the CTW/STW profile (for example, the iC Speed profile) must be part of the signals list.<br>1: Use process data (controlled by PLC).<br>Use the previously processed data when the data valid bit was true (no control by PLC). |
| 11 | Reserved | Reserved for future use. |

**Table 67: iC Speed Profile Control Word Bits** - (continued)

| Bit number | Name | Description |
|---|---|---|
| 12 | User-defined | These bits are reserved for application-specific advanced control. Select the value ***CTW bit x***for any input parameter to use this signal for the activation of a selected function. For more information, refer to the *Parameter Descriptions*chapter. |
| 13 | User-defined | |
| 14 | User-defined | |
| 15 | User-defined | |

*1) Edge-triggered from 0 to 1 to reset the fault.*

### 9.2.3 Status Word

**Table 68: iC Speed Profile Status Word Bits**

| Bit number | Name | Description |
|---|---|---|
| 0 | Control ready | 0 = The device controls are not ready and do not react to process data.<br>1 = The device controls are ready and react to process data. |
| 1 | Frequency converter ready | 0 = The frequency converter is not ready for operation. This status does not involve faults and warnings as they are indicated in their respective bits elsewhere.<br>1 = The frequency converter is ready for operation. |
| 2 | Coast | 0 = The frequency converter has an active coast signal and has released the motor.<br>1 = There are no active coast signals, and the motor can start when a start signal is given. |
| 3 | Fault | 0 = There are no faults.<br>1 = A fault has occurred, and an acknowledge signal is required to re-establish operation. |
| 4 | Reserved | Reserved. |
| 5 | Reserved | Reserved. |
| 6 | Reserved | Reserved. |
| 7 | Warning | 0 = There are no warnings.<br>1 = A warning is active. |
| 8 | Speed=reference | 0 = The motor runs, but the current speed is different from the current speed reference, for example, while the speed ramps up or down during start or stop.<br>1 = The current motor speed matches the current speed reference within a given tolerance. The tolerance is product-specific. |
| 9 | Bus control/Local operation | 0 = The device does not react on commands from the fieldbus, for 1 of the following reasons:<br>• CTW bit 10 = 0.<br>• HMI is in local mode.<br>• MyDrive® Insight has taken control.<br>• Control places do not include fieldbus.<br>1 = The device is controlled and reacting to I/O and process data. |

**Table 68: iC Speed Profile Status Word Bits** - (continued)

| Bit number | Name | Description |
|---|---|---|
| 10 | Frequency limit | 0 = The output frequency has exceeded the defined motor limits.<br>1 = The output frequency is within the defined motor limits.<br>The speed limits are set with the parameters in parameter group ***5.8.3 Speed Limits and Monitors***. |
| 11 | Operation | 0 = There are no active start requests, and the process does not run. The motor is coasted and is not started.<br>1 = The process is running, and the motor can be running or start at any time. |
| 12 | Reserved | Reserved. |
| 13 | Reserved | Reserved. |
| 14 | User-defined | These bits are reserved for application-specific advanced control. For more information, refer to the *Parameter Descriptions* chapter. |
| 15 | User-defined | |

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