ENGINEERING TOMORROW

Programming Guide

VLT® BACnet/IP MCA 125

VLT® HVAC Drive FC 102

vlt-drives.danfoss.com

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1 Introduction

1.1 Purpose of the Manual

The *VLT® BACnet/IP MCA 125 Programming Guide* provides information about configuring the system, controlling the frequency converter, parameter access, programming, and troubleshooting.

The programming guide is intended for use by qualified personnel familiar with the VLT® frequency converter, with BACnet/IP technology, and with the PC or PLC used as a master in the system.

Read the instructions before programming and follow the procedures in this manual.

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1.2 Additional Resources

Resources available for the frequency converters and optional equipment:

- The relevant frequency converter *operating guide* provides the necessary information for getting the frequency converter up and running.
- The relevant frequency converter *design guide* provides detailed information about capabilities and functionality to design motor control systems.
- The relevant frequency converter *programming guide* provides greater detail on working with parameters and many application examples.
- The *VLT® BACnet/IP MCA 125 Installation Guide* provides information about installing the BACnet/IP and about troubleshooting.
- The *VLT® BACnet/IP MCA 125 Programming Guide* provides information about configuring the system, controlling the frequency converter, parameter access, programming, troubleshooting, and some typical application examples.

Supplementary publications and manuals are available from Danfoss. See *drives.danfoss.com/knowledge-center/technical-documentation/* for listings.

1.3 Document and Software Version

Edition	Remarks	Software version	
		Frequency converter	BACnet/IP MCA 125
MG92L1xx	First edition	4.4x	1.02

Table 1.1 Document and Software Version

1.4 Product Overview

1.4.1 Intended Use

This programming guide relates to BACnet/IP interface. Ordering numbers:

- 134B1586 (conformal coated)

The BACnet/IP interface is designed to communicate with any system complying with the BACnet/IP standard. BACnet/IP provides users with the network tools to deploy standard Ethernet technology for building automation applications while enabling internet and enterprise connectivity.

VLT® BACnet/IP MCA 125 is intended for use with:

- VLT® HVAC Drive FC 102.

1.5 Approvals and Certifications

More approvals and certifications are available. For more information, contact a local Danfoss partner.

1.6 Symbols, Abbreviations, and Conventions

Abbreviation	Definition
AI	Analog input
AO	Analog output
AV	Analog value
B-AAC	BACnet advanced application controller
B-ASC	BACnet application-specific controller
BI	Binary input
BMS	Building management system
BO	Binary output
BV	Binary value
CC	Control card
CO	Exception calendar
COS	Change of state
COV	Change of value
CSV	Character string value
CTW	Control word
DHCP	Dynamic host configuration protocol
EE	Event enrollment
EMC	Electromagnetic compatibility
FC	Frequency converter
I/O	Input/output
IP	Internet protocol
LAN	Local area network
LCP	Local control panel
LED	Light emitting diode
Lsb	Least significant bit
MAV	Main actual value (actual output)
MRV	Main reference value
Msb	Most significant bit
MSV	Multi-state value
N/A	Not applicable
NC	Notification class
PC	Personal computer
PLC	Programmable logic controller
PNU	Parameter number
REF	Reference (= MRV)
RSTP	Rapid spanning tree protocol
RTC	Real-time clock
SO	Schedule object
STP	Spanning tree protocol
STW	Status word
TL	Trend log
UTC	Universal time coordinated

Table 1.2 Symbols and Abbreviations

Conventions

Numbered lists indicate procedures.

Bullet lists indicate other information and description of illustrations.

Italicized text indicates:

- Cross-reference.
- Link.
- Parameter name.
- Parameter group name.
- Parameter option.

All dimensions in drawings are in mm (in).

2 Safety

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2.1 Safety Symbols

The following symbols are used in this guide:

⚠WARNING

Indicates a potentially hazardous situation that could result in death or serious injury.

⚠CAUTION

Indicates a potentially hazardous situation that could result in minor or moderate injury. It can also be used to alert against unsafe practices.

NOTICE

Indicates important information, including situations that can result in damage to equipment or property.

2.2 Qualified Personnel

Correct and reliable transport, storage, installation, operation, and maintenance are required for the trouble-free and safe operation of the frequency converter. Only qualified personnel are allowed to install and operate this equipment.

Qualified personnel are defined as trained staff, who are authorized to install, commission, and maintain equipment, systems, and circuits in accordance with pertinent laws and regulations. Also, the qualified personnel must be familiar with the instructions and safety measures described in this manual.

2.3 Safety Precautions

⚠WARNING

HIGH VOLTAGE

Frequency converters contain high voltage when connected to AC mains input, DC supply, or load sharing. Failure to perform installation, start-up, and maintenance by qualified personnel can result in death or serious injury.

- **Only qualified personnel must perform installation, start-up, and maintenance.**

⚠WARNING

UNINTENDED START

When the frequency converter is connected to AC mains, DC supply, or load sharing, the motor can start at any time. Unintended start during programming, service, or repair work can result in death, serious injury, or property damage. The motor can start with an external switch, a fieldbus command, an input reference signal from the LCP or LOP, via remote operation using MCT 10 Set-up Software, or after a cleared fault condition.

To prevent unintended motor start:

- **Press [Off/Reset] on the LCP before programming parameters.**
- **Disconnect the frequency converter from the mains.**
- **Completely wire and assemble the frequency converter, motor, and any driven equipment before connecting the frequency converter to AC mains, DC supply, or load sharing.**

⚠WARNING

DISCHARGE TIME

The frequency converter contains DC-link capacitors, which can remain charged even when the frequency converter is not powered. High voltage can be present even when the warning LED indicator lights are off. Failure to wait the specified time after power has been removed before performing service or repair work can result in death or serious injury.

- **Stop the motor.**
- **Disconnect AC mains and remote DC-link supplies, including battery back-ups, UPS, and DC-link connections to other frequency converters.**
- **Disconnect or lock PM motor.**
- **Wait for the capacitors to discharge fully. The minimum waiting time is specified in the *chapter Safety* in the *operating guide* supplied with the frequency converter.**
- **Before performing any service or repair work, use an appropriate voltage measuring device to make sure that the capacitors are fully discharged.**

⚠WARNING

LEAKAGE CURRENT HAZARD

Leakage currents exceed 3.5 mA. Failure to ground the frequency converter properly can result in death or serious injury.

- **Ensure the correct grounding of the equipment by a certified electrical installer.**

⚠WARNING

EQUIPMENT HAZARD

Contact with rotating shafts and electrical equipment can result in death or serious injury.

- **Ensure that only trained and qualified personnel perform installation, start-up, and maintenance.**
- **Ensure that electrical work conforms to national and local electrical codes.**
- **Follow the procedures in this guide.**

⚠CAUTION

INTERNAL FAILURE HAZARD

An internal failure in the frequency converter can result in serious injury when the frequency converter is not properly closed.

- **Ensure that all safety covers are in place and securely fastened before applying power.**

3 Configuration

3.1 IP Settings

All IP-related parameters are located in *parameter group 12-0* IP Settings*:

- *Parameter 12-00 IP Address Assignment*.
- *Parameter 12-01 IP Address*.
- *Parameter 12-02 Subnet Mask*.
- *Parameter 12-03 Default Gateway*.
- *Parameter 12-04 DHCP Server*.
- *Parameter 12-05 Lease Expires*.
- *Parameter 12-06 Name Servers*.
- *Parameter 12-07 Domain Name*.
- *Parameter 12-08 Host Name*.
- *Parameter 12-09 Physical Address*.

The VLT® BACnet/IP MCA 125 offers several ways of IP address assignment.

Setting up the frequency converter with a manually assigned IP address:

Parameter	Value
Parameter 12-00 IP Address Assignment	*[0] MANUAL*
Parameter 12-01 IP Address	192.168.0.xxx[1)]
Parameter 12-02 Subnet Mask	255.255.255.0[1)]
Parameter 12-03 Default Gateway	Optional

Table 3.1 Set up Parameters for a Manually Assigned IP address

1) Class C IP address example. Any valid IP address can be entered.

NOTICE

A power cycle is necessary after setting the IP parameters manually.

Setting up the frequency converter with automatically (BOOTP/DHCP) assigned IP address or via the hardware switches:

Parameter	Value
Parameter 12-00 IP Address Assignment	*[1] DHCP* *[2] BOOTP*
Parameter 12-01 IP Address	Read only
Parameter 12-02 Subnet Mask	Read only
Parameter 12-03 Default Gateway	Read only

Table 3.2 Set up Parameters for Automatically Assigned IP address

When assigning the IP address by DHCP/BOOTP server or hardware switches, the assigned IP address and subnet mask can be readout in *parameter 12-01 IP Address* and *parameter 12-02 Subnet Mask*. In *parameter 12-04 DHCP Server*, the IP address of the found DHCP or BOOTP server is shown. For DHCP only: The remaining lease-time can be readout in *parameter 12-05 Lease Expires*.

Parameter 12-09 Physical Address reads out the MAC address of the option, which is also printed on the label of the option. If fixed leases are used together with DHCP or BOOTP, the physical MAC address is linked with a fixed IP address.

NOTICE

If no DHCP or BOOTP reply has been received after 4 attempts (for example, if the DHCP/BOOTP server has been powered off), the option returns to the last good known IP address.

Parameter 12-03 Default Gateway is optional and only used in routed networks.

Optional parameters used with domain name server systems:

- *Parameter 12-06 Name Servers*.
- *Parameter 12-07 Domain Name*.
- *Parameter 12-08 Host Name*.

If DHCP or BOOTP is selected as IP address assignment, these parameters are read-only.

3.2 Ethernet Link Parameters

Parameter group 12-1 Ethernet Link Parameters* contains ethernet link information:

- *Parameter 12-10 Link Status*.
- *Parameter 12-11 Link Duration*.
- *Parameter 12-12 Auto Negotiation*.
- *Parameter 12-13 Link Speed*.
- *Parameter 12-14 Link Duplex*.

NOTICE

The Ethernet link parameters are unique per port.

Parameter 12-10 Link Status and *parameter 12-11 Link Duration* show information on the link status per port. *Parameter 12-10 Link Status* shows *[0] No Link* or *[1] Link* according to the status of the present port.

Parameter 12-11 Link Duration shows the duration of the link on the present port. If the link is broken, the counter resets.

Parameter 12-12 Auto Negotiation is a feature that enables 2 connected Ethernet devices to select a common transmission parameter, such as speed and duplex mode. In this process, the connected devices first share their capabilities for these parameters and then select the fastest transmission mode that they both support. By default, this function is enabled. Incapability between the connected devices may lead to decreased communication performance. To prevent decreased performance, disable auto negotiation.

If *parameter 12-12 Auto Negotiation* is set to *[0] Off*, link speed and duplex mode can be configured manually in *parameter 12-13 Link Speed* and *parameter 12-14 Link Duplex*.

Parameter 12-13 Link Speed shows/sets the link speed per port. If no link is present, none is shown.

Parameter 12-14 Link Duplex shows/sets the duplex mode per port:

- Half duplex provides communication in both directions, but only in 1 direction at a time (not simultaneously).
- Full-duplex allows communication in both directions, and unlike half duplex, allows for communication in both directions to happen simultaneously.

3.3 IP Traffic

The use of ethernet-based network for industrial automation purposes calls for careful and thorough network design. Especially the use of active network components like switches and routers requires detailed know-how about the behavior of IP traffic.

Redundancy
Several redundancy protocols exist today, where spanning tree protocol (STP) and rapid spanning tree protocol (RSTP) is frequently used in HVAC systems. The VLT® BACnet/IP MCA 125 can be installed in a network that uses STP or RSTP. The STP or RSTP is a feature that must be provided by the switch installed in front of the MCA 125. The MCA 125 does not play an active role in spanning tree, but it reacts on possible commands from the switch in front of the MCA 125.

3.4 BACnet Settings

All BACnet-related parameters are located in *parameter group 8-7* IP Settings* and *parameter group 12-7* BACnet*.

Relevant parameters for *parameter group 8-7* IP Settings*:

- *Parameter 8-70 BACnet Device Instance*.
- *Parameter 8-74 "I-Am" Service*.
- *Parameter 8-75 Initialisation Password*.

The VLT® BACnet/IP MCA 125 share these parameters with the built-in BACnet MS/TP interface. This means, that if the BACnet MS/TP and the MCA 125 BACnet/IP interface is connected at the same time, the settings affect both interfaces. It is not possible to assign a unique device instance to each interface. Therefore, the frequency converter should only be connected to 1 network at a time for proper function of the BACnet.

Parameter 8-70 BACnet Device Instance sets the device instance of the frequency converter. Each device connected to the BACnet network must have a unique device instance. If 2 devices have the same device instance, the BACnet network goes into failure mode. When the DIP switches on the MCA 125 are set to on or off, the option uses the value set in *parameter 8-70 BACnet Device Instance*. In all other cases, the option uses the values set by the DIP as Device instance. If BACnet MS/TP is enabled on the RS485 port of the control card, the BACnet MS/TP protocol uses *parameter 8-70 BACnet Device Instance*. By doing so, the frequency converter can have 2 device instances.

Parameter 8-74 "I-Am" Service sets the time interval for sending the “I-Am” telegram to the BACnet network. Select whether the device should send the “I-Am” service message only at power-up, or continuously with an interval of approximately 1 minute.

In *parameter 8-75 Initialisation Password*, enter the password needed for execution of drive reinitialization from BACnet. The default password is “admin”.

Relevant parameters for *parameter group 12-7* BACnet*:

- *Parameter 12-70 BACnet Status*.
- *Parameter 12-71 BACnet Datalink*.
- *Parameter 12-72 BACnet UDP Port*.
- *Parameter 12-75 BBMD IP Address*.
- *Parameter 12-76 BBMD Port*.
- *Parameter 12-77 BBMD Reg. Interval*.
- *Parameter 12-78 Device ID Conflict Detection*.
- *Parameter 12-79 Message Counter*.

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Parameter group 12-7 BACnet* is only available if the frequency converter has a BACnet/IP interface installed. Setting up this parameter group is only possible in the MCA 125 BACnet/IP interface. If the BACnet/IP has to run via IP network (UDP), this parameter group has a default setting which allows it to be omitted in most cases.

Parameter 12-70 BACnet Status shows the status of the MCA 125 BACnet/IP interface. For detailed information, see *chapter 5 Parameters*.

Parameter 12-71 BACnet Datalink selects if the BACnet/IP interface uses the BACnet Ethernet, BACnet/IP, or all datalink layer. If all datalinks are selected, the BACnet/IP autodetects which BACnet layer to use.

Parameter 12-72 BACnet UDP Port sets the port number used for the UDP connection. It is recommended to use a port number within the ranges of 47808–47826 and 49752–65535.

Parameter 12-75 BBMD IP Address sets the IP address of the remote BBMD management device. If set to 0.0.0.0, the foreign device function is disabled.

Parameter 12-76 BBMD Port sets the port number in the BBMD management device that handles the broadcast messages.

Parameter 12-77 BBMD Reg. Interval sets the registration interval in s, at which the frequency converter re-registers itself in the remote BBMD managing device.

Parameter 12-78 Device ID Conflict Detection specifies the time interval in minutes, where the MCA 125 sends a "Who has" with its own device instance. This detects if a device has been programmed to use the same device instance (faulty configuration). *Warning 34 Fieldbus fault* is issued until next detection.

Parameter 12-79 Message Counter contains an array of 5 counters. They can be used to verify that the BMS controller sends data to the frequency converter.

For information about the BACnet broadcast management device (BBMD), see *chapter 6 Foreign Device*.

3.5 Network Monitoring

In control systems, it is of highest priority that the controller and network works correct. The VLT® BACnet/IP MCA 125 is designed to monitor the system for the availability of the controller and the network.

Typical faults detected by the MCA 125:

- Power loss (controller or network components).
- Cable faults (broken cable).
- Malfunction of network components (partly).
- Controller program stopped execution.

For indication of fieldbus faults detected by the fieldbus option directly, the option can activate *warning 34 Fieldbus fault* (W34). *Warning 34 Fieldbus fault* is suppressed for 60 s after power-up, to allow the controller to establish connection to the MCA 125.

For monitoring the communication to the controller, the drive has a timer which can be set to a value from 0.5–18.000 s (5 hours). The timer starts the countdown when it receives a valid write command to 1 of the objects listed in *Table 3.3*:

Object type	Short name	Object number
Analog output	AO	All
Analog value	AV	1, 2, 31, 36, 41
Binary value	BV	1, 2, 25, 26, 27
Multistage value	MS	1

Table 3.3 Objects to Trigger Countdown

The controller must retrigger the timer within the time set in *parameter 8-03 Control Timeout Time*. If the controller fails to retrigger the timer within the timeframe, the frequency converter issues *alarm 17 Ctrl.word TO*, and executes 1 or more of the following commands:

- Sets the motor into a well-defined state (*parameter 8-04 Control Timeout Function* for example: *[5] Stop and trip*).
- Sets digital outputs to a well-defined state (for example: On, Off, no change).
- Sets analog outputs to a well-defined state (for example: 0–100% no change).

By this, the frequency converter reacts in a known way, when communication faults occur. When communication is re-established, the *parameter 8-05 End-of-Timeout Function* defines how the drive acts, when communication is restored.

The parameters for monitoring communication are listed in *Table 3.4*:

ID	Name	Factory set-up	Note
8-03	Control Timeout Time	60.0 s	Application dependent
8-04	Control Timeout Function	Off	Application dependent
8-05	End-of-Timeout Function	Resume set-up	If set up change in *parameter 8-04 Control Timeout Function*
8-06	Reset Control Timeout	Do not reset	No BACnet access
5-30	Terminal 27, D Output	No operation	Application dependent
5-31	Terminal 29, D Output	No operation	Application dependent
5-40	Function Relay1 & 2	Alarm; Running	Application dependent
6-51	Terminal 42 Output	No operation	Application dependent

Table 3.4 Parameters for Monitoring Communication

For I/O options, see the relevant parameters for the option.

The monitoring feature works from the simple state machine, as shown in *Illustration 3.1*:

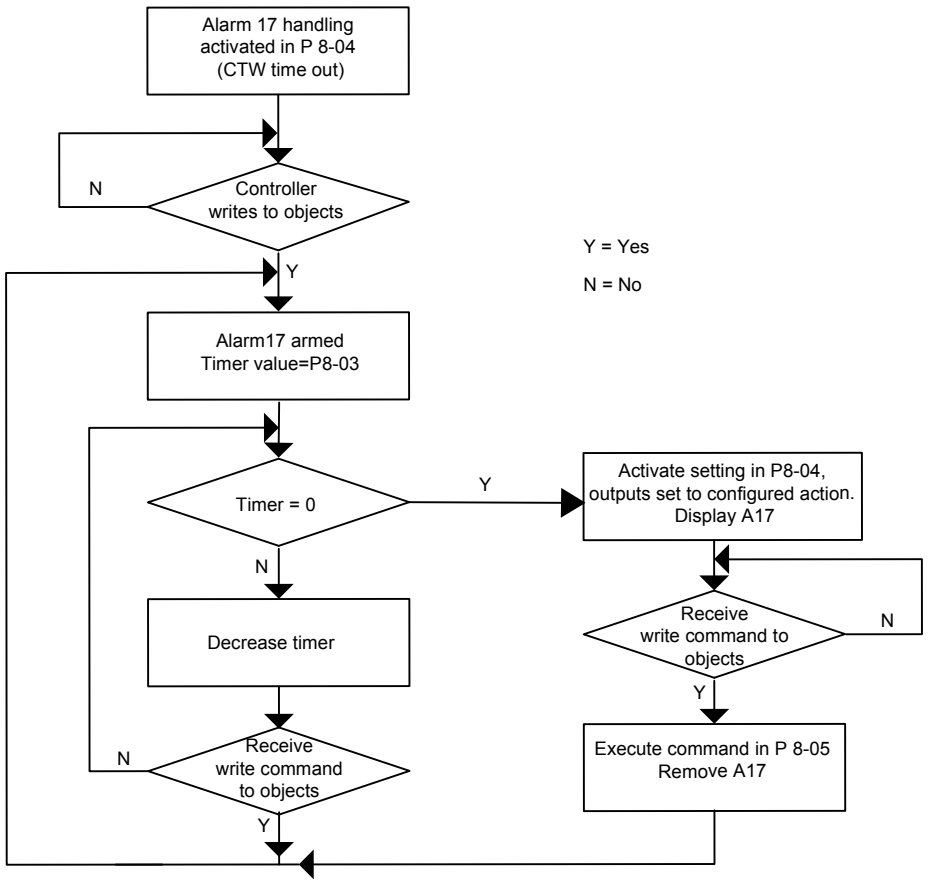

Illustration 3.1 Simple State Machine

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Parameter 8-03 Control Timeout Time defines the maximum timeframe between writing to the present value of 1 of the objects that keep the *alarm 17 Ctrl.word TO* suppressed. The value set in *parameter 8-03 Control Timeout Time* should not exceed the timeframe which the application can tolerate without failing or leading to faults. It has been proven that sending 3 write commands within the time set in *parameter 8-03 Control Timeout Time* gives a stable system. In noisy environments, the numbers can be set higher, but improving the installation should be done first.

Example:
The cooling tower can accept loss of communication for up to 3 minutes. *Parameter 8-03 Control Timeout Time* is therefore set to 180 s. The controller is programmed to send a write command every 60 s and allows 2 commands to be lost before issuing *alarm 17 Ctrl.word TO*. When the fault occurs, the frequency converter is set to *[4] Max. speed* in *parameter 8-04 Control Timeout Function*. This setting generates maximum cooling, which is the best action for the application. The default value of *parameter 8-05 End-of-Timeout Function* is *[1] Resume set-up*, since no set-up change is selected in *parameter 8-04 Control Timeout Function*.

4 BACnet Objects

The following objects are supported by VLT® BACnet/IP MCA 125:

- Device
- Binary input
- Binary output
- Binary value
- Analog input
- Analog output
- Analog value
- Multistate value
- Loop
- Notification class
- Calendar
- Schedule
- Trend log
- Event enrollment
- CharacterString value
- Exception calendar

ID	Object name	Unit	R/W	COV	Commandable	Parameter	Available from	Changeable unit
AI: 0	Analog input 53	%	R	Yes	Yes	1662	Control card	No
AI: 1	Analog input 54	%	R	Yes	Yes	1664	Control card	No
AI: 2	Analog in X30/11	%	R	No	Yes	1675	MCB 101	No
AI: 3	Analog in X30/12	%	R	No	Yes	1676	MCB 101	No
AI: 4	Analog in X42/1	V[1)]	R	No	Yes	1830	MCB 109	No
AI: 5	Analog in X42/3	V[1)]	R	No	Yes	1831	MCB 109	No
AI: 6	Analog in X42/5	V[1)]	R	No	Yes	1832	MCB 109	No
AI: 7	Analog input X48/2	%	R	No	Yes	1836	MCB 114	No
AI: 8	Analog input X48/4	°C	R	No	Yes	1837	MCB 114	Yes
AI: 9	Analog input X48/7	°C	R	No	Yes	1838	MCB 114	Yes
AI: 10	Analog input X48/10	°C	R	No	Yes	1839	MCB 114	Yes

Table 4.1 AI Objects

1) This unit is defined in parameter 26-00 Terminal X42/1 Mode, parameter 26-01 Terminal X42/3 Mode, and parameter 26-02 Terminal X42/5 Mode. The unit cannot be changed from the BACnet.

ID	Object name	Unit	R/W	COV	Commandable	Parameter	Available from	Changeable unit
AO: 0	Terminal 42 output bus control	%	R/W	No	Yes	653	Control card	No
AO: 1	Pulse out #27 bus control	%	R/W	No	Yes	593	Control card	No
AO: 2	Pulse out #29 bus control	%	R/W	No	Yes	595	Control card	No
AO: 3	Terminal X30/8 output bus control	%	R/W	No	Yes	663	MCB 101	No
AO: 4	Analog output X42/7	V	R/W	No	Yes	2643	MCB 109	Yes
AO: 5	Analog output X42/9	V	R/W	No	Yes	2653	MCB 109	Yes
AO: 6	Analog output X42/11	V	R/W	No	Yes	2663	MCB 109	Yes

Table 4.2 AO Objects

ID	Object name	Unit	R/W	COV	Commandable	Parameter	Available from	Changeable unit
AV: 0	Speed act value	%	R	Yes	No	1682	Control card	No
AV: 1	Input reference 1	%	R/W	No	Yes	1682	Control card	No
AV: 2	Input reference 2	%	R/W	No	Yes	1682	Control card	No
AV: 3	Output speed	%	R	No	No	MAV	Control card	Yes
AV: 4	PID feedback	%	R	No	No	MAV	Control card	No
AV: 5	Motor current	Amps	R	Yes	No	1614	Control card	Yes
AV: 6	Power	kW	R	Yes	No	1610	Control card	Yes
AV: 15	Motor thermal	%	R	Yes	No	1618	Control card	No
AV: 21	Operating hours	Hours	R	No	No	1500	Control card	No
AV: 22	Running hours	Hours	R	No	No	1501	Control card	No
AV: 23	kWh counter	kWh	R	No	No	1502	Control card	Yes
AV: 24	Motor voltage	V	R	No	No	1612	Control card	Yes
AV: 25	Frequency	Hz	R	Yes	No	1613	Control card	No
AV: 26	Torque	%	R	Yes	No	1622	Control card	No
AV: 27	DC-link voltage	V	R	No	No	1630	Control card	Yes
AV: 28	Heat sink temp.	°Deg	R	No	No	1634	Control card	Yes
AV: 29	Inverter thermal	%	R	No	No	1635	Control card	No
AV: 30	Setpoint 1	%	R/W	No	No	2021	Control card	No
AV: 31	Bus feedback 1	%	R/W	No	No	894	Control card	No
AV: 35	Setpoint 2	%	R/W	No	No	2022	Control card	No
AV: 36	Bus feedback 2	%	R/W	No	No	895	Control card	No
AV: 40	Setpoint 3	%	R/W	No	No	2023	Control card	No
AV: 41	Bus Feedback 3	%	R/W	No	No	896	Control card	No
AV: 50	Alarm log: Error code	None	R	No	No	1530	Control card	No
AV: 51	Fault code	None	R	No	No	1)	Control card	No
AV: 52	PID start speed	Hz	R/W	No	No	2083	Control card	No
AV: 53	On reference bandwidth	%	R/W	No	No	2084	Control card	No
AV: 54	PID proportional gain	None	R/W	No	No	2093	Control card	No
AV: 55	PID integral time	Seconds	R/W	No	No	2094	Control card	No
AV: 56	PID differentiation time	Seconds	R/W	No	No	2095	Control card	No
AV: 57	PID differentiation gain limit	None	R/W	No	No	2096	Control card	No
AV: 58	Sensorless readout	None	R	Yes	No	1850	Control card	No
AV: 59	PID output	%	R/W	No	No	1658	Control card	No
AV: 60	PID setpoint	%	R/W	No	No	1659	Control card	No
AV: 61	Alarm word	None	R	No	No	1690	Control card	No
AV: 62	Alarm word 2	None	R	No	No	1691	Control card	No
AV: 63	Warning word	None	R	No	No	1692	Control card	No
AV: 64	Warning word 2	None	R	No	No	1693	Control card	No
AV: 70	Feedback [unit]	%	R	Yes	No	1652	Control card	No

Table 4.3 AV Objects

1) List of 0–228 faults from ASHRAE.

ID	Object name	Unit	R/W	Commandable	Parameter	Available from
BI: 0	Digital input term 33	On/Off	R	Yes	1660, Bit 0	Control card
BI: 1	Digital input term 32	On/Off	R	Yes	1660, Bit 1	Control card
BI: 2	Digital input term 29	On/Off	R	Yes	1660, Bit 2	Control card
BI: 3	Digital input term 27	On/Off	R	Yes	1660, Bit 3	Control card
BI: 4	Digital input term 19	On/Off	R	Yes	1660, Bit 4	Control card
BI: 5	Digital input term 18	On/Off	R	Yes	1660, Bit 5	Control card
BI: 6	Digital input term 37	On/Off	R	Yes	1660, Bit 6	Control card
BI: 7	Digital input GPIO term X30/2	On/Off	R	Yes	1660, Bit 7	MCB 101
BI: 8	Digital input GPIO term X30/3	On/Off	R	Yes	1660, Bit 8	MCB 101
BI: 9	Digital input GPIO term X30/4	On/Off	R	Yes	1660, Bit 9	MCB 101

Table 4.4 BI Objects

ID	Object name	Unit	R/W	Commandable	Parameter	Available from
BO: 0	Digital output term 27	On/Off	R/W	Yes	590, Bit 0	Control card
BO: 1	Digital output term 29	On/Off	R/W	Yes	590, Bit 1	Control card
BO: 2	GPIO output term X30/6	On/Off	R/W	Yes	590, Bit 2	MCB 101
BO: 3	GPIO output term X30/7	On/Off	R/W	Yes	590, Bit 3	MCB 101
BO: 4	Relay 1	On/Off	R/W	Yes	590, Bit 4	Control card
BO: 5	Relay 2	On/Off	R/W	Yes	590, Bit 5	Control card
BO: 6	Option B relay 1 output	On/Off	R/W	Yes	590, Bit 6	MCB 105
BO: 7	Option B relay 2 output	On/Off	R/W	Yes	590, Bit 7	MCB 105
BO: 8	Option B relay 3 output	On/Off	R/W	Yes	590, Bit 8	MCB 105

Table 4.5 BO Objects

ID	Object name	R/W	COV	Commandable	Parameter + Bit #	Available from
BV: 1	RUN/STOP command	R/W	No	Yes	CTW=047c + bit 15	Control card
BV: 2	REF 1/REF 2 select	R/W	No	Yes	MAV	Control card
BV: 3	Fault reset command	R/W	No	No	CTW Bit 7	Control card
BV: 4	RUN/STOP monitor	R	No	No	STW Bit 1	Control card
BV: 5	OK/FAULT monitor	R	No	No	STW Bit 3, 6 & 7	Control card
BV: 6	HAND/AUTO reference	R	No	No	16-95 Bit 1	Control card
BV: 21	Warning	R	No	No	STW Bit 7	Control card
BV: 22	Trip	R	No	No	STW Bit 3	Control card
BV: 23	Triplock	R	No	No	STW Bit 6	Control card
BV: 24	Coasting	R/W	No	Yes	CTW Bit 3	Control card
BV: 25	CW/CCW	R/W	No	Yes	CTW Bit 15	Control card
BV: 26	Jog	R/W	No	Yes	CTW Bit 8	Control card
BV: 27	Reset	R/W	No	Yes	CTW Bit 7	Control card
BV: 28	Reset kWh counter	R/W	No	Yes	1506	Control card
BV: 29	Reset running hours counter	R/W	No	No	1507	Control card
BV: 30	Reverse	R/W	No	No	CTW Bit 15	Control card
BV: 31	Speed = reference	R	No	No	STW Bit 8	Control card
BV: 32	Bus control	R	No	No	STW Bit 9	Control card
BV: 33	Running	R	No	No	STW Bit 11	Control card
BV: 34	Ramp 1/Ramp 2	R/W	No	Yes	CTW Bit 9	Control card
BV: 35	ECB test mode	R	No	No	3110 Bit 0	MCO 104
BV: 36	ECB drive mode	R	No	No	3110 Bit 1	MCO 104
BV: 37	ECB auto. bypass enable	R	No	No	3110 Bit 2	MCO 104
BV: 38	ECB bypass mode	R	No	No	3110 Bit 3	MCO 104

Table 4.6 BV Objects

ID	Object name	R/W	Commandable	Parameter + Bit #	Available from
MSV: 0	Smart logic controller state	R	No	1638	Control card
MSV: 1	Active set-up	R/W	Yes	CTW Bit 13 & 14	Control card
MSV: 3	Configuration mode	R/W	No	100	Control card

Table 4.7 Multistate

ID	Object name	R/W	Parameter	Available from
NC: 0	Warning notifier	R/W	None, MCA 125	MCA 125
NC: 1	Trip notifier	R/W	None, MCA 125	MCA 125
NC: 3	Triplock notifier	R/W	None, MCA 125	MCA 125
NC: 100	NC 100	R/W	None, MCA 125	MCA 125
NC: 200	NC 200	R/W	None, MCA 125	MCA 125
NC: 300	NC 300	R/W	None, MCA 125	MCA 125
NC: 400	NC 400	R/W	None, MCA 125	MCA 125

Table 4.8 Notification Class

ID	Object name	R/W	Available from
TL: 0	Trend log 0	R/W	MCA 125
TL: 1	Trend log 1	R/W	MCA 125
TL: 2	Trend log 2	R/W	MCA 125
TL: 3	Trend log 3	R/W	MCA 125
TL: 4	Trend log 4	R/W	MCA 125
TL: 5	Trend log 5	R/W	MCA 125
TL: 6	Trend log 6	R/W	MCA 125

Table 4.9 Trend Log

ID	Object name	R/W	Parameter	Available from
Loop: 0	Drive close loop	R/W	2093, 2094, 2095	MCA 125

Table 4.10 Loop Object[1)]

1) Object is linked to objects: AV:54, AV:55, and AV:56

ID	Object name	R/W	Parameter	Available from
EE: 0	Event enrollment 0	R/W	None, MCA 125	MCA 125
EE: 1	Event enrollment 1	R/W	None, MCA 125	MCA 125
EE: 2	Event enrollment 2	R/W	None, MCA 125	MCA 125
EE: 3	Event enrollment 3	R/W	None, MCA 125	MCA 125
EE: 4	Event enrollment 4	R/W	None, MCA 125	MCA 125
EE: 5	Event enrollment 5	R/W	None, MCA 125	MCA 125
EE: 6	Event enrollment 6	R/W	None, MCA 125	MCA 125
EE: 7	Event enrollment 7	R/W	None, MCA 125	MCA 125
EE: 8	Event enrollment 8	R/W	None, MCA 125	MCA 125
EE: 9	Event enrollment 9	R/W	None, MCA 125	MCA 125
EE: 10	Event enrollment 10	R/W	None, MCA 125	MCA 125
EE: 11	Event enrollment 11	R/W	None, MCA 125	MCA 125
EE: 12	Event enrollment 12	R/W	None, MCA 125	MCA 125
EE: 13	Event enrollment 13	R/W	None, MCA 125	MCA 125

Table 4.11 Event Enrollment

ID	Object name	R/W	Parameter	Available from
CSV: 1	Pump status	R	None, MCA 125	MCA 125

Table 4.12 CharacterString Value

ID	Object name	R/W	Parameter	Available from
SO: 0	Drive schedule 0	R/W	None, MCA 125	MCA 125
SO: 1	Drive schedule 1	R/W	None, MCA 125	MCA 125
SO: 2	Drive schedule 2	R/W	None, MCA 125	MCA 125
SO: 3	Drive schedule 3	R/W	None, MCA 125	MCA 125
SO: 4	Drive schedule 4	R/W	None, MCA 125	MCA 125
SO: 5	Drive schedule 5	R/W	None, MCA 125	MCA 125

Table 4.13 Schedule Object

ID	Object name	R/W	Parameter	Available from
CO: 0	Exception calendar	R/W	None, MCA 125	MCA 125
CO: 1	Exception calendar	R/W	None, MCA 125	MCA 125
CO: 2	Exception calendar	R/W	None, MCA 125	MCA 125
CO: 3	Exception calendar	R/W	None, MCA 125	MCA 125
CO: 4	Exception calendar	R/W	None, MCA 125	MCA 125
CO: 5	Exception calendar	R/W	None, MCA 125	MCA 125

Table 4.14 Exception Calendar

ID	Object name	R/W	Parameter	Available from
EO: 0	Event log	R	None, MCA 125	MCA 125

Table 4.15 Event Log

5 Parameters

5.1 Parameter Group 8-**

5.1.1 8-0* General Settings

8-01 Control Site

The setting in this parameter overrides the settings in *parameter 8-50 Coasting Select* to *parameter 8-56 Preset Reference Select*.

Option:		Function:
[0]	Digital and ctrl.word	Use both digital input and control word.
[1]	Digital only	Use digital inputs only.
[2]	Controlword only	Use control word only.

8-02 Control Source

Select the source of the control word: 1 of 2 serial interfaces, or 4 installed options. During initial power-up, the frequency converter automatically sets this parameter to *[3] Option A* if it detects a valid fieldbus option installed in slot A. If the option is removed, the frequency converter detects a change in the configuration, sets *parameter 8-02 Control Source* back to default setting *[1] FC Port*, and the frequency converter trips. If an option is installed after initial power-up, the setting of *parameter 8-02 Control Source* does not change, but the frequency converter trips and shows *alarm 67, Option Changed*.

Option:		Function:
		NOTICE **This parameter cannot be adjusted while the motor is running.**
[0]	None	
[1]	FC Port	
[2]	USB Port	
[3]	Option A	
[4]	Option B	
[5]	Option C0	
[6]	Option C1	
[30]	External Can	

8-03 Control Timeout Time

Range:		Function:
Size related*	[0.5 - 18000 s]	Enter the maximum time expected to pass between the reception of 2 consecutive telegrams. If this time is exceeded, it indicates that the serial communication has stopped. The function selected in *parameter 8-04 Control Timeout Function* is then carried out. A valid control word triggers the timeout counter. The minimum value that can be set depends on the actual frequency converter used. The object list holds information on the objects that triggers the control timeout: • Analog outputs • Binary outputs • AV0 • AV1 • AV2 • AV4 • BV1 • BV2 • BV3 • BV4 • BV5 • Multistate outputs

8-04 Control Timeout Function

Select the timeout function. The timeout function is activated when the control word fails to be updated within the time period specified in *parameter 8-03 Control Timeout Time*. *[20] N2 Override Release* only appears after setting the Metasys N2 protocol.

To change the set-up after a timeout, configure as follows:

1. Set *parameter 0-10 Active Set-up* to *[9] Multi set-up*.
2. Select the relevant link in *parameter 0-12 This Set-up Linked to*.

Option:		Function:
[0] *	Off	Resumes control via fieldbus (fieldbus or standard), using the most recent control word.
[1]	Freeze output	Freezes output frequency until communication resumes.
[2]	Stop	Stops with auto restart when communication resumes.
[3]	Jogging	Runs the motor at jog frequency until communication resumes.
[4]	Max. speed	Runs the motor at maximum frequency until communication resumes.
[5]	Stop and trip	Stops the motor, then resets the frequency converter to restart via:

8-04 Control Timeout Function

Select the timeout function. The timeout function is activated when the control word fails to be updated within the time period specified in *parameter 8-03 Control Timeout Time*. *[20] N2 Override Release* only appears after setting the Metasys N2 protocol.

To change the set-up after a timeout, configure as follows:

1. Set *parameter 0-10 Active Set-up* to *[9] Multi set-up*.
2. Select the relevant link in *parameter 0-12 This Set-up Linked to*.

Option:		Function:
		• Fieldbus. • [Reset]. • Digital input.
[7]	Select setup 1	Changes the set-up after a control word timeout. If communication resumes after a timeout, *parameter 8-05 End-of-Timeout Function* either resumes the set-up used before the timeout, or retains the set-up endorsed by the timeout function.
[8]	Select setup 2	See *[7] Select set-up 1*.
[9]	Select setup 3	See *[7] Select set-up 1*.
[10]	Select setup 4	See *[7] Select set-up 1*.
[20]	N2 Override Release	
[27]	Forced stop and trip	Only if Metasys N2 is selected in *parameter 8-30 Protocol*.

8-05 End-of-Timeout Function

Select the action after receiving a valid control word following a timeout.

This parameter is active only when *parameter 8-04 Control Timeout Function* is set to:

- *[7] Set-up 1*.
- *[8] Set-up 2*.
- *[9] Set-up 3*.
- *[10] Set-up 4*.

Option:		Function:
[0]	Hold set-up	Retains the set-up selected in *parameter 8-04 Control Timeout Function* and shows a warning until *parameter 8-06 Reset Control Timeout* toggles. Then the frequency converter resumes its original set-up.
[1] *	Resume set-up	Resumes the set-up that was active before the timeout.

8-06 Reset Control Timeout

This parameter is active only when option *[0] Hold set-up* has been selected in *parameter 8-05 End-of-Timeout Function*.

Option:		Function:
[0] *	Do not reset	Retains the set-up specified in *parameter 8-04 Control Timeout Function*: • *[7] Set-up 1*. • *[8] Set-up 2*. • *[9] Set-up 3*. • *[10] Set-up 4*.
[1]	Do reset	Restores the frequency converter to the original set-up following a control word timeout. The frequency converter performs the reset and immediately reverts to the *[0] Do not reset* setting.

8-07 Diagnosis Trigger

Not all fieldbusses support the diagnosis functions.

Option:		Function:
[0] *	Disable	Send no extended diagnosis data (EDD).
[1]	Trigger on alarms	Send EDD after alarms.
[2]	Trigger alarm/warn.	Send EDD after alarms or warnings.

8-08 Readout Filtering

Use this function if the speed feedback value readouts on the fieldbus fluctuate. Select *[1] Motor Data LP-Filter* if the function is required. A power cycle is required for changes to take effect.

Option:		Function:
[0]	Motor Data Std-Filt.	Normal fieldbus readouts.
[1]	Motor Data LP-Filter	Filtered fieldbus readouts of the following parameters: • *Parameter 16-10 Power [kW]* • *Parameter 16-11 Power [hp]* • *Parameter 16-12 Motor Voltage* • *Parameter 16-14 Motor current* • *Parameter 16-16 Torque [Nm]* • *Parameter 16-17 Speed [RPM]* • *Parameter 16-22 Torque [%]*

8-09 Communication Charset

Select the communication character set to be supported.

Option:		Function:
[0]	ISO 8859-1	
[1]	ANSI X3.4	
[2]	UTF - 8	

5.1.2 8-1* Ctrl. Word Settings

8-10 Control Profile

Select the interpretation of the control and status words corresponding to the installed fieldbus. Only the selections valid for the fieldbus installed in slot A are visible in the LPC display. For guidelines in selection of *[0] Frequency converter profile* and *[1] PROFIdrive profile*, refer to the *design guide* of the related product. For more guidelines in the selection of *[1] PROFIdrive profile*, *[5] ODVA*, and *[7] CANopen DSP 402*, see the *installation guide* for the installed fieldbus.

Option:		Function:
[0] *	FC profile	
[1]	PROFIdrive profile	
[5]	ODVA	Available only with VLT® DeviceNet MCA 104 and VLT® EtherNet/IP MCA 121.
[7]	CANopen DSP 402	Only available with CANopen MCA 105, EtherCAT MCA 124, or POWERLINK MCA 123.

8-13 Configurable Status Word STW

This parameter enables configuration of bits 12–15 in the status word.
Array [16]

Option:		Function:
[0]	No function	
[1] *	Profile Default	The function corresponds to the profile default selected in *parameter 8-10 Control Profile*.
[2]	Alarm 68 Only	Only set if *alarm 68, Safe Torque Off* occurs.
[3]	Trip excl Alarm 68	Set if a trip occurs, unless *alarm 68, Safe Torque Off* is set to execute the trip.
[10]	T18 DI status	The bit indicates the status of terminal 18. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[11]	T19 DI status	The bit indicates the status of terminal 19. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[12]	T27 DI status	The bit indicates the status of terminal 27. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[13]	T29 DI status	The bit indicates the status of terminal 29. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[14]	T32 DI status	The bit indicates the status of terminal 32. 0 indicates that the terminal is low. 1 indicates that the terminal is high.
[15]	T33 DI status	The bit indicates the status of terminal 33. 0 indicates that the terminal is low.

8-13 Configurable Status Word STW

This parameter enables configuration of bits 12–15 in the status word.
Array [16]

Option:		Function:
		1 indicates that the terminal is high.
[16]	T37 DI status	The bit indicates the status of terminal 37. 0 indicates that T37 is low (Safe Torque Off). 1 indicates that T37 is high (normal).
[21]	Thermal warning	The thermal warning turns on when the temperature exceeds the limit in the motor, frequency converter, brake resistor, or thermistor.
[30]	Brake fault (IGBT)	Output is logic 1 when the brake IGBT is short-circuited. Use this function to protect the frequency converter if there is a fault on the brake modules. Use the output/relay to cut out the main voltage from the frequency converter.
[40]	Out of ref range	
[49]	Derate active	
[60]	Comparator 0	See *parameter group 13-1* Comparators*. If comparator 0 is evaluated as true, the output goes high. Otherwise, it is low.
[61]	Comparator 1	See *parameter group 13-1* Comparators*. If comparator 1 is evaluated as true, the output goes high. Otherwise, it is low.
[62]	Comparator 2	See *parameter group 13-1* Comparators*. If comparator 2 is evaluated as true, the output goes high. Otherwise, it is low.
[63]	Comparator 3	See *parameter group 13-1* Comparators*. If comparator 3 is evaluated as true, the output goes high. Otherwise, it is low.
[64]	Comparator 4	See *parameter group 13-1* Comparators*. If comparator 4 is evaluated as true, the output goes high. Otherwise, it is low.
[65]	Comparator 5	See *parameter group 13-1* Comparators*. If comparator 5 is evaluated as true, the output goes high. Otherwise, it is low.
[70]	Logic Rule 0	See *parameter group 13-4* Logic Rules*. If logic rule 0 is evaluated as true, the output goes high. Otherwise, it is low.
[71]	Logic Rule 1	See *parameter group 13-4* Logic Rules*. If logic rule 1 is evaluated as true, the output goes high. Otherwise, it is low.
[72]	Logic Rule 2	See *parameter group 13-4* Logic Rules*. If logic rule 2 is evaluated as true, the output goes high. Otherwise, it is low.

8-13 Configurable Status Word STW		
This parameter enables configuration of bits 12–15 in the status word. Array [16]		
Option:		**Function:**
[73]	Logic Rule 3	See *parameter group 13-4* Logic Rules*. If logic rule 3 is evaluated as true, the output goes high. Otherwise, it is low.
[74]	Logic Rule 4	See *parameter group 13-4* Logic Rules*. If logic rule 4 is evaluated as true, the output goes high. Otherwise, it is low.
[75]	Logic Rule 5	See *parameter group 13-4* Logic Rules*. If logic rule 5 is evaluated as true, the output goes high. Otherwise, it is low.
[80]	SL digital out A	See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic action *[38] Set digital out A high* is executed. The output goes low whenever the smart logic action *[32] Set digital out A low* is executed.
[81]	SL digital out B	See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic action *[39] Set digital out B high* is executed. The output goes low whenever the smart logic action *[33] Set digital out B low* is executed.
[82]	SL digital out C	See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic action *[40] Set digital out C high* is executed. The output goes low whenever the smart logic action *[34] Set digital out C low* is executed.
[83]	SL digital out D	See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic action *[41] Set digital out D high* is executed. The output goes low whenever the smart logic action *[35] Set digital out D low* is executed.
[84]	SL digital out E	See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic action *[42] Set digital out E high* is executed. The output goes low whenever the smart logic action *[36] Set digital out E low* is executed.
[85]	SL digital out F	See *parameter 13-52 SL Controller Action*. The output goes high whenever the smart logic action *[43] Set digital out F high* is executed. The output goes low whenever the smart logic action *[37] Set digital out F low* is executed.
[86]	ATEX ETR cur. alarm	
[87]	ATEX ETR freq. alarm	

8-13 Configurable Status Word STW		
This parameter enables configuration of bits 12–15 in the status word. Array [16]		
Option:		**Function:**
[88]	ATEX ETR cur. warning	
[89]	ATEX ETR freq. warning	

5.1.3 8-3* FC Port Settings

8-30 Protocol		
Protocol selection for the integrated FC (standard) Port (RS485) on the control card. *Parameter group 8-7* BACnet* is only visible when *[9] FC Option* is selected.		
Option:		**Function:**
		NOTICE **Further details can be found in the *VLT® HVAC Drive FC 102 Metasys Operating Instructions*.**
[0]	FC	Communication according to the FC Protocol as described in the *VLT® HVAC Drive FC 102 Design Guide, RS485 Installation and Set-up*.
[1]	FC MC	Same as *[0] FC* but to be used when downloading SW to the frequency converter or uploading dll file (covering information regarding parameters available in the frequency converter and their inter-dependencies) to MCT 10 Set-up Software.
[2]	Modbus RTU	Communication according to the Modbus RTU protocol as described in the *VLT® HVAC Drive FC 102 Design Guide, RS485 Installation and Set-up*.
[3]	Metasys N2	Communication protocol. The N2 software protocol is general in nature to accommodate the unique properties each device may have. See *VLT® HVAC Drive Metasys Operating Instructions*.
[4]	FLN	Communication according to the Apogee FLN P1 protocol.
[5]	BACnet	Communication according to an open data communications protocol (building automation and control network), American National Standard (ANSI/ASHRAE 135-1995).
[9]	FC Option	To be used when a gateway is connected to the integrated RS485 port, for example the BACnet gateway. Following changes take place:

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8-30 Protocol

Protocol selection for the integrated FC (standard) Port (RS485) on the control card.
Parameter group 8-7 BACnet* is only visible when *[9] FC Option* is selected.

Option:		Function:
		• Address for the FC port is set to 1, and *parameter 8-31 Address* is now used to set the address for the gateway on the network, for example BACnet. See *VLT® HVAC Drive BACnet Operating Instruction*. • Baud rate for the FC port is set to a fixed value (115.200 Baud), and *parameter 8-32 Baud Rate* is now used to set the baud rate for the network port (for example BACnet) on the gateway.
[20]	LEN	

8-31 Address

Range:		Function:
Size related*	[1 - 255]	Enter the address for the frequency converter (standard) port. Valid range: Depends on selected protocol.

8-32 Baud Rate

Baud rates 9600, 19200, 38400, and 76800 are valid for BACnet only. The default value depends on the FC protocol.

Option:		Function:
[0]	2400 Baud	
[1]	4800 Baud	
[2]	9600 Baud	
[3]	19200 Baud	
[4]	38400 Baud	
[5]	57600 Baud	
[6]	76800 Baud	
[7]	115200 Baud	

8-33 Parity / Stop Bits

Parity and stop bits for the protocol *parameter 8-30 Protocol* using the FC port. For some of the protocols, not all options are visible. Default depends on the protocol selected.

Option:		Function:
[0]	Even Parity, 1 Stop Bit	
[1]	Odd Parity, 1 Stop Bit	
[2]	No Parity, 1 Stop Bit	
[3]	No Parity, 2 Stop Bits	

8-34 Estimated cycle time

Range:		Function:
0 ms*	[0 - 1000000 ms]	In noisy environments, the interface may be blocked due to overload or bad frames. This parameter specifies the time between 2 consecutive frames on the network. If the interface does not detect valid frames in that time, it flushes the receive buffer.

8-35 Minimum Response Delay

Range:		Function:
Size related*	[5 - 10000 ms]	Specify the minimum delay time between receiving a request and transmitting a response. This is used for overcoming modem turnaround delays.

8-36 Maximum Response Delay

Range:		Function:
Size related*	[11 - 10001 ms]	Specify the maximum allowed delay time between transmitting a request and receiving a response. Exceeding this delay time causes control word timeout.

8-37 Maximum Inter-Char Delay

Range:		Function:
Size related*	[0.00 - 35.00 ms]	Specify the maximum allowed time interval between receipt of 2 bytes. This parameter activates timeout if transmission is interrupted.

8-39 Protocol Firmware version

Range:		Function:
0*	[0 - 10]	Firmware revision for: • FC is in index 0. • Modbus is in index 1. • Metasys N2 is in index 2. • FLN is in index 3. • BACnet is in index 4.

5.1.4 8-4* Telegram Selection

8-40 Telegram Selection

Enables use of freely configurable telegrams or standard telegrams for the FC port.

Option:		Function:
[1] *	Standard telegram 1	
[101]	PPO 1	
[102]	PPO 2	
[103]	PPO 3	
[104]	PPO 4	
[105]	PPO 5	
[106]	PPO 6	
[107]	PPO 7	
[108]	PPO 8	
[200]	Custom telegram 1	

8-42 PCD Write Configuration

Different parameters can be assigned to PCD 3–10 of the PPOs (the number of PCDs depends on the PPO type). The values in PCD 3–10 are written to the selected parameters as data values.

Option:		Function:
[0]	None	
[302]	Minimum Reference	
[303]	Maximum Reference	
[341]	Ramp 1 Ramp Up Time	
[342]	Ramp 1 Ramp Down Time	
[351]	Ramp 2 Ramp Up Time	
[352]	Ramp 2 Ramp Down Time	
[380]	Jog Ramp Time	
[381]	Quick Stop Ramp Time	
[411]	Motor Speed Low Limit [RPM]	
[412]	Motor Speed Low Limit [Hz]	
[413]	Motor Speed High Limit [RPM]	
[414]	Motor Speed High Limit [Hz]	
[416]	Torque Limit Motor Mode	
[417]	Torque Limit Generator Mode	
[553]	Term. 29 High Ref./Feedb. Value	
[558]	Term. 33 High Ref./Feedb. Value	
[590]	Digital & Relay Bus Control	
[593]	Pulse Out #27 Bus Control	
[595]	Pulse Out #29 Bus Control	
[597]	Pulse Out #X30/6 Bus Control	
[615]	Terminal 53 High Ref./Feedb. Value	
[625]	Terminal 54 High Ref./Feedb. Value	
[653]	Terminal 42 Output Bus Control	
[663]	Terminal X30/8 Output Bus Control	
[673]	Terminal X45/1 Bus Control	
[683]	Terminal X45/3 Bus Control	
[890]	Bus Jog 1 Speed	
[891]	Bus Jog 2 Speed	

8-42 PCD Write Configuration

Different parameters can be assigned to PCD 3–10 of the PPOs (the number of PCDs depends on the PPO type). The values in PCD 3–10 are written to the selected parameters as data values.

Option:		Function:
[894]	Bus Feedback 1	
[895]	Bus Feedback 2	
[896]	Bus Feedback 3	
[1680]	Fieldbus CTW 1	
[1682]	Fieldbus REF 1	
[1685]	FC Port CTW 1	
[1686]	FC Port REF 1	
[2013]	Minimum Reference/Feedb.	
[2014]	Maximum Reference/Feedb.	
[2021]	Setpoint 1	
[2022]	Setpoint 2	
[2023]	Setpoint 3	
[2643]	Terminal X42/7 Bus Control	
[2653]	Terminal X42/9 Bus Control	
[2663]	Terminal X42/11 Bus Control	

8-43 PCD Read Configuration

Different parameters can be assigned to PCDs 3–10 of the PPOs (the number of PCDs depends on the PPO type). PCD 3–10 hold the actual data value of the selected parameters.

Option:		Function:
[0]	None	
[15]	Readout: actual setup	
[894]	Bus Feedback 1	
[895]	Bus Feedback 2	
[896]	Bus Feedback 3	
[1397]	Alert Alarm Word	
[1398]	Alert Warning Word	
[1399]	Alert Status Word	
[1500]	Operating hours	
[1501]	Running Hours	
[1502]	kWh Counter	
[1600]	Control Word	
[1601]	Reference [Unit]	
[1602]	Reference [%]	
[1603]	Status Word	
[1605]	Main Actual Value [%]	
[1609]	Custom Readout	
[1610]	Power [kW]	
[1611]	Power [hp]	
[1612]	Motor Voltage	
[1613]	Frequency	
[1614]	Motor current	
[1615]	Frequency [%]	
[1616]	Torque [Nm]	
[1617]	Speed [RPM]	
[1618]	Motor Thermal	
[1622]	Torque [%]	
[1623]	Motor Shaft Power [kW]	

8-43 PCD Read Configuration		
Different parameters can be assigned to PCDs 3–10 of the PPOs (the number of PCDs depends on the PPO type). PCD 3–10 hold the actual data value of the selected parameters.		
Option:		**Function:**
[1624]	Calibrated Stator Resistance	
[1626]	Power Filtered [kW]	
[1627]	Power Filtered [hp]	
[1630]	DC Link Voltage	
[1632]	Brake Energy /s	
[1633]	Brake Energy Average	
[1634]	Heatsink Temp.	
[1635]	Inverter Thermal	
[1638]	SL Controller State	
[1639]	Control Card Temp.	
[1650]	External Reference	
[1652]	Feedback[Unit]	
[1653]	Digi Pot Reference	
[1654]	Feedback 1 [Unit]	
[1655]	Feedback 2 [Unit]	
[1656]	Feedback 3 [Unit]	
[1660]	Digital Input	
[1661]	Terminal 53 Switch Setting	
[1662]	Analog Input 53	
[1663]	Terminal 54 Switch Setting	
[1664]	Analog Input 54	
[1665]	Analog Output 42 [mA]	
[1666]	Digital Output [bin]	
[1667]	Pulse Input #29 [Hz]	
[1668]	Pulse Input #33 [Hz]	
[1669]	Pulse Output #27 [Hz]	
[1670]	Pulse Output #29 [Hz]	
[1671]	Relay Output [bin]	
[1672]	Counter A	
[1673]	Counter B	
[1675]	Analog In X30/11	
[1676]	Analog In X30/12	
[1677]	Analog Out X30/8 [mA]	
[1678]	Analog Out X45/1 [mA]	
[1679]	Analog Out X45/3 [mA]	
[1684]	Comm. Option STW	
[1685]	FC Port CTW 1	
[1690]	Alarm Word	
[1691]	Alarm Word 2	
[1692]	Warning Word	
[1693]	Warning Word 2	
[1694]	Ext. Status Word	
[1695]	Ext. Status Word 2	
[1696]	Maintenance Word	
[1830]	Analog Input X42/1	
[1831]	Analog Input X42/3	
[1832]	Analog Input X42/5	
[1833]	Analog Out X42/7 [V]	
[1834]	Analog Out X42/9 [V]	

8-43 PCD Read Configuration		
Different parameters can be assigned to PCDs 3–10 of the PPOs (the number of PCDs depends on the PPO type). PCD 3–10 hold the actual data value of the selected parameters.		
Option:		**Function:**
[1835]	Analog Out X42/11 [V]	
[1836]	Analog Input X48/2 [mA]	
[1837]	Temp. Input X48/4	
[1838]	Temp. Input X48/7	
[1839]	Temp. Input X48/10	
[1850]	Sensorless Readout [unit]	
[1860]	Digital Input 2	

5.1.5 8-5* Digital/Bus

Parameters for configuring the control word merging.

NOTICE

These parameters are active only when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.

8-50 Coasting Select		
Select the trigger for the coasting function.		
Option:	**Function:**	
[0]	Digital input	A digital input triggers the coasting function.
[1]	Bus	A serial communication port or the fieldbus triggers the coasting function.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the coasting function.
[3] *	Logic OR	The fieldbus/serial communication port or a digital input triggers the coasting function.

8-52 DC Brake Select		
Select control of the DC brake via the terminals (digital input) and/or via the fieldbus.		
Option:	**Function:**	
		NOTICE **When *parameter 1-10 Motor Construction* is set to *[1] PM non-salient SPM*, only selection *[0] Digital input* is available.**
[0]	Digital input	Activate a start command via a digital input.
[1]	Bus	Activate a start command via the serial communication port or fieldbus option.
[2]	Logic AND	Activate a start command via the fieldbus/serial communication port and also via 1 of the digital inputs.
[3]	Logic OR	Activate a start command via the fieldbus/serial communication port or via 1 of the digital inputs.

8-53 Start Select

Select the trigger for the start function.

Option:		Function:
[0]	Digital input	A digital input triggers the start function.
[1]	Bus	A serial communication port or the fieldbus triggers the start function.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the start function.
[3] *	Logic OR	The fieldbus/serial communication port or a digital input triggers the start function.

8-54 Reversing Select

Select control of the frequency converter reverse function via the terminals (digital input) and/or via the fieldbus.

Option:		Function:
		NOTICE **This parameter is active only when *parameter 8-01 Control Site* is set to *[0] Digital and control word*.**
[0]	Digital input	Activates reverse command via a digital input.
[1]	Bus	Activates reverse command via the serial communication port or fieldbus option.
[2]	Logic AND	Activates reverse command via the fieldbus/ serial communication port, AND via 1 of the digital inputs.
[3]	Logic OR	Activates reverse command via the fieldbus/ serial communication port OR via 1 of the digital inputs.

8-55 Set-up Select

Select the trigger for the set-up selection.

Option:		Function:
[0]	Digital input	A digital input triggers the set-up selection.
[1]	Bus	A serial communication port or the fieldbus triggers the set-up selection.
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the set-up selection.
[3] *	Logic OR	The fieldbus/serial communication port or a digital input triggers the set-up selection.

8-56 Preset Reference Select

Option:		Function:
		Select the trigger for the preset reference selection.
[0]	Digital input	A digital input triggers the preset reference selection.
[1]	Bus	A serial communication port or the fieldbus triggers the preset reference selection.

8-56 Preset Reference Select

Option:		Function:
[2]	Logic AND	The fieldbus/serial communication port and a digital input trigger the preset reference selection.
[3] *	Logic OR	The fieldbus/serial communication port or a digital input triggers the preset reference selection.

5.1.6 8-7* BACnet

NOTICE

Parameters in this group are active only when *parameter 8-30 Protocol* is set to *[5] BACnet*.

8-70 BACnet Device Instance

Range:		Function:
1*	[0 - 4194302]	Enter a unique ID number for the BACnet device. ***NOTICE*** **This parameter is active only when *parameter 8-30 Protocol* is set to *[9] FC Option*, or if a VLT® BACnet/IP MCA 125 is installed.**

8-72 MS/TP Max Masters

Range:		Function:
127*	[1 - 127]	Define the address of the master which holds the highest address in this network. Decreasing this value optimizes polling for the token.

8-73 MS/TP Max Info Frames

Range:		Function:
1*	[1 - 65534]	Define how many info/data frames the device is allowed to send while holding the token.

8-74 "I-Am" Service

Select whether the device should send the "I-Am" service message only at power-up, or continuously with an interval of approximately 1 minute.

Option:		Function:
[0] *	Send at power-up	
[1]	Continuously	

8-75 Initialisation Password

Range:		Function:
Size related*	[1 - 20]	Enter the password needed for execution of Drive Re-initialization from BACnet.

5.1.7 8-8* FC Port Diagnostics

These parameters are used for monitoring the bus communication via the frequency converters RS485 port.

8-80 Bus Message Count

Range:		Function:
0*	[0 - 0]	This parameter shows the number of valid telegrams detected on the bus.

8-81 Bus Error Count

Array [6]

Range:		Function:
0*	[0 - 0]	This parameter shows the number of telegrams with faults (for example CRC fault) detected on the bus.

8-82 Slave Messages Rcvd

Range:		Function:
0*	[0 - 0]	This parameter shows the number of valid telegrams addressed to the slave sent by the frequency converter.

8-83 Slave Error Count

Range:		Function:
0*	[0 - 0]	This parameter shows the number of error telegrams, which are not executed by the frequency converter.

8-84 Slave Messages Sent

Range:		Function:
0*	[0 - 0]	This parameter shows the number of messages sent from this frequency converter.

8-85 Slave Timeout Errors

Range:		Function:
0*	[0 - 0]	This parameter shows the number of messages suppressed due to timeout.

5.1.8 8-9* Bus Jog

8-94 Bus Feedback 1

Range:		Function:
0*	[-200 - 200]	Write feedback to this parameter via the serial communication port or fieldbus option. Select this parameter as a feedback source in *parameter 20-00 Feedback 1 Source*, *parameter 20-03 Feedback 2 Source*, or *parameter 20-06 Feedback 3 Source*.

8-95 Bus Feedback 2

Range:		Function:
0*	[-200 - 200]	See *parameter 8-94 Bus Feedback 1* for further details.

8-96 Bus Feedback 3

Range:		Function:
0*	[-200 - 200]	See *parameter 8-94 Bus Feedback 1* for further details.

5.2 Parameter Group 12-**

5.2.1 12-0* IP Settings

12-00 IP Address Assignment

Selects the IP address assignment method.

Option:		Function:
[0]	MANUAL	Set the IP-address in *parameter 12-01 IP Address*.
[1]	DHCP	IP-address is assigned via DHCP Server.
[2]	BOOTP	IP-address is assigned via BOOTP server.
[10]	DCP	IP-adress is assigned via DCP server
[20]	From node ID	IP-adress is assigned from node ID.

12-01 IP Address

Range:		Function:
0*	[0 - 2147483647]	Configure the IP address of the option. Read-only, if *parameter 12-00 IP Address Assignment* is set to DHCP or BOOTP. In POWERLINK, the IP address follows the *parameter 12-60 Node ID* last byte and the first part is fixed to 192.168.100 (node ID).

12-02 Subnet Mask

Range:		Function:
0*	[0 - 4244635647]	Configure the IP subnet mask of the option. Read-only, if *parameter 12-00 IP Address Assignment* is set to DHCP or BOOTP. In POWERLINK, it is fixed to 255.255.255.0.

12-03 Default Gateway

Range:		Function:
0*	[0 - 2147483647]	Configure the IP default gateway of the option. Read-only, if *parameter 12-00 IP Address Assignment* is set to DHCP or BOOTP. In a non-routed network, this address is set to the IP address of the I/O device.

12-04 DHCP Server

Range:		Function:
0*	[0 - 2147483647]	Read-only. Show the IP address of the found DHCP or BOOTP server.

12-05 Lease Expires

Range:		Function:
Size related*	[0 - 0]	Shows the lease-time left for the current DHCP-assigned IP address in dd:hh:mm:ss.

12-06 Name Servers

Range:		Function:
0*	[0 - 2147483647]	IP addresses of domain name servers. Can be automatically assigned when using DHCP.

12-07 Domain Name

Range:		Function:
0	[0 - 48]	Domain name of the attached network. Can be automatically assigned when using DHCP network.

12-08 Host Name

Range:		Function:
0*	[0 - 48]	Logical (given) name of option.

NOTICE

The display of the frequency converter only shows the first 19 characters, but the remaining characters are stored in the frequency converter. If hardware switches are different from all ON or all OFF, the switches have priority.

12-09 Physical Address

Range:		Function:
0*	[0 - 17]	Read-only. Show the physical (MAC) address of the option. The format is: xx:xx:xx:xx:xx:xx.

5.2.2 12-1* Ethernet Link Parameters

Applies to the whole parameter group.

Index [0] is used for port 1, and index [1] is used for port 2. For EtherCAT, index [0] is for the in-port and index [1] is for the out-port.

12-10 Link Status

Read-only. Shows the link status of the Ethernet ports.

Option:		Function:
[0] *	No Link	
[1]	Link	

12-11 Link Duration

Range:		Function:
Size related*	[0 - 0]	Read-only. Shows the duration of the present link on each port in dd:hh:mm:ss.

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12-12 Auto Negotiation

Configures auto negotiation of Ethernet link parameters, for each port: ON or OFF.

Option:		Function:
		NOTICE **In POWERLINK, this parameter is fixed to OFF setting.**
[0]	Off	*Link Speed* and *Link Duplex* can be configured in *parameter 12-13 Link Speed* and *parameter 12-14 Link Duplex*.
[1] *	On	

12-13 Link Speed

Force the link speed for each port in 10 Mbps or 100 Mbps. If *parameter 12-12 Auto Negotiation* is set to *[1] On*, this parameter is read-only and shows the actual link speed. If no link is present, *[0] None* is shown.

Option:		Function:
		NOTICE **In POWERLINK, this parameter is locked to 100 Mbps.**
[0] *	None	
[1]	10 Mbps	
[2]	100 Mbps	

12-14 Link Duplex

Force the duplex for each port to full or half duplex. If *parameter 12-12 Auto Negotiation* is set to *[1] On*, this parameter is read-only. In POWERLINK, this parameter is locked to half duplex.

Option:		Function:
[0]	Half Duplex	
[1] *	Full Duplex	

12-18 Supervisor MAC

MAC Addresses of currently active supervisors.

Range:		Function:
0*	[0 - 2147483647]	

12-19 Supervisor IP Addr.

IP Addresses of currently active supervisors.

Range:		Function:
0*	[0 - 2147483647]	

5.2.3 12-7* BACnet

12-70 BACnet Status

Range:		Function:
0*	[0 - 4294967295]	Status parameter 32 bit. Only the 9 least significant bits are used.

12-71 BACnet Datalink

Select if the BACnet/IP interface uses the BACnet Ethernet, BACnet/IP, or All Datalink layer. If *All Datalinks* is selected, the BACnet/IP auto detects which BACnet layer to use.

Option:		Function:
[0]	All Datalinks	
[1] *	BACnet/IP	
[2]	BACnet Ethernet	

12-72 BACnet UDP Port

Range:		Function:
47808*	[1 - 65535]	Select the port number on UDP, which is used for the BACnet communication. Has to match the type of port used in the BMS system.

12-75 BBMD IP Address

Range:		Function:
0*	[0 - 2147483647]	Sets the IP address of the remote BBMD management device. If set to 0.0.0.0, the foreign device function is disabled.

12-76 BBMD Port

Range:		Function:
47808*	[1 - 65535]	Sets the port number of the BBMD management device that handles the broadcast messages.

12-77 BBMD Reg. Interval

Range:		Function:
10 s*	[1 - 65535 s]	Sets the registration interval in s, at which the frequency converter re-registers itself in the remote BBMD managing device.

12-78 Device ID Conflict Detection

Range:		Function:
0 min*	[0 - 525600 min]	This parameter specifies time interval in minutes, where the VLT® BACnet/IP MCA 125 sends a "Who Has" with its own device instance. Detects if a device has been programmed to use the same device instance (faulty configuration). *Warning 34 Fieldbus fault* is issued until next detection.

12-79 Message Counter

Range:		Function:
0*	[0 - 4294967294]	This parameter contains an array of 5 counters. They can be used to verify that the BMS controller sends data to the frequency converter:

12-79 Message Counter		
Range:		**Function:**
		• Index 1: Total number of received and sent bus messages. • Index 2: Total number of received bus messages. • Index 3: Total number of sent messages. • Index 4: Total number of error messages. • Index 5: Total number of retried (timed out) messages.

5.2.4 12-8* Other Ethernet Services

12-80 FTP Server		
Enables/disables the built-in FTP server.		
Option:		**Function:**
[0] *	Disabled	Disable the built-in FTP server.
[1]	Enabled	Enable the built-in FTP server.

12-81 HTTP Server		
Enables/disables the built-in HTTP (web) server.		
Option:		**Function:**
[0] *	Disabled	Disable the built-in HTTP (web) server.
[1]	Enabled	Enable the built-in HTTP (web) server.

12-82 SMTP Service		
Enables/disables the SMTP (e-mail) service on the option.		
Option:		**Function:**
[0] *	Disabled	Disable the SMTP (e-mail) service on the option.
[1]	Enabled	Enable the SMTP (e-mail) service on the option.

12-83 SNMP Agent		
Enable or disable the local SNMP Agent.		
Option:		**Function:**
[0]	Disabled	
[1] *	Enabled	

12-84 Address Conflict Detection		
Detect and resolve IP address conflicts with this device in the network.		
Option:		**Function:**
[0]	Disabled	
[1] *	Enabled	

12-85 ACD Last Conflict		
Range:		**Function:**
0*	[0 - 2147483647]	The contested IP address of the most recent address conflict.

12-89 Transparent Socket Channel Port		
Range:		**Function:**
Size related*	[0 - 65535]	Configure the TCP port number for the transparent socket channel. This configuration enables FC telegrams to be sent transparently on Ethernet via TCP. Default value is 4000, 0 means disabled. The MCT 10 Set-up Software uses this port.

5.2.5 12-9* Advanced Ethernet Settings

12-90 Cable Diagnostic		
Enable/disable advanced cable diagnosis function. If enabled, the distance to cable errors can be readout in *parameter 12-93 Cable Error Length*. The parameter resumes to the default setting of disable after the diagnostics have finished.		
Option:		**Function:**
[0] *	Disabled	Disable the cable diagnostic function.
[1]	Enabled	Enable the cable diagnostic function.

12-91 Auto Cross Over		
Option:		**Function:**
[0]	Disabled	Disables the auto crossover function. ***NOTICE*** **Disabling of the auto crossover function requires crossed Ethernet cables for daisy-chaining the options.**
[1] *	Enabled	Enables the auto crossover function.

12-92 IGMP Snooping		
This function prevents flooding of the Ethernet protocol stack by only forwarding multicast packets to ports that are member of the multicast group.		
Option:		**Function:**
[0]	Disabled	Disable the IGMP Snooping function.
[1] *	Enabled	Enable the IGMP Snooping function.

12-93 Cable Error Length		
Range:		**Function:**
0*	[0 - 65535]	If cable diagnostics is enabled in *parameter 12-90 Cable Diagnostic*, the built-in switch is available via time domain reflectometry (TDR). This is a measurement technique which detects common cabling problems such as open circuits, short circuits, and impedance mismatches,

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12-93 Cable Error Length

Range:		Function:
		or breaks in transmission cables. The distance from the option to the error is shown in meters with an accuracy of +/- 2 meters. The value 0 means no errors detected.

12-94 Broadcast Storm Protection

Range:		Function:
-1 %*	[-1 - 20 %]	The built-in switch protects the switch system from receiving too many broadcast packages, which can use up network resources. The value indicates a percentage of the total bandwidth that is allowed for broadcast messages. Example: OFF means that the filter is disabled - all broadcast messages are passed through. The value 0% means that no broadcast messages are passed through. A value of 10% means that 10% of the total bandwidth is allowed for broadcast messages. If the number of broadcast messages exceeds the 10% threshold, they are blocked.

12-95 Inactivity timeout

Range:		Function:
120*	[0 - 3600]	Apply to *parameter 12-94 Broadcast Storm Protection*, if the broadcast storm protection should also include multicast telegrams messages.

12-96 Port Config

Enable/disable port-mirroring function. For troubleshooting with a network analyser tool.

Option:		Function:
[0]	Normal	No port-mirroring.
[1]	Mirror Port 1 to 2	All network traffic on port 1 is mirrored to port 2.
[2]	Mirror Port 2 to 1	All network traffic on port 2 is mirrored to port 1.
[10]	Port 1 disabled	
[11]	Port 2 disabled	
[254]	Mirror Int. Port to 1	
[255]	Mirror Int. Port to 2	

12-97 QoS Priority

Range:		Function:
Size related*	[0 - 63]	Each index sets the DSCP value of different types of QoS prioritized messages.

12-98 Interface Counters

Range:		Function:
0*	[0 - 4294967296]	Advanced interface counters from built-in switch can be used for low-level trouble-shooting. The parameter shows a sum of port 1 + port 2.

12-99 Media Counters

Range:		Function:
0*	[0 - 4294967296]	Advanced interface counters from built-in switch can be used for low-level trouble-shooting. The parameter shows a sum of port 1 + port 2.

5.3 Parameter List

Par-ameter	Parameter description	Default value	4-set-up	FC 302 only	Change during operation	Conver-sion index	Type
8-0* General Settings							
8-01	Control Site	ExpressionLimit	All set-ups		TRUE	-	Uint8
8-02	Control Source	ExpressionLimit	All set-ups		TRUE	-	Uint8
8-03	Control Timeout Time	ExpressionLimit	1 set-up		TRUE	-1	Uint32
8-04	Control Timeout Function	[0] Off	1 set-up		TRUE	-	Uint8
8-05	End-of-Timeout Function	[1] Resume set-up	1 set-up		TRUE	-	Uint8
8-06	Reset Control Timeout	[0] Do not reset	All set-ups		TRUE	-	Uint8
8-07	Diagnosis Trigger	[0] Disable	2 set-ups		TRUE	-	Uint8
8-08	Readout Filtering	ExpressionLimit	All set-ups		TRUE	-	Uint8
8-09	Communication Charset	ExpressionLimit	2 set-ups		TRUE	-	Uint8
8-1* Control Settings							
8-10	Control Profile	[0] FC profile	All set-ups		TRUE	-	Uint8
8-13	Configurable Status Word STW	[1] Profile Default	All set-ups		TRUE	-	Uint8
8-3* FC Port Settings							
8-30	Protocol	ExpressionLimit	1 set-up		TRUE	-	Uint8
8-31	Address	ExpressionLimit	1 set-up		TRUE	0	Uint8
8-32	Baud Rate	ExpressionLimit	1 set-up		TRUE	-	Uint8
8-33	Parity / Stop Bits	ExpressionLimit	1 set-up		TRUE	-	Uint8
8-34	Estimated cycle time	0 ms	2 set-ups		TRUE	-3	Uint32
8-35	Minimum Response Delay	ExpressionLimit	1 set-up		TRUE	-3	Uint16
8-36	Maximum Response Delay	ExpressionLimit	1 set-up		TRUE	-3	Uint16
8-37	Maximum Inter-Char Delay	ExpressionLimit	1 set-up		TRUE	-5	Uint16
8-39	Protocol Firmware version	0 N/A	All set-ups		FALSE	0	VisStr[10]
8-4* FC MC protocol set							
8-40	Telegram Selection	[1] Standard telegram 1	2 set-ups		TRUE	-	Uint8
8-42	PCD Write Configuration	ExpressionLimit	2 set-ups		TRUE	-	Uint16
8-43	PCD Read Configuration	ExpressionLimit	2 set-ups		TRUE	-	Uint16
8-5* Digital/Bus							
8-50	Coasting Select	[3] Logic OR	All set-ups		TRUE	-	Uint8
8-52	DC Brake Select	ExpressionLimit	All set-ups		TRUE	-	Uint8
8-53	Start Select	[3] Logic OR	All set-ups		TRUE	-	Uint8
8-54	Reversing Select	ExpressionLimit	All set-ups		TRUE	-	Uint8
8-55	Set-up Select	[3] Logic OR	All set-ups		TRUE	-	Uint8
8-56	Preset Reference Select	[3] Logic OR	All set-ups		TRUE	-	Uint8
8-7* BACnet							
8-70	BACnet Device Instance	1 N/A	1 set-up		TRUE	0	Uint32
8-72	MS/TP Max Masters	127 N/A	1 set-up		TRUE	0	Uint8
8-73	MS/TP Max Info Frames	1 N/A	1 set-up		TRUE	0	Uint16
8-74	"I-Am" Service	[0] Send at power-up	1 set-up		TRUE	-	Uint8
8-75	Initialisation Password	ExpressionLimit	1 set-up		TRUE	0	VisStr[20]
8-8* FC Port Diagnostics							
8-80	Bus Message Count	0 N/A	All set-ups		TRUE	0	Uint32
8-81	Bus Error Count	0 N/A	All set-ups		TRUE	0	Uint32
8-82	Slave Messages Rcvd	0 N/A	All set-ups		TRUE	0	Uint32
8-83	Slave Error Count	0 N/A	All set-ups		TRUE	0	Uint32
8-84	Slave Messages Sent	0 N/A	All set-ups		TRUE	0	Uint32
8-85	Slave Timeout Errors	0 N/A	All set-ups		TRUE	0	Uint32
8-89	Diagnostics Count	0 N/A	1 set-up		TRUE	0	Int32

Par-ameter	Parameter description	Default value	4-set-up	FC 302 only	Change during operation	Conver-sion index	Type
8-9* Bus Jog / Feedback							
8-90	Bus Jog 1 Speed	100 RPM	All set-ups		TRUE	67	Uint16
8-91	Bus Jog 2 Speed	200 RPM	All set-ups		TRUE	67	Uint16
8-94	Bus Feedback 1	0 N/A	1 set-up		TRUE	0	N2
8-95	Bus Feedback 2	0 N/A	1 set-up		TRUE	0	N2
8-96	Bus Feedback 3	0 N/A	1 set-up		TRUE	0	N2

Table 5.1 Parameter Group 8-**

Par-ameter	Parameter description	Default value	4-set-up	FC 302 only	Change during operation	Conver-sion index	Type
12-0* IP Settings							
12-00	IP Address Assignment	ExpressionLimit	2 set-ups		TRUE	-	Uint8
12-01	IP Address	0 N/A	1 set-up		TRUE	0	OctStr[4]
12-02	Subnet Mask	0 N/A	1 set-up		TRUE	0	OctStr[4]
12-03	Default Gateway	0 N/A	1 set-up		TRUE	0	OctStr[4]
12-04	DHCP Server	0 N/A	2 set-ups		TRUE	0	OctStr[4]
12-05	Lease Expires	ExpressionLimit	All set-ups		TRUE	0	TimD
12-06	Name Servers	0 N/A	1 set-up		TRUE	0	OctStr[4]
12-07	Domain Name	0 N/A	1 set-up		TRUE	0	VisStr[48]
12-08	Host Name	0 N/A	1 set-up		TRUE	0	VisStr[48]
12-09	Physical Address	0 N/A	1 set-up		TRUE	0	VisStr[17]
12-1* Ethernet Link Parameters							
12-10	Link Status	[0] No Link	All set-ups		TRUE	-	Uint8
12-11	Link Duration	ExpressionLimit	All set-ups		TRUE	0	TimD
12-12	Auto Negotiation	[1] On	2 set-ups		TRUE	-	Uint8
12-13	Link Speed	[0] None	2 set-ups		TRUE	-	Uint8
12-14	Link Duplex	[1] Full Duplex	2 set-ups		TRUE	-	Uint8
12-18	Supervisor MAC	0 N/A	2 set-ups		TRUE	0	OctStr[6]
12-19	Supervisor IP Addr.	0 N/A	2 set-ups		TRUE	0	OctStr[4]
12-2* Process Data							
12-20	Control Instance	ExpressionLimit	1 set-up		TRUE	0	Uint8
12-21	Process Data Config Write	ExpressionLimit	All set-ups		TRUE	-	Uint16
12-22	Process Data Config Read	ExpressionLimit	All set-ups		TRUE	-	Uint16
12-27	Primary Master	0 N/A	1 set-up		TRUE	0	OctStr[4]
12-28	Store Data Values	[0] Off	All set-ups		TRUE	-	Uint8
12-29	Store Always	[0] Off	1 set-up		TRUE	-	Uint8
12-3* EtherNet/IP							
12-30	Warning Parameter	0 N/A	All set-ups		TRUE	0	Uint32
12-31	Net Reference	[0] Off	2 set-ups		TRUE	-	Uint8
12-32	Net Control	[0] Off	2 set-ups		TRUE	-	Uint8
12-33	CIP Revision	ExpressionLimit	All set-ups		TRUE	0	Uint16
12-34	CIP Product Code	ExpressionLimit	1 set-up		TRUE	0	Uint16
12-35	EDS Parameter	0 N/A	All set-ups		TRUE	0	Uint32
12-37	COS Inhibit Timer	0 N/A	All set-ups		TRUE	0	Uint16
12-38	COS Filter	0 N/A	All set-ups		TRUE	0	Uint16
12-4* Modbus TCP							
12-40	Status Parameter	0 N/A	All set-ups		TRUE	0	Uint16

Par-ameter	Parameter description	Default value	4-set-up	FC 302 only	Change during operation	Conver-sion index	Type
12-41	Slave Message Count	0 N/A	All set-ups		TRUE	0	Uint32
12-42	Slave Exception Message Count	0 N/A	All set-ups		TRUE	0	Uint32
12-7* BACnet							
12-70	BACnet Status	0 N/A	All set-ups		TRUE	0	Uint32
12-71	BACnet Datalink	[1] BACnet/IP	2 set-ups		TRUE	-	uint8
12-72	BACnet UDP Port	47808 N/A	2 set-ups		FALSE	0	Uint16
12-75	BBMD IP Address	0 N/A	1 set-up		TRUE	0	OctStr[4]
12-76	BBMD Port	47808 N/A	2 set-ups		TRUE	0	Uint16
12-77	BBMD Reg. Interval	10 s	1 set-up		FALSE	0	Uint16
12-78	Device ID Conflict Detection	0 min	2 set-ups		TRUE	70	Uint32
12-79	Message Counter	0 N/A	All set-ups		TRUE	0	Uint32
12-8* Other Ethernet Services							
12-80	FTP Server	[0] Disabled	2 set-ups		TRUE	-	Uint8
12-81	HTTP Server	[0] Disabled	2 set-ups		TRUE	-	Uint8
12-82	SMTP Service	[0] Disabled	2 set-ups		TRUE	-	Uint8
12-83	SNMP Agent	[1] Enabled	2 set-ups		TRUE	-	Uint8
12-84	Address Conflict Detection	[1] Enabled	2 set-ups		TRUE	-	Uint8
12-85	ACD Last Conflict	0 N/A	2 set-ups		TRUE	0	OctStr[35]
12-89	Transparent Socket Channel Port	ExpressionLimit	2 set-ups		TRUE	0	Uint16
12-9* Advanced Ethernet Services							
12-90	Cable Diagnostic	[0] Disabled	2 set-ups		TRUE	-	Uint8
12-91	Auto Cross Over	[1] Enabled	2 set-ups		TRUE	-	Uint8
12-92	IGMP Snooping	[1] Enabled	2 set-ups		TRUE	-	Uint8
12-93	Cable Error Length	0 N/A	1 set-up		TRUE	0	Uint16
12-94	Broadcast Storm Protection	-1 %	2 set-ups		TRUE	0	Int8
12-95	Inactivity timeout	120 N/A	2 set-ups		TRUE	0	Uint16
12-96	Port Config	ExpressionLimit	2 set-ups		TRUE	-	Uint8
12-97	QoS Priority	ExpressionLimit	2 set-ups		TRUE	0	Int8
12-98	Interface Counters	0 N/A	All set-ups		TRUE	0	Uint32
12-99	Media Counters	0 N/A	All set-ups		TRUE	0	Uint32

Table 5.2 Parameter Group 12-**

5.4 Data Types

The numbers on the left refer to a conversion figure, and the numbers on the right are used when writing or reading parameters.

Conversion index	Conversion factor
67	1/60
6	1000000
5	100000
4	10000
3	1000
2	100
1	10
0	1
-1	0.1
-2	0.01
-3	0.001
-4	0.0001
-5	0.00001
-6	0.000001

Table 5.3 Conversion Index and Factor

6 Foreign Device

The VLT® BACnet/IP MCA 125 uses services such as "Who Is" and "I-Am", which both are based on broadcasts. These services are required to discover devices within a network.

When more than 1 IP network is used, routers are installed to join the networks. The routers do not forward broadcasts from 1 network to another. The BACnet handles this by providing a technology called BBMD – BACnet broadcast management device. The BBMD can be made easily by adding 1 BBMD device in each network. The BBMDs are configured so that the broadcasts they receive on their local network is packed into an IP frame and sent to the other BBMD. The second BBMD now transmits the broadcast to its local network. This solution requires an extra device in each network and is costlier.

In installations where only a few devices are on the remote side, a foreign device registration (FD) might be more efficient. The remote network does not require a BBMD to be installed locally. Instead, each BACnet device with the foreign device feature establishes a direct connection to the BBMD in the remote network.

The FD holds at least 3 parameters for configuration:

- *Parameter 12-75 BBMD IP Address* which holds the IP address of the BBMD.
- *Parameter 12-76 BBMD Port* defines which port the BBMD uses.
- *Parameter 12-77 BBMD Reg. Interval* defines the interval of how often the FD sends information to the BBMD.

Illustration 6.1 shows an example of a set-up consisting of 2 networks:

- Network 1: This is where the remote drive is located. This network has no controller, and the frequency converter is using the BBMD in the BMS controller in network 2.
- Network 2: This is where the BMS controller is connected. The IP address of the BMS controller is 192.168.1.10, and the BMS controller also has the BBMD feature. The BBMD is using port number 47808.

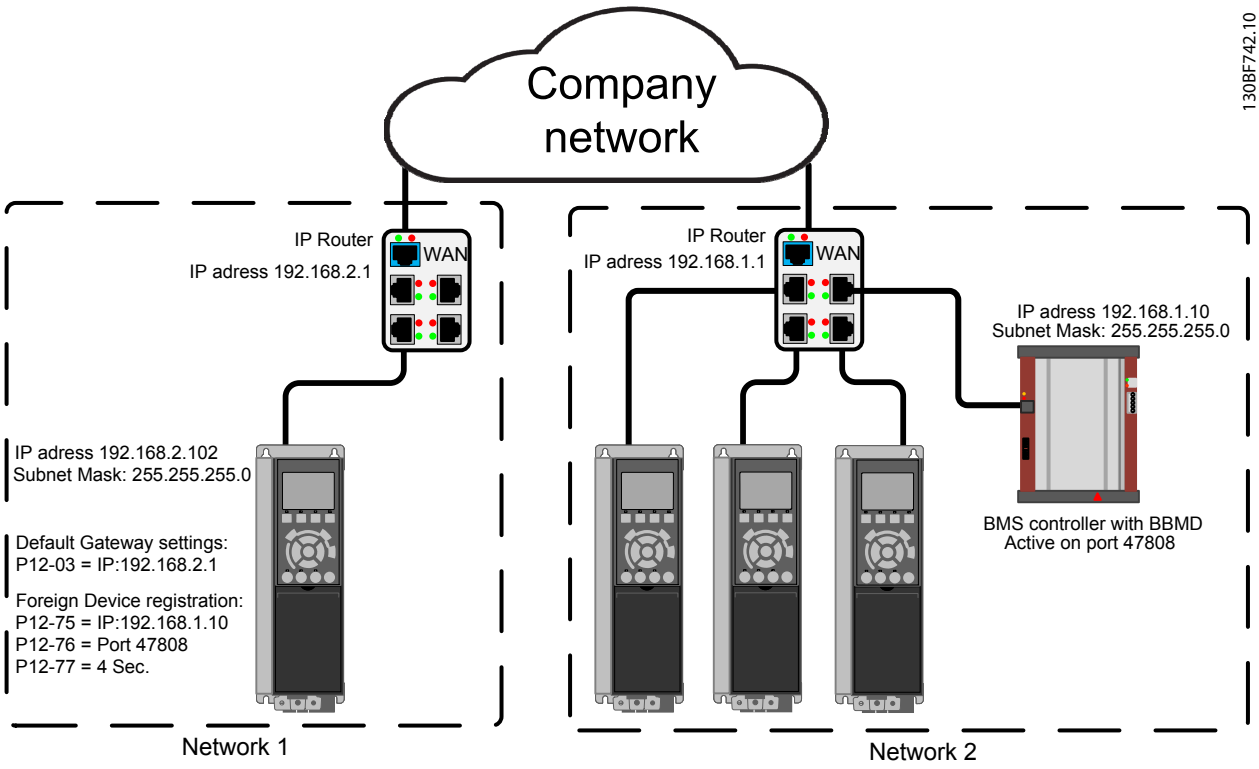

Illustration 6.1 Example with 2 Networks

7 Troubleshooting

7.1 Step-by-step Troubleshooting

7.1.1 LED Status

The VLT® BACnet/IP MCA 125 interface has 3 bicolored LEDs that allow fast and detailed diagnosis. Each LED is linked to its unique part of the BACnet/IP interface, see *Table 7.1*.

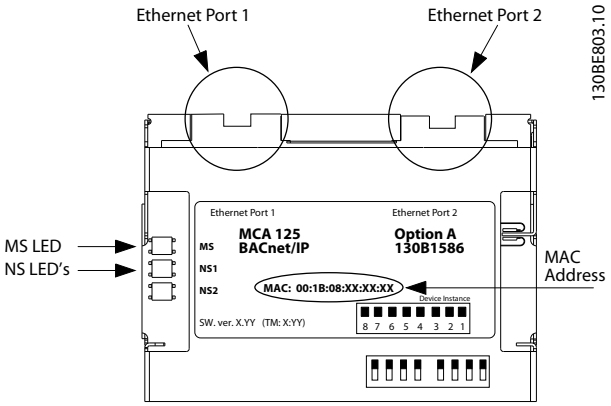

Illustration 7.1 Overview of BACnet/IP Interface

LED label	Description
MS	Module status. Reflects the activity on the BACnet/IP stack.
NS1	Network status 1. Reflects the activity on Ethernet port 1.
NS2	Network status 2. Reflects the activity on Ethernet port 2.

Table 7.1 LED Label

State	LED		Description
Power up	Red/ green:	Solid red/green	The device is powering up.
Running	Green:	Flashing green	No IP address is configured.
	Green:	Solid green	The link is OK and the IP address is configured.
	Red:	Flashing red	Fault: • IP address conflict • Device ID error
	Red:	Solid red	Alarm

Table 7.2 MS: Module Status

State	LED		Description
Power up	Red/ green:	Solid red/green	The device is powering up (after MS LED).
Running	Green:	Flashing green	No IP address is configured.
	Green:	Solid green	The link is active and the IP address is configured.
	Red:	Solid red	The IP address assigned to the device is already in use.
	Off	Off	There is no link or the link has been removed after valid IP address has been entered.

Table 7.3 NS1+NS2: Network Status (1 per Port)

7.1.2 No Communication with the Frequency Converter

Check: Link status
The status of the Ethernet link can be directly identified using the LEDs when no BACnet connection is established.
Use *parameter 12-10 Link Status* to verify presence of the link.
Use *parameter 12-11 Link Duration* to verify that the link is steadily present.
The parameter shows the duration of the present link and is preset to 00:00:00:00 when the link is broken.

Check: Cabling
In rare cases of cabling misconfiguration, the option may show the presence of a link but no communication is running. Exchange the cable if in doubt.

Check: IP address
Verify that the option has a valid IP address (refer to *parameter 12-01 IP Address*). When the option has identified a duplicate IP address, NS LEDs are steady red. When the option is set up for BOOTP or DHCP, verify that a BOOTP or DHCP server is connected in *parameter 12-04 DHCP Server*. If no server is connected, the parameter shows: 000.000.000.000.

8 Appendix

8.1 BIBBs

Category	Description	B-AAC
Data sharing	Data sharing read property	DS-RP-B
	Data sharing read property multiple	DS-RPM-A,B
	Data sharing write property	DS-WP-B
	Data sharing write property multiple	DS-WPM-B
	Data sharing - COV-B[1)]	DS-COV-B
Alarm and event management	Alarm enrolment acknowledge	AE-ACK-B
	Alarm and event information	AE-INFO-B
	Alarm and event - alarm summary-B[1)]	AE-ASUM-B
Scheduling	Scheduling - Advanced view and modify	SHED-I-B
Trending	Trending - Viewing and modifying trend internal-B[1)]	T-VMT-I-B
Device and network management	Device management - Dynamic device binding B[1)]	DM-DDB-B
	Device management - Dynamic device binding A[2)]	DM-DDB-A
	Device management - List manipulation-B[1)]	DM-LM-B
	Device management - Dynamic object binding	DM-DOB-B
	Device management - Device communication control	DM-DCC-B
	Device management - UTC time synchronization	DM-UTC-B
	Device management - Reinitialize device	DM-RD-B

Table 8.1 Descriptions of BIBBs

1) B = Server

2) A = Client

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