VACON® 100 INDUSTRIAL
VACON® 100 FLOW
VACON® 100 X
AC DRIVES

INTEGRATED PROFINET IO
INSTALLATION MANUAL

VACON®

Table of contents

1. Safety

This manual contains clearly marked cautions and warnings that are intended for your personal safety and to avoid any unintentional damage to the product or connected appliances.

Read the information included in cautions and warnings carefully.

The cautions and warnings are marked as follows:

Table 1. Warning signs

	= DANGER! Dangerous voltage
	= WARNING or CAUTION
	= Caution! Hot surface

1.1 Danger

	The **components of the power unit are live** when the drive is connected to mains potential. Coming into contact with this voltage is **extremely dangerous** and may cause death or severe injury.
	The **motor terminals U, V, W and the brake resistor terminals are live** when the AC drive is connected to mains, even if the motor is not running.
	After disconnecting the AC drive from the mains, **wait** until the indicators on the keypad go out (if no keypad is attached, see the indicators on the cover). Wait 5 more minutes before doing any work on the connections of the drive. Do not open the cover before this time has expired. After expiration of this time, use a measuring equipment to absolutely ensure that no voltage is present. **Always ensure absence of voltage before starting any electrical work!**
	The control I/O-terminals are isolated from the mains potential. However, the **relay outputs and other I/O-terminals may have a dangerous control voltage** present even when the AC drive is disconnected from mains.
	Before connecting the AC drive to mains make sure that the front and cable covers of the drive are closed.
	During a ramp stop (see the Application Manual), the motor is still generating voltage to the drive. Therefore, do not touch the components of the AC drive before the motor has completely stopped. Wait until the indicators on the keypad go out (if no keypad is attached, see the indicators on the cover). Wait additional 5 minutes before starting any work on the drive.

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/

1.2   Warnings

⚠️	The AC drive is meant for **fixed installations only**.
⚠️	**Do not perform any measurements** when the AC drive is connected to the mains.
⚠️	The **earth leakage current** of the AC drives exceeds 3.5mA AC. According to standard EN61800-5-1, **a reinforced protective ground connection** must be ensured. See Chapter 1.3.
⚠️	If the AC drive is used as a part of a machine, the **machine manufacturer is responsible** for providing the machine with a **supply disconnecting device** (EN 60204-1).
⚠️	Only **spare parts** delivered by VACON® can be used.
⚠️	At power-up, power break or fault reset **the motor will start immediately** if the start signal is active, unless the pulse control for Start/Stop logic has been selected. Furthermore, the I/O functionalities (including start inputs) may change if parameters, applications or software are changed. Disconnect, therefore, the motor if an unexpected start can cause danger.
⚠️	The **motor starts automatically** after automatic fault reset if the auto restart function is activated. See the Application Manual for more detailed information.
⚠️	**Prior to measurements on the motor or the motor cable**, disconnect the motor cable from the AC drive.
⚠️	**Do not touch the components on the circuit boards**. Static voltage discharge may damage the components.
⚠️	Check that the **EMC level** of the AC drive corresponds to the requirements of your supply network.

1.3   Earthing and earth fault protection

⚠ **CAUTION!**

The AC drive must always be earthed with an earthing conductor connected to the earthing terminal marked with ⏚.

The earth leakage current of the drive exceeds 3.5mA AC. According to EN61800-5-1, one or more of the following conditions for the associated protective circuit must be satisfied:

a)   The protective conductor must have a cross-sectional area of at least 10 mm2 Cu or 16 mm2 Al, through its total run.

b)   Where the protective conductor has a cross-sectional area of less than 10 mm2 Cu or 16 mm2 Al, a second protective conductor of at least the same cross-sectional area must be provided up to a point where the protective conductor has a cross-sectional area not less than 10 mm2 Cu or 16 mm2 Al.

c)   Automatic disconnection of the supply in case of loss of continuity of the protective conductor.

The cross-sectional area of every protective earthing conductor which does not form part of the supply cable or cable enclosure must, in any case, be not less than:

-   2.5mm² if mechanical protection is provided or
-   4mm² if mechanical protection is not provided.

The earth fault protection inside the AC drive protects only the drive itself against earth faults in the motor or the motor cable. It is not intended for personal safety.

Due to the high capacitive currents present in the AC drive, fault current protective switches may not function properly.

⚠   **Do not perform any voltage withstand tests** on any part of the AC drive. There is a certain procedure according to which the tests must be performed. Ignoring this procedure can cause damage to the product.

NOTE! You can download the English and French product manuals with applicable safety, warning and caution information from http://drives.danfoss.com/knowledge-center/technical-documentation/.

REMARQUE Vous pouvez télécharger les versions anglaise et française des manuels produit contenant l'ensemble des informations de sécurité, avertissements et mises en garde applicables sur le site http://drives.danfoss.com/knowledge-center/technical-documentation/.

2.   PROFINET IO – general info

PROFINET IO defines the communication with decentrally connected peripheral devices.

It defines the entire data exchange between IO-controllers (devices with "master functionality") and the IO-devices (devices with "slave functionality"), as well as parameter setting and diagnosis. PROFINET IO is designed for the fast data exchange between Ethernet-based field devices and follows the provider-consumer model.

2.1   PROFINET IO protocol

Table 2.

Connections and communications	Interface	100BaseTX, IEEE 802.3 compatible
	Data transfer method	Ethernet half/full -duplex
	Data transfer speed	10/100 MBit/s, autosensing
	Protocol	PROFINET IO
	Connector	Shielded RJ45 connector
	Cable type	CAT5e STP
	Default IP	Selectable: Fixed or DHCP

Table 3. Abbreviations and their explanations

Abbreviation	Explanation
STW1	Steuerwort 1 (German for control word 1)
ZSW1	Zustandwort 1 (German for status word 1)
PDO	Process data out
PDI	Process data in
PNU	Parameter number
NSOLL	Sollwert (German for reference value)
NIST	Istwert (German for actual value)

2.2   Connections and wiring

The VACON®100 supports 10/100Mb speeds in both Full- and Half-duplex modes. However, real-time process control requires the Full-duplex mode and the 100-megabit speed. Drives must be connected to the Ethernet network with a Shielded Twisted Pair (STP) CAT-5e cable (or better). Use only industrial standard components in the network and avoid complex structures to minimize the length of response time and the amount of incorrect dispatches.

2.3   ACD (Address Conflict Detection) in Ethernet networks.

The VACON®100 implements ACD algorithm (IETF RFC 5227).

The ACD algorithm tries to actively detect if the IP address configured to this device is been used by another device in the same network. To accomplish this, ACD sends four ARP request packets when the device's Ethernet interface goes up or when its IP address changes. ACD prevents the use of the Ethernet interface until the ARP probing finishes. This delays the startup of fieldbus protocols about one second.

During the delay or after it, the ACD passively checks incoming ARP messages for use of the device's IP address. If another device with the same IP address is detected, the ACD will try to defend its IP address with a single ARP message. If the other device with the same IP address also supports ACD, it should stop using the address. If not, the ACD will close the Ethernet connection and indicate the situation with an Alarm. This is done according the "DefendWithPolicyB".

Acknowledging of the Alarm is not possible if the problem is active. ACD opens Ethernet connection if the other device with the same IP address disappears from the network. Alarm can be acknowledged after this. Other policies are not supported. If the fieldbus protocol has been active, a fieldbus fault may be activated (depends on the fieldbus and drive application configuration).

If IP settings are set via Profinet IO DCP messages, then ACD will be disabled until drive is restarted. This is done because some PLCs expect to be able to connect to drive immediately after setting IP settings. ACD causes a few second delay before that is possible. After connecting failure, the PLC usually waits twenty seconds or more before trying again. This then means that getting successful connection takes more than twenty seconds and will cause unnecessary delay for process control.

3.   PROFINET IO INSTALLATION

3.1   Installation in VACON® 100

1	Open the cover of the AC drive.

⚡	The relay outputs and other I/O-terminals may have a dangerous control voltage present even when the AC drive is disconnected from mains.

M4x55

9174.emf
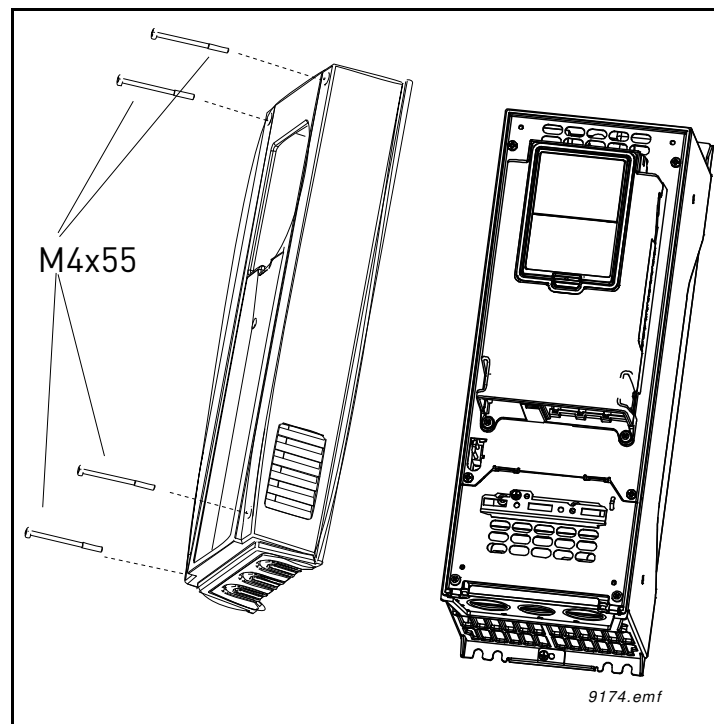
Figure 1.

2	Locate the components that you will need on the AC drive to connect and run the Ethernet cables.

⚠	**Be sure not to** plug the Ethernet cable to the terminal under the keypad! This can harm your personal computer.

3	Connect the Ethernet cable to its terminal and run the cable through the conduit as shown in Figure 2.

Ethernet cable

9316.emf
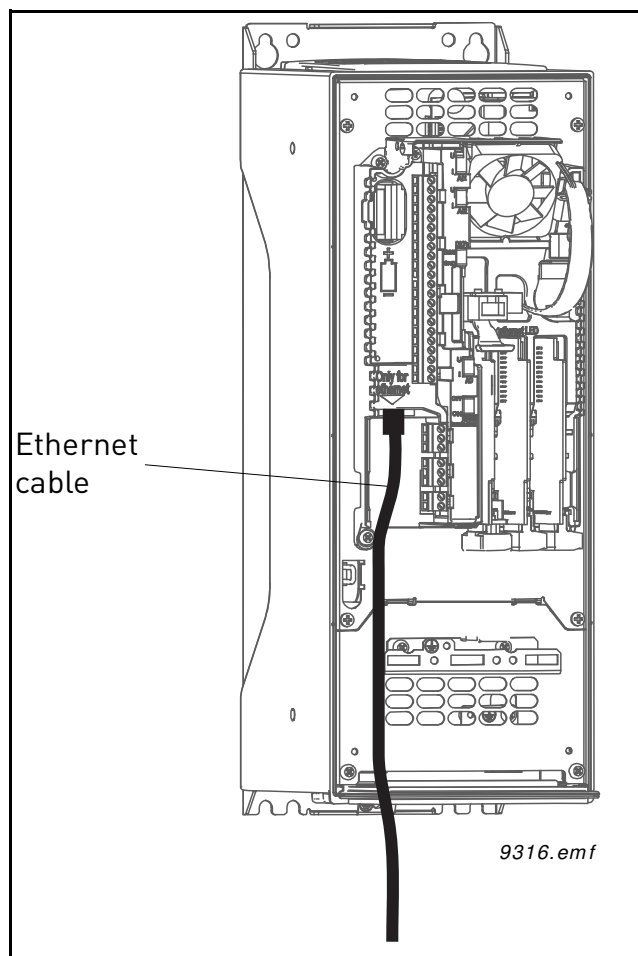
Figure 2.

| 4 | **Protection class IP21:** Cut free the opening on the AC drive cover for the Ethernet cable.
Protection class IP54: Cut the rubber grommets open to slide the cables through. If the grommets fold in while you are inserting the cable, draw the cable back a bit to straighten the grommets up. Do not cut the grommet openings wider than what is necessary for the cables you are using.
NOTE! To meet the requirements of the enclosure class IP54, the connection between the grommet and the cable must be tight. Therefore, lead the first bit of the cable out of the grommet **straight** before letting it bend. If this is not possible, the tightness of the connection must be ensured with insulation tape or a cable tie. |
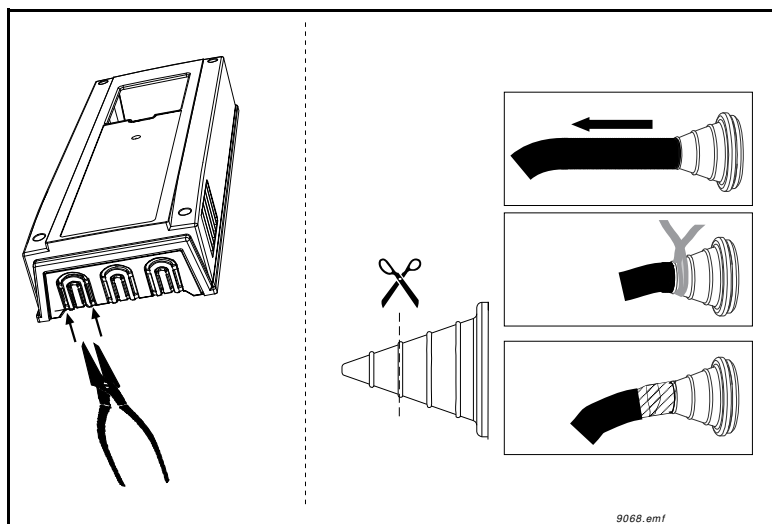
Figure 3. Leading the cables. Left: IP21, right: IP54.

5	Put the coverof the AC drive back. **NOTE!** When you are planning the cable runs, remember to keep the distance between the Ethernet cable and the motor cable at a **minimum of 30 cm**.

Ethernet cable

Figure 4.

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
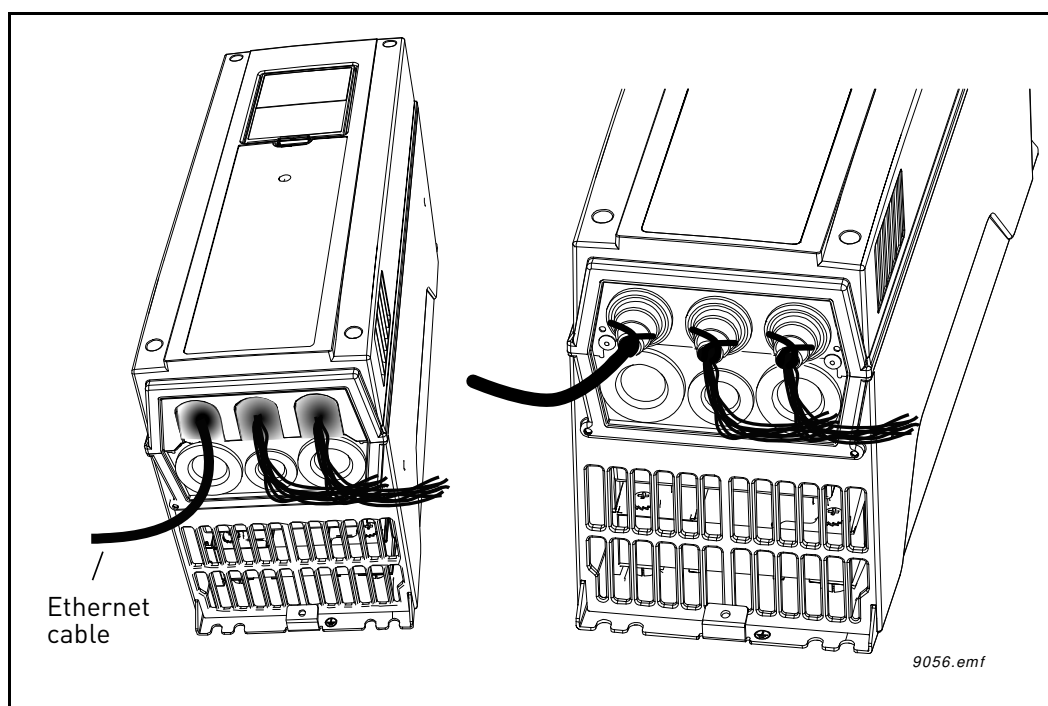
3.2   Installation in VACON® 100 X

The AC drive can be connected to fieldbus either through RS485 or Ethernet. The connection for Ethernet is left to the control terminals.

Ethernet connection

11752_uk
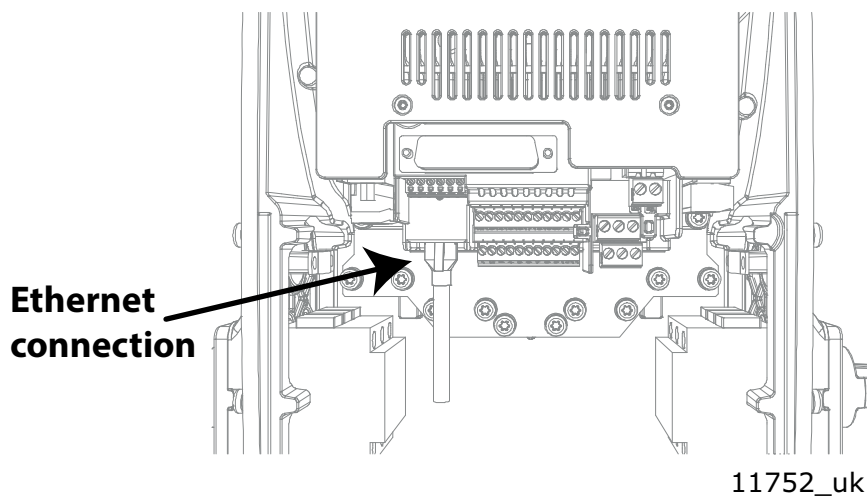
Figure 5.

3.2.1   Prepare for use through Ethernet

1	Connect the Ethernet cable (see specification in) to its terminal and run the cable through the conduit plate.

2	Remount the powerhead. **NOTE:** When planning the cable runs, remember to keep the distance between the Ethernet cable and the motor cable at a minimum of 30 cm.

For more detailed information, see the user's manual of the fieldbus you are using.

4.   FIELDBUS PARAMETERIZATION

The following chapter describes briefly how to parameterise the AC drive in order for the motor to be controllable via fieldbus. These instructions are written for basic applications. For more information, consult the application-specific manual.

In order for the AC drive to accept commands from the fieldbus network, the control place of the AC drive has to be set to fieldbus. The default value of the parameter "Control Place" is usually I/O. Note that if the control unit firmware is updated, the default settings are restored. In addition, some applications may have the remote speed reference selection set by default to other than fieldbus. In these cases, the speed reference selection must be set to fieldbus, in order for the speed reference to be controlled via fieldbus.

NOTE! The motor control mode should be selected to support the used process and profile.

The navigation path to the fieldbus parameters may differ from application to application. The exemplary paths below apply to the VACON$^{®}$ 100 AC drive.

Basic information on how to use the control keypad you will find in the VACON$^{®}$ 100 INDUSTRIAL Application Manual.

4.1   FIELDBUS CONTROL AND BASIC REFERENCE SELECTION

The following tables list some of the parameters related to fieldbus control in case of VACON$^{®}$ applications for the VACON$^{®}$ 100 Family AC drives. See the application specific manuals for more detailed information.

Parameters can be read and written by using the drive panel, PC Tool or fieldbus protocol. See chapter 5.4.8 for reading and writing application parameters over PROFINET IO. Notice that some of connections parameters for fieldbus may need to be set (depending on your configuration) via panel or PC tool, before you can connect over fieldbus and write application parameters.

Table 4. Parametrization for Vacon$^{®}$ 100 (standard application)

Parameter name	ID	Value	Default	Panel Tree
Control mode	600	0 = Frequency 1 = Speed 2 = Torque	0	P 3.1.2.1
Remote control place	172	1 = Fieldbus CTRL	0	P 3.2.1
Local / remote	211	0 = Remote	0	P 3.2.2
Fieldbus ref. sel.	122	3 = Fieldbus	0	P 3.3.1.10

4.1.1   TORQUE CONTROL PARAMETRIZATION

Some extra parametrisation has to be made in order to control the frequency control with torque control. The following instructions are for the VACON$^{®}$100, see the application specific manual for more detailed information.

- Motor control mode (ID 600) should be configured to "Torque control" (2).

To configure the drive to use correct torque reference, select the parameter "Torque Reference Selection" to ProcessDataIn1 (9). This can be done with: PC-tool or panel in panel tree: P 3.3.2.1, ID 64.

4.2   PROFINET IO parameters and monitoring values

The integrated PROFINET IO protocol in the VACON® 100 drive must be selected when ordering the drive. If the drive is not equipped with the integrated PROFINET IO protocol, the PROFINET IO menus do not appear, and the protocol cannot be used.

Settings for PROFINET IO can be found under "I/O and Hardware / Ethernet / PROFINET IO". PRO-FINET IO has two menus, one for parameters and one for monitoring. If the protocol is disabled, the monitoring menu is not shown on the panel.

Table 5. PROFINET parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P5.9.5.1.1	Protocol in use	0 = Dis-abled	1 = Enabled	-	0 = Dis-abled	2434	0 = Not in use 1 = PROFINET enabled. The parameter is locked for editing when the drive is in RUN state.
P5.9.5.1.2	Communication time-out	0	65535	s	10	2435	0 = The time-out is defined by Master. (= Watchdog time).
P5.9.5.1.3	Name Of Station	0	240	chars	Drive spe-cific	2597	Visible only in VACON® Live. See Chapter 4.2.1.

Table 6. PROFINET monitoring values

Code	Parameter	Min	Max	Unit	Default	ID	Description
P5.9.5.2.1	Name of station	-	-	-	-	2436	A value used to uniquely identify the device on the network. This monitoring value is normally not visible but appears when a PROFINET IO connection is established.
P5.9.5.2.2	Fieldbus protocol status	1	3	-	-	2437	1 = Initializing (only before first connection) 2 = Stopped 3 = Operational 4 = Faulted
P5.9.5.2.3	Communication status	0	999	-	0	2438	0-99 Number of messages with errors. 0-999 Number of messages without communication errors.
P5.9.5.2.4	Setpoint telegram	1	4	-	1	2439	Telegram used in the setpoint direction. 1 = Vendor-specific 1 2 = Vendor-specific 2 3 = Vendor-specific 3 4 = Vendor-specific 4
P5.9.5.2.5	Actual value telegram	1	4	-	1	2440	Telegram used in the actual value direction. 1 = Vendor-specific 1 2 = Vendor-specific 2 3 = Vendor-specific 3 4 = Vendor-specific 4

Table 6. PROFINET monitoring values

Code	Parameter	Min	Max	Unit	Default	ID	Description
P5.9.5.2.6	Number of process data	0	8	-	0	2441	The number of additional process data fields selected for communication.
P5.9.5.2.7	Drive control word	0	FFFFFFFFh	hex	0	2442	The latest control word (vendor-specific format) received from the drive application. (Can be used for debugging purposes.)
P5.9.5.2.8	Drive status word	0	FFFFFFFFh	hex	0	2443	The latest status word (vendor-specific format) received from the drive application. (Can be used for debugging purposes.)
P5.9.5.2.9	Connection time-outs	0	65535_d	-	0	2444	The number of connection timeouts that have occurred in the PROFINET IO protocol.
P5.9.5.2.10	Parameter access	0	99999_d	-	0	2445	The number of parameter accesses received by the device.
P5.9.5.2.11	Profile control word	0	FFFFFFFFh	hex	0	2595	STW1 sent by master. Not updated when vendor specific control word is used.
P5.9.5.2.12	Profile status word	0	FFFFFFFFh	hex	0	2596	ZSW1 sent to master. Not updated when vendor specific control word is used.

4.2.1 Name of Station

The Profinet IO "Name of Station" parameter can be set via VACON® Live. Other possibility is to set this name by writing it via Ethernet with the DCP protocol. The name is empty if no name is set, or if name is set as "temporary" by network device.

4.2.2 Communication timeout

The Communication timeout defines how much time can pass from the last received message from the Master Device before a fieldbus fault is generated. This value is considered as an additional timeout which works on top of the timeout mechanism of the PROFINET IO protocol. When a connection loss is noticed, fault activation is started. If communication timeout value is zero, the fault is activated immediately, otherwise the fault activates after a specified time. If the connection is re-opened before the specified time has elapsed, no fault is created.

See Chapter 5.5.

4.3 Ethernet common settings

Usually in PROFINET IO network the PLC will set IP settings of the drive automatically when it tries to connect to it. User only needs to set Profinet IO "Name Of Station" value which will used to identify the drive in PLC program.

Table 7. Common Ethernet Settings

Panel Tree	Parameter	Range	Default	ID	Description
P5.9.1.1	IP address mode	Fixed (1), DHCP(2)	DHCP (2)	2482	IP Mode
P5.9.1.2	Duplicate IP Detection	Disabled (0), Enabled (1)	enabled	2569	When disabled drive does not check for or react to address conflict situation.
P5.9.1.3.1	IP address	1.0.0.0 - 223.255.255.255	192.168.0.10	2529	Fixed IP address
P5.9.1.3.2	Subnet mask	0.0.0.0- 255.255.255.255	255.255.0.0	2530	Fixed Subnet mask
P5.9.1.3.3	Default gateway	0.0.0.0- 255.255.255.255	192.168.0.1	2531	Fixed default gateway
P5.9.1.4	Active IP address	-	-	2483	Shows current active IP address. It is same as fixed value if IP mode is "Fixed".
P5.9.1.5	Active subnet mask	-	-	2484	Shows current active subnet mask. It is same as fixed value if IP mode is "Fixed".
P5.9.1.6	Active default gateway	-	-	2485	Shows current active default gateway. It is same as fixed value if IP mode is "Fixed".
P5.9.1.7	MAC address	-	-	2486	Drive MAC address

4.3.1   IP ADDRESS MODE

The IP mode determines how the drive IP settings are set. If a DHCP server is selected, then the drive will try to retrieve its IP settings from the DHCP server connected to the local network. If the drive is unable to retrieve its IP settings, it will set a link-local address as the current IP address after about one minute (for example 169.x.x.x).

If "Fixed IP" is set as IP mode, the settings from submenu "Fixed IP settings" are used.

In PROFINET network IP settings are usually set by the PLC via DCP protocol during connection process. When this is happens, IP mode is set to fixed and given settings are stored to "Fixed IP settings".

4.3.2   ACTIVE IP ADDRESS, SUBNET MASK AND DEFAULT GATEWAY

This value cannot be changed. If IP mode is "fixed" then it will display same value as in Fixed IP address. If mode is "DHCP", the value is 0.0.0.0 when DHCP is retrieving IP settings or 169.x.x.x if it could not retrieve an address. Otherwise it shows currently active IP address.

Exception to above is that if IP settings were set from PLC via DCP protocol and PLC set the settings with flag "temporary", then IP settings are reset during drive startup to "0.0.0.0" and IP mode is still "Fixed".

4.3.3   MAC ADDRESS

The MAC address of the control board. MAC address (Media Access Control) is a unique address given to each network host. It is not editable.

5.   PROFINET IO PROTOCOL

PROFINET is the Ethernet-based automation standard of PROFIBUS International for the implementation of an integrated and consistent automation solution based on Industrial Ethernet. PROFINET supports the integration of simple distributed field devices and time-critical applications in (switched) Ethernet communication, as well as the integration of component-based distributed automation systems for vertical and horizontal integration of networks.

The VACON® 100 AC drive implements PROFINET IO version 2.3 with conformance class B and the netload class I, making it suitable for use in larger automation systems.

5.1   PROFIdrive 4.1 profile

To provide interoperability between devices from different manufacturers, a "standard" must be defined so that:

- The devices behave in the same way.
- They produce and/or consume the same basic set of I/O data.
- They contain the same basic set of configurable attributes.

The formal definition of this information is known as a device profile.

5.2   PROFIdrive 4.1 state machine

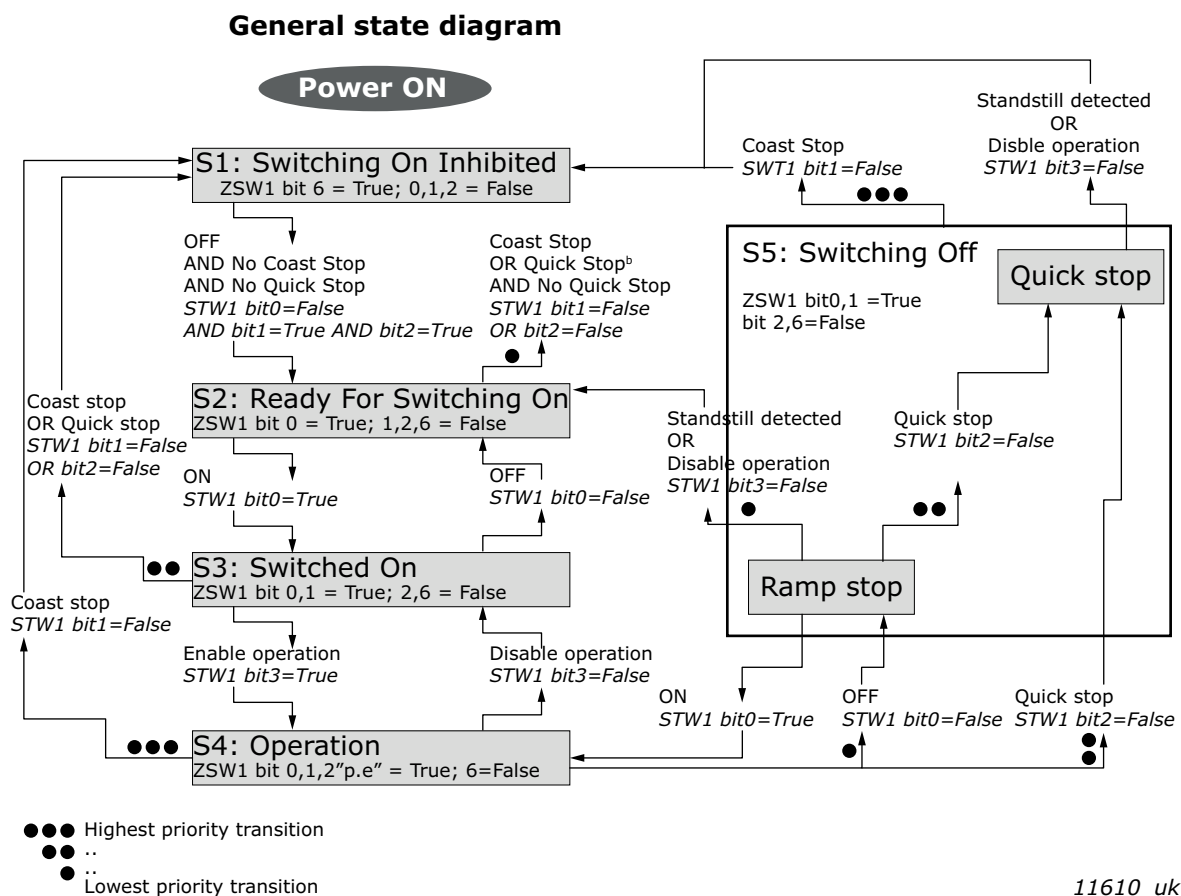STW1 (Control Word) and ZSW1 (Status Word) follow the state machine presented below:

Figure 6. General state diagram

5.3   PROFINET IO process communication

The PROFIdrive profile specifies telegrams used for process communication. The VACON® 100 AC drive supports four types of different telegrams with and without extra process data items. These telegrams contain either PROFIdrive or VACON® specific signals or a combination of both.

The following chapters describe the different types of telegrams and the signals that form them.

5.3.1   Telegram types

The telegrams defined in the chapters below use different combinations of control and reference values. Control and status word can be either VACON® specific or defined in PROFIDrive standard. Speed reference and actual values can use different scaling.

Please check details of telegrams before taking them in use.

5.3.1.1   Standard Telegram 1 and variants

Standard Telegram 1 types are used, when a standard VACON® application is used and PROFIdrive functionality is required. These telegrams (table below) use PROFIdrive-defined control word, status word, speed setpoint value and speed actual value. When using these telegrams, the process data fields are communicated as 16-bit values. STW1 will force edge sensitive run control.

Table 8. Standard Telegram 1 and variants

Telegram No.	Telegram	Abbreviation
1	Standard Telegram 1	ST1
102	Standard Telegram 1 + 1 Process Data	ST1 + 1 PD
103	Standard Telegram 1 + 2 Process Data	ST1 + 2 PD
104	Standard Telegram 1 + 3 Process Data	ST1 + 3 PD
100	Standard Telegram 1 + 4 Process Data	ST1 + 4 PD
105	Standard Telegram 1 + 5 Process Data	ST1 + 5 PD
106	Standard Telegram 1 + 6 Process Data	ST1 + 6 PD
107	Standard Telegram 1 + 7 Process Data	ST1 + 7 PD
101	Standard Telegram 1 + 8 Process Data	ST1 + 8 PD

Table 9. Standard Telegram 1 setpoint and actual data

Bytes	Setpoint		Actual value	
1...2	STW1	5.3.2.1	ZSW1	5.3.2.2
3...4	NSOLL_A	5.3.2.3	NIST_A	5.3.2.4
5...6	PDI1		PDO1	
7...8	PDI2	5.3.2.11	PDO2	5.3.2.11
...	...		...	
19...20	PDI8		PDO8	

5.3.1.2   <u>VACON®-specific Telegram 1 and its variants</u>

These telegrams (table below) use VACON® defined control word, status word, speed setpoint value and speed actual value to directly access the AC drive application. When using these telegrams, the process data fields are communicated as 16-bit values.

Table 10. Vendor telegram 1 and variants

Telegram No.	Telegram	Abbreviation
108	Vendor Telegram 1	Vendor 1
109	Vendor Telegram 1 + 1 Process Data	Vendor 1 + 1 PD
110	Vendor Telegram 1 + 2 Process Data	Vendor 1 + 2 PD
111	Vendor Telegram 1 + 3 Process Data	Vendor 1 + 3 PD
112	Vendor Telegram 1 + 4 Process Data	Vendor 1 + 4 PD
113	Vendor Telegram 1 + 5 Process Data	Vendor 1 + 5 PD
114	Vendor Telegram 1 + 6 Process Data	Vendor 1 + 6 PD
115	Vendor Telegram 1 + 7 Process Data	Vendor 1 + 7 PD
116	Vendor Telegram 1 + 8 Process Data	Vendor 1 + 8 PD

Table 11. Vendor telegram 1 setpoint and actual data

Bytes	Setpoint		Actual value	
1...2	FB FIXED CW	5.3.2.5	FB FIXED SW	5.3.2.6
3...4	FB SPEED REF	5.3.2.9	FB SPEED ACT	5.3.2.10
5...6	PDI1		PDO1	
7...8	PDI2	5.3.2.11	PDO2	5.3.2.11
...	...		....	
19...20	PDI8		PDO8	

5.3.1.3   <u>*VACON®-specific Telegram 2 and its variants*</u>

These telegrams (table below) use VACON® defined control word, status word, speed setpoint value and speed actual value to directly access the AC drive application. The difference to vendor telegram 1 types are the added general control and status words.

Table 12. Vendor telegram 2 and variants

Telegram No.	Telegram	Abbreviation
117	Vendor Telegram 2	Vendor 2
118	Vendor Telegram 2 + 1 Process Data	Vendor 2 + 1 PD
119	Vendor Telegram 2 + 2 Process Data	Vendor 2 + 2 PD
120	Vendor Telegram 2 + 3 Process Data	Vendor 2 + 3 PD
121	Vendor Telegram 2 + 4 Process Data	Vendor 2 + 4 PD
122	Vendor Telegram 2 + 5 Process Data	Vendor 2 + 5 PD
123	Vendor Telegram 2 + 6 Process Data	Vendor 2 + 6 PD
124	Vendor Telegram 2 + 7 Process Data	Vendor 2 + 7 PD
125	Vendor Telegram 2 + 8 Process Data	Vendor 2 + 8 PD

Table 13. Vendor telegram 2 setpoint and actual data

Bytes	Setpoint		Actual value	
1...2	FB FIXED CW	5.3.2.5	FB FIXED SW	5.3.2.6
3...4	FB GENERAL CW	5.3.2.7	FB GENERAL SW	5.3.2.8
5...6	FB SPEED REF	5.3.2.9	FB SPEED ACT	5.3.2.10
7...10	PDI1		PDO1	
11...14	PDI2	5.3.2.11	PDO2	5.3.2.11
...	...		...	
35...38	PDI8		PDO8	

5.3.1.4   VACON®-specific Telegram 3 and its variants

These telegrams (table below) use PROFIdrive-defined control word, status word, speed setpoint value and thus the ProfiDrive state machine, with VACON® general control and status words for added functionality. STW1 will force edge sensitive run control.

Table 14. Vendor telegram 3 and variants

Telegram No.	Telegram	Abbreviation
126	Vendor Telegram 3	Vendor 3
127	Vendor Telegram 3 + 1 Process Data	Vendor 3 + 1 PD
128	Vendor Telegram 3 + 2 Process Data	Vendor 3 + 2 PD
129	Vendor Telegram 3 + 3 Process Data	Vendor 3 + 3 PD
130	Vendor Telegram 3 + 4 Process Data	Vendor 3 + 4 PD
131	Vendor Telegram 3 + 5 Process Data	Vendor 3 + 5 PD
132	Vendor Telegram 3 + 6 Process Data	Vendor 3 + 6 PD
133	Vendor Telegram 3 + 7 Process Data	Vendor 3 + 7 PD
134	Vendor Telegram 3 + 8 Process Data	Vendor 3 + 8 PD

Table 15. Vendor telegram 3 setpoint and actual data

Bytes	Setpoint		Actual value	
1...2	STW1	5.3.2.1	ZSW1	5.3.2.2
3...4	FB GENERAL CW	5.3.2.7	FB GENERAL SW	5.3.2.8
5...6	NSOLL_A	5.3.2.3	NIST_A	5.3.2.4
7...10	PDI1		PDO1	
11...14	PDI2	5.3.2.11	PDO2	5.3.2.11
...	...		...	
35...38	PDI8		PDO8	

5.3.1.5   VACON®-specific Telegram 4 and its variants

Use these telegram types (table below) as a replacement for the OPT-CP option board, when using "Bypass mode".

Table 16. Vendor telegram 4 and variants

Telegram No.	Telegram	Abbreviation
135	Vendor Telegram 4	Vendor 4
136	Vendor Telegram 4 + 4 Process Data	Vendor 4 + 4 PD
137	Vendor Telegram 4 + 8 Process Data	Vendor 4 + 8 PD

Table 17. Vendor telegram 4 setpoint and actual data

Bytes	Setpoint		Actual value	
1...2	FB FIXED CW	5.3.2.5	FB GENERAL SW	5.3.2.8
3...4	FB SPEED REF	5.3.2.9	FB SPEED ACT	5.3.2.10
5...6	PDI1		PDO1	
7...8	PDI2	5.3.2.11	PDO2	5.3.2.11
...	...		...	
19...20	PDI8		PDO8	

5.3.2   Telegram building blocks

5.3.2.1   PROFIdrive Control Word 1 (STW1)

The following table lists the assignments of bits in the control word 1.

Table 18. Overview of the assignments of bits of the control word 1

Bit	Significance	
	Bit value is 1	Bit value is 0
0	ON	OFF
1	No Coast Stop (no OFF2)	Coast Stop (OFF2)
2	No Quick Stop (no OFF3)	Quick Stop (OFF3)
3	Enable Operation	Disable Operation
4	Enable Ramp Generator	Reset Ramp Generator
5	Unfreeze Ramp Generator	Freeze Ramp Generator
6	Enable Setpoint	Disable Set Point
7	Fault Acknowledge (0 -> 1)	
8	Not used	
9	Not used	
10*	Control by PLC	No control by PLC
11	Device-specific	Device-specific
12-15	Device-specific	Device-specific

*Bits in a control word do not have any effect unless bit 10 is enabled.

Bit 0: Switching ON / OFF

This bit is used in combination with other bits to enable operation of the drive. When this bit is set to 0 during operation, the drive performs a ramp stop.

Bit 1: Coast stop command

This bit is used to request a coast stop to be executed. When it is set to 0 during operation, the drive performs a coast stop.

Bit 2: Quick stop command

This bit is used to request a quick stop to be executed. When it is set to 0 during operation, the drive quickly ramps down to zero speed and stops.

Bit 3: Enabling of operation

This bit is used in combination with other bits to enable operation of the drive. When it is set to 0 during operation, the drive performs a coast stop.

Bit 4: Enabling of ramp generator

This bit is used in combination with other bits to enable operation of the drive. When it is set to 0 during operation, the drive quickly decelerates to zero speed.

Bit 5: Freezing of ramp generator

This bit can be used to freeze the setpoint value used by the drive. The value is frozen if this bit is set to 0. If the bit is 1, the setpoint value provided by the master is continuously updated.

Bit 6: Enabling of setpoint value

This bit can be used to disable the fieldbus setpoint value. If this bit is set to 0, the option board ignores the setpoint value by the master and instead uses a setpoint value of 0. During operation, if this bit is set to 0, the drive decelerates to a standstill.

Bit 7: Fault acknowledge

This bit is used to acknowledge faults in the drive. When a rising edge (0 -> 1) is seen in this bit by the option board, it requests the drive to acknowledge present faults. The functionality of this bit is rising-edge sensitive only.

Bit 10: Control by PLC

This bit is used by the master to indicate that it is in control of the slave and that the commands sent via fieldbus are valid.

During operation, this bit must be 1. If the drive is not operating and this bit is 0, the drive cannot be started.

If the drive is operating, and this bit becomes 0, the option board freezes the process data provided to the drive, and sets its state to FAULT. The drive reaction to this fieldbus fault depends on the drive parameterization.

5.3.2.2   PROFIdrive Status Word 1 (ZSW1)

The table below lists the assignments of the status word 1.

Table 19. Overview of the assignments of bits of the status word 1

Bit	Significance	
	Bit value is 1	Bit value is 0
0	Ready to Switch On	Not Ready To Switch On
1	Ready To Operate	Not Ready To Operate
2	Operation Enabled (drive follows set-point)	Operation Disabled
3	Fault Present	No Fault
4	Coast Stop Not Activated (No OFF2)	Coast Stop Activated (OFF2)
5	Quick Stop Not Activated (No OFF3)	Quick Stop Activated (OFF3)
6	Switching On Inhibited	Switching On Not Inhibited
7	Warning Present	No Warning
8	Speed Error Within Tolerance Range	Speed Error Out Of Tolerance Range
9	Control by PLC Requested	No Control by PLC Requested
10	f Or n Reached Or Exceeded	f Or n Not Reached
11	Device-specific	Device-specific
12	Drive running	Drive stopped
13	Drive is ready to go to running state	Drive is not ready

Bit 0: Readiness to switch on

This bit indicates whether the drive is ready to switch on the power electronics. When the bit has the value 0, the drive is not ready to switch on the power electronics. When the bit has the value 1, the drive is ready to switch on the power electronics.

Bit 1: Readiness to operate

This bit indicates whether the drive is ready to begin operation. When the bit has the value 0, the power electronics is switched off and the drive is unable to begin operation. When the bit has the value 1, the power electronics is switched on and the drive can begin operation if requested by the master.

Bit 2: State of operation

This bit indicates whether the drive is operating or not. When the bit has the value 0, the drive is not operating. When the bit has the value 1, the drive is operating.

Bit 3: Presence of fault

This bit indicates the presence of unacknowledged faults in the drive. When the bit has the value 0, no unacknowledged faults are present in the drive. When the bit has the value 1, at least one unacknowledged fault is present in the drive.

Bit 4: Coast stop activated

This bit indicates whether a coast stop command is active or not. When the bit has the value 0, a coast stop command is active. When the bit has the value 1, no coast stop command is active.

Bit 5: Quick stop activated

This bit indicates whether a quick stop command is active or not. When the bit has the value 0, a quick stop command is active. When the bit has the value 1, no quick stop command is active.

Bit 6: Switching on inhibition

This bit indicates whether the power electronics may be switched on or not. When the bit has the value 0, the power electronics may be switched on. When the bit has the value 1, the power electronics are prevented from switching on.

Bit 7: Presence of warning

This bit indicates the presence of warning/alarm information in the drive. When the bit has the value 0, no warning is present. When the bit has the value 1, a warning is present.

Bit 8: Running at setpoint

This bit indicates whether the drive is operating and the actual speed value matches the setpoint value. When the bit has the value 0, the actual speed value does not match the setpoint value. When the bit has the value 1, the actual speed value matches the setpoint value.

Bit 9: Request control by master

This bit indicates whether the fieldbus master should take control of the drive. When this bit has the value 0, the master does not take control of the drive. When this bit has the value 1, the master is requested to take control of the drive.

In VACON® 100, this bit depends on the configuration for the drive control place. If the control place is assigned to fieldbus, the bit has the value 1. If the control place is elsewhere, the bit has the value 0.

Bit 10: Setpoint reached or exceeded

This bit indicates whether the setpoint value has been reached or exceeded. When this bit has the value 0, the setpoint value has not been reached or exceeded. When this bit has the value 1, the setpoint value has been reached or exceeded.

Bit 12: Drive running

This bit indicates drive state. If bit is 1, the motor is running. If bit is zero, the motor has been stopped.

Bit 13: Drive ready

This bit indicates drive state. If bit is 1, the drive is ready for transition to running state.

5.3.2.3   PROFIdrive speed setpoint value NSOLL_A

Normalised 16-bit speed setpoint (containing a sign bit and a 15-bit integer).

- NSOLL_A = 0x4000 corresponds to 100% of the parameterized maximum motor speed.
- NSOLL_A = 0xC000 corresponds to -100% of the parameterized maximum motor speed.

5.3.2.4   PROFIdrive speed actual value NIST_A

Normalised 16-bit actual speed.

- NIST_A = 0x4000 corresponds to 100% of the parameterized maximum motor speed.
- NIST_A = 0xC000 corresponds to -100% of the parameterized maximum motor speed.

5.3.2.5   VACON® FBFixedControlWord

For details about vendor control word, see Chapter 12 "APPENDIX 2 - CONTROL AND STATUS WORD"

5.3.2.6   VACON®FBFixedStatusWord

For details about vendor status word, see Chapter 12 "APPENDIX 2 - CONTROL AND STATUS WORD".

5.3.2.7   VACON® FBGeneralControlWord

FB General Control Word is 16-bit in length and it is completely application-dependent.

5.3.2.8   VACON® FBGeneralStatusWord

FB General Status Word is 16-bit in length and it is completely application-dependent.

5.3.2.9   VACON® FBSpeedReference

The FBSpeedReference value is unsigned in the range 0...10000d (0...2710h). The value 0 corresponds to MinimumFrequency and the value 10000d corresponds to MaximumFrequency. Requested direction is indicated using bit 1 in the FBFixedControlWord.

5.3.2.10   VACON® FBSpeedActual

The FBActualSpeed value is unsigned in the range 0...10000d (0...2710h). The value 0 corresponds to MinimumFrequency and the value 10000d corresponds to MaximumFrequency. The direction is indicated using bit 2 in the FBFixedStatusWord.

5.3.2.11   VACON® Process Data

The Process Data variables are vendor-specific variables that can be communicated to and from the drive. There can be up to eight Process Data variables communicated in a single telegram. Values sent from the option board to the master are called ProcessDataOut variables, while the values sent from the master to the option board are called ProcessDataIn variables. The contents of the ProcessDataOut variables can be parameterised in the drive using a feature known as Fieldbus Process Data mapping. See the drive's Application Manual for further details.

5.3.3   QUICK SETUP

By following these instructions, you can easily and fast set up your Profinet IO for use:

In the AC drive application: Choose Fieldbus as the active control place (see the drive's User's Manual).

In the Master software:

1.Set the Control Word value to 0hex.

2.Set the Control Word value to 47Ehex.

3.Set the Control Word value to 47Fhex.

4.AC drive status is RUN.

5.Set the Reference value to '2000Hex' (=50.00%).

6.Actual speed is 2000Hex (25.00 Hz if MinFreq is 0.00 Hz and MaxFreq is 50.00 Hz)

7.Set the Control Word value to 47Ehex.

8.AC drive status is STOP.

5.4   PROFIdrive IO parameters

5.4.1   Parameters of the PROFIdrive

The table below lists the basic PROFIdrive parameters (continued on the next page).

Table 20. PROFIdrive basic parameters

PNU	Significance	Data type	Explanation
915	Selection switch for DO IO Data in the setpoint telegram	Array[n] Unsigned16	Describes the data in the setpoint telegram. The parameter is an array of signals' numbers that creates the setpoint telegram.
916	Selection switch for DO IO Data in the actual value telegram	Array[n] Unsigned16	Describes the data in the actual value telegram. The parameter is an array of signals' numbers that creates the actual value telegram.
922	Telegram selection	Unsigned16	Currently selected standard telegram is read. It returns for example 1 for ST1. See chapter 5.3.1.1., chapter 5.3.1.2, chapter 5.3.1.3, chapter 5.3.1.4 for possible values.
923	List of all parameters for signals	Array[n] Unsigned16	The parameter is an array. The index of the array indicates for a signal number and its value for corresponding parameter number. Not supported standard signals, those in range 1-99, have values set to 0. Gaps between the device-specific signals are also filled with 0. Refer to Table 23.
930	Operating mode	Unsigned16	1 = Speed control mode
944	Fault message counter	Unsigned16	The fault message counter is incremented each time that the fault buffer changes. This means that it is guaranteed that the fault buffer is consistently read-out. Without this parameter, it is not guaranteed that the fault buffer does not change while reading-out.
947	Fault number	Array[n] Unsigned16	The parameter is an array of 8 elements. The first element indicates an active unacknowledged fault. The following elements contain acknowledged ones. The latest acknowledged fault number is at index 1 and oldest one at index 7.

Table 20. PROFIdrive basic parameters

PNU	Significance	Data type	Explanation
964	Drive Unit Identification	Array[n] Unsigned16	An array is structured in the following way (index meaning): 0 = Manufacturer code (0x01BA) 1 = Drive Unit Type (0x0002): 1 = VACON NX series, 2 = VACON 100 series, 3 = VACON 20 series 2 = Software version - XXYYd (XX - major revision, YY - minor revision) 3 = Firmware date (year) - YYYYd 4 = Firmware date (day/month) - DDMMd 5 = Number of Drive Objects (0x0001)
965	Profile identification number	OctetString2	Two bytes to identify the profile that is used. 1st - profile number; PROFIdrive (3d) 2nd - profile version number; 4.1 (41d)
975	DO identification	Array[n] Unsigned16	An array is structured in the following way (index meaning): 0 = Manufacturer code (0x01BA) 1 = Drive Unit Type (0x0003) 2 = Software version - XXYYd (XX - major revision, YY - minor revision) 3 = Firmware date (year) - YYYYd 4 = Firmware date (day/month) - DDMMd 5 = Drive Object Type Class - Axis (0x0001) 6 = Drive Object Sub-class 1 - Only Application Class 1 (0x0001) 7 = Drive Object ID (value 1)
980 - 989	Number list of defined parameter	Array[n] Unsigned16	980: This is a list of the parameter numbers of all the implemented parameters. The list does not contain the number 980-989. Parameters are listed in the ascending (growing) order. The end-of-list is indicated by the value 0. 981-989: Not used. Length of each is 1 and value is 0, indicating an empty list.

5.4.1.1   PROFIdrive parameters for PROFINET IO communication interface

The table below lists the PROFINET IO communication interface parameters.

Table 21. PROFIdrive parameters

PNU	Significance	Data type	Explanation
61000	NameOfStation	Octect-String[240] with-out null termination	Name of Station for the PROFINET IO Network Interface, which is related to this Drive Unit.
61001	IpOfStation	Unsigned32	IP Address of the Station for the PROFI-NET IO Network Interface.
61002	MacOfStation	OctetString [6]	MAC Address of the Station for the PRO-FINET IO Network Interface
61003	DefaultGatewayOfStation	Unsigned32	Default Gateway for the Station for the PROFINET IO Network Interface.
61004	SubnetMaskOfStation	Unsigned32	Subnet Mask of the Station for the PRO-FINET IO Network Interface.

5.4.2   Vendor-specific PROFIdrive parameters

The table below lists vendor-specific PROFIdrive parameters.

Table 22. PROFIdrive drive-specific parameters

PNU	Significance	Data type	Explanation
9900	Test parameter (non-array)	Unsigned16	For testing purposes. Does not affect the operation of the drive.
9901	Test parameter (array)	Array[n] Unsigned16	An array of 16 elements. Used only for testing purposes. Does not affect the operation of the drive.
10001	Drive parameter access	Array[n] Special case, data type depends from the sub index	A parameter used to access parameters from the drive application. You can do this by putting the desired drive parameter ID into the sub index field of the parameter request. See chapter 5.4.8
10100	Profile control word (STW1)	Unsigned16	PROFIdrive 4.1 control word (STW1).
10101	Profile speed setpoint value (NSOLL_A)	Integer16	PROFIdrive 4.1 speed setpoint value (NSOLL_A).
10102	Profile status word (ZSW1)	Unsigned16	PROFIdrive 4.1 status word (ZSW1).
10103	Profile speed actual value (NIST_A)	Integer16	PROFIdrive 4.1 speed actual value (NIST_A).
10109	VACON® 16-bit Process Data In	Array[n] Unsigned16	An array of 16 elements. From PDI1 (index 0) to PDI16 (index 15).
10110	VACON® 16-bit Process Data Out	Array[n] Unsigned16	An array of 16 elements. From PDO1 (index 0) to PDO16 (index 15).
10111	Speed physical reference parameter	Unsigned16	The parameter describes how many RPM is meant by 100% in the PROFIdrive 4.1 speed setpoint and actual value fields.
10112	VACON® Fixed Control Word	Unsigned16	Fixed control word.

Table 22. PROFIdrive drive-specific parameters

PNU	Significance	Data type	Explanation
10113	VACON® Fixed Status Word	Unsigned16	Fixed status word.
10114	VACON® Speed reference	Unsigned16	Speed reference.
10115	VACON® Speed Actual value	Unsigned16	Actual speed value.
10118	Clear VACON® fault history	Unsigned16	To clear the fault history, write a value to the parameter.
10119	Read VACON® fault history	Array[n] Unsigned16	An array of 40 elements consisting of VACON® fault history fault codes.
10120	VACON® General Control word	Unsigned16	General control word.
10121	VACON® General Status word	Unsigned16	General status word.
10122	VACON® 32-bit Process Data In	Array[n] Unsigned32	An array of 16 elements. From PDI1 (index 0) to PDI8 (index 7).
10123	VACON® 32-bit Process Data Out	Array[n] Unsigned32	An array of 16 elements. From PDO1 (index 0) to PDO8 (index 7).
10124	Drive operation time counter	Unsigned32	Drive operation time in seconds as 32 bit unsigned integer.
10125	Drive operation time trip counter	Unsigned32	Drive operation time trip counter in seconds as 32 bit unsigned integer. Writing zero will reset trip counter.
10126	Drive energy counter	Float32	Drive energy counter in KWh as 32 bit float (IEEE 754).
10127	Drive energy trip counter	Float32	Drive energy trip counter in KWh as 32 bit float (IEEE 754). Writing zero will reset trip counter.

5.4.3   PROFIdrive signal numbers

The table below lists the PROFIdrive signal numbers (continued on the next page).

Table 23. PROFIdrive signal numbers

Signal no.	Signal name	PNU	PNU name
1	Control word 1	10100	PROFIdrive control word (STW1)
2	Status word 1	10102	PROFIdrive status word (ZSW1)
5	Speed setpoint A	10101	PROFIdrive speed setpoint value (NSOLL_A)
6	Speed actual value A	10103	PROFIdrive speed actual value (NIST_A)
51	Output current	10104	Always returns zero.
52	Active current (torque proportional)	10105	Always returns zero.
54	Active power	10106	Always returns zero.
57	Speed actual value A	10107	Always returns zero.
58	Drive status/fault word	10108	Always returns zero.
100	VACON® PDO1	10110	VACON® 16-bit Process Data Out
101	VACON® PDO2	10110	VACON® 16-bit Process Data Out
102	VACON® PDO3	10110	VACON® 16-bit Process Data Out

Table 23. PROFIdrive signal numbers

Signal no.	Signal name	PNU	PNU name
103	VACON® PDO4	10110	VACON® 16-bit Process Data Out
104	VACON® PDO5	10110	VACON® 16-bit Process Data Out
105	VACON® PDO6	10110	VACON® 16-bit Process Data Out
106	VACON® PDO7	10110	VACON® 16-bit Process Data Out
107	VACON® PDO8	10110	VACON® 16-bit Process Data Out
110	VACON® PDI1	10109	VACON® 16-bit Process Data In
111	VACON® PDI2	10109	VACON® 16-bit Process Data In
112	VACON® PDI3	10109	VACON® 16-bit Process Data In
113	VACON® PDI4	10109	VACON® 16-bit Process Data In
114	VACON® PDI5	10109	VACON® 16-bit Process Data In
115	VACON® PDI6	10109	VACON® 16-bit Process Data In
116	VACON® PDI7	10109	VACON® 16-bit Process Data In
117	VACON® PDI8	10109	VACON® 16-bit Process Data In
118	VACON® fixed control word	10112	VACON® Fixed Control Word
119	VACON® fixed status word	10113	VACON® Fixed Status Word
120	VACON® fixed reference value	10114	VACON® Speed reference
121	VACON® fixed actual value	10115	VACON® Speed Actual value
122	VACON® general control word	10120	VACON® General Control word
123	VACON® general status word	10121	VACON® General Status word
124	VACON® DW PDO1	10123	VACON® 32-bit Process Data Out
125	VACON® DW PDO2	10123	VACON® 32-bit Process Data Out
126	VACON® DW PDO3	10123	VACON® 32-bit Process Data Out
127	VACON® DW PDO4	10123	VACON® 32-bit Process Data Out
128	VACON® DW PDO5	10123	VACON® 32-bit Process Data Out
129	VACON® DW PDO6	10123	VACON® 32-bit Process Data Out
130	VACON® DW PDO7	10123	VACON® 32-bit Process Data Out
131	VACON® DW PDO8	10123	VACON® 32-bit Process Data Out
132	VACON® DW PDI1	10123	VACON® 32-bit Process Data Out
133	VACON® DW PDI2	10123	VACON® 32-bit Process Data Out
134	VACON® DW PDI3	10122	VACON® 32-bit Process Data In
135	VACON® DW PDI4	10122	VACON® 32-bit Process Data In
136	VACON® DW PDI5	10122	VACON® 32-bit Process Data In

Table 23. PROFIdrive signal numbers

Signal no.	Signal name	PNU	PNU name
137	VACON® DW PDI6	10122	VACON® 32-bit Process Data In
138	VACON® DW PDI7	10122	VACON® 32-bit Process Data In
139	VACON® DW PDI8	10122	VACON® 32-bit Process Data In

5.4.4 User specific record data

For easy access to drive parameters and monitoring values, the VACON® 100 AC drive maps the PROFINET user specific record indexes 0x0000 - 0x7FFF directly into the application IDs of the drive based on the IEC61131 standard. Both read and write access is supported.

NOTE! The response data is in raw format. See application manual for available IDs, amount of decimals and the unit used for the parameters.

Table 24. Application ID access settings

Slot	Subslot	Description
1	2	Access IDs as VACON® 100 actual data type

In the examples below, the following index values are used:

- 102 = Maximum frequency (Hz)
- 600 = Motor control mode

Table 25. Example 1: Reading values from the AC drive

AC drive	Read command			Response		
	Slot	Subslot	Index	Hex	Dec	Actual value
VACON® 100	1	2	102	00 07 A1 20	500000	50.0000 Hz
			600	00 00 00 01	1	1 = OL Speed

Table 26. Example 2: Writing values for the AC drive

AC drive	Write command					Actual value
	Slot	Subslot	Index	Length	Value (Hex)	
VACON® 100	1	2	102	4	00 06 DD D0	45.0000 Hz
			600	4	00 00 00 00	0 = OL Frequency

5.4.5   Base Mode Parameter Access Model

The PROFIdrive parameters are accessed according to the model presented below:

11611_uk
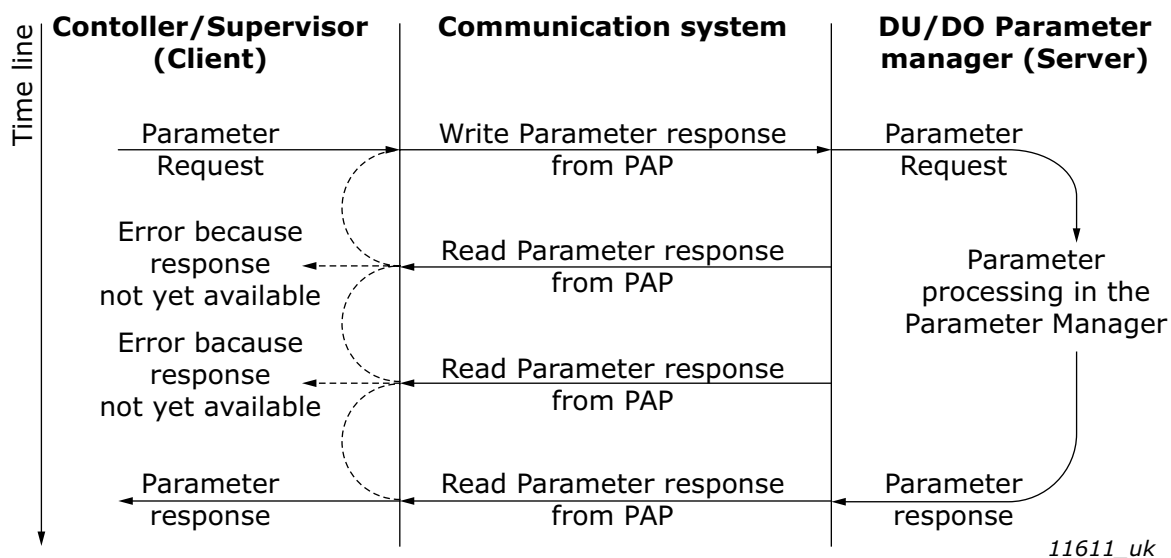
Figure 7. PROFIdrive parameter access model

Both indexes can be used to access PROFIdrive parameters. There is no difference in operation between them with current implementation.

Table 27. Parameter access services

Parameter access service	Index
Base Mode Parameter - Local	0xB02E
Base Mode Parameter - Global	0xB02F

The structure of parameter requests is described in the table below:

Table 28. Parameter request

Block definition	Byte n+1	Byte n	n
Request Header	Request Reference	Request ID	0
	Axis-No. / DO-ID	No. of Parameters = n	2
1st Parameter Address	Attribute	No. of Elements	4
	Parameter Number (PNU)		
	Subindex		
nth Parameter Address	...		4 + 6 x (n – 1)
1st Parameter Value(s) (only for request "Change parameter")	Format	No. of Values	4 + 6 x n
	Values		
	...		

Block definition	Byte n+1	Byte n	n
nth Parameter Values	...		
			4 + 6 x n + ... + (For-mat_n x Qty_n)

The structure of parameter responses is described in the table below:

Table 29. Parameter response

Block definition	Byte n+1	Byte n	n
Response header	Request Ref. mirrored	Response ID	0
	Axis-No. / DO-ID mirrored	No. of Parameters = n	2
1st Parameter Value(s) (only for request "Request")	Format	No. of Values	4
	Values or Error Values		
	...		
nth Parameter Values	...		
			4 + ... + (Format_n x Qty_n)

The table below contains descriptions of parameters.

Table 30. Parameter description

Sub-index	Field name	Data type	Description
1	Identifier (ID)	Unsigned16	A bitmask with information about the parameter characteristics.
2	Number of array ele-ments	Unsigned16	For array parameters, the number of elements in the array.
3	Standardisation factor	FloatingPoint (IEEE 754)	If the information represented by the parameter can be converted into a stan-dardised form, this field contains a fac-tor for this conversion.
4	Variable attribute	Array of two Unsigned8	Contains two index numbers for describing the parameter information.
5	Reserved	Array of four Unsigned8	Reserved, always 0.
6	Name	ASCII string, 16 char-acters	Symbolic name of the parameter.
7	Low limit	Array of four Unsigned8	Limit for valid values of the parameter.

Sub-index	Field name	Data type	Description
8	High limit	Array of four Unsigned8	Limit for valid values of the parameter.
9	Reserved	Array of two Unsigned8	Reserved, always 0.
10	ID extension	Unsigned16	Not used, always 0.
11	Normalisation reference parameter	Unsigned16	Parameter number, the value of which is used as normalisation reference for the parameter whose description this is.
12	Normalisation field	Unsigned16	Contains information about normalisation of this parameter.

5.4.5.1   Parameter requests

There are two types of parameter requests in PROFIdrive:

- Read requests for reading parameters from the device
- Change requests for writing parameters to the device

Each parameter request consists of three elements:

- Request header
- Parameter address
- Parameter value (only in Change requests)

Request header	Parameter address(es)	Parameter value(s)

5.4.5.2   Request header

The request header consists of 4 fields, each one octet in size.

Table 31. Request header

Octet number	Field name	Description	Allowed values
1	Request Reference	Unique number for each request/response pair. This value is changed by the master for each new request. It is mirrored by the slave in the response.	A bitmask with information about the parameter characteristics.
2	Request ID	Defines the type of request.	Use 0x01 for Read requests. Use 0x02 for Change requests. Other values are not allowed.
3	Axis Number	Not used, should be set to 1.	Use 1 for VACON® 100 PROFINET IO. Other values should not be used.
4	Requested number of parameters	The number of parameters affected by the request.	Values 1 to 39 are allowed. The value 0 is not allowed. Values 40 to 255 are not allowed.

5.4.5.3　　Parameter address

The parameter address consists of 4 fields, totaling six octets in size.

Table 32. Parameter address

Octet number	Field name	Description	Allowed values
1	Attribute	Describes which part of a parameter should be accessed.	Use 0x10 for reading/writing the value of a parameter. Use 0x20 for reading the description of a parameter. Use 0x30 for reading the text of a parameter (not supported). Other values should not be used.
2	Number of elements	Specifies the number of elements that are addressed in an array.	Values 0 and 1 are allowed for non-array parameters. Values 1 to 234 are allowed for array parameters. Other values should not be used.
3...4	Parameter number	The number of the parameter to be addressed.	Allowed values are those of supported parameters, see chapter 5.4.6.2.
5...6	Subindex	Defines the first array element of the parameter to be accessed.	Values 0 to 65535 are allowed. Other values are not allowed.

The "Parameter number" and "Subindex" fields are two-octet fields, while the "Attribute" and "No. of elements" fields are one-octet fields.

5.4.5.4　　Parameter value

The parameter value field is included only in Change requests (not in Read requests). The parameter value field consists of a two-octet parameter value header followed by a list of values. Depending on the format of the parameter, the octet size of a single value is one, two or four octets. The total size of the parameter value field thus depends on the format and number of values in the message.

Table 33. Parameter value

Octet number	Field name	Description	Allowed values
1	Format	Describes the data type of the parameter.	Use 0x41 for Byte. Use 0x42 for Word. Use 0x43 for Double Word. Value 0x44 is used for Error. Other values should not be used.
2	Number of values	Defines the number of values in the parameter value field.	Values 0 to 234 are possible. Subject to limitations as described below.
3...	Value	The value of the parameter.	Values 0 to 65535 are allowed. Other values are not allowed.

The number of values which can be transmitted in one frame has been limited to 39.

5.4.6   Parameter responses

There are two types of parameter responses in PROFIdrive:

- Write response (response to a Write request)
- Read response (response to a Read request)

A read response consists of two elements:

- Response header
- Parameter value(s) (depending on the request type)

Response header	Parameter value(s)

5.4.6.1   Error response

If an error occurred in the Parameter Access, the response provided by the slave is an error response. An error response contains 4 octets as described below.

Table 34. Error response

Octet number	Field name	Description	Allowed values
1	Function Number	Operation number.	The slave returns 0xDE to indicate an error read response. The slave returns 0xDF to indicate an error write response. Other values are not used in the Parameter Access.
2	Error Decode	Defines how the error information in the following two fields should be decoded.	Always 128 in PROFIdrive. Other values are not used in the Parameter Access.
3	Error Code 1	High 4 bits indicate error class, 4 lower bits indicate error code.	See Chapter 5.4.6.3 "PROFIdrive Parameter Access errors"
4	Error Code 2	Application-specific.	Always 0 in PROFIdrive.

5.4.6.2   PROFIdrive 4.1 error classes and codes

The table below lists PROFIdrive profile 4.1 error classes and codes.

Table 35. PROFIdrive 4.1 error classes and codes

Error class	Error codes	PROFIdrive meaning
0x0...0x9 = reserved (not used)		
0xA = applica-tion	0x0 = read error 0x1 = write error 0x2 = module failure 0x3...0x7 = reserved (not used) 0x8 = version conflict 0x9 = feature not supported 0xA...0xF = user-specific (not used)	
0xB = access	0x0 = invalid index	0xB0 = parameter requests are not supported.
	0x1 = write length error 0x2 = invalid slot 0x3 = type conflict 0x4 = invalid area	
	0x5 = state conflict	0xB5 = parameter access is temporarily not possible due to internal processing status.
	0x6 = access denied	
	0x7 = invalid range	0xB7 = Write request with error in the parameter request header.
	0x8 = invalid parameter 0x9 = invalid type	
	0xA...0xF = user-specific (not used)	
0xC = resource	0x0 = read constraint con-flict 0x1 = write constraint con-flict 0x2 = resource busy 0x3 = resource unavailable 0x4...0x7 = reserved (not used) 0x8...0xF = user-specific (not used)	
0xD...0xF = user-specific (not used)		

5.4.6.3   PROFIdrive Parameter Access errors

In addition to the error indications in the error response field, details about the error are provided in the parameter value field. The third octet in the parameter value is set to 0x00 and the fourth octet is assigned the error number, as described in Table 36.

Table 36. PROFIdrive parameter access errors

Error number	Meaning	When used
0x00	Impermissible parameter number	Access to unavailable parameter.
0x01	Parameter value cannot be changed	Change request to a read-only parameter.
0x02	0x0 = invalid index	0xB0 = parameter requests are not supported.
0x03	Invalid subindex	Access to an unavailable subindex of an array parameter.
0x04	Non-array parameter	Attempt to access subindex of a non-array parameter.
0x05	Incorrect data type	Change request containing invalid data type for the accessed parameter.
0x06	Setting not permitted (may only be reset)	Change request to a non-zero value, where this is not allowed.
0x07	Description element cannot be changed	Change request to a read-only parameter description element.
0x08	Reserved (not used)	
0x09	No description data available	Access to unavailable parameter description.
0x0A	Reserved (not used)	
0x0B	No operation priority	Change request without access rights to perform the change.
0x0C...0x0E	Reserved (not used)	
0x0F	No text array available	Access to unavailable parameter text array.
0x10	Reserved (not used)	
0x11	Request cannot be executed	Access is temporarily not possible due to unspecified reasons.
0x12...0x13	Reserved (not used)	
0x14	Value impermissible	Change request with a value within the allowed range, but is otherwise not permissible.
0x15	Response too long	The length of the respose exceeds the maximum transmittable length.
0x16	Impermissible parameter address	Error in the parameter address field.
0x17	Illegal format	Illegal format was provided in write request.
0x18	Number of values are not consistent	The number of values in the write request does not match the number of values in the parameter.
0x19	Axis non-existent	Access to non-existent axis number

Table 36. PROFIdrive parameter access errors

Error number	Meaning	When used
0x20	Parameter text cannot be changed	Change request to unavailable parameter text.
0x21	Invalid request ID	If a parameter request does not have the request ID 01h or 02h, this error code is returned.
0x22...0x64	Reserved (not used)	
0x65	Invalid request reference	Unallowed value for request reference.
0x66	Invalid request ID	Unallowed value in request ID (neither Request Parameter nor Change Parameter).
0x67	Reserved (not used)	
0x68	Invalid number of parameters	Invalid number of parameters in request (0 or greater than 39).
0x69	Invalid attribute	Invalid attribute specified in request.
0x6A	Reserved (not used)	
0x6B	Request is too short	Not enough parameter value data was transmitted in a Change request. Alternatively, the request did not contain a complete parameter address.
0x6C	Parameter not found.	Parameter was not found or error occurred while accessing it.
0x6D	Invalid change request.	Issue with request was found and request was not handled.
0x6E	General error	General error occurred.
0x6F...0xFF	Reserved (not used)	

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/

5.4.6.4 Response header

The response header consists of 4 fields, each one is octet in size.

Table 37. Response header

Octet number	Field name	Description	Allowed values
1	Request Reference	Unique number for each request/response pair.	Mirrored by the slave.
2	Response ID	Defines the type of response. An error in the execution of a request is indicated by setting bit 7 in this field.	Uses 0x01 for successful request parameter operation. Uses 0x02 for successful change parameter operation. Uses 0x80 to indicate that an invalid request ID was received. Uses 0x81 for unsuccessful request parameter operation. Uses 0x82 for unsuccessful change parameter operation. Other values are not used.
3	Axis Number	Not used, should be set to 1.	Mirrored by the slave.
4	Requested number of parameters	The number of parameters affected by the request.	Number of parameters in the response. Mirrored from the request.

5.4.6.5 Parameter values

Parameter values are included in the response only if the request was of "Request parameter" type. For details on the contents of this field, see Parameter value on Chapter 5.4.5.4 "Parameter value"

5.4.7 Drive parameter access using application ID

It is possible to read and write drive parameters using the application ID number using the PNU 10001. The targeted application ID is put into the subindex field.

5.4.8 Parameter channel examples

The parameter channel operations follow the same process every time. Figure 8 shows a successful operation. It is important to wait long enough after "Write request" before doing "Read request". If read operation is done too soon, drive has not finished processing the operation and will respond with error (see Figure 2 PROFIdrive parameter access model). Then the PLC must try to read again after some time. Time between write and read requests depends on the operation. Figure 4 shows what the parameter request looks like in Wireshark and Figure 5 shows how "PROFINET Master Simulator" tool is used for requesting the value.
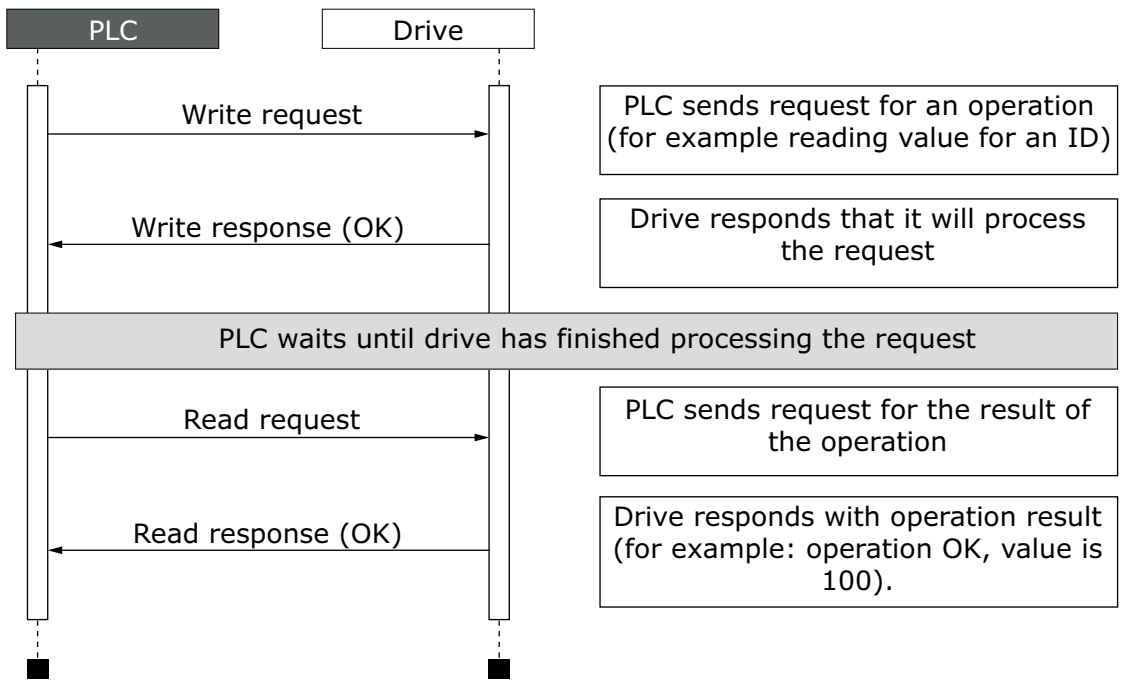
11753_uk

Figure 8. Successful paramater channel operation

11754_00

Figure 9. Wireshark capture of requesting value for ID103
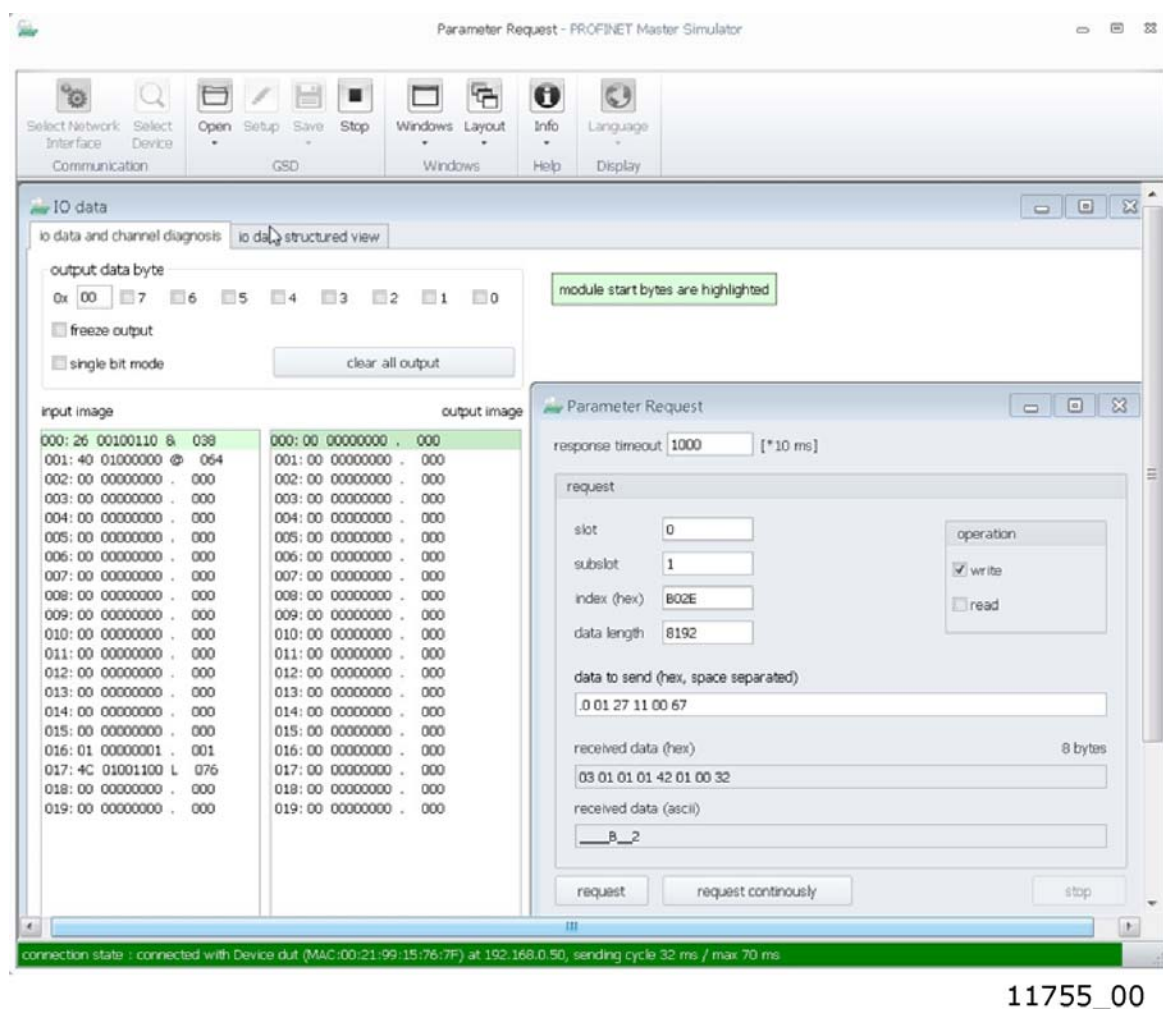
11755_00

Figure 10. Screen capture from "PROFINET Master Simulator" requesting value for ID103.

5.4.8.1   Request first element of PNU964 value

The following information is used for this request:

Table 38. Request first element of PNU964

Field	Contents
Request reference	0x01
Request ID	0x01 = Request parameter
Axis Number	0x01
No. of Parameters	0x01
Attribute	0x10 = Value
No. of elements	0x01
Parameter Number	0x03C4 (964d)
Subindex	0x0000 (0d)

The following table contains messages sent during requesting value for PNU964.

Table 39. Messages sent and received during requesting value for PNU964

Message	Operation		Data
1	**Write request**	**Request header**	0x01 0x01 0x01 0x01
		Parameter address	0x10 0x01 0x03 0xC4 0x00 0x00
2	Write request response from drive to PLC		
-	PLC waits until drive has finished processing the requested operation		
3	PLC sends read request		
4	**Read request response**	**Response header**	0x01 0x01 0x01 0x01
		Parameter value	0x42 0x01 0x01 0xBA

The parameter value reveals that the format of the value is "Word" (0x42), there is one value in the response (0x01) and the actual value is 0x01BA.

5.4.8.2   Request all elements of PNU964 value

The following information is used for this request.

Table 40. Request all elements of PNU 964

Field	Contents
Request reference	0x02
Request ID	0x01 = Request parameter
Axis Number	0x01
No. of Parameters	0x01
Attribute	0x10 = Value
No. of elements	0x06
Parameter Number	0x03C4 (964d)
Subindex	0x0000 (0d)

The following table contains messages sent during requesting all values for PNU964.

Table 41. Messages sent and received during requesting all values for PNU964

Message	Operation		Data
1	**Write request**	**Request header**	0x02 0x01 0x01 0x01
		Parameter address	0x10 0x06 0x03 0xC4 0x00 0x00
2	Write request response from drive to PLC		
-	PLC waits until drive has finished processing the requested operation		
3	PLC sends read request		
4	**Read request response**	**Response header**	0x02 0x01 0x01 0x01
		Parameter value	0x42 0x06 0x01 0xBA 0x00 0x02 0x00 0x64 0x07 0xDE 0x00 0x65 0x00 0x01

The returned value consists of six words (0x42 means Word, 0x06 is the number of values returned), and the values are 0x01BA, 0x0002, 0x0064, 0x07DE, 0x0065, and 0x0001. Thus the following information can be determined about the device:

- Manufacturer code is 0x01BA
- Drive Unit type is 0x0002
- Software version is 1.0 (0x0064 = 0100d)
- Firmware date (year) is 2014 (0x07DE)
- Firmware date (day/month) is 1/1 (0x0065 = 101d)
- The device contains one axis

5.4.8.3   Requesting the value of drive parameter ID 103

The following information is used for this request:

Table 42. Request value of parameter ID 103

Field	Contents
Request reference	0x03
Request ID	0x01 = Request parameter
Axis Number	0x01
No. of Parameters	0x01
Attribute	0x10 = Value
No. of elements	0x01
Parameter Number	0x2711 (10001d)
Subindex	0x0067 (103d)

Following table contains messages sent during requesting value for ID 103.

Table 43. Messages sent and received during requesting value for ID 103

Message	Operation		Data
1	**Write request**	**Request header**	0x03 0x01 0x01 0x01
		Parameter address	0x10 0x01 0x27 0x11 0x00 0x67
2	Write request response from drive to PLC		
-	PLC waits until drive has finished processing the requested operation		
3	PLC sends read request		
4	**Read request response**	**Response header**	0x03 0x01 0x01 0x01
		Parameter value	0x42 0x01 0x00 0x0A

The parameter value reveals that the format of the value is "Word" (0x42), there is one value in the response (0x01) and the actual value is 0x000A. Because this value was read from the drive application, the Drive Application Manual contains details on how to interpret the value. In this example, the Acceleration time would be one second.

5.4.8.4   Changing the value of drive parameter ID 103 (successful)

The following information is used for this request:

Table 44. Request to write the value of parameter ID 103

Field	Contents
Request reference	0x04
Request ID	0x02 = Write parameter
Axis Number	0x01
No. of Parameters	0x01
Attribute	0x10 = Value
No. of elements	0x01
Parameter Number	0x2711 (10001d)
Subindex	0x0067 (103d)
Parameter datatype	0x42 = WORD
Number of parameters	0x01
Value: HI byte	0x00
Value: LOW byte	0x28

Following table contains messages sent during writing value to ID 103.

Table 45. Messages sent and received during writing value to ID 103

Message	Operation		Data
1	**Write request**	**Request header**	0x04 0x02 0x01 0x01
		Parameter address	0x10 0x01 0x27 0x11 0x00 0x67
		Parameter value	0x42 0x01 0x00 0x28
2	Write request response from drive to PLC		
-	PLC waits until drive has finished processing the requested operation		
3	PLC sends read request		
4	**Read request response**	**Response header**	0x04 0x02 0x01 0x01

Answer indicates a successful operation.

5.4.8.5   Changing the value of drive parameter ID 103 (unsuccessful)

This example shows behaviour in case where ID modification fails. PLC writes request to change ID 103 value to 0d (Acceleration Time = 0.0s, not allowed)

Table 46. Request to write the value of parameter ID 103

Field	Contents
Request reference	0x05
Request ID	0x02 = Write parameter
Axis Number	0x01
No. of Parameters	0x01
Attribute	0x10 = Value
No. of elements	0x01
Parameter Number	0x2711 (10001d)
Subindex	0x0067 (103d)
Parameter datatype	0x42 = WORD
Number of parameters	0x01
Value: HI byte	0x00
Value: LOW byte	0x00

Following table contains messages sent during unsuccessful writing value to ID 103.

Table 47. Messages sent and received during unsuccessful writing value to ID 103

Message	Operation		Data
1	**Write request**	**Request header**	0x05 0x02 0x01 0x01
		Parameter address	0x10 0x01 0x27 0x11 0x00 0x67
		Parameter value	0x42 0x01 0x00 0x00
2	Write request response from drive to PLC		
-	PLC waits until drive has finished processing the requested operation		
3	PLC sends read request		
4	**Read request response**	**Response header**	0x05 0x82 0x01 0x01
		Parameter value	0x44 0x01 0x00 0x02

Answer indicates an unsuccessful operation with error "Low or high limit exceeded".

5.5   PROFINET IO communications and connection timeout

The PROFINET IO declares a watchdog time within which both master and slave must send IO back to each other. This watchdog time is a factor of the communication cycle time and is set by the master. Minimum cycle time for VACON® 100 PROFINET IO is 4 milliseconds.

The PROFINET IO also declares the process data validity on a submodule level. This validity is informed between provider and consumer with the IOPS (Input/Output Provider State) byte. If the incoming data validity is other than GOOD, VACON® 100 ignores this data completely and uses the latest valid data.

When the data state toggles from GOOD to BAD or an IO message is not received within the watchdog time, the timeout setting value is activated and a fault is created after it elapses. This means that the panel parameter "Communication timeout" (refer to chapter 4.2.2) is used as an additional timeout value. The same behaviour applies if a connection is closed or the cable disconnects (link loss). See Figure 11 for the timeout fault logic.

11719_uk
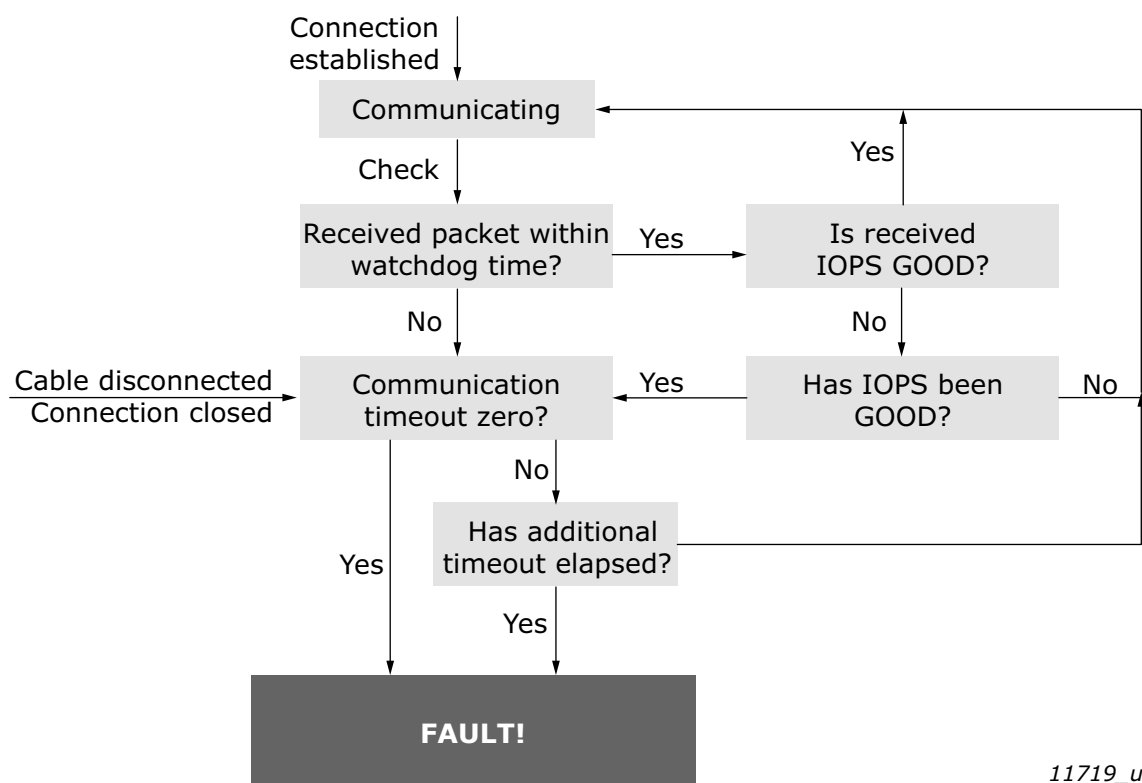
Figure 11. PROFINET IO communication and timeout fault

The VACON® 100 will set its data status to GOOD as soon as it receives valid data from the AC drive. Unless the communication to the AC drive breaks, the data remains GOOD. The IOCS are GOOD as soon as the option board is able to receive and handle IO data.

6.   FAULT TRACING

When the AC drive control diagnostics detect an unusual operating condition, the drive opens a notification, for example, on the keypad. The keypad shows the ordinal number of the fault, the fault code and a short fault description.

You can reset the fault with the Reset button on the control keypad or via the I/O terminal. The faults are stored in the Fault history menu, which can be browsed. The different fault codes are in the fault table below. The fault table presents only the faults related to the fieldbus in use.

If you need support in problems related to PROFINET IO, send a description of the problem together with the Drive Info File taken with VACON® Live to your local support. If possible, also send a "Wireshark" log from the situation if applicable.

6.1   Other fault conditions

The following fault tracing diagram will help you to locate and fix some of the most usual problems.
If the problem persists, contact your local distributor.
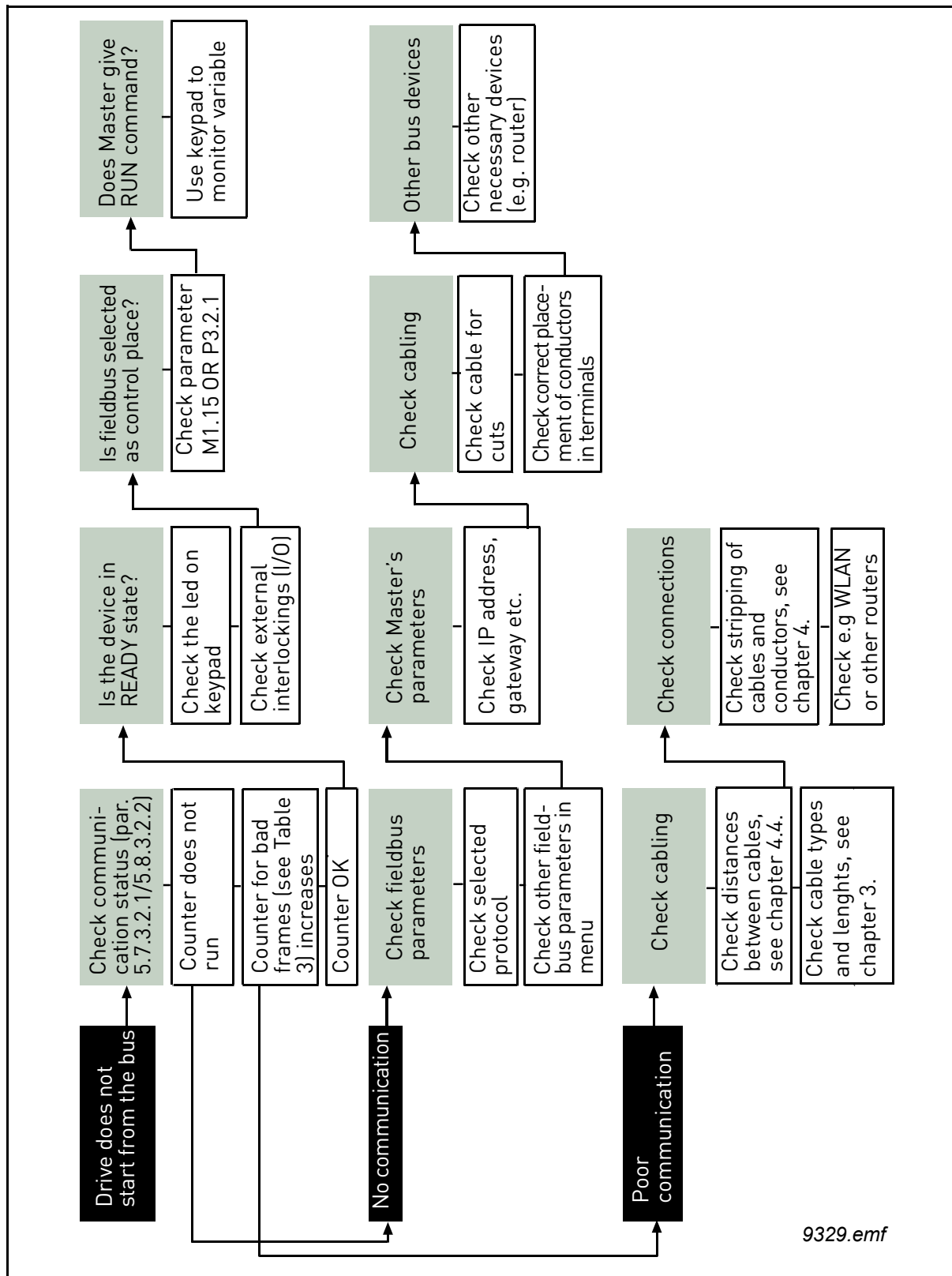
Figure 12. Fault tracing diagram for PROFINET IO

7.   APPENDIX 1 – PROCESS DATA

Process Data IN (Master to Slave)

The use of Process Data In variables depends on the used application. The configuration of the data is free.

Process Data OUT (Slave to Master)

The use of Process Data Out variables depends on the used application. The Fieldbus Master can read the AC drive's actual values using process data variables. The control applications use the process data as follows:

Table 48. Process Data OUT variables

ID	Data	Value	Unit	Scale
2104	Process data OUT 1	Output Frequency	Hz	0.01 Hz
2105	Process data OUT 2	Motor Speed	rpm	1 rpm
2106	Process data OUT 3	Motor Current	A	0.1 A
2107	Process data OUT 4	Motor Torque	%	0.10 %
2108	Process data OUT 5	Motor Power	%	0.10 %
2109	Process data OUT 6	Motor Voltage	V	0.1 V
2110	Process data OUT 7	DC link voltage	V	1 V
2111	Process data OUT 8	Active Fault Code	-	-

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/

8.   APPENDIX 2 - CONTROL AND STATUS WORD

8.1   Control Word bit description

The Control word is composed of 32 bits. FBFixedControlWord consist of the first 16 bits. FBGeneralControlWord consist of the remaining 16 bits. While the functionality of FBFixedControlWord is fixed in the VACON® standard applications, the functionality of FBGeneralControlWord is totally application specific and can vary even in the VACON® standard applications.

The meanings of FBFixedControlWord bits are described below. Unused bits have to be set to zero.

NOTE! This table is valid for VACON® standard applications. VACON® 100 HVAC may not support all functions.

Table 49. FBFixedControlWord bits

Bit	Function		Description
0	Start/Stop	0	Stop request from fieldbus.
		1	Run request from fieldbus.
1	Direction	0	Requested direction is "FORWARD".
		1	Requested direction is "REVERSE".
2	Fault reset	0	No action.
		1	Rising edge (0->1) = Active faults, alarms and infos are reset.
3	Stop mode 1	0	Stop mode is unmodified.
		1	Stop mode is overridden to "Coasting".
4	Stop mode 2	0	Stop mode is unmodified.
		1	Stop mode is overridden to "Ramping".
5	Quick ramp time	0	Normal deceleration ramp time.
		1	Deceleration ramp time is switched to shorter than normal.
6	Freeze Setpoint	0	Changes in the setpoint value from fieldbus (FB Speed Reference) are taken into use by the application.
		1	Changes in the setpoint value from fieldbus (FB Speed Reference) are not taken into use by the application.
7	Setpoint to Zero	0	The setpoint value from fieldbus is taken from FB Speed Reference.
		1	The setpoint value from fieldbus is changed to 0.
8	Request Fieldbus Control	0	Control Place is as parameterized in the drive (unchanged).
		1	Control Place is overridden to Fieldbus Control.
9	Request Fieldbus Reference	0	Source of the setpoint value is as parameterized in the drive (unchanged).
		1	Source of the setpoint value is overridden to Fieldbus.
10	Jogging 1	0	No action.
		1	Jogging request with ref1.
11	Jogging 2	0	No action.
		1	Jogging request with ref2.
12	Quick stop	0	No action
		1	Drive executes quick stop / emergency stop.
13-15	Reserved		

Table 50. Control word bit support in Vacon 100 drives

Bit	Function	VACON® 100 INDUSTRIAL / FLOW	VACON® 100 HVAC
0	Start/Stop	X	X
1	Direction	X	X
2	Fault reset	X	X
3	Stop mode 1	X	X
4	Stop mode 2	X	X
5	Quick ramp time	X	
6	Freeze Setpoint	X	X
7	Setpoint to Zero	X	
8	Request Fieldbus Control	X	X
9	Request Fieldbus Reference	X	X
10	Jogging 1	X	
11	Jogging 2	X	
12	Quick stop	X	
13-15	Reserved		

8.2   Status Word Descriptions

The Status word is composed of 32 bits. FBFixedStatusWord consist of the first 16 bits. FBGeneralStatusWord consist of the remaining 16 bits. While the functionality of FBFixedStatusWord is fixed in the VACON® standard applications, the functionality of FBGeneralStatusWord is totally application specific and can vary even in the VACON® standard applications.

The meanings of FBFixedStatusWord bits are described below. Unused bits have to be set to zero..

Table 51. FBFixedStatusWord bits

Bit	Function		Description
B0	Ready	0	Drive is not ready.
		1	Drive is ready to run.
B1	Run	0	Motor is not running.
		1	Motor is running.
B2	Direction	0	Motor is running clockwise.
		1	Motor is running counterclockwise.
B3	Fault	0	No fault active.
		1	Drive has an active fault.
B4	Alarm	0	No alarm active.
		1	Drive has active alarm.
B5	At reference	0	Motor is not running at reference speed.
		1	Motor is running at reference speed.
B6	Zero speed	0	Motor is not at zero speed.
		1	Motor is running at zero speed.
B7	Flux ready	0	Motor is not magnetized.
		1	Motor is magnetized.
B8-B12	Reserved		

9.   APPENDIX 3 – EXAMPLE WITH SIEMENS PLC

Following examples shows how to use SIMATIC STEP 7 and Siemens TIA Portal with VACON® 100 AC drive.

The GSDML files for the configuration can be downloaded from:

http://drives.danfoss.com/services/software-downloads/ -> VACON FIELDBUS CONFIGURATIONS

9.1   Siemens STEP 7

This example shows how to configure the Siemens S7-300 PLC series to use the VACON® 100 AC drive with the SIMATIC STEP 7 programming tool. Check your individual PLC information. The information used in this example probably differs from the one you have.

1. Create new project. Give new name and press OK.
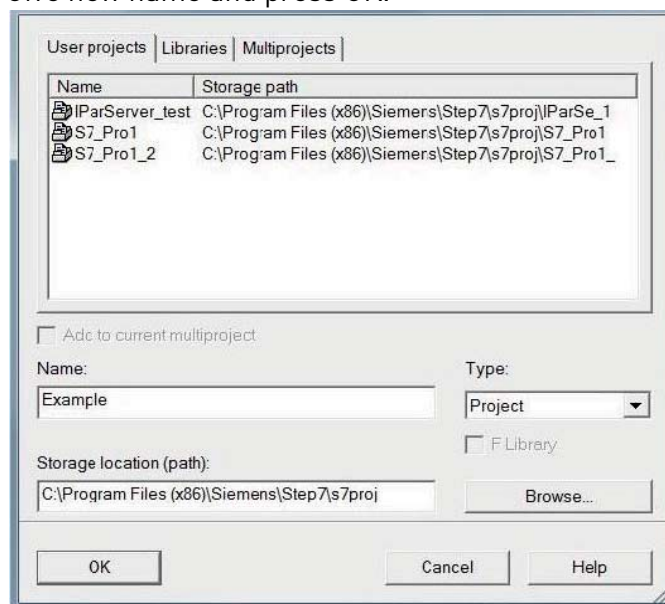
11694_uk

2. Insert the station.
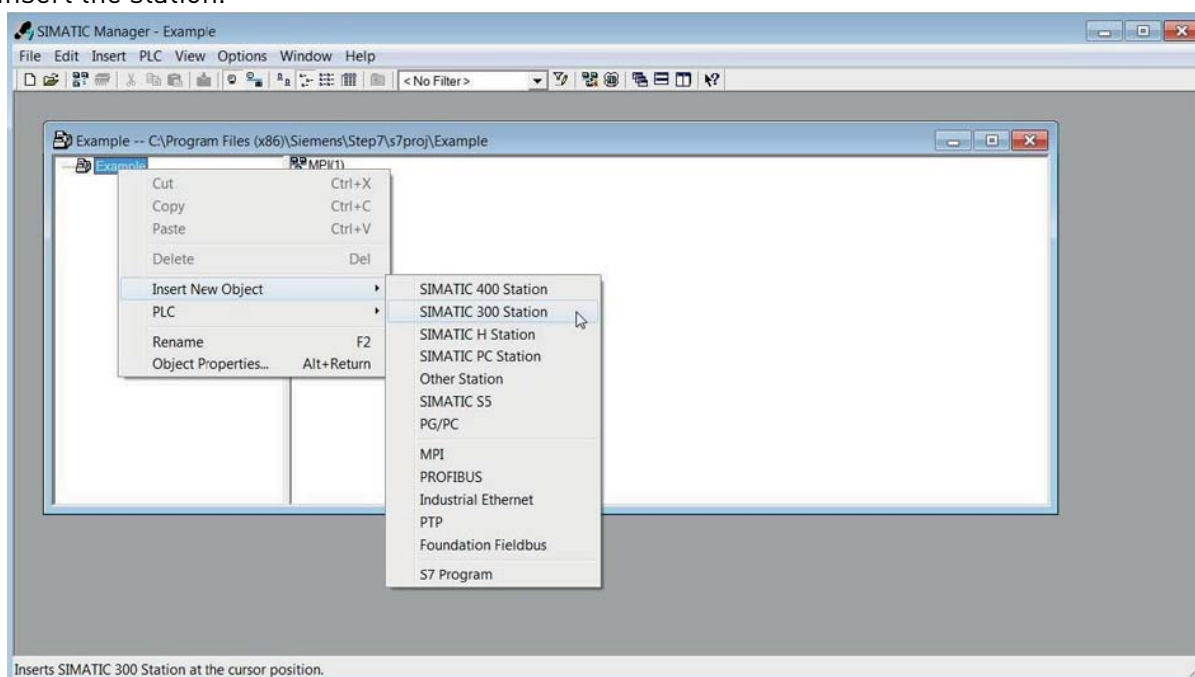
11695_uk

3. Double-click the "Hardware" icon to open the HW config window.
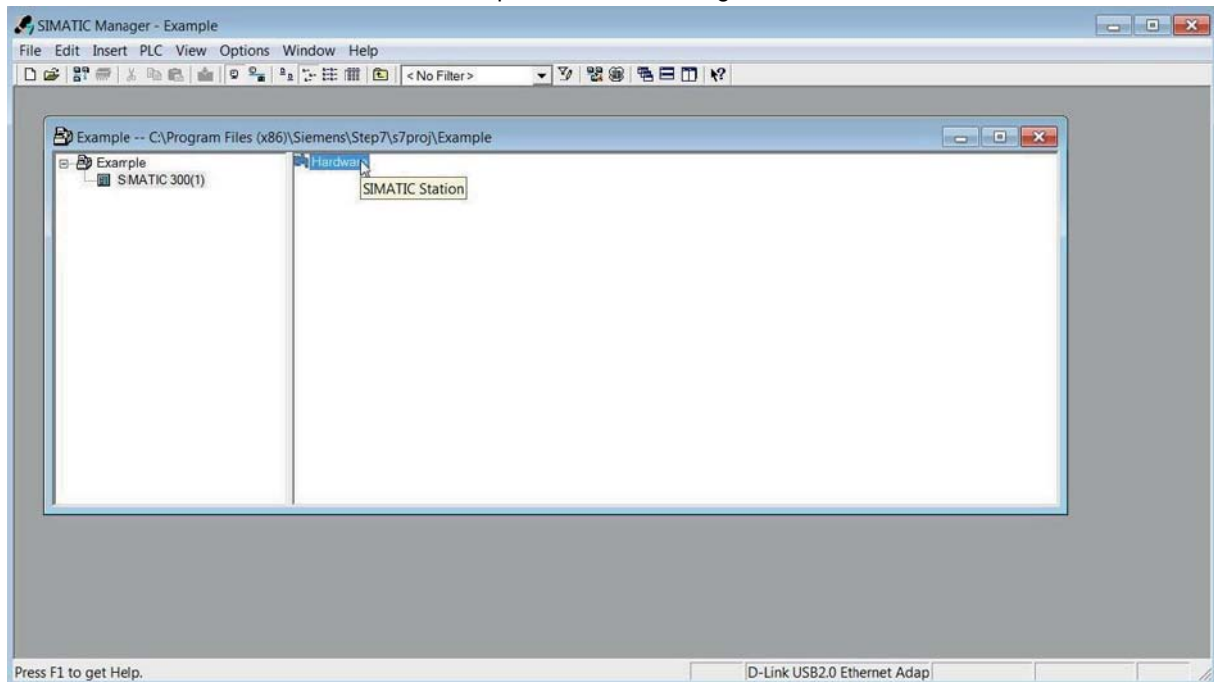
11696_uk

4. Insert the rail.

11697_uk

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
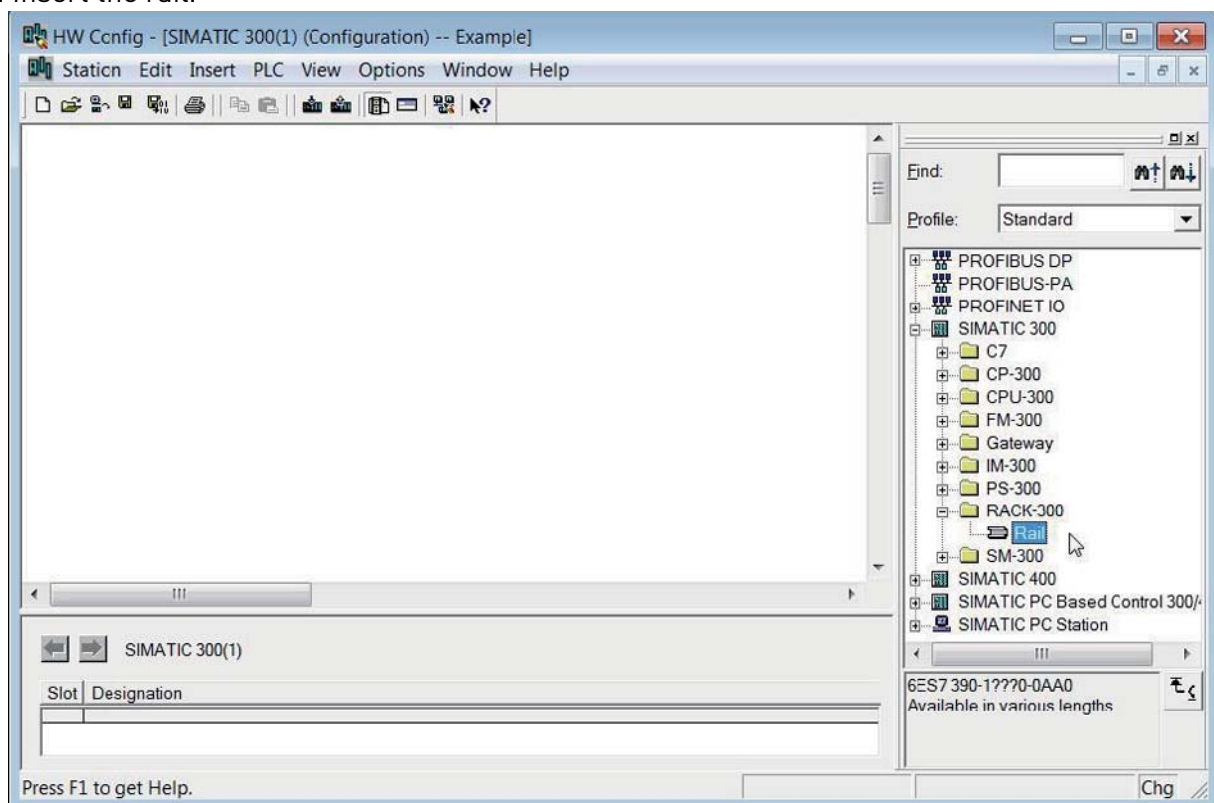
5. Insert the power supply.
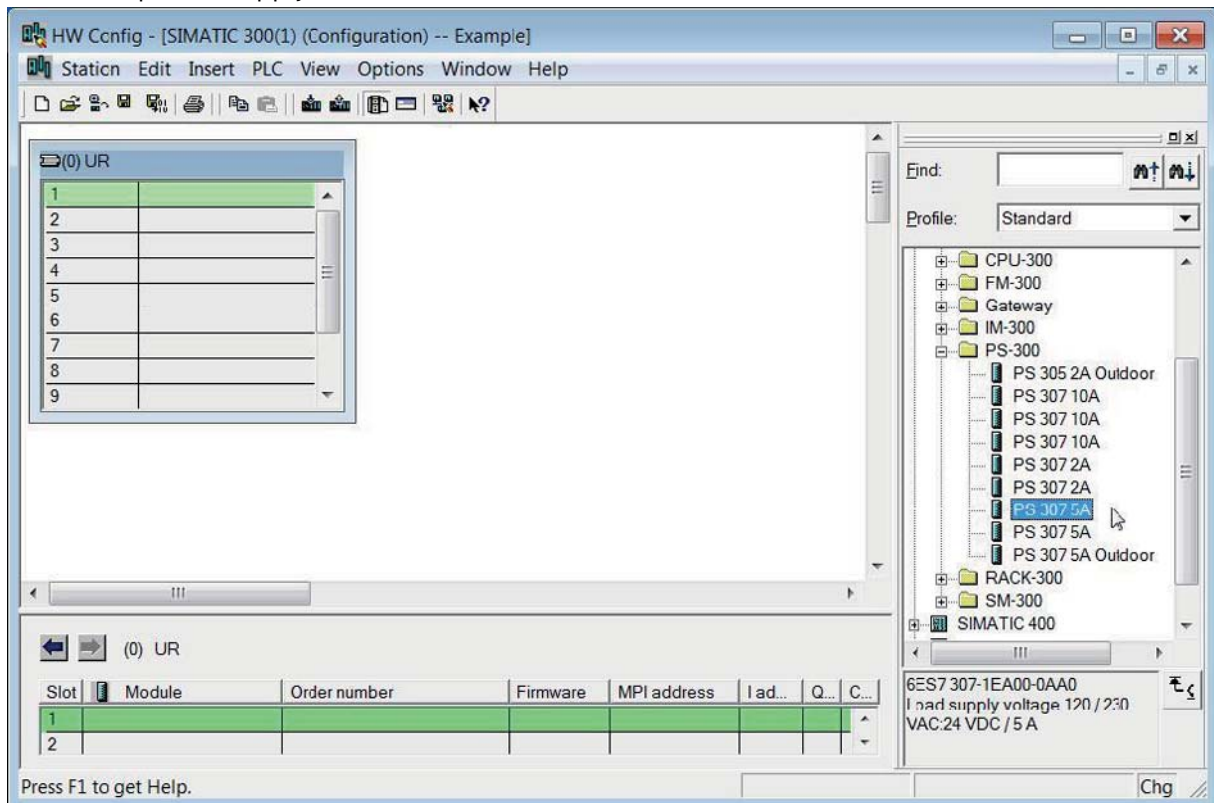
11698_uk

6. Insert the CPU.
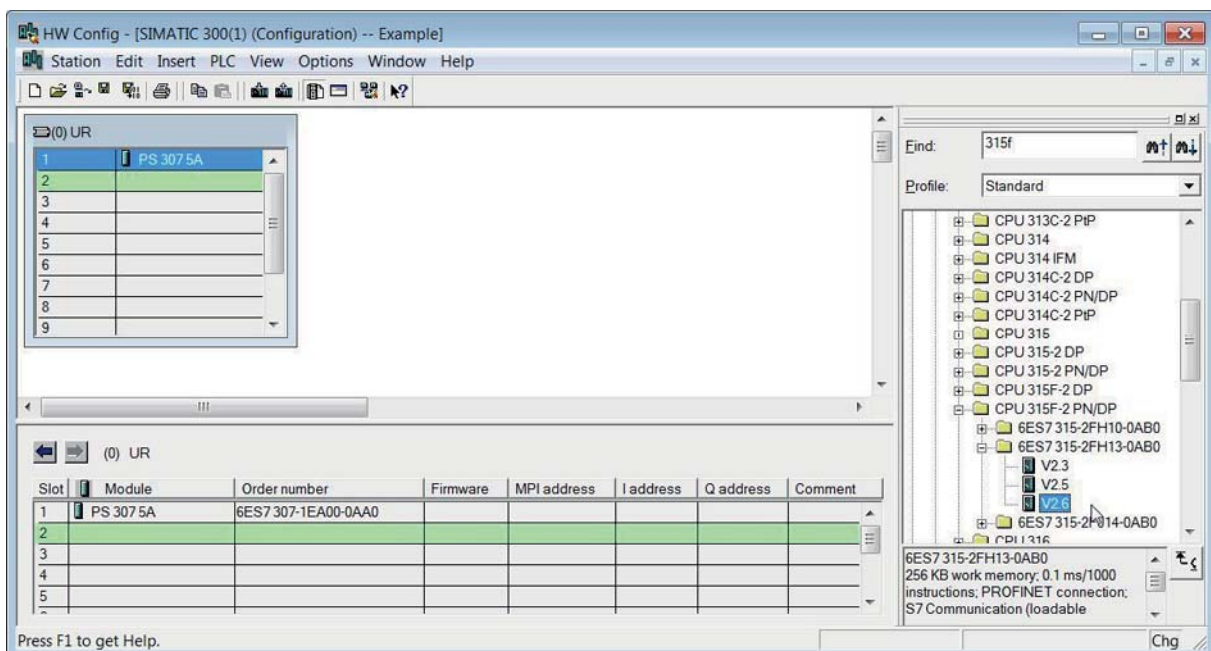
11699_uk

7. Change the IP address and select the subnet by clicking **New**.
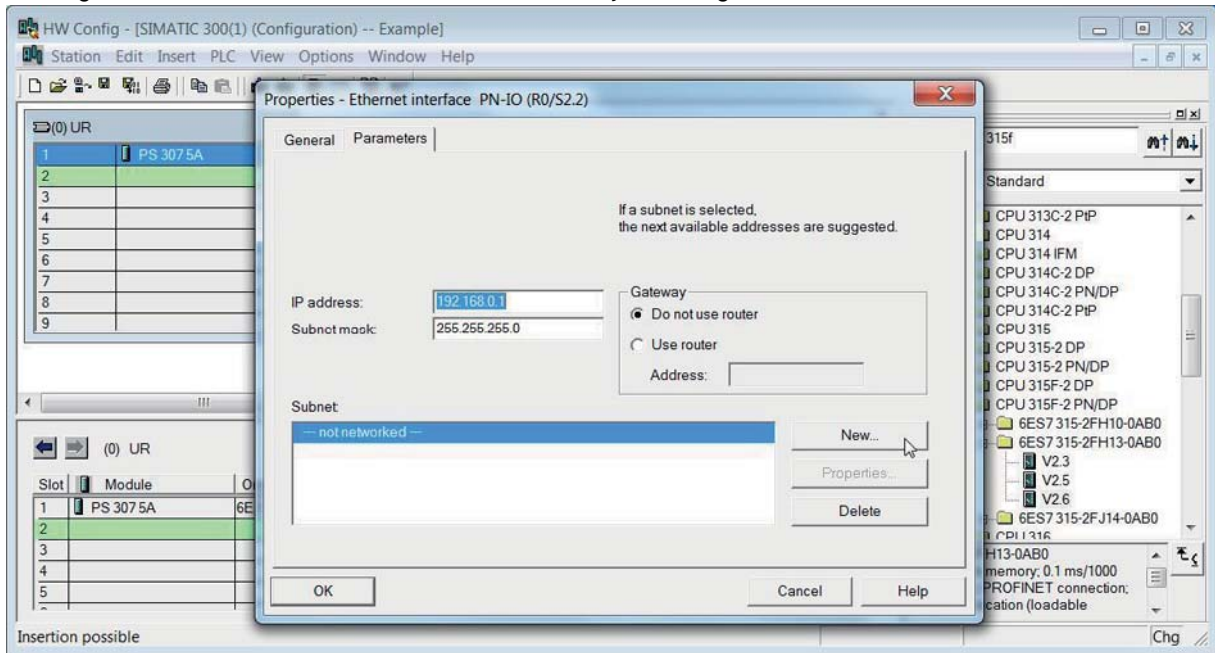
11700_uk

8. Click OK.

11701_uk

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
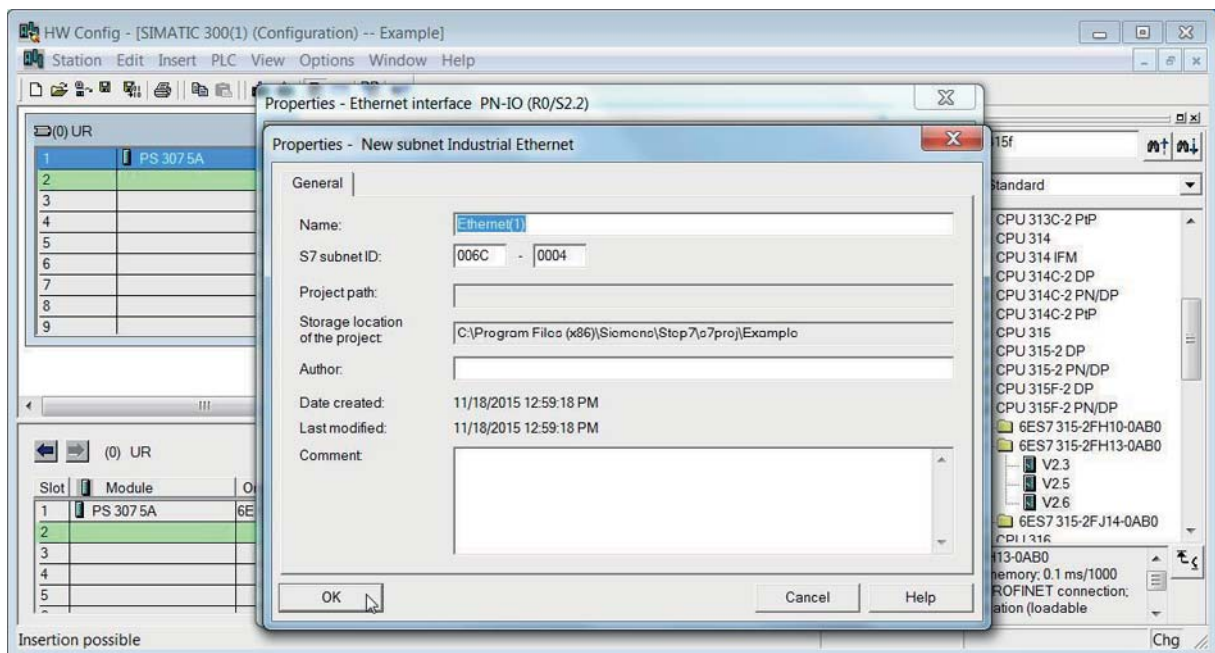
9. Click OK.
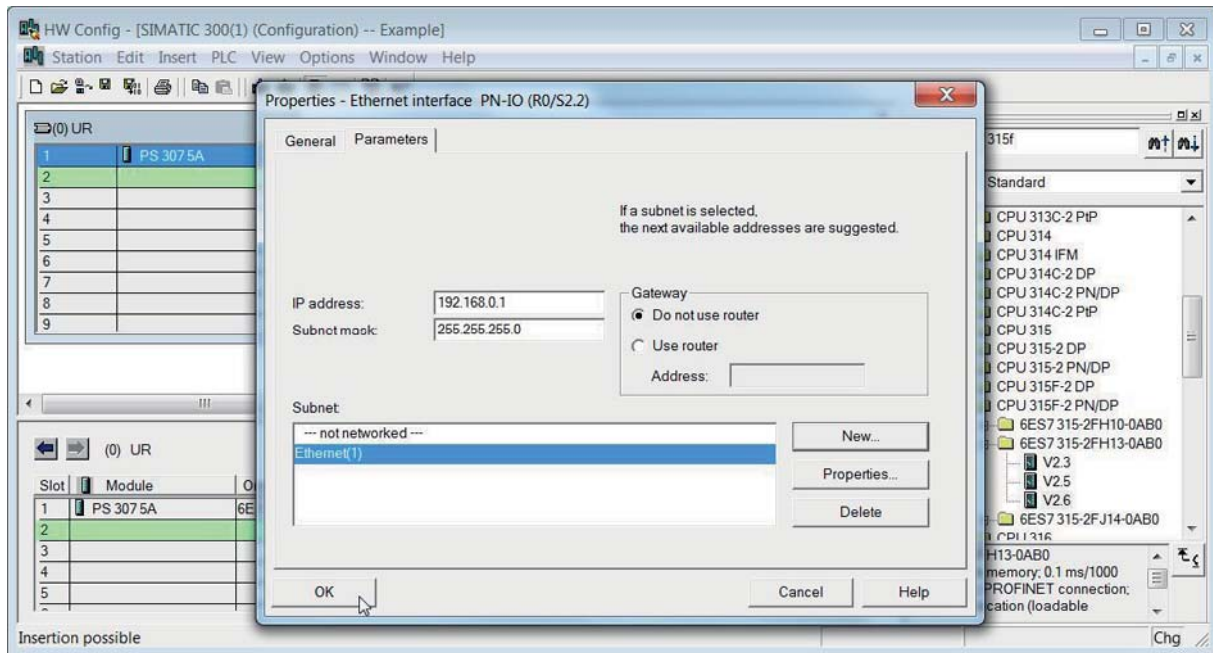
11702_uk

10. Now the configuration should look like this:
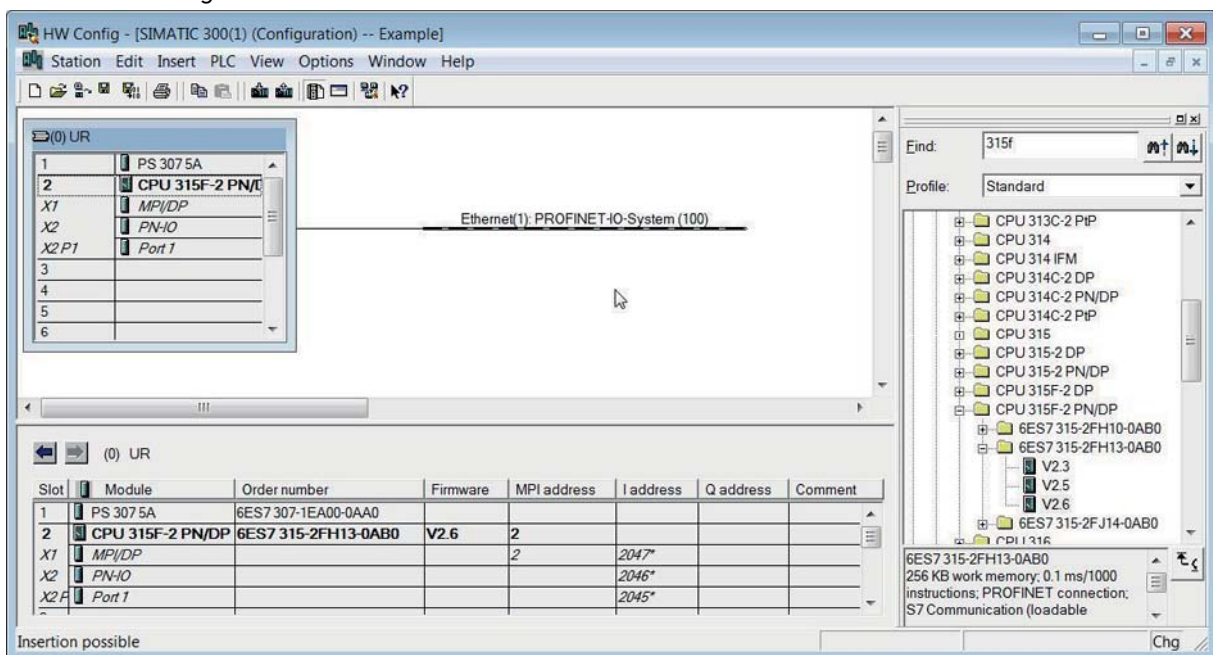
11703_uk

11. Drag and drop VACON 100 to Profinet IO system.
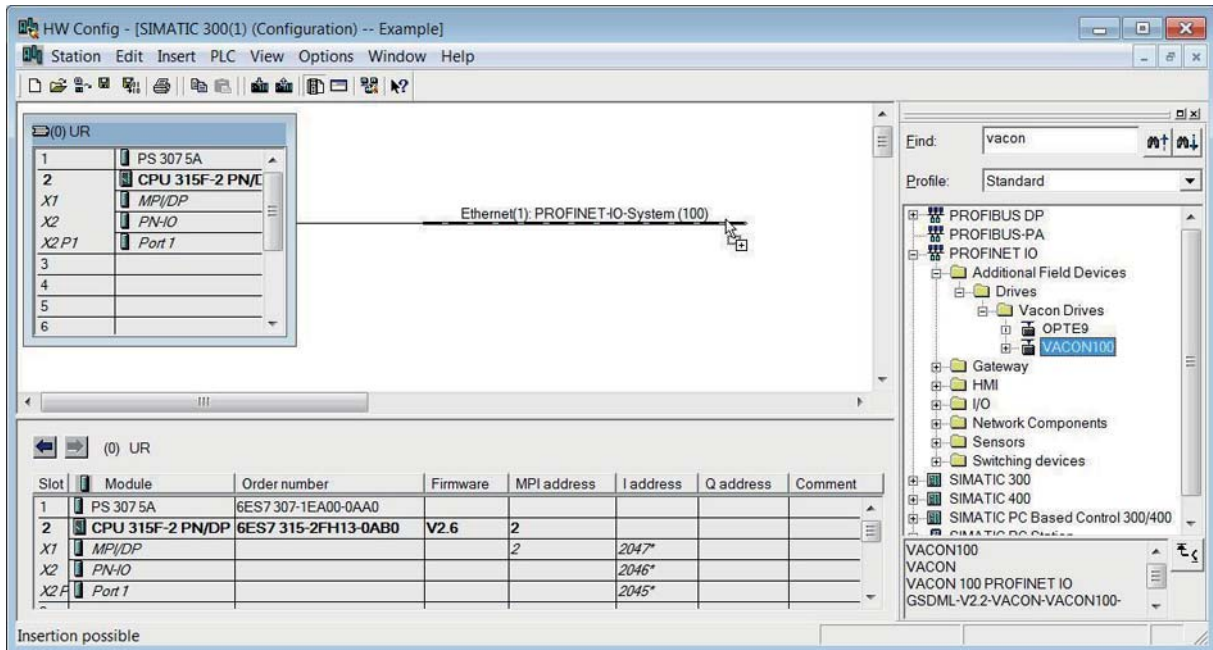
11704_uk

12. Select a communication profile.

11705_uk

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
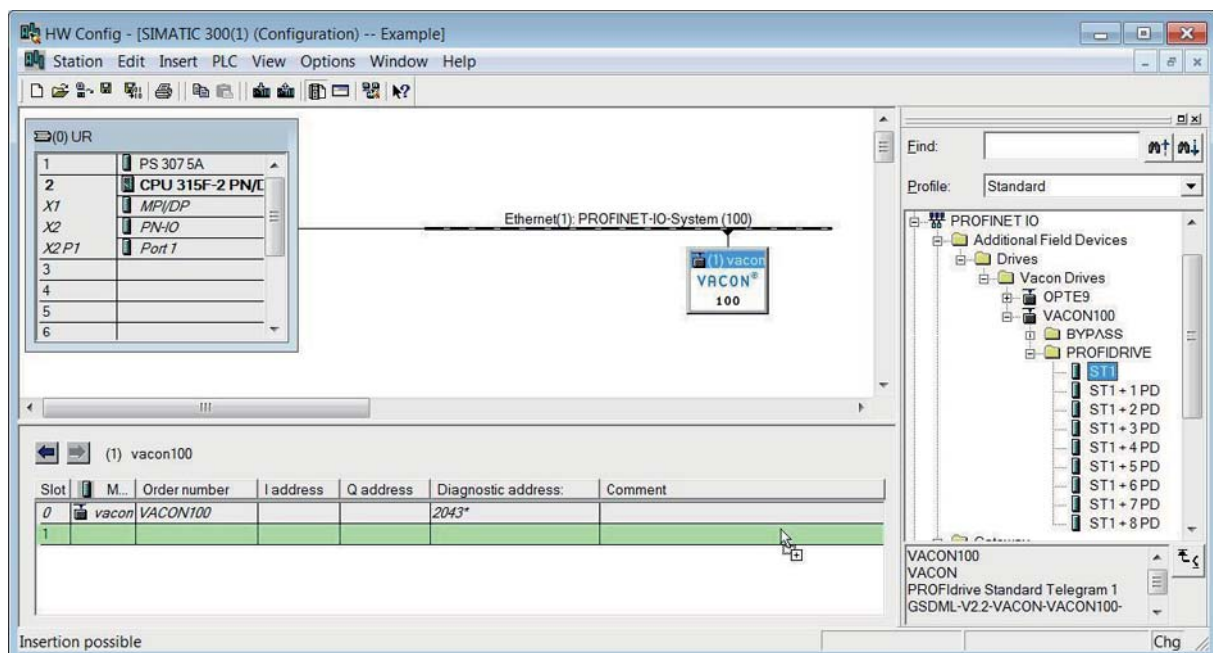
13. Change the drive properties. Give here the name you have configured to the drive via VACON®
Live or instead of next step "Verify device name", use the "Assing device name" function. By default,
the VACON® 100 AC drive will have a generated name in format "control-<SERIAL_NUMBER>"
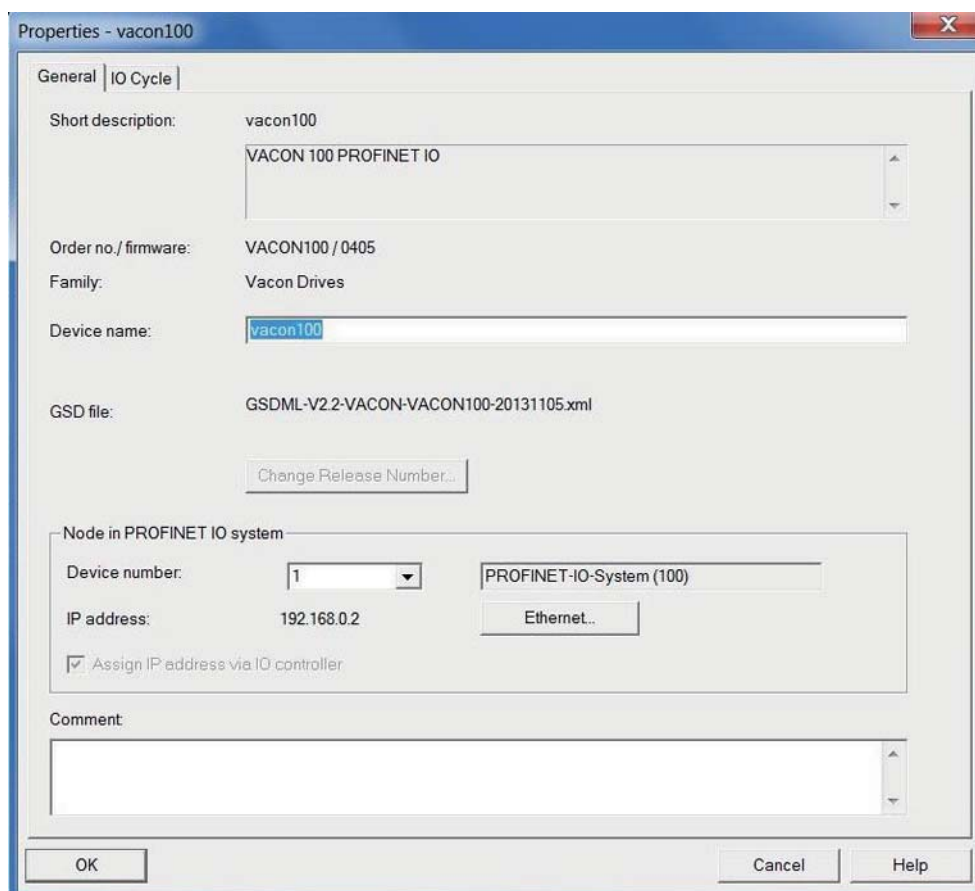
11706_uk

14. Assign/Verify the Device Name.
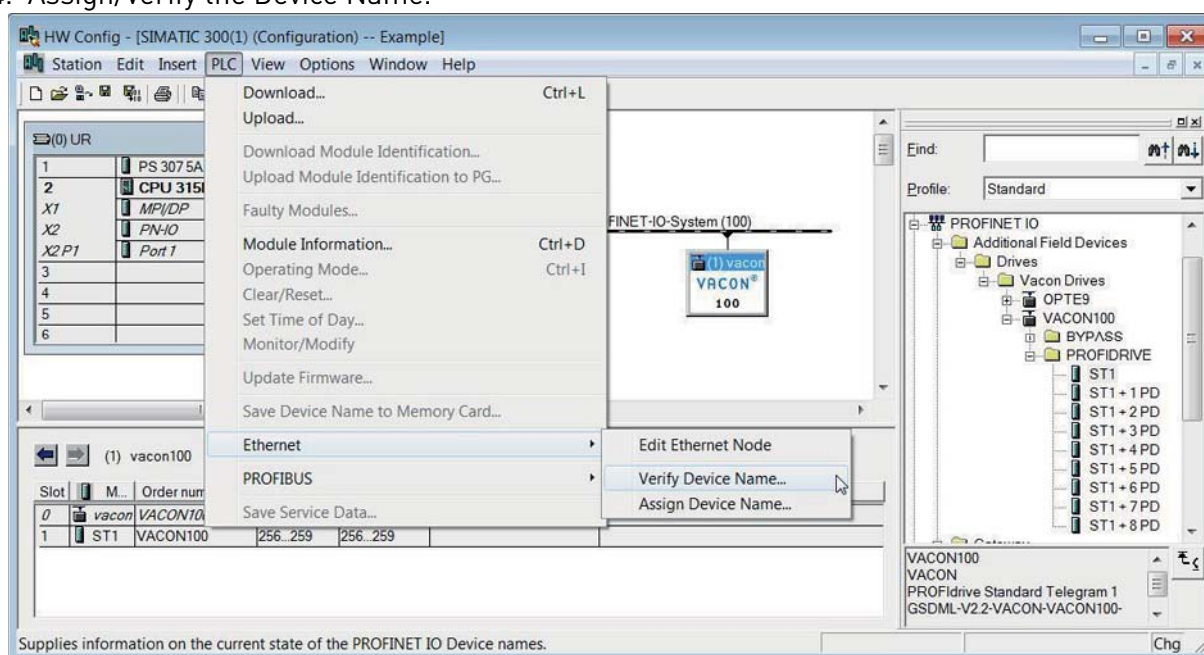
11707_uk

15. Name verified. Close the window.
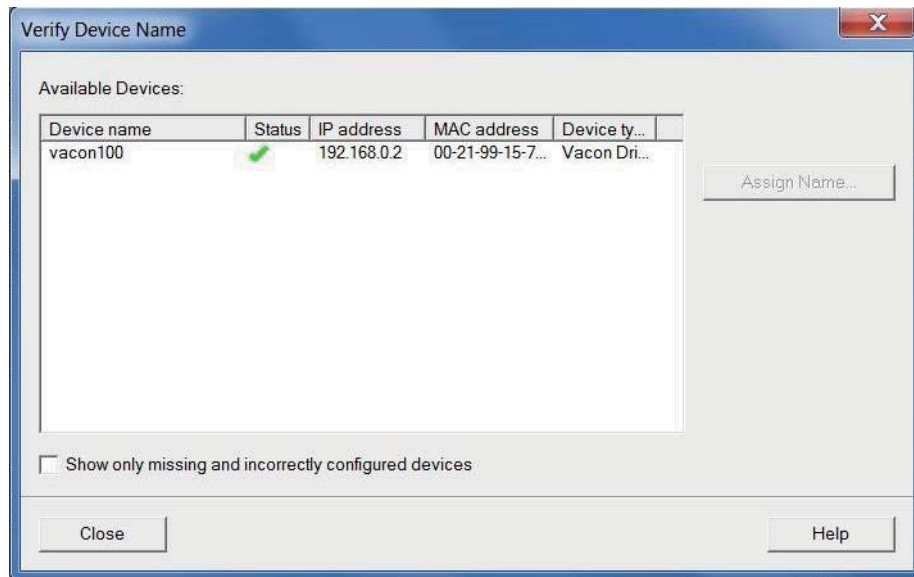
11708_uk

16. Select the correct drive and click the "Assing Name"-button.

11709_uk

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
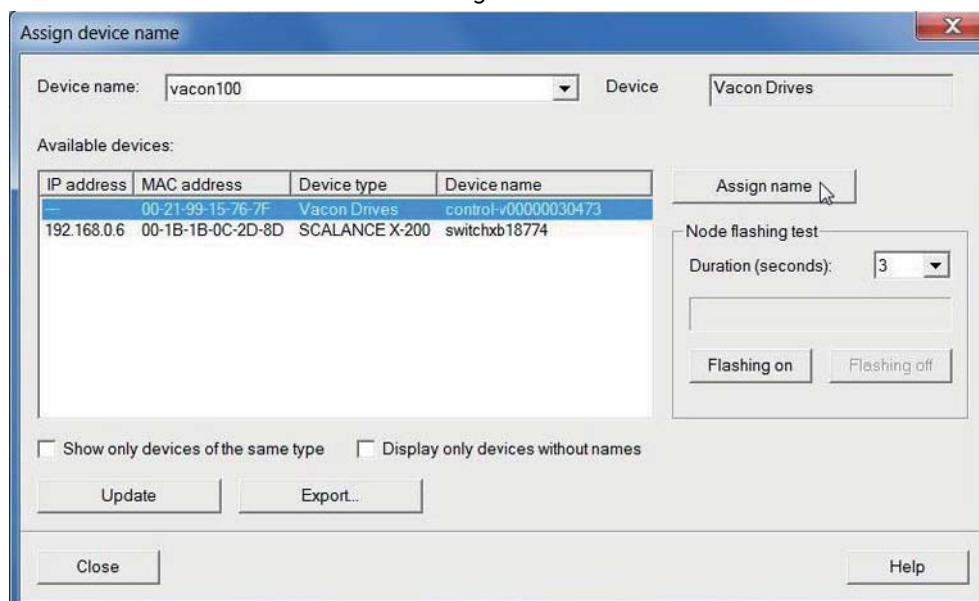
17. Change the IO cycle to 4 ms (minimum) or greater.
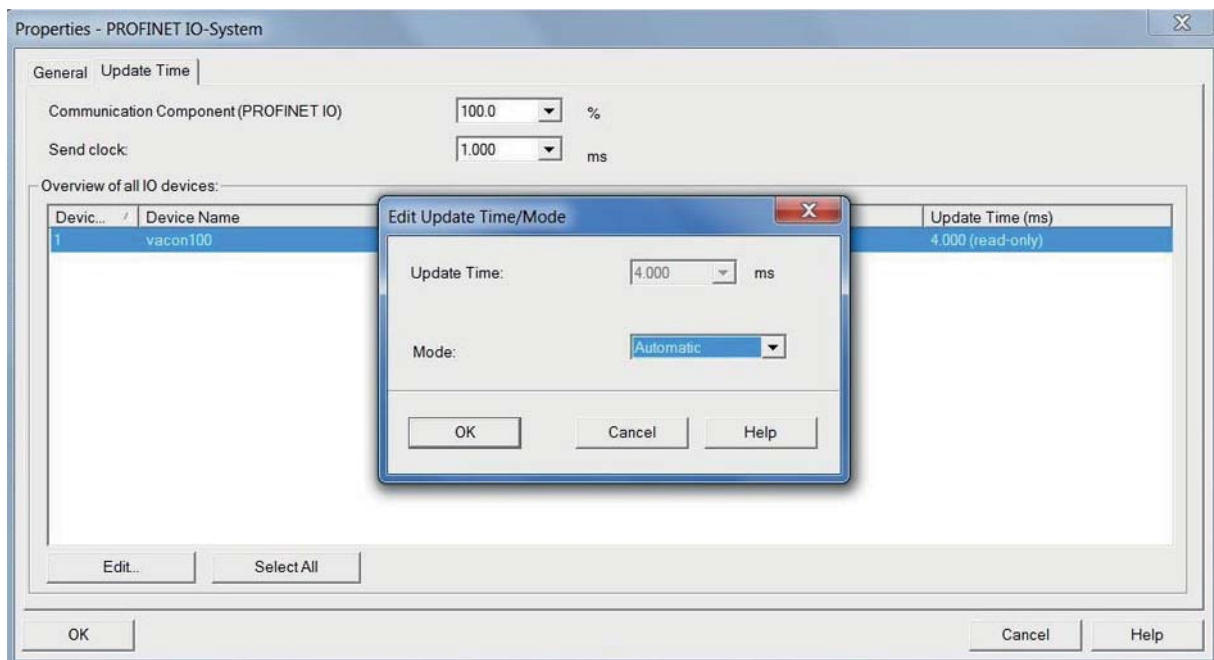
11710_uk

Next step is to download the program into PLC. After this, the PLC starts communication with the VACON® 100 AC drive. Please note that controlling of AC drive requires a PLC programming block which contains the controlling logic.

9.2   Siemens TIA Portal

This example shows how to configure the Siemens S7-300 PLC series to use the VACON® 100 AC drive with the Siemens TIA Portal programming tool. Check your individual PLC information. The information used in this example probably differs from the one you have.

1. Create a new project.
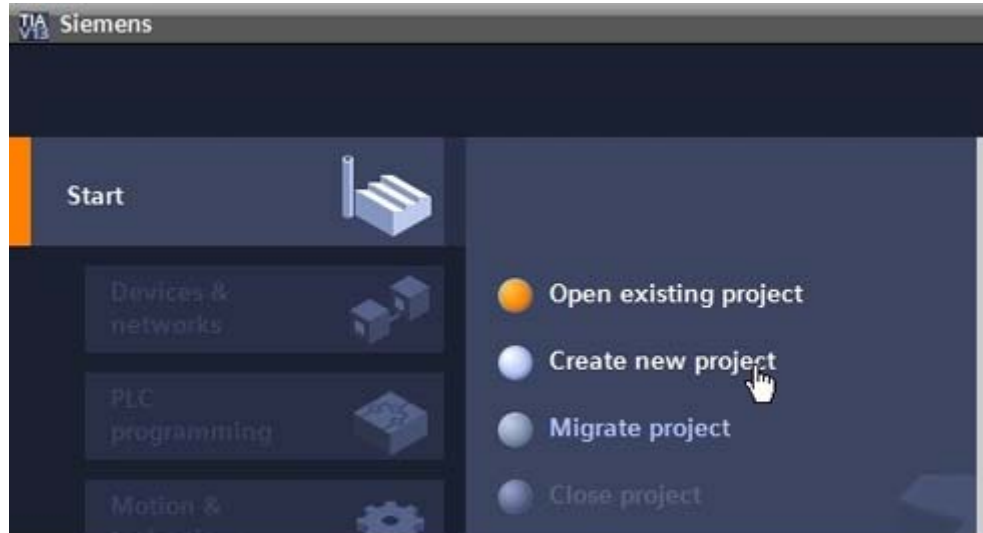
11756_00

2. Give the project a name and location and click "Create". When the project is created, click "Project View" from the lower left corner of the screen.
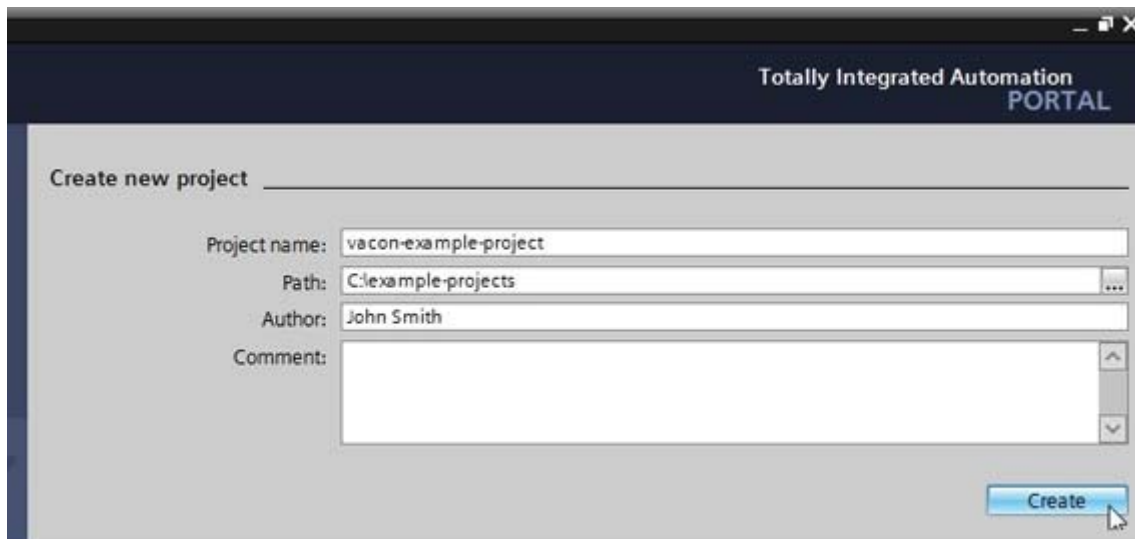
11757_00

3. Double-click on "Devices & networks".
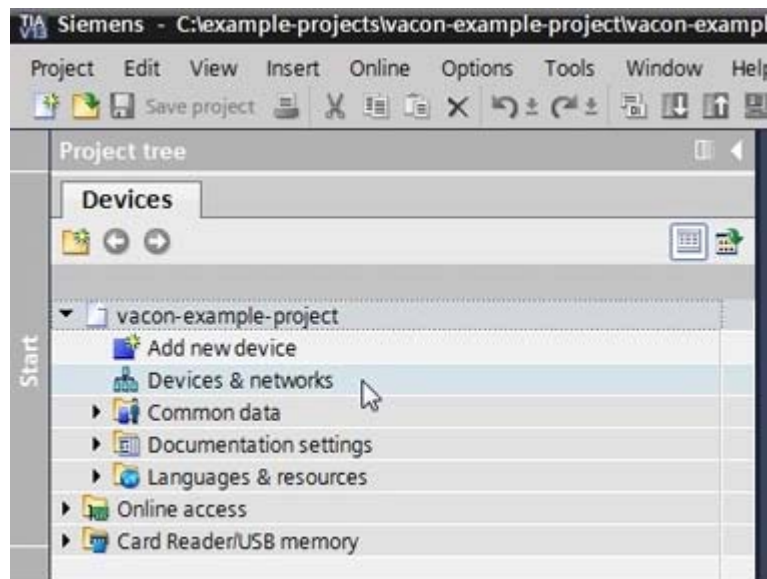
11758_00

4. Drag and drop the PLC you are using.
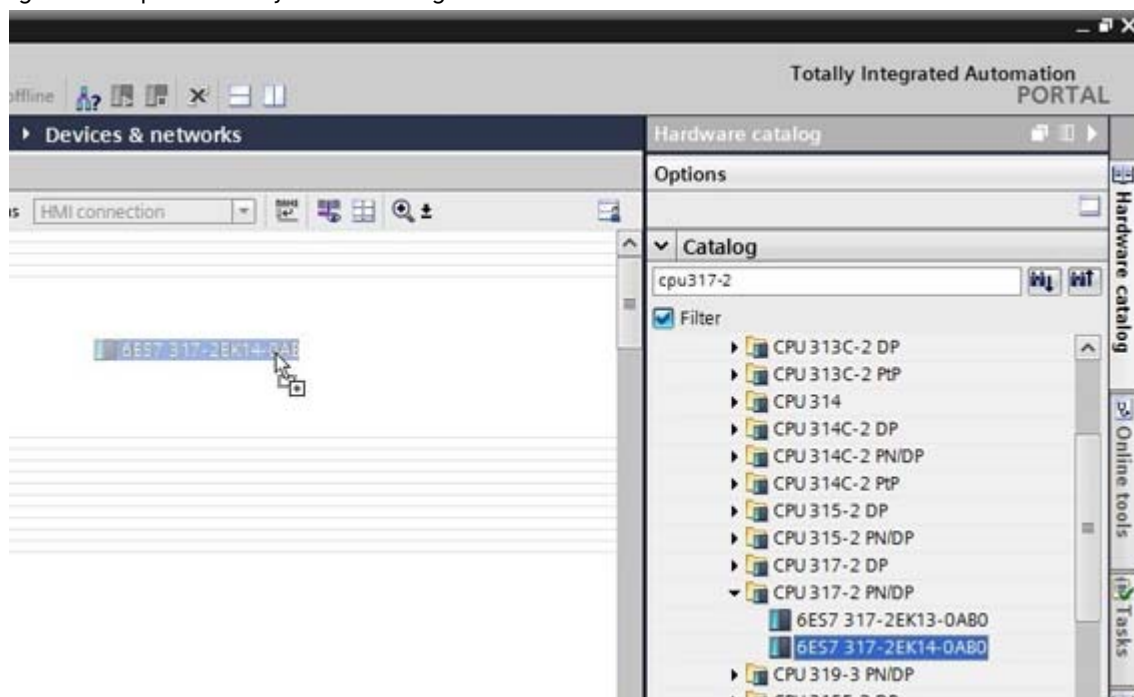
11759_00

5. Add VACON 100.
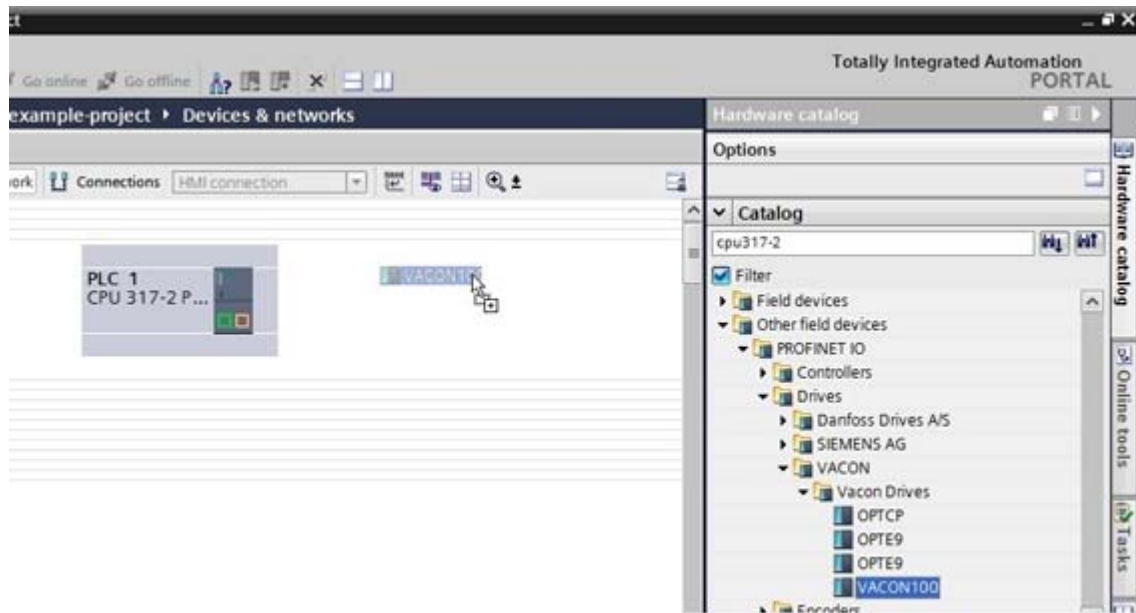
11760_00

6. Click the blue text "Not assigned" to assign IO controller.
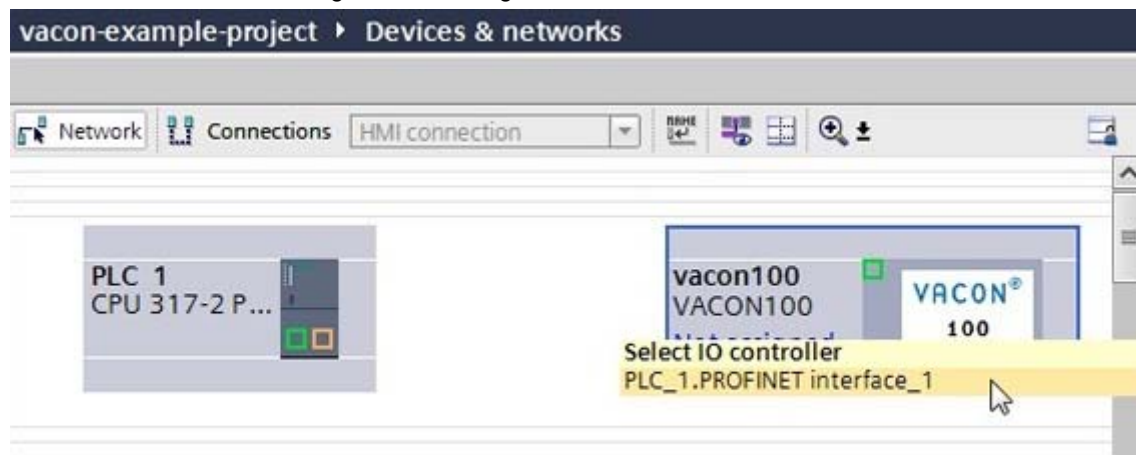
11761_00

7. Assign the connections between the Ethernet ports in "Topology view".

11762_00

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
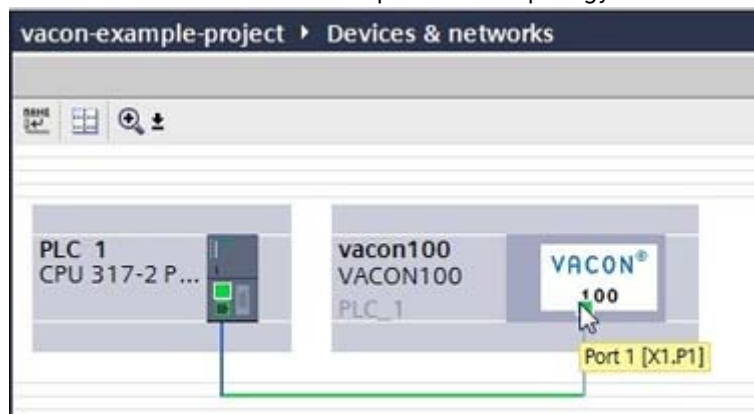
8. Assign IP settings and Name of Station to the VACON® 100 drive.
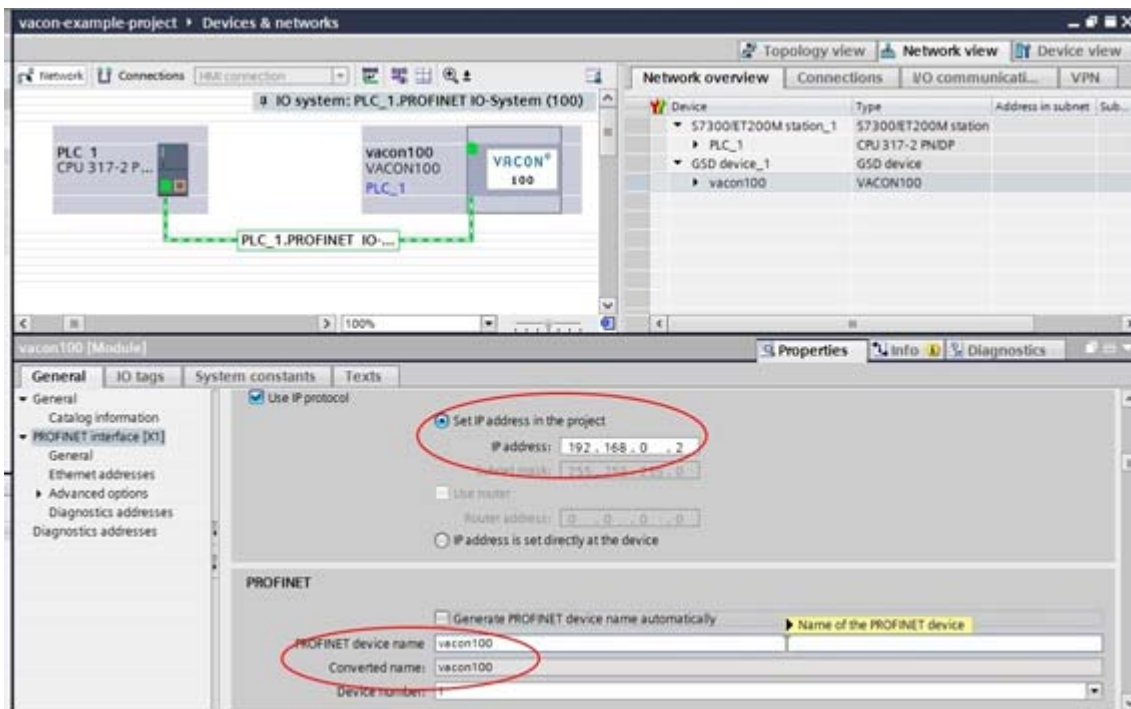
11763_00

9. Double-click on the VACON® 100 drive to open the device view.
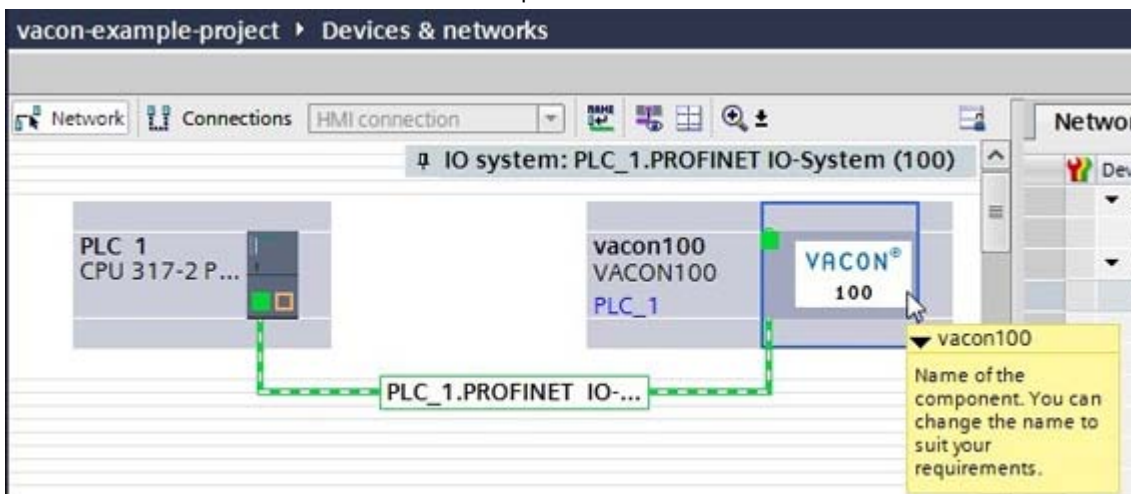
11764_00

10. Drag and drop the used telegram to the configuration.
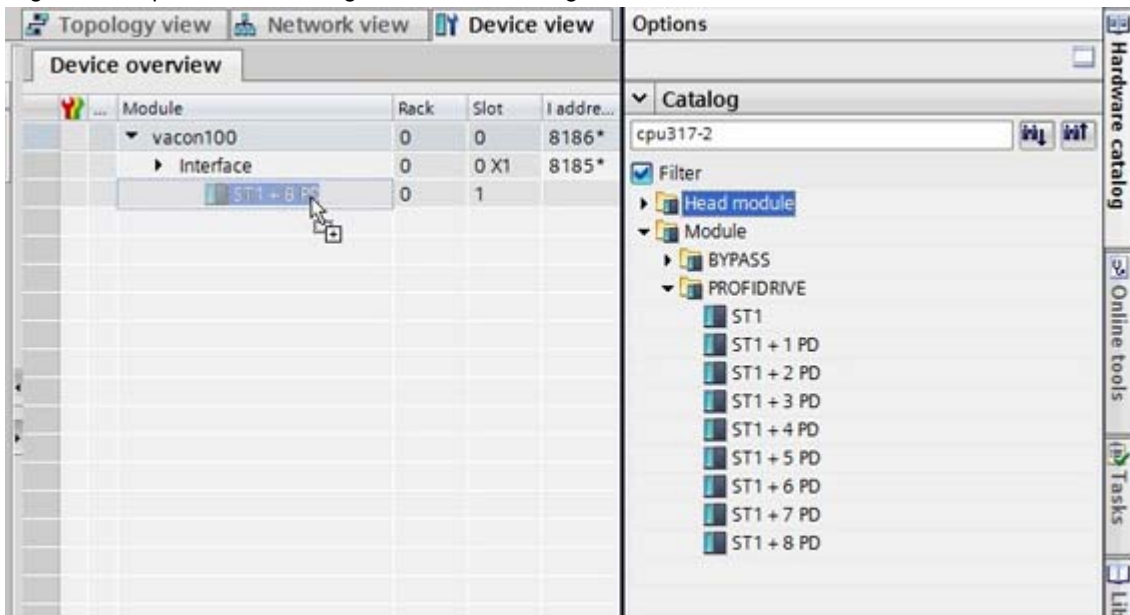
11765_00

11. The configuration is complete. Follow the next steps to load the configuration to the PLC.

11766_00

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
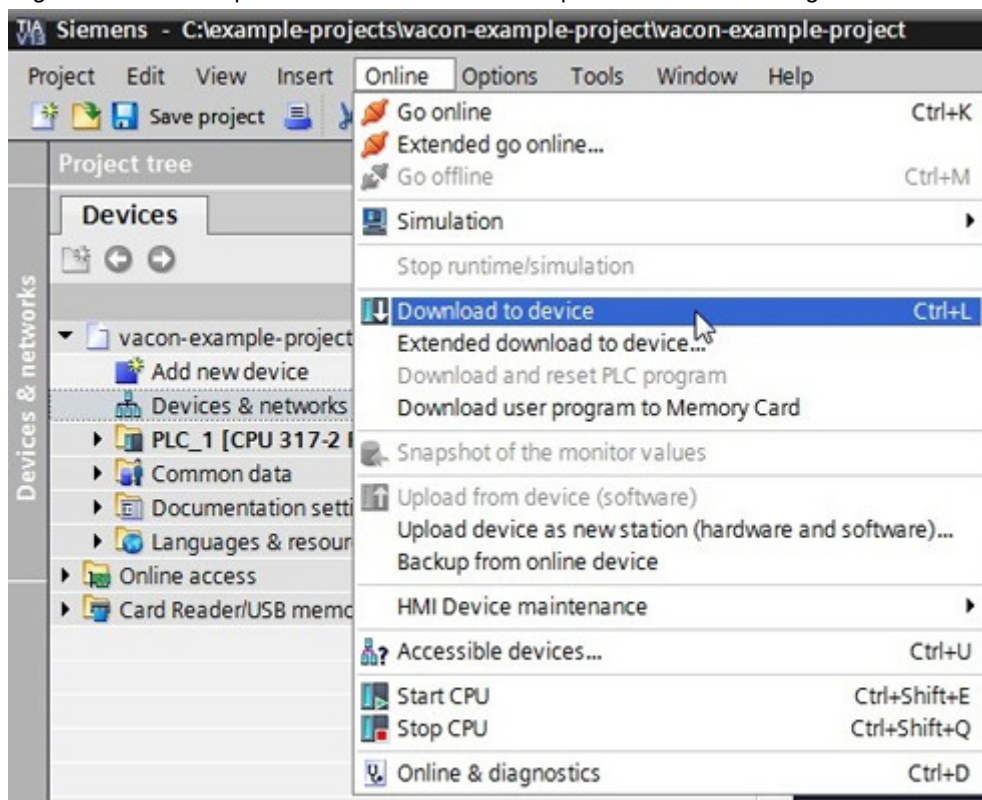
12. Select the connection interface from the dropdown menu (how the PC with TIA Portal is connected to network with the PLC). Then click search. When the search is completed you should see your PLC in the list. Select it and click Load.
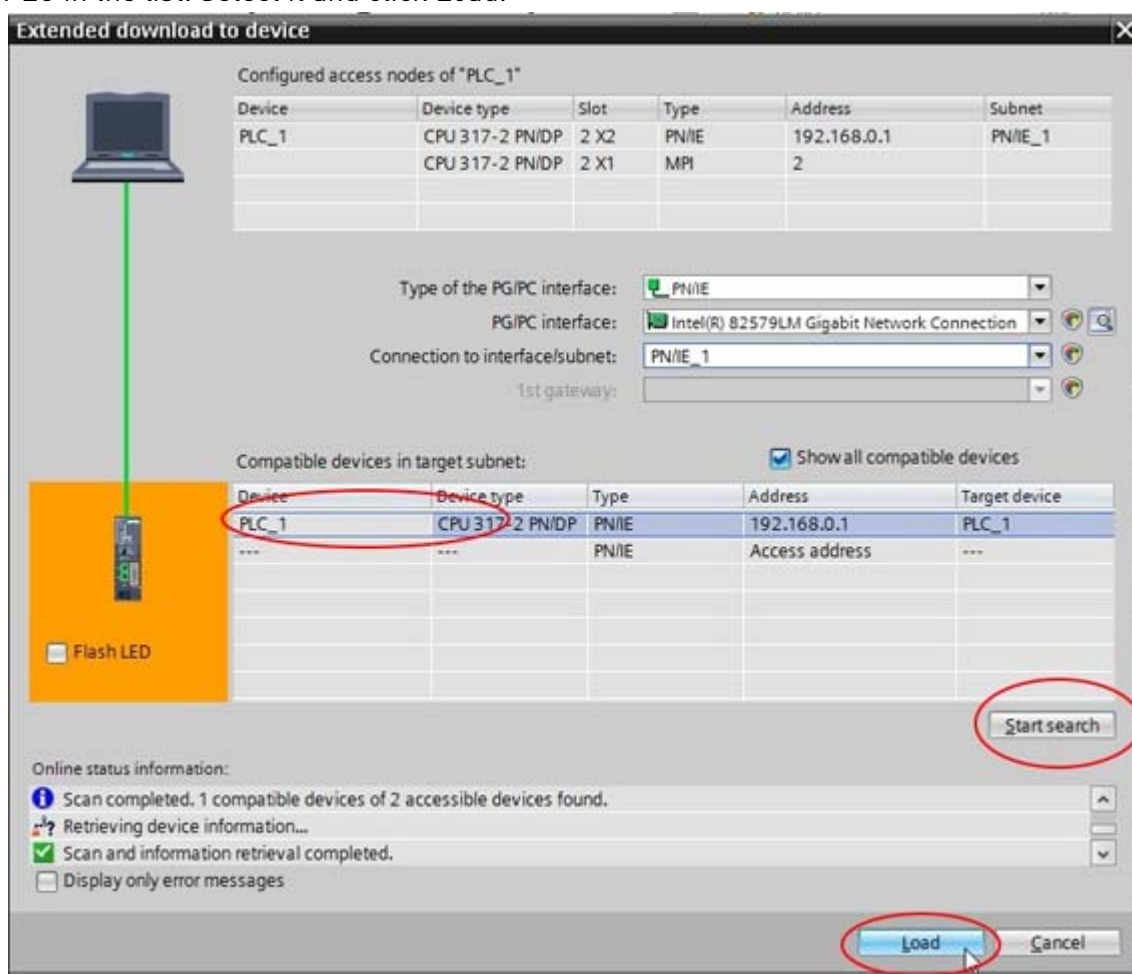
11767_00

13. TIA portal compiles the program.

11768_00

14. Click Load to load the program to the PLC.

11769_00

15. When the loading is ready, click Finish. Now the PLC should start communicating with the VACON® 100 AC drive.

11770_00

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
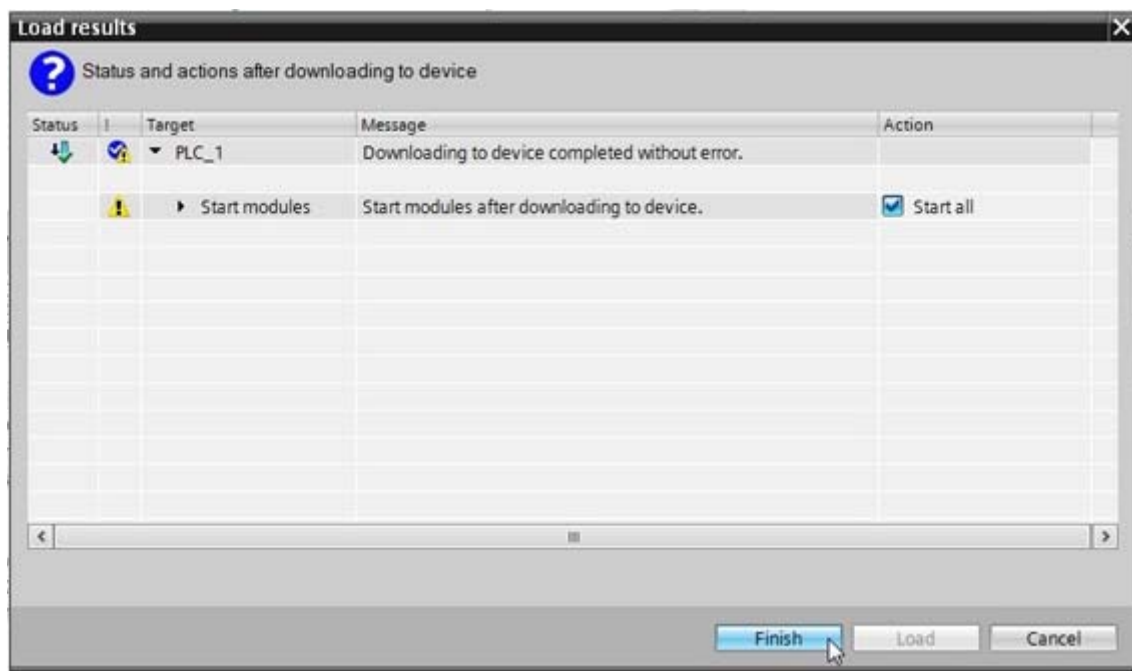
10.   APPENDIX 4 – EXAMPLE WITH SIEMENS SIMATIC PDM

The EDD files for Siemens SIMATIC PDM can be downloaded from:

http://drives.danfoss.com/services/software-downloads/ -> VACON FIELDBUS CONFIGURATIONS

1. Extract EDD files to a selected folder, and use PDM Device Integration manager to read the files into PDM catalogue.
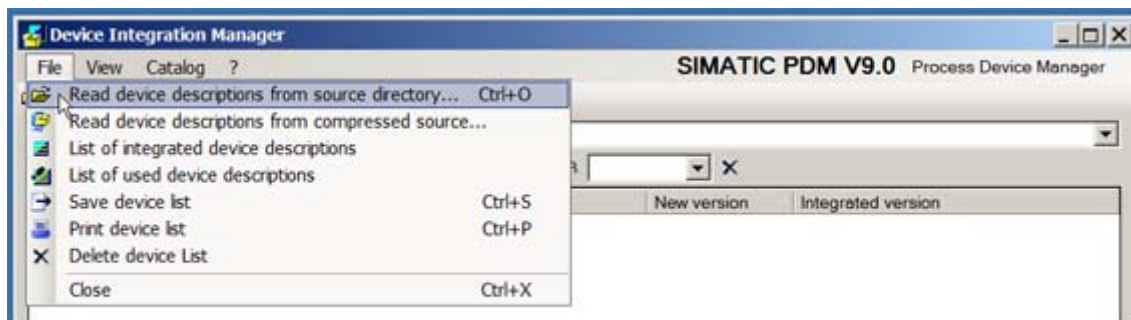
11730_uk

2. Click the "Integration" button.
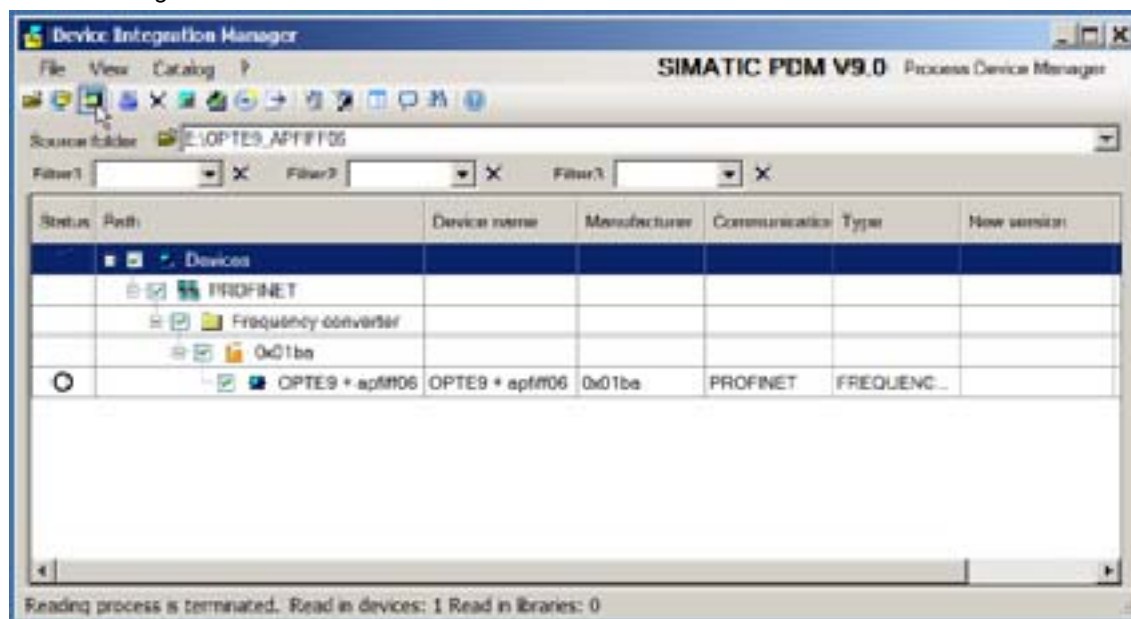
11731_uk

3. When the integration is done, you can start to use VACON® 100 AC drive in PDM.

11771_00

Local contacts: http://drives.danfoss.com/danfoss-drives/local-contacts/
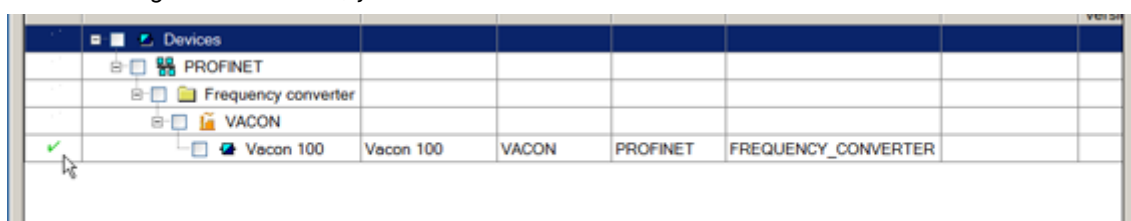
10

4. To add VACON® 100 AC drive into the network, select Profinet network and right-click to select "Insert New Object" -> "Object".
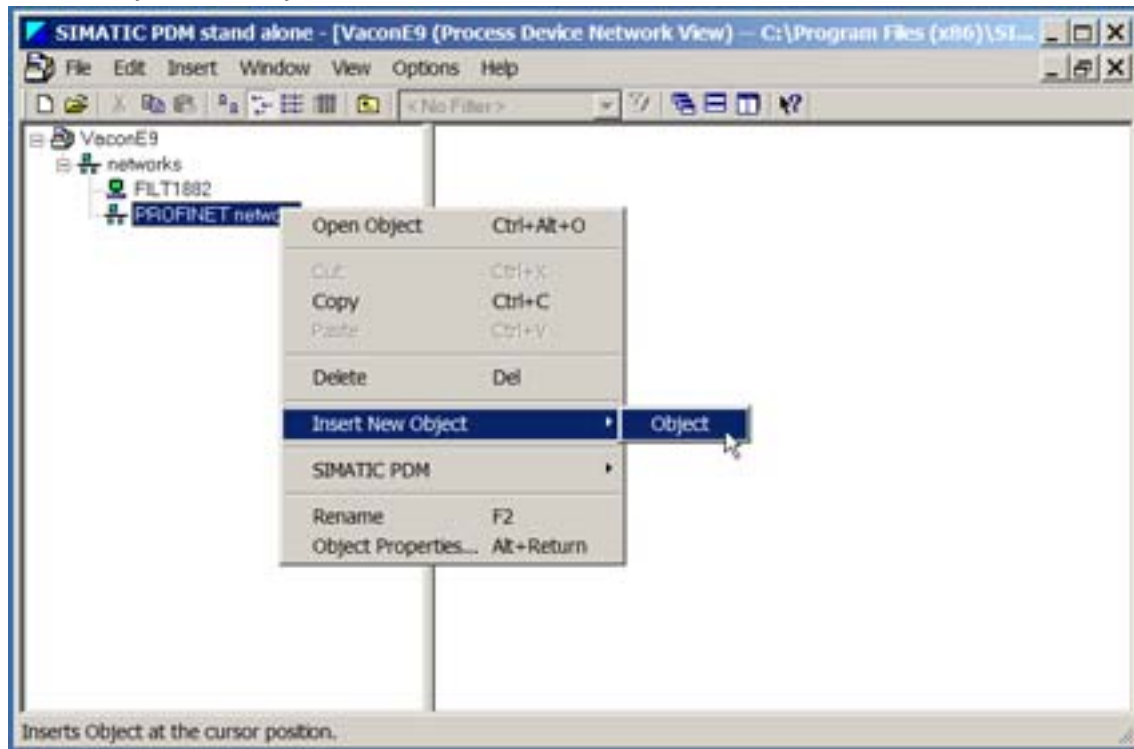
11732_uk

5. Assign Device Type and select Vacon 100.
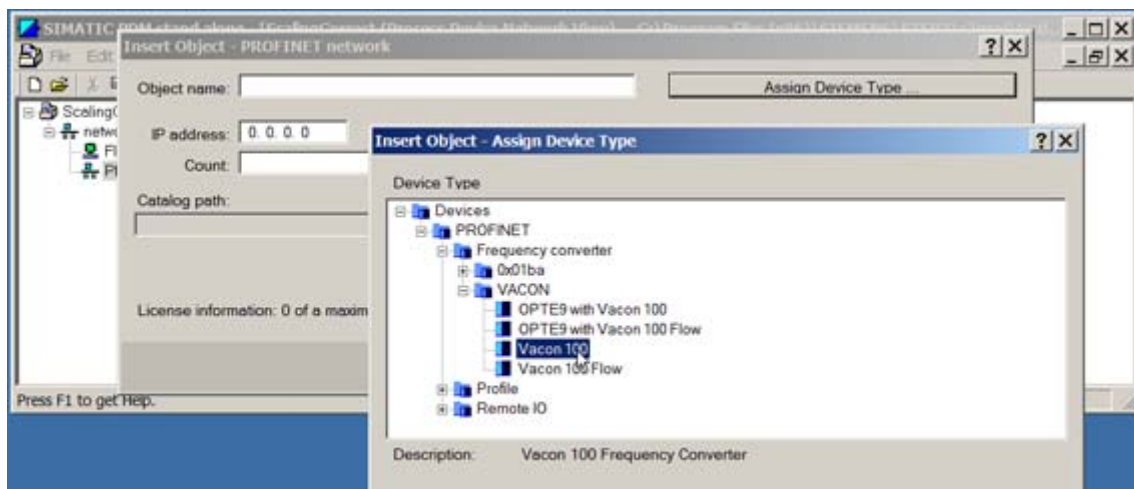
11772_00

6. Enter the correct IP address for the VACON® 100 AC drive.
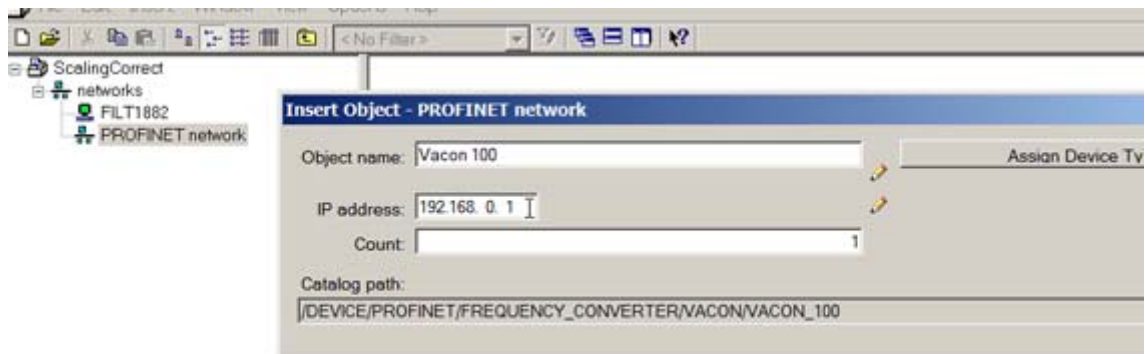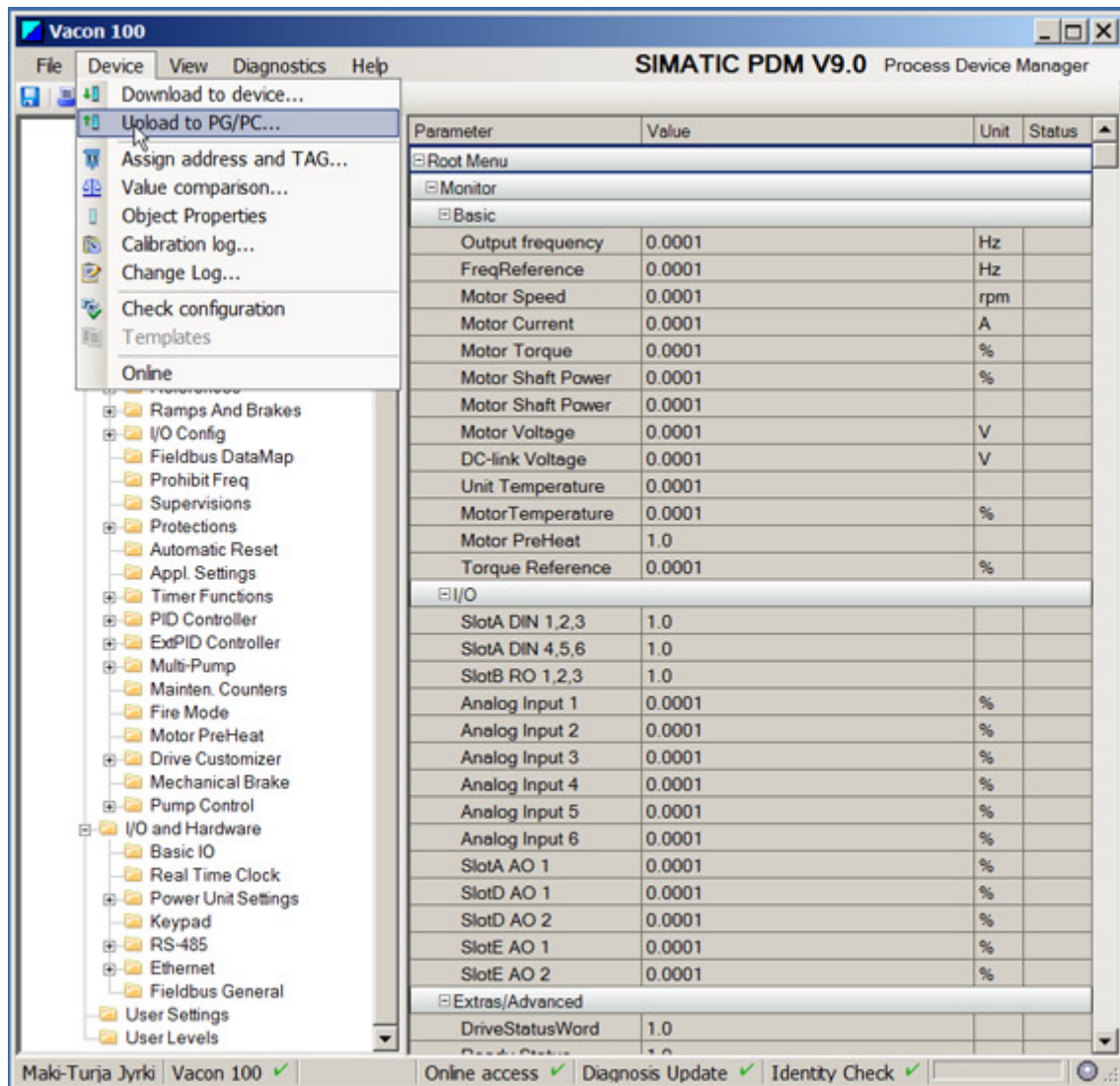

11773_00

11774_00

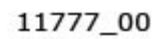7. You can access the drive parameters by opening the object.
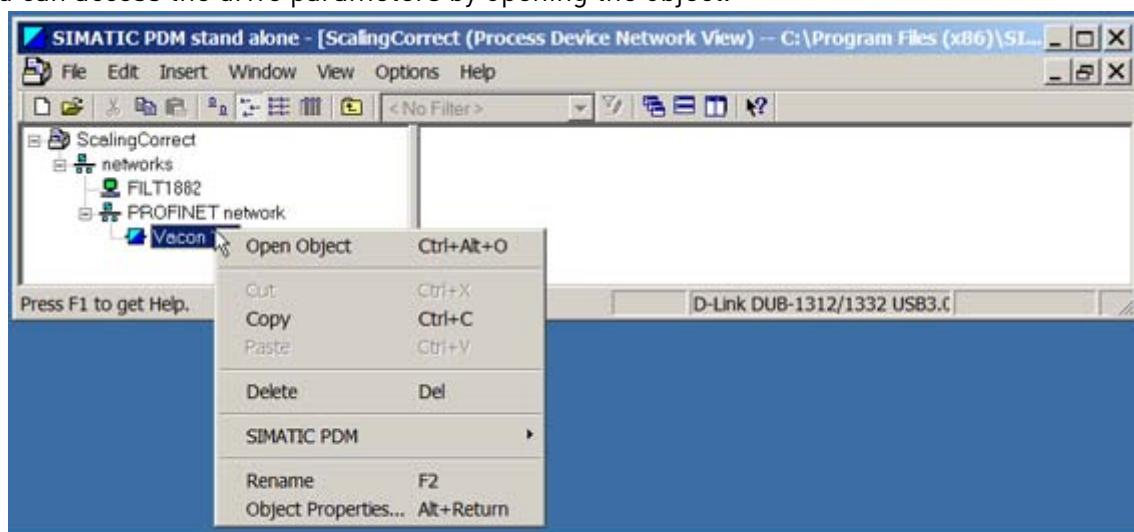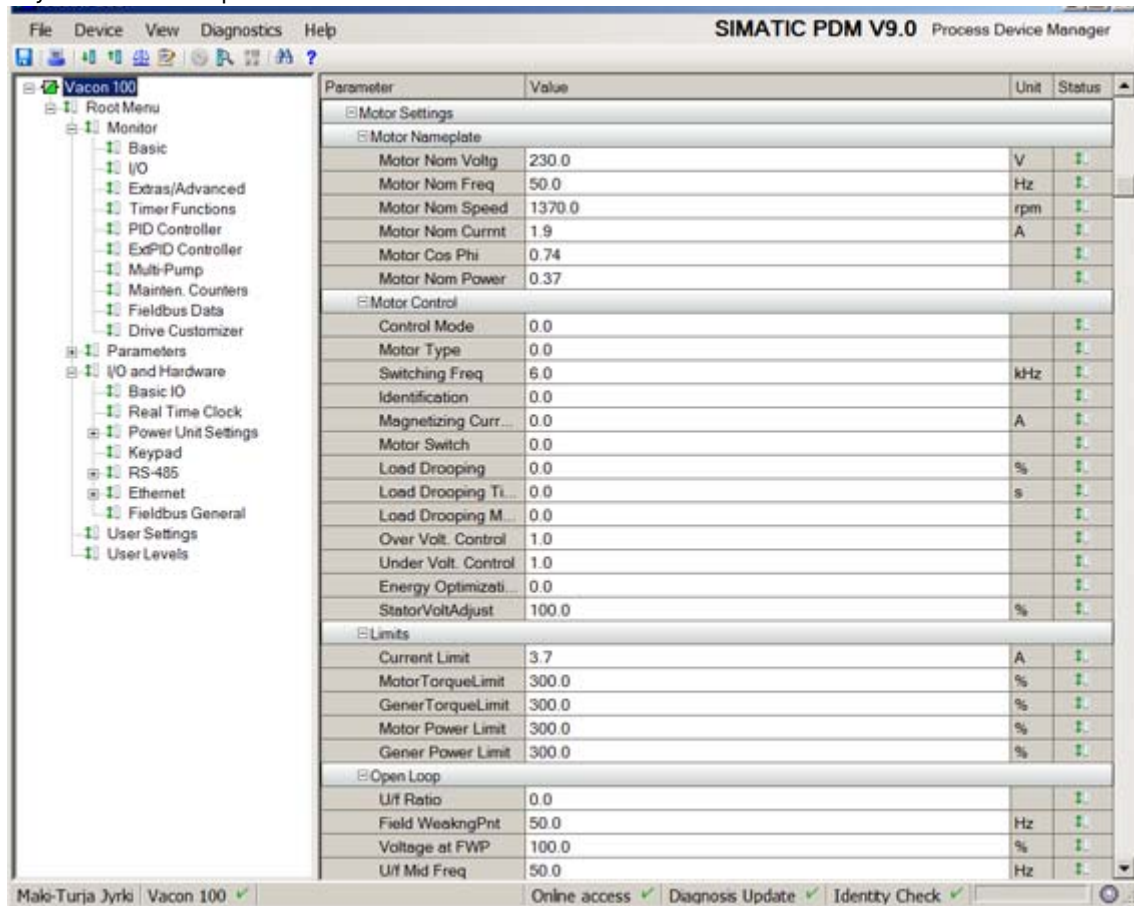

11775_00

8. You get a view of uninitialized drive parameters. To download parameters into PDM, select "Device" -> "Upload to PG/PC".
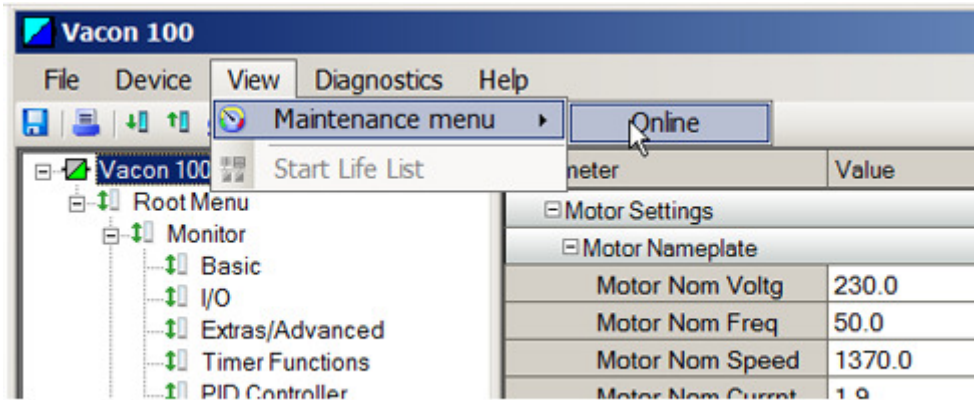

11776_00

11777_00

9. Now you have the updated values that can also be downloaded to the device.
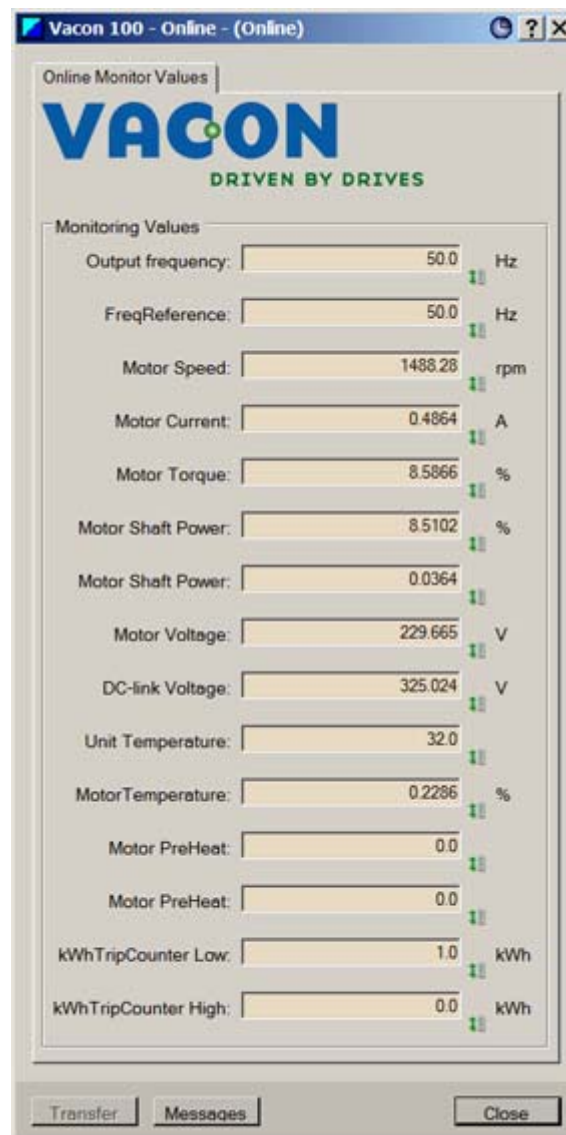

11778_00

10. You can also go live and monitor the Basic monitor menu.

11779_00

11780_00

11.   APPENDIX 5 – LWIP LICENCE

License for LWIP

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