VACON® 100
AC DRIVES

INTEGRATED PROFINET IO INSTALLATION MANUAL

VACON®

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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.

Please 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.

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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 brake 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. Futhermore, 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 www.vacon.com/downloads.

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 www.vacon.com/downloads.

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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

2.2 ABBREVIATIONS USED IN THE MANUAL

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)

3. PROFINET IO INSTALLATION

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.

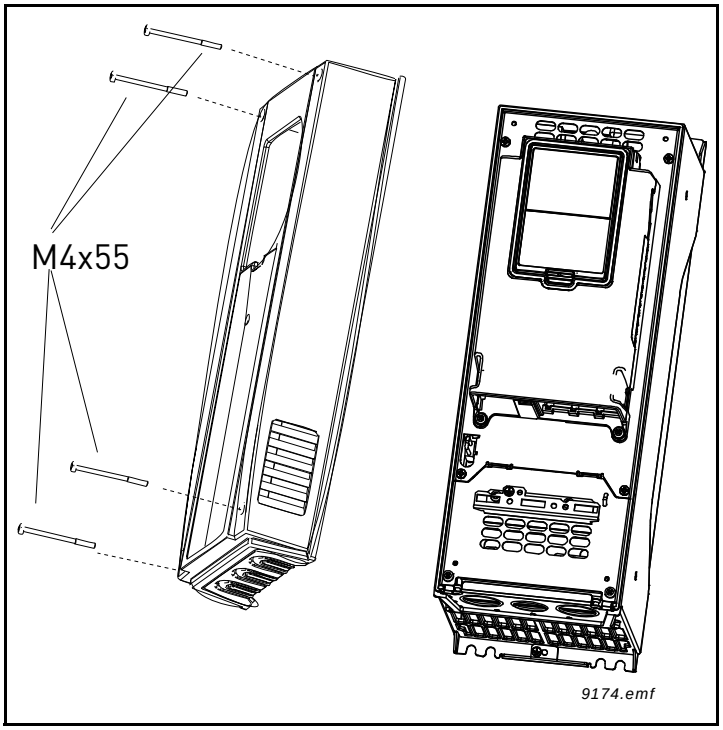

Figure 1.

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.

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3.1 PREPARE FOR USE THROUGH ETHERNET

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

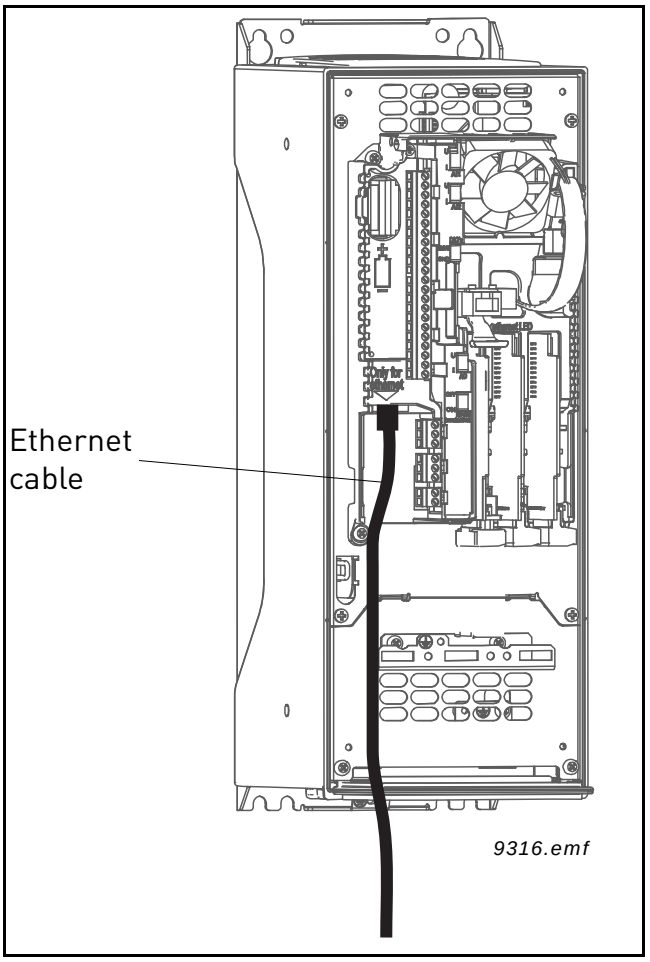

Figure 2.

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.

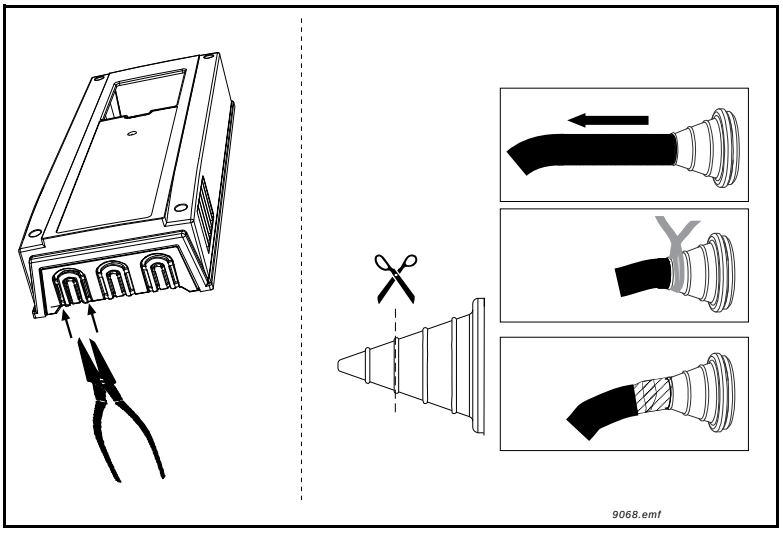

Figure 3. Leading the cables. Left: IP21, right: IP54.

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**.

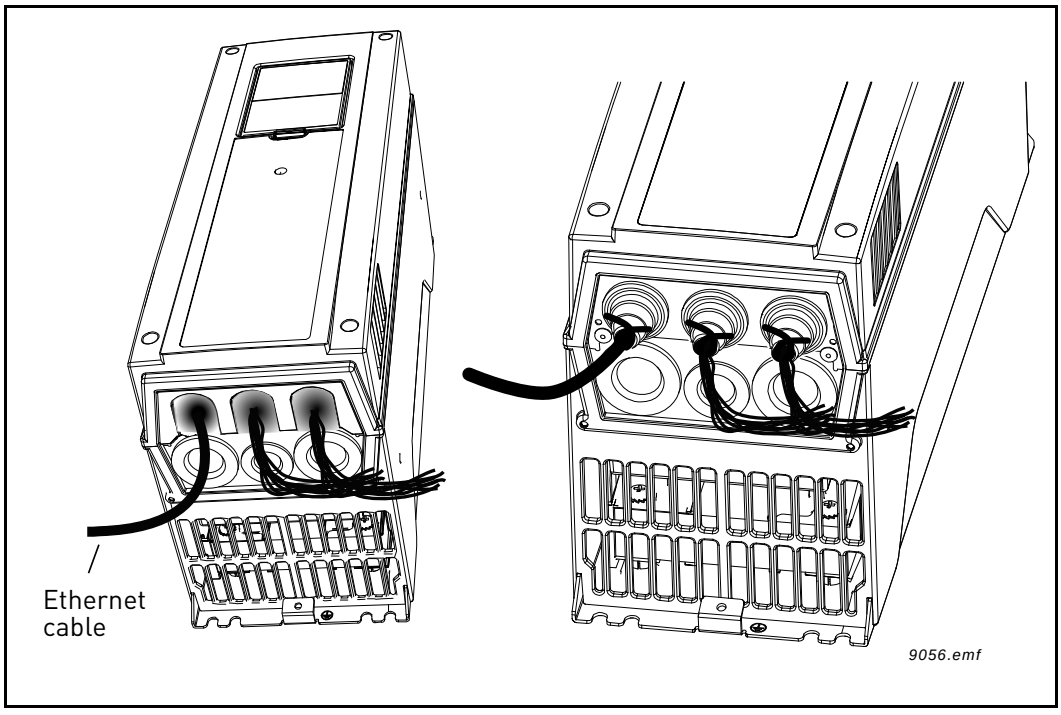

Figure 4.

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4. COMMISSIONING

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.

PROFINET IO is configured from the panel or with Vacon Live. Settings for PROFINET IO can be found under "I/O and Hardware / Ethernet / PROFINET IO". PROFINET 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.

In addition to settings below, PROFINET IO uses common network settings (that is IP address, network mask, etc.).

Basic information on how to use the control keypad you will find in the Vacon 100 Drive Application Manual (publication DPD00927).

The navigation path to the fieldbus parameters may differ from application to application. The exemplary paths below apply to the Vacon 100 drive standard applications.

1	First ensure that the right fieldbus protocol is selected. ***Navigate: Main Menu > I/O and Hardware (M5) > Ethernet (M5.9) > Common settings (M5.9.1.) > Protocol (P5.9.1.1) > Edit > (Choose protocol)***
2	Select *'Fieldbus control'* as the *Remote Control Place*. ***Navigate: Main Menu > Quick Setup (M1) > Rem. Ctrl. Place (P1.15)*** OR ***Navigate: Main Menu > Parameters (M3) > Start/Stop Setup (M3.2) > Rem. Ctrl. Place (P3.2.1)***
3	Choose source of reference. ***Navigate: Main Menu > Parameters (M3) > References (M3.3)***
4	Set fieldbus parameters (M5.9).

For Fieldbus Process Data Mapping, see Vacon 100 Application manual.

4.1 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.

4.2 PROFINET IO PARAMETERS AND MONITORING VALUES

Table 4. PROFINET parameters

Code	Parameter	Min	Max	Unit	Default	ID	Description
P5.9.5.1.1	Protocol in use	0	1		0	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 specific	-	Visible only in Vacon Live. See Chapter 4.2.1.

Table 5. 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	3		1	2439	Telegram used in the setpoint direction. 1 = Vendor-specific 1 2 = Vendor-specific 2 3 = Vendor-specific 3
P5.9.5.2.5	Actual value telegram	1	3		1	2440	Telegram used in the actual value direction. 1 = Vendor-specific 1 2 = Vendor-specific 2 3 = Vendor-specific 3
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		0	2442	The latest control word (vendor-specific format) received from the drive application. (Can be used for debugging purposes.)

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Table 5. PROFINET monitoring values

Code	Parameter	Min	Max	Unit	Default	ID	Description
P5.9.5.2.8	Drive status word	0	FFFFFFFFh		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		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		0	2596	ZSW1 sent to master. Not updated when vendor specific control word is used.

4.2.1 NAME OF STATION

"Name of Station" parameter can be set only via Vacon Live. This parameter is not visible on keypad. Other possibility is to set this name by writing it from PLC.

If no name is set, the drive will generate a temporary name. The name is formed from the drive power unit serial number or, if that value is not available, from the control unit MAC address. The format is: control-<unique identifier>.

Example: control-v00000030473

Example: control-002199ff0329

4.3 PROFIDRIVE 4.1 STATE MACHINE

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

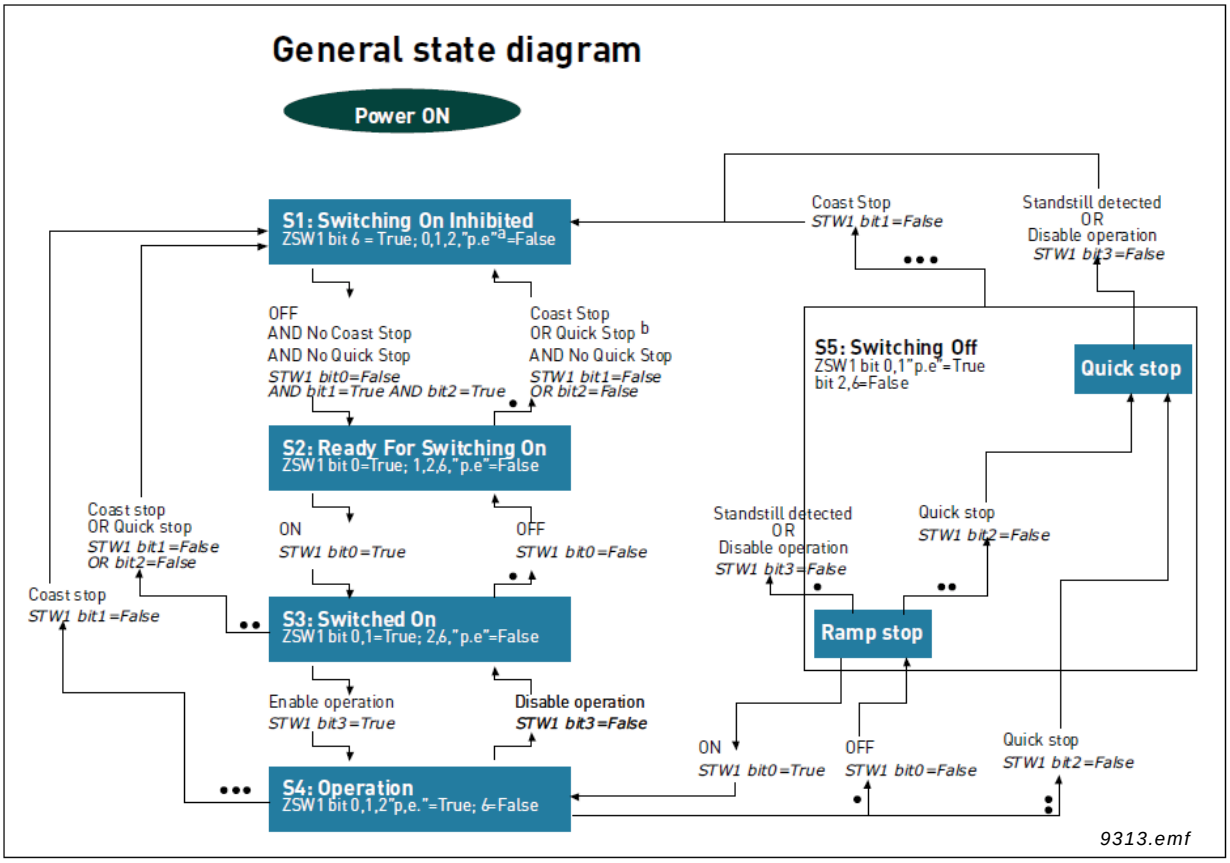

Figure 5.

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4.4 PROFIDRIVE PARAMETERS IMPLEMENTED BY VACON® 100

4.4.1 BASE MODE PARAMETER ACCESS MODEL

PROFIdrive parameters are accessed according to the model presented below:

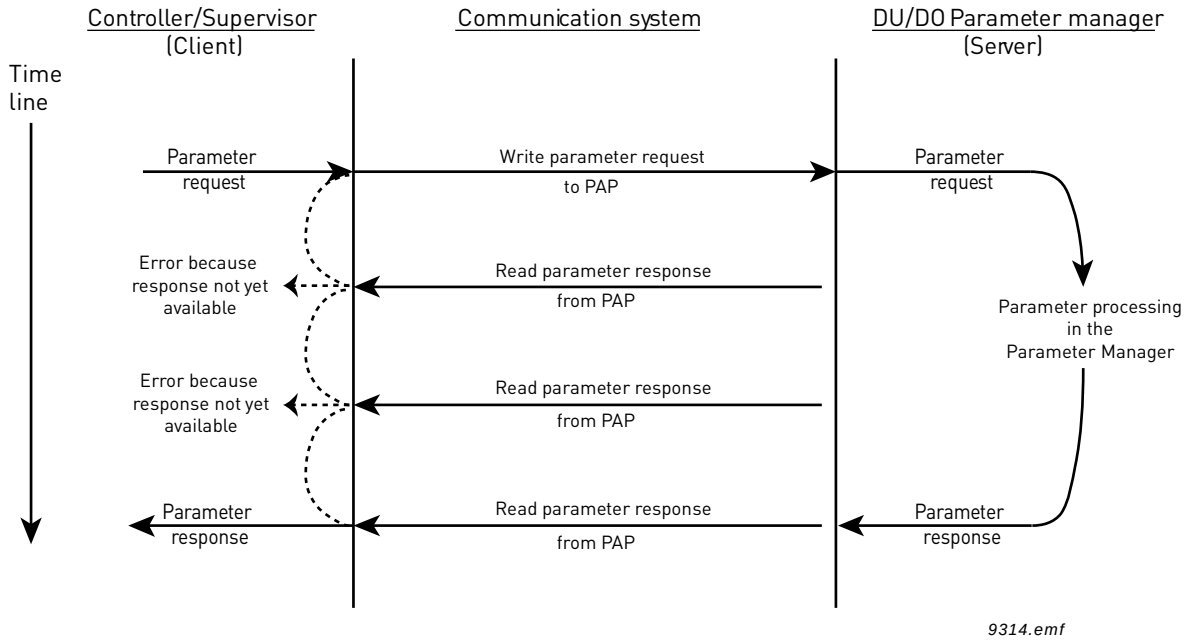

Figure 6.

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

Table 6.

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

Table 7. 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		
	...		
nth Parameter Values	...		
			4 + 6 x n + ... + (Format_n x Qty_n)

Table 8. 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)

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Table 9. 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 elements	Unsigned16	For array parameters, the number of elements in the array.
3	Standardisation factor	FloatingPoint	If the information represented by the parameter can be converted into some standardised form, this field contains a factor 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 characters	Symbolic name of the parameter.
7	Low limit	Array of four Unsigned8	Limit for valid values of the parameter.
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.

4.4.2 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)

4.4.2.1 Request header

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

Table 10.

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.	Values 1 to 255 are allowed. Value 0 restricted by PROFIdrive 4.1 -> only 1...255 allowed.
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.

4.4.2.2 Parameter address

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

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Table 11.

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 4.4.4
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.

4.4.2.3 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 12.

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.

Because of the limitation in the maximum length of the Parameter Access messages (PROFIBUS DP: 240 bytes), the number of values which can be transmitted in one frame is limited by the parameter format.

4.4.3 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)

4.4.3.1 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 13.

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 4.4.3.2.
4	Error Code 2	Application-specific.	Always 0 in PROFIdrive.

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4.4.3.2 PROFIdrive 4.1 error classes and code

Table 14.

Error class	Error codes	PROFIdrive meaning
0x0...0x9 = reserved (not used)		
0xA = application	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 conflict 0x1 = write constraint conflict	
	0x2 = resource busy	
	0x3 = resource unavailable	
	0x4...0x7 = reserved (not used) 0x8...0xF = user-specific (not used)	
0xD...0xF = user-specific (not used)		

4.4.3.3 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 the table below (continued on next page).

Table 15.

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	Low or high limit exceeded	Change request which exceeds parameter value range.
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.

Table 15.

Error number	Meaning	When used
0x06	Setting not permitted (may only be reset)	Change request to 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	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
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 (not 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	Reserved (not used)	
0x6D	Reserved (not used)	
0x6E...0xFF	Reserved (not used)	

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4.4.3.4 Response header

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

Table 16.

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 arameter 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.

4.4.3.5 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 page 17.

4.4.4 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.

4.4.5 PARAMETER CHANNEL EXAMPLES

4.4.5.1 Request first element of PNU964 value

The following information is used for this request.

Table 17.

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 request for the master is:

Table 18.

PROFINET Write request header	Request header	Parameter address
...	0x01 0x01 0x01 0x01	0x10 0x01 0x03 0xC4 0x00 0x00

The slave responds to the write request with a PROFINET write response header.

Table 19.

PROFINET Write response header
...

The master reads the result of the operation from the drive using a PROFINET read request header.

Table 20.

PROFINET Read request header
...

The slave responds to the read request:

Table 21.

PROFINET Read response header	Response header	Parameter value
...	0x01 0x01 0x01 0x01	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.

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4.4.5.2 Request all elements of PNU964 value

The following information is used for this request.

Table 22.

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 request from the master is:

Table 23.

PROFINET Write request header	Request header	Parameter address
...	0x02 0x01 0x01 0x01	0x10 0x06 0x03 0xC4 0x00 0x00

The slave responds to the write request with a PROFINET write response header.

Table 24.

PROFINET Write response header
...

The master reads the result of the operation from the drive using a PROFINET read request header.

Table 25.

PROFINET Read request header
...

The slave responds to the read request:

Table 26.

PROFINET Read response header	Response header	Parameter value
...	0x02 0x01 0x01 0x01	0x42 0x06 0x01 0xBA 0x00 0x02 0x01 0x97 0x07 0xDC 0x0B 0x5F 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, 0x0197, 0x07DC, 0x0B5F, and 0x0001. Thus the following information can be determined about the device:

- Manufacturer code is 0x01BA
- Drive Unit type is 0x0002
- Software version is 4.7 (0x0197 = 407d)
- Firmware date (year) is 2012 (0x07DC)
- Firmware date (day/month) is 29/11 (0x0B5F = 2911d)
- The device contains one axis

4.4.5.3 Requesting the value of drive parameter ID 103

The following information is used for this request:

Table 27.

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)

The request from the master is:

Table 28.

PROFINET Write request header	Request header	Parameter address
...	0x03 0x01 0x01 0x01	0x10 0x01 0x27 0x11 0x00 0x67

The slave acknowledges with a PROFINET write response header.

Table 29.

PROFINET Write response header
...

The master reads the result of the operation from the drive using a PROFINET read request header.

Table 30.

PROFINET Read request header
...

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The slave responds to the read request:

Table 31.

PROFINET Read response header	Response header	Parameter value
...	0x03 0x01 0x01 0x01	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.

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

The following information is used for this request:

Table 32. 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

The request from the master is:

Table 33. Request from master

PROFINET Write request header	Request header	Parameter address	Parameter value
...	0x04 0x02 0x01 0x01	0x10 0x01 0x27 0x11 0x00 0x67	0x42 0x01 0x00 0x28

The slave acknowledges with a PROFINET write response header.

Table 34. Response from slave

PROFINET Write response header
...

The master reads the result of the operation from the drive using a PROFINET read request header.

Table 35. Read request from master

PROFINET Read request header
...

Slave response:

Table 36. Slave response to read request

PROFINET Read response header	Response header
...	0x04 0x02 0x01 0x01

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

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

Table 37. 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

The request from the master is:

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Table 38. Request from master

PROFINET Write request header	Request header	Parameter address	Parameter value
...	0x05 0x02 0x01 0x01	0x10 0x01 0x27 0x11 0x00 0x67	0x42 0x01 0x00 0x00

The slave acknowledges with a PROFINET write response header.

Table 39. Response from slave

PROFINET Write response header
...

The master reads the result of the operation from the drive using a PROFINET read request header.

Table 40. Read request from master

PROFINET Read request header
...

Slave response:

Table 41. Slave response to read request

PROFINET Read response header	Response header	Parameter value
...	0x05 0x82 0x01 0x01	0x44 0x01 0x00 0x02

5. COMMUNICATIONS

5.1 PARAMETERS OF THE PROFIDRIVE

Table 42. 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: 1 for ST1 100 for ST1 + PD[1..4] 101 for ST1 + PD[1..8] 102 for ST1 + PD1 103 for ST1 + PD[1..2] 104 for ST1 + PD[1..3] 105 for ST1 + PD[1..5] 106 for ST1 + PD[1..6] 107 for ST1 + PD[1..7]
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 a parameter number. Not supported standard signals, those in range 1-99, have values set to 0. Gaps between device-specific signals are also filled with 0. Refer to Table 44.
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.
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) 2 = Software version - $XXYY_d$ (XX - major revision, YY - minor revision) 3 = Firmware date (year) - $YYYY_d$ 4 = Firmware date (day/month) - $DDMM_d$ 5 = Number of Drive Objects (0x0001)
965	Profile identification number	OctetString2	Two bytes to identify the profile that is used. 1^{st} - profile number; PROFIdrive (3_d) 2^{nd} - profile version number; 4.1 (41_d)

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Table 42. PROFIdrive basic parameters

PNU	Significance	Data type	Explanation
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 - $XXYY_d$ (XX - major revision, YY - minor revision) 3 = Firmware date (year) - $YYYY_d$ 4 = Firmware date (day/month) - $DDMM_d$ 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.

5.1.1 PROFIDRIVE PARAMETERS FOR PROFINET IO COMMUNICATION INTERFACE

Table 43.

PNU	Significance	Data type	Explanation
61000	NameOfStation	OctectString[240] without 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 PROFINET IO Network Interface.
61002	MacOfStation	OctetString [6]	MAC Address of the Station for the PROFINET 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 PROFINET IO Network Interface.

5.1.2 PROFIDRIVE SIGNAL NUMBERS IN VACON® 100

Table 44.

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	

Table 44.

Signal no.	Signal name	PNU	PNU name
52	Active current (torque proportional)	10105	
54	Active power	10106	
57	Speed actual value A	10107	
58	Drive status/fault word	10108	
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
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
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

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5.2 VENDOR-SPECIFIC PROFIDRIVE PARAMETERS

Table 45. 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 4.4.5.
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 8 elements. From PDI1 (index 0) to PDI8 (index 7).
10110	Vacon 16-bit Process Data Out	Array[n] Unsigned16	An array of 8 elements. From PDO1 (index 0) to PDO8 (index 7).
10111	Speed physical reference parameter	Unsigned16	The parameter describes how many RPM is meant by 100% in the PROFIdrive 4.1 speed set-point and actual value fields.
10112	Vacon Fixed Control Word	Unsigned16	
10113	Vacon Fixed Status Word	Unsigned16	
10114	Vacon Speed reference	Unsigned16	
10115	Vacon Speed Actual value	Unsigned16	
10118	Clear Vacon fault history	Unsigned16	To clear the fault history, add a value to the parameter.
10119	Read Vacon fault history	Array[n] Unsigned8	An array of 40 elements.
10120	Vacon General Control word	Unsigned16	
10121	Vacon General Status word	Unsigned16	
10122	Vacon 32-bit Process Data In	Array[n] Unsigned32	An array of 8 elements. From PDI1 (index 0) to PDI8 (index 7).
10123	Vacon 32-bit Process Data Out	Array[n] Unsigned32	An array of 8 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.

5.3 TELEGRAMS IMPLEMENTED BY VACON® 100

5.3.1 TELEGRAM BUILDING BLOCKS

5.3.1.1 STW1 - Control Word 1

Table 46. Overview of the assignment of the bits of control word 1

Bit	Significance	
	Speed control mode	
	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 Generato	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

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5.3.1.2 ZSW1 - Status Word 1

Table 47. Overview of the assignment of the bits of status word 1

Bit	Significance	
	Speed control mode	
	Bit 1	Bit 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 Requested	No Control Requested
10	f Or n Reached Or Exceeded	f Or n Not Reached
11	Device-specific	Device-specific
12	Device-specific	Device-specific
13	Device-specific	Device-specific
14-15	Device-specific	Device-specific

5.3.1.3 PROFIdrive speed setpoint value NSOLL_A

Normalised 16-bit speed setpoint. NSOLL_A = 0x4000 corresponds to 100% of the nominal motor speed.

5.3.1.4 PROFIdrive speed actual value NIST_A

Normalised 16-bit actual speed. NIST_A = 0x4000 corresponds to 100% of the nominal motor speed.

5.3.1.5 Vendor-specific FBFixedControlWord

NOTE! This is valid for Vacon standard applications. If you want to make your own application, the same bits must be defined for PROFIdrive for them to work properly.

- Bit 0 = Start/Stop:
  0: Stop request from fieldbus.
  1: Run request from fieldbus.
- Bit 1 = Direction:
  0: Requested direction is "FORWARD".
  1: Requested direction is "REVERSE".
- Bit 2 = Fault Reset:
  0: No action.
  1: No action. Rising edge (0->1) = Active faults, alarms and infos are reset.
- Bit 3 = Coast Stop Mode:
  0: Stop mode is unmodified.
  1: Stop mode is overridden to "Coasting".

- Bit 4 = Ramp Stop Mode:
  0: Stop mode is unmodified.
  1: Stop mode is overridden to "Ramping".
- Bit 5 = Quick Ramp Time: 0:
  Normal deceleration ramp time. 1: Deceleration ramp time is switched to shorter than normal.
- Bit 6 = Freeze Setpoint:
  0: Changes in the setpoint value from fieldbus (FBSpeedReference) are taken into use by the application.
  1: Changes in the setpoint value from fieldbus (FBSpeedReference) are not taken into use by the application.
- Bit 7 = Setpoint to Zero:
  0: The setpoint value from fieldbus is taken from FBSpeedReference.
  1: The setpoint value from fieldbus is switched to 0. The value goes to 0.
- Bit 8 = Request Fieldbus Control:
  0: Control Place is as parameterised in the drive (unchanged).
  1: Control Place is overridden to Fieldbus Control.
- Bit 9 = Request Fieldbus Reference:
  0: Source of setpoint value is as parameterised in the drive (unchanged).
  1: Source of setpoint value is overridden to Fieldbus.
- Bit 10 = Inching 1
- Bit 11 = Inching 2
- Bit 12 = Quick Stop:
  0: Drive operates as normal.
  1: Drive executes quick stop / emergency stop.
- Bit 13 = Reserved
- Bit 14 = Reserved
- Bit 15 = Reserved

5.3.1.6 Vendor-specific 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.

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5.3.1.7 Vendor-specific FBFixedStatusWord

NOTE! This is valid for Vacon standard applications. If you want to make your own application, the same bits must be defined for PROFIdrive for them to work properly.

- Bit 0 = Ready Indication:
  0: Drive is not ready for operation (NOT READY state).
  1: Drive is ready for operation (READY or RUN state).
- Bit 1 = Run/Stop Indication:
  0: Drive is not running.
  1: Drive is in the RUN state.
- Bit 2 = Direction Indication:
  0: Drive is running in the FORWARD direction.
  1: Drive is running in the REVERSE direction.
- Bit 3 = Fault Indication:
  0: No fault is active in the drive.
  1: At least one fault is active in the drive.
- Bit 4 = Alarm Indication:
  0: No alarm is active in the drive.
  1: At least one alarm is active in the drive.
- Bit 5 = Setpoint Reached Indication:
  0: The requested setpoint value has not been reached.
  1: The drive is running at the requested setpoint value.
- Bit 6 = Zero Speed Indication:
  0: The actual speed value of the drive is not zero.
  1: The actual speed value of the drive is zero (standstill).
- Bit 7 = Motor Magnetised Indication:
  0: The motor is not magnetised.
  1: The motor is magnetised.
- Bit 8 = Reserved
- Bit 9 = Reserved
- Bit 10 = Reserved
- Bit 11 = Reserved
- Bit 12 = Reserved
- Bit 13 = Application-Specific
- Bit 14 = Application-Specific
- Bit 15 = Application-Specific

5.3.1.8 Vendor-specific 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. Direction is indicated using bit 2 in the FBFixedStatusWord.

5.3.1.9 Vendor-specific FBGeneralControlWord

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

5.3.1.10 Vendor-specific FBGeneralStatusWord

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

5.3.1.11 Vendor-specific 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 Vacon 100 drive to the master are called ProcessDataOut variables, while values sent from the master to the Vacon 100 drive are called ProcessDataIn variables. The contents of the ProcessDataOut variables can be parameterised in the Vacon 100 drive using a feature known as Fieldbus Process Data mapping. See the Vacon 100 Application Manual for further details.

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5.3.2 PROFIdrive Standard Telegram 1 and vendor-specific variants

These telegrams use the PROFIdrive-defined control word, status word, speed setpoint value and speed actual value. It is also possible to use up to eight Process Data fields. Using these telegrams, the process data fields are communicated as 16-bit values.

Table 48.

Telegram No.	Telegram
1	Standard Telegram 1
102	Standard Telegram 1 + PD1
103	Standard Telegram 1 + PD[1..2]
104	Standard Telegram 1 + PD[1..3]
100	Standard Telegram 1 + PD[1..4]
105	Standard Telegram 1 + PD[1..5]
106	Standard Telegram 1 + PD[1..6]
107	Standard Telegram 1 + PD[1..7]
101	Standard Telegram 1 + PD[1..8]

5.3.2.1 Setpoint data

Table 49.

Standard Telegram 1		Additional process Data (16-bit each)							
STW1 (16-bit) (See Chapter 5.3.1.1)	NSOLL_A (16-bit) (See Chapter 5.3.1.3)	PDI1 (See Chapter 5.3.1.11)	PDI2 (See Chapter 5.3.1.11)	PDI3 (See Chapter 5.3.1.11)	PDI4 (See Chapter 5.3.1.11)	PDI5 (See Chapter 5.3.1.11)	PDI6 (See Chapter 5.3.1.11)	PDI7 (See Chapter 5.3.1.11)	PDI8 (See Chapter 5.3.1.11)

5.3.2.2 Actual data

Table 50.

Standard Telegram 1		Additional process Data (16-bit each)							
ZSW1 (16-bit) (See Chapter 5.3.1.2)	NIST_A (16-bit) (See Chapter 5.3.1.4)	PDO1 (See Chapter 5.3.1.11)	PDO2 (See Chapter 5.3.1.11)	PDO3 (See Chapter 5.3.1.11)	PDO4 (See Chapter 5.3.1.11)	PDO5 (See Chapter 5.3.1.11)	PDO6 (See Chapter 5.3.1.11)	PDO7 (See Chapter 5.3.1.11)	PDO8 (See Chapter 5.3.1.11)

5.3.3 VENDOR-SPECIFIC TELEGRAM 1 AND ITS VARIANT

These telegrams use the vendor-specific control word, status word, speed setpoint value and speed actual value. It is also possible to use up to eight vendor-specific Process Data fields. Using these telegrams, the process data fields are communicated as 16-bit values.

Table 51.

Telegram No.	Telegram
108	Vendor-specific Telegram 1
109	Vendor-specific Telegram 1 + PD1
110	Vendor-specific Telegram 1 + PD[1..2]
111	Vendor-specific Telegram 1 + PD[1..3]
112	Vendor-specific Telegram 1 + PD[1..4]
113	Vendor-specific Telegram 1 + PD[1..5]
114	Vendor-specific Telegram 1 + PD[1..6]
115	Vendor-specific Telegram 1 + PD[1..7]
116	Vendor-specific Telegram 1 + PD[1..8]

5.3.3.1 Setpoint data

Table 52.

Vendor-specific Telegram 1		Additional process Data (16-bit each)							
FB Fixed CW (16-bit) (See Chapter 5.3.1.5)	FB Speed Reference (16-bit) (See Chapter 5.3.1.6)	PDI1 (See Chapter 5.3.1.11)	PDI2 (See Chapter 5.3.1.11)	PDI3 (See Chapter 5.3.1.11)	PDI4 (See Chapter 5.3.1.11)	PDI5 (See Chapter 5.3.1.11)	PDI6 (See Chapter 5.3.1.11)	PDI7 (See Chapter 5.3.1.11)	PDI8 (See Chapter 5.3.1.11)

5.3.3.2 Actual data

Table 53.

Vendor-specific Telegram 1		Additional process Data (16-bit each)							
FB Fixed SW (16-bit) (See Chapter 5.3.1.7)	FB Speed Actual (16-bit) (See Chapter 5.3.1.8)	PDO1 (See Chapter 5.3.1.11)	PDO2 (See Chapter 5.3.1.11)	PDO3 (See Chapter 5.3.1.11)	PDO4 (See Chapter 5.3.1.11)	PDO5 (See Chapter 5.3.1.11)	PDO6 (See Chapter 5.3.1.11)	PDO7 (See Chapter 5.3.1.11)	PDO8 (See Chapter 5.3.1.11)

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5.3.4 VENDOR-SPECIFIC TELEGRAM 2 AND ITS VARIANTS

These telegrams use the vendor-specific fixed and general control word, status word, speed setpoint value and speed actual value. It is also possible to use up to eight vendor-specific Process Data fields. Using these telegrams, the process data fields are communicated as 32-bit values.

Table 54.

Telegram No.	Telegram
117	Vendor-specific Telegram 2
118	Vendor-specific Telegram 2 + PD1
119	Vendor-specific Telegram 2 + PD[1..2]
120	Vendor-specific Telegram 2 + PD[1..3]
121	Vendor-specific Telegram 2 + PD[1..4]
122	Vendor-specific Telegram 2 + PD[1..5]
123	Vendor-specific Telegram 2 + PD[1..6]
124	Vendor-specific Telegram 2 + PD[1..7]
125	Vendor-specific Telegram 2 + PD[1..8]

5.3.4.1 Setpoint data

Table 55.

Vendor-specific Telegram 2			Additional process Data (32-bit each)							
FB Fixed CW (16-bit) (See Chapter 5.3.1.5)	**FB Gen CW (16-bit) (See Chapter 5.3.1.9)**	FB Speed Reference (16-bit) (See Chapter 5.3.1.6)	PDI1 (See Chapter 5.3.1.11)	PDI2 (See Chapter 5.3.1.11)	PDI3 (See Chapter 5.3.1.11)	PDI4 (See Chapter 5.3.1.11)	PDI5 (See Chapter 5.3.1.11)	PDI6 (See Chapter 5.3.1.11)	PDI7 (See Chapter 5.3.1.11)	PDI8 (See Chapter 5.3.1.11)

5.3.4.2 Actual data

Table 56.

Vendor-specific Telegram 2			Additional process Data (32-bit each)							
FB Fixed SW (16-bit) (See Chapter 5.3.1.7)	**FB Gen SW (16-bit) (See Chapter 5.3.1.10)**	FB Speed Actual (16-bit) (See Chapter 5.3.1.8)	PDO1 (See Chapter 5.3.1.11)	PDO2 (See Chapter 5.3.1.11)	PDO3 (See Chapter 5.3.1.11)	PDO4 (See Chapter 5.3.1.11)	PDO5 (See Chapter 5.3.1.11)	PDO6 (See Chapter 5.3.1.11)	PDO7 (See Chapter 5.3.1.11)	PDO8 (See Chapter 5.3.1.11)

5.3.5 VENDOR-SPECIFIC TELEGRAM 3 AND ITS VARIANTS

These telegrams use a mix of PROFIdrive and vendor-specific data. It is possible to use also up to eight vendor-specific Process Data fields. Using these telegrams, the process data fields are communicated as 32-bit values.

Table 57.

Telegram No.	Telegram
126	Vendor-specific Telegram 3
127	Vendor-specific Telegram 3 + PD1
128	Vendor-specific Telegram 3 + PD[1..2]
129	Vendor-specific Telegram 3 + PD[1..3]
130	Vendor-specific Telegram 3 + PD[1..4]
131	Vendor-specific Telegram 3 + PD[1..5]
132	Vendor-specific Telegram 3 + PD[1..6]
133	Vendor-specific Telegram 3 + PD[1..7]
134	Vendor-specific Telegram 3 + PD[1..8]

5.3.5.1 Setpoint data

Table 58.

Vendor-specific Telegram 3			Additional process Data (32-bit each)							
STW1 (16-bit) (See Chapter 5.3.1.1)	FB Gen CW (16-bit) (See Chapter 5.3.1.9)	**NSOLL_A (16-bit) (See Chapter 5.3.1.3)**	PDI1 (See Chapter 5.3.1.11)	PDI2 (See Chapter 5.3.1.11)	PDI3 (See Chapter 5.3.1.11)	PDI4 (See Chapter 5.3.1.11)	PDI5 (See Chapter 5.3.1.11)	PDI6 (See Chapter 5.3.1.11)	PDI7 (See Chapter 5.3.1.11)	PDI8 (See Chapter 5.3.1.11)

5.3.5.2 Actual data

Table 59.

Vendor-specific Telegram 3			Additional process Data (32-bit each)							
ZSW1 (16-bit) (See Chapter 5.3.1.2)	FB Gen SW (16-bit) (See Chapter 5.3.1.10)	**NIST_A (16-bit) (See Chapter 5.3.1.4)**	PDO1 (See Chapter 5.3.1.11)	PDO2 (See Chapter 5.3.1.11)	PDO3 (See Chapter 5.3.1.11)	PDO4 (See Chapter 5.3.1.11)	PDO5 (See Chapter 5.3.1.11)	PDO6 (See Chapter 5.3.1.11)	PDO7 (See Chapter 5.3.1.11)	PDO8 (See Chapter 5.3.1.11)

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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 to contact Vacon service in problems related to PROFINET IO, please send a description of the problem together with the *Drive Info File* to fieldbus@vacon.com.

NOTE! When you are contacting a distributor or a factory because of a fault condition, always write down all texts and codes on the keypad display. Then send a description of the problem together with the *Drive Info File* to tech.supportVDF@vacon.com.

6.1 TYPICAL FAULT CONDITIONS

Table 60. Typical fault conditions

Fault condition	Possible cause	Remedy
Cabling	• Supply or motor cables are located too close to the fieldbus cable • Wrong type of fieldbus cable • Too long cabling	
Grounding	Inadequate grounding.	Ensure grounding in all points on the net
Connections	Faulty connections: • Excessive stripping of cables • Conductors in wrong terminals • Too loose connections of conductors	
Parameter	• Faulty address • Overlapping slave addresses • Wrong control place selected	

6.2 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.

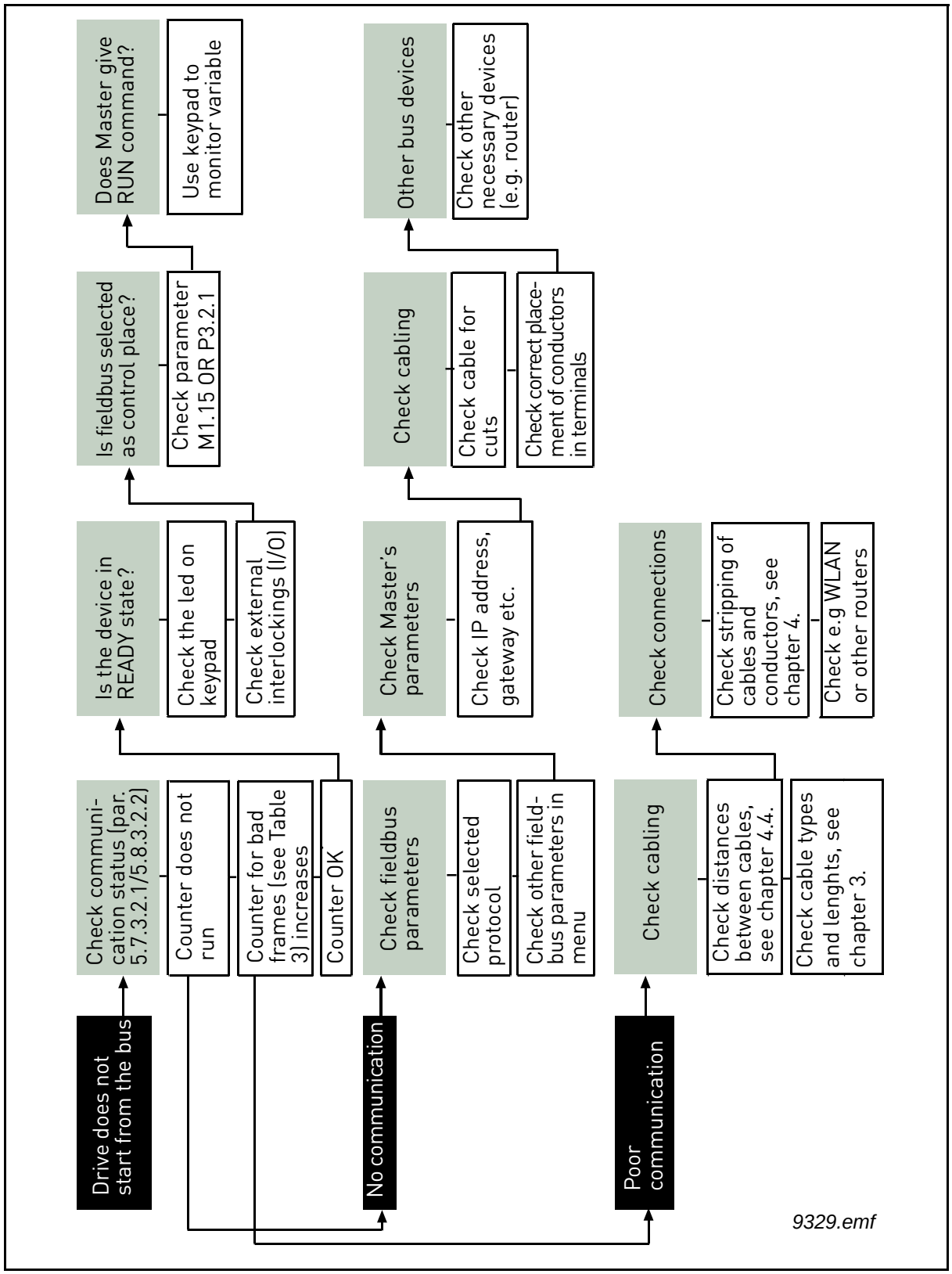

Figure 7. Fault tracing diagram for PROFINET IO

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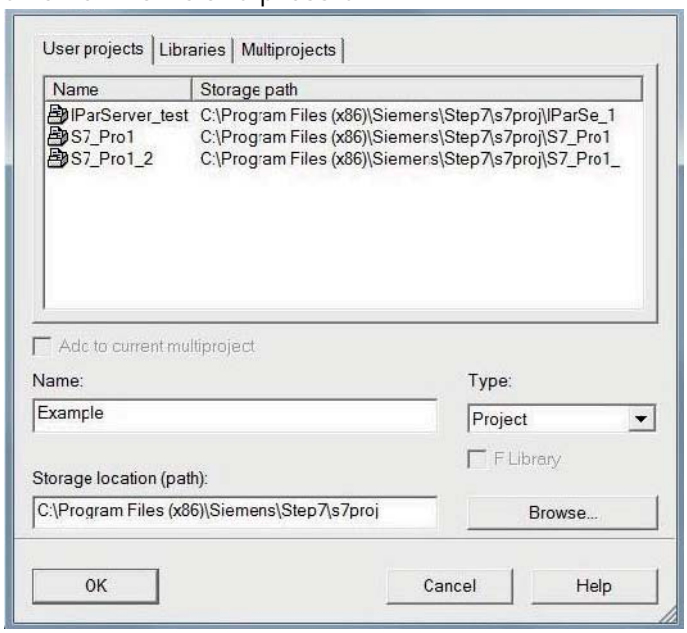
7. APPENDIX 1 - EXAMPLE WITH SIEMENS PLC

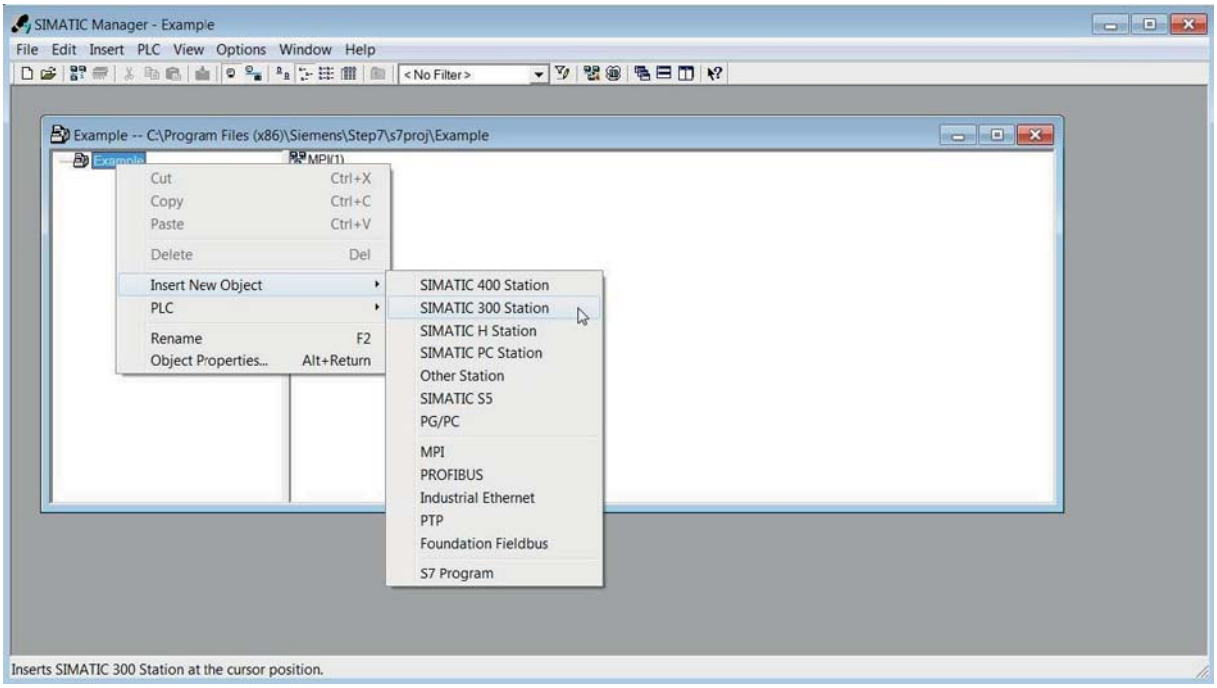
This example shows how to configure with SIMATIC STEP 7 programming tool Siemens S7-300 PLC series to use Vacon 100 drive. Please check your own PLC information. The one used in this example probably differs from the one you have.

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



11694_uk

2. Insert the station



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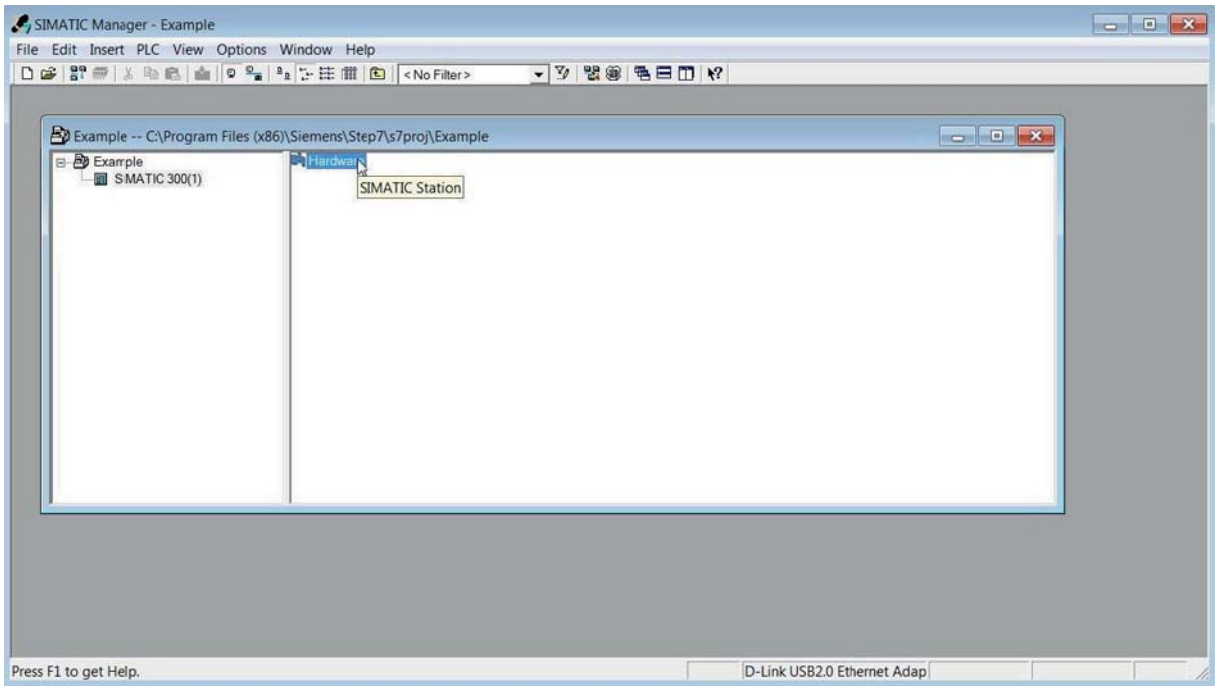
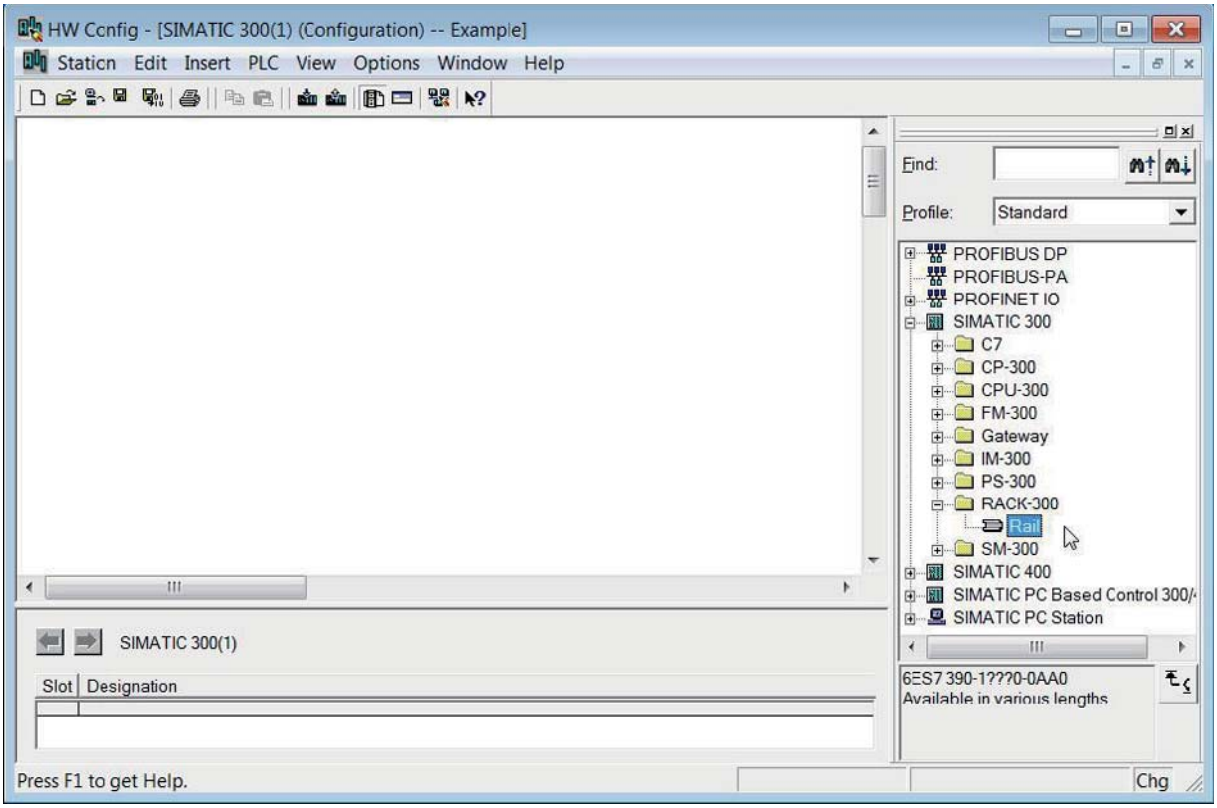
3. Double-click the "Hardware" icon to open the HW config window.



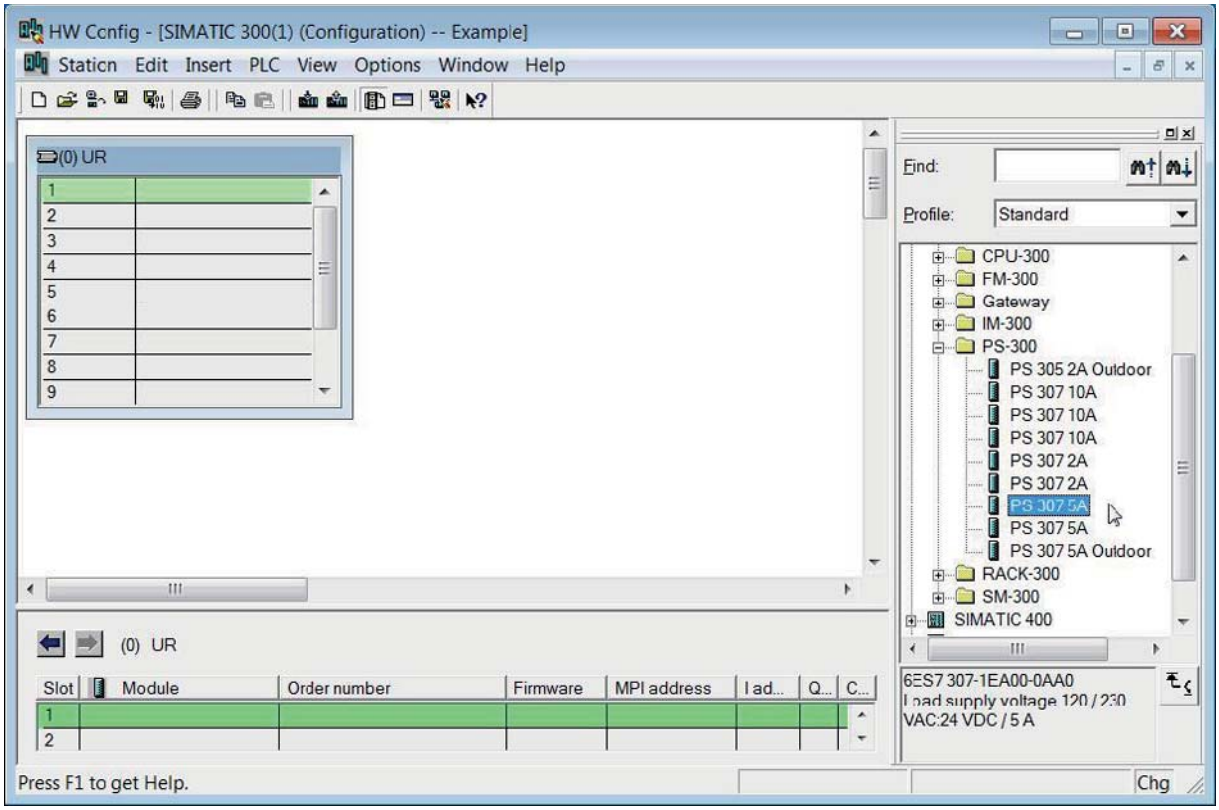
11696_uk

4. Insert the rail



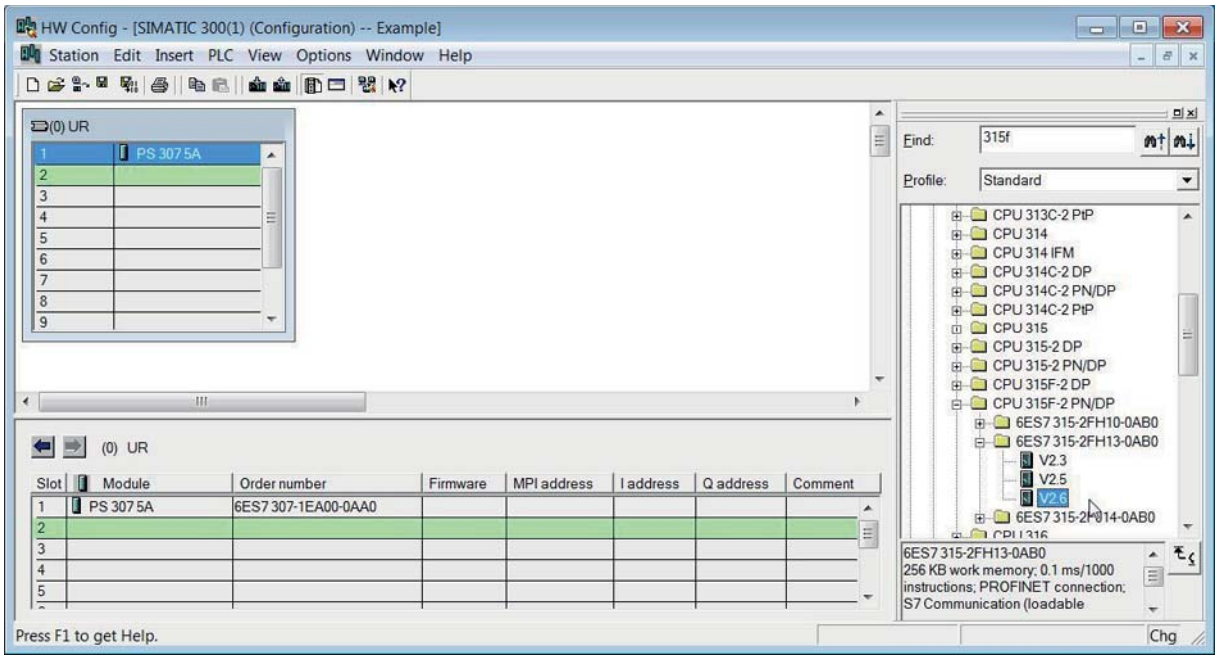
11697_uk

5. Insert the power supply



11698_uk

6. Insert the CPU



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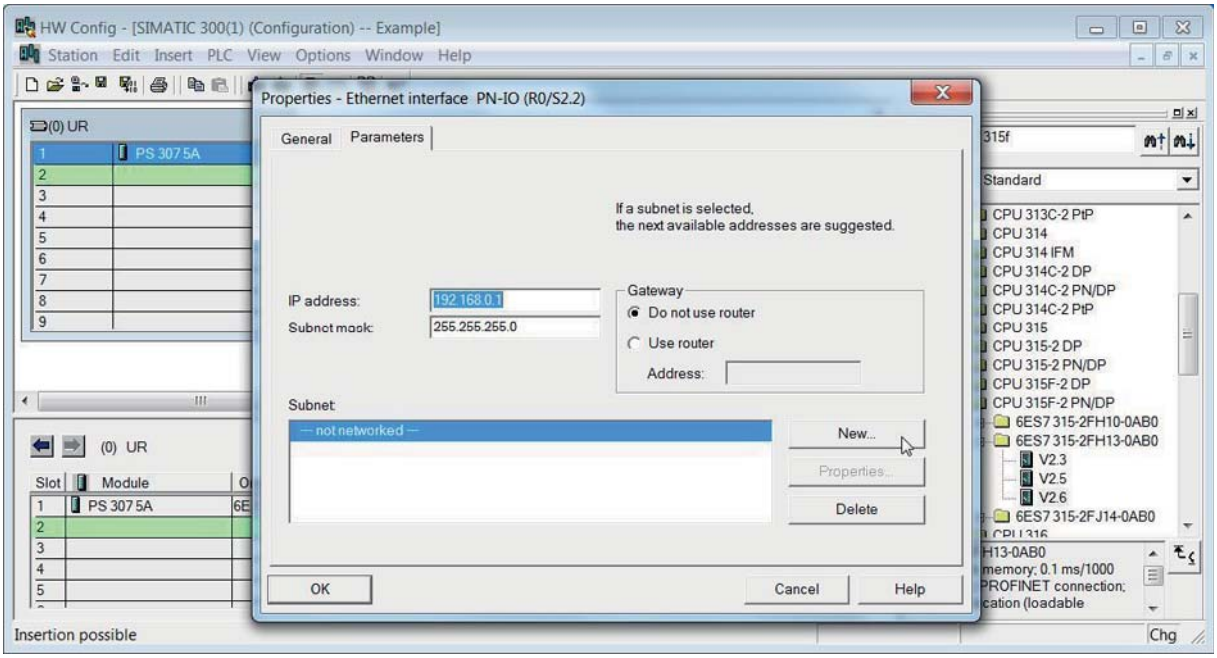
7. Change the IP address and select the subnet by clicking **New**.



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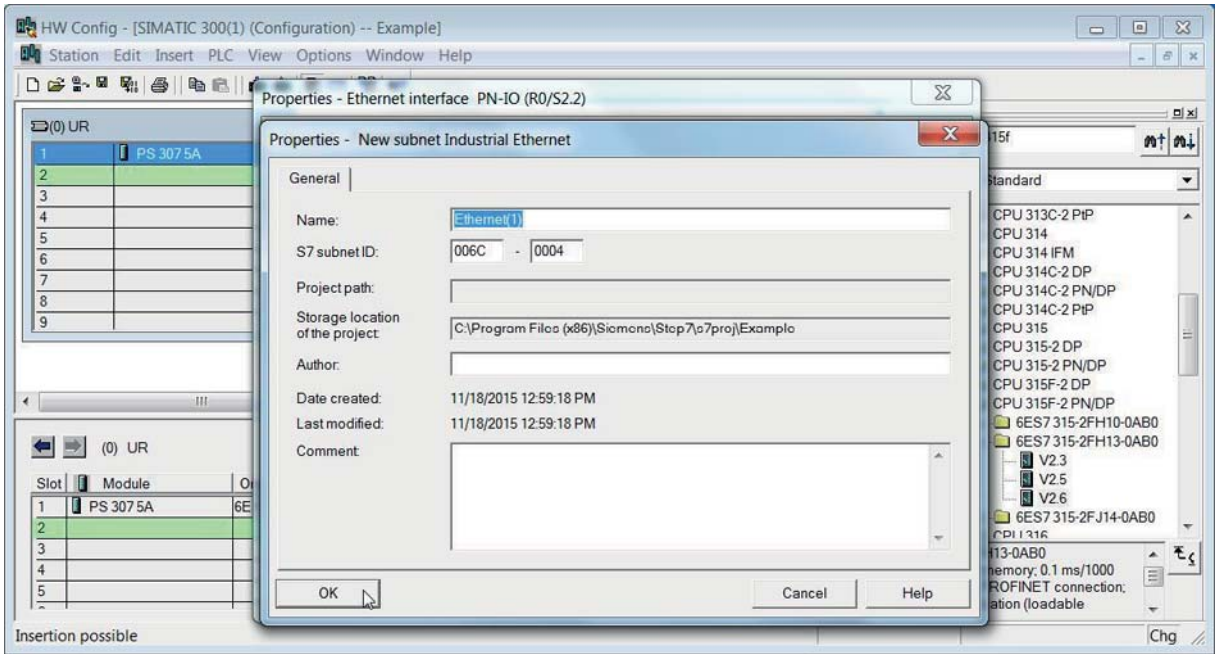
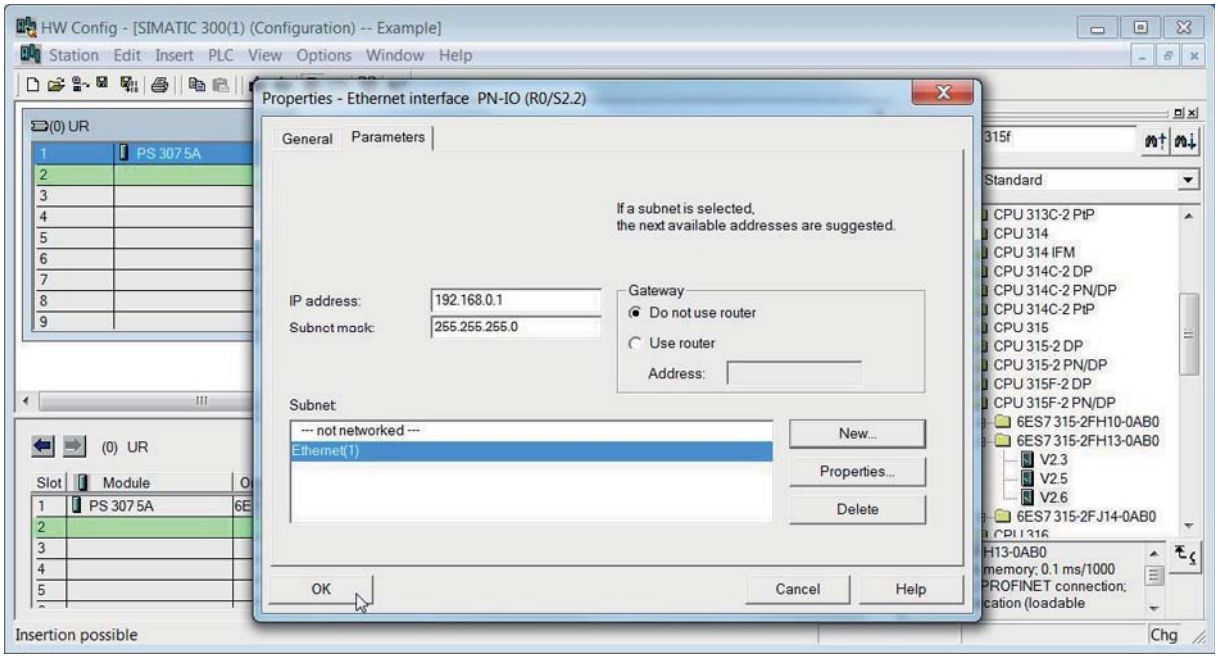
8. Click OK



11701_uk

9. Click OK



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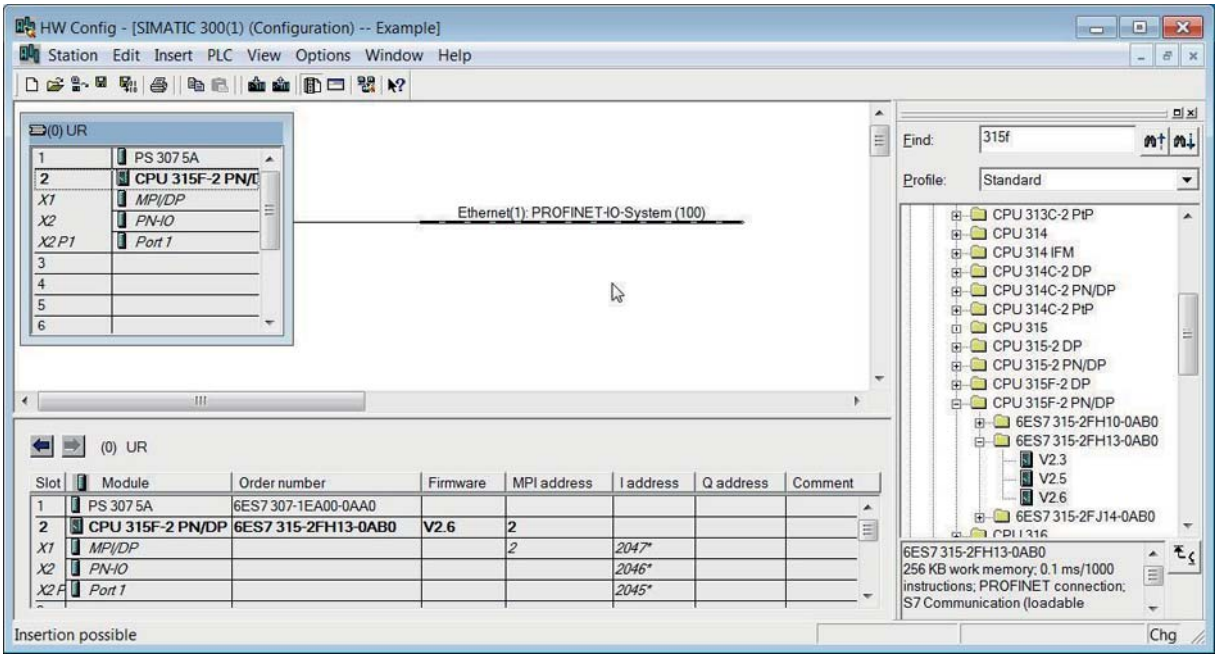
10. Now the configuration should look like this



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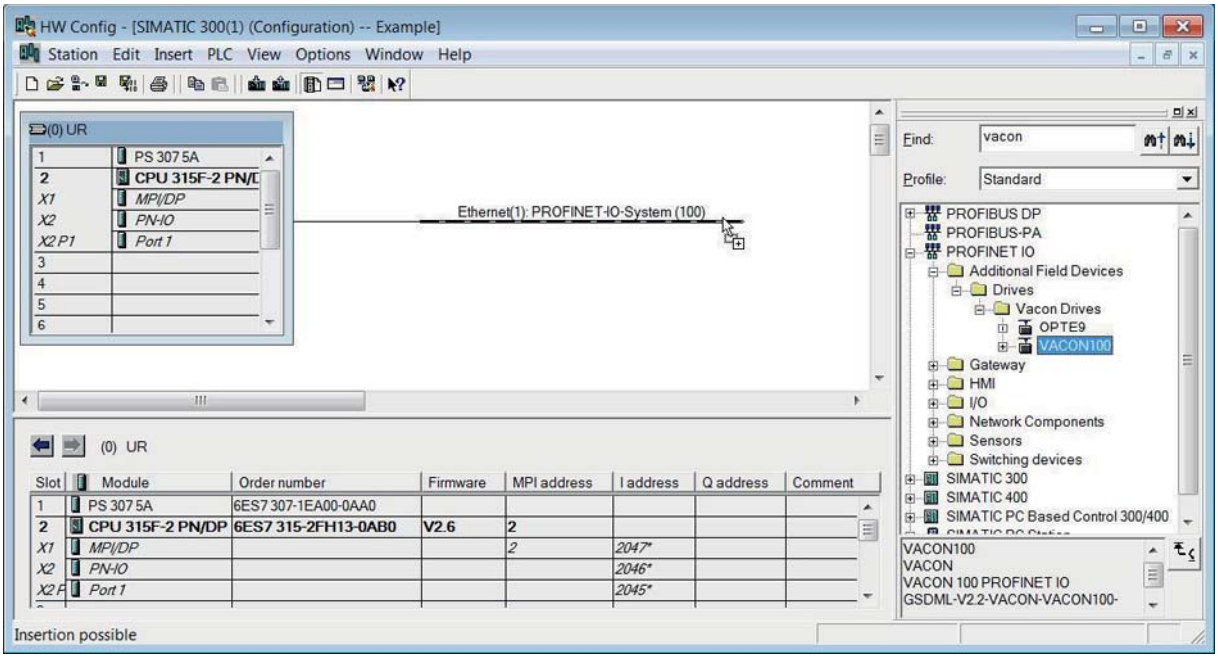
11. Drag and drop Vacon 100 to Profinet IO system



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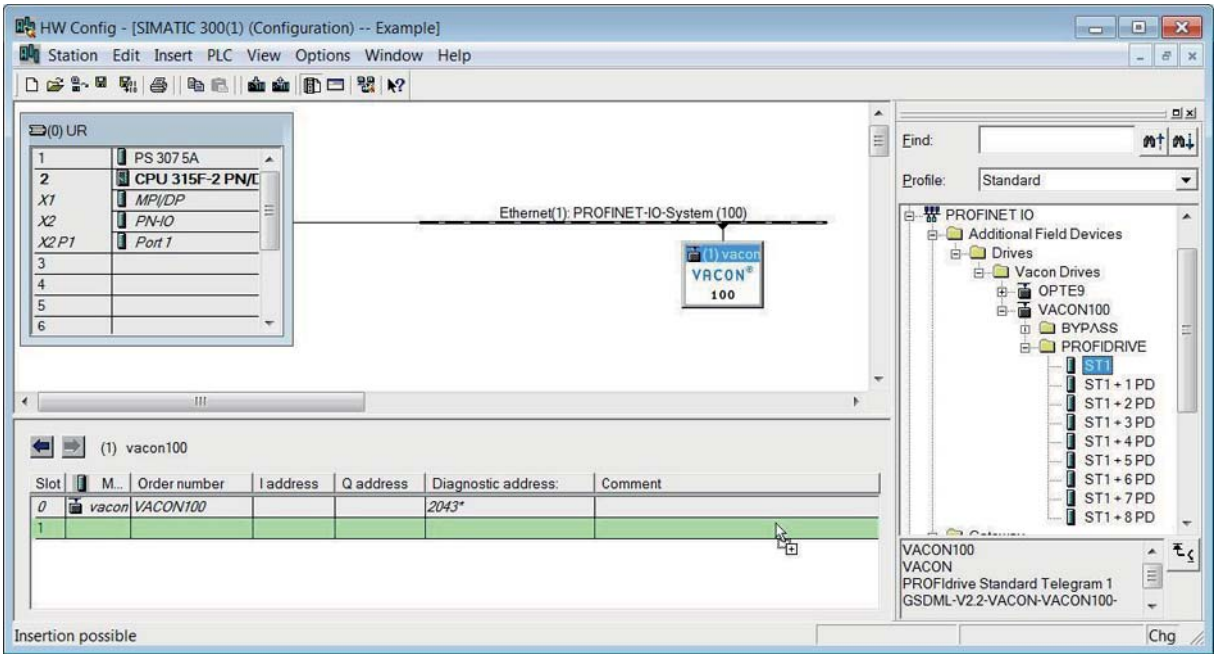
12. Select a communication profile



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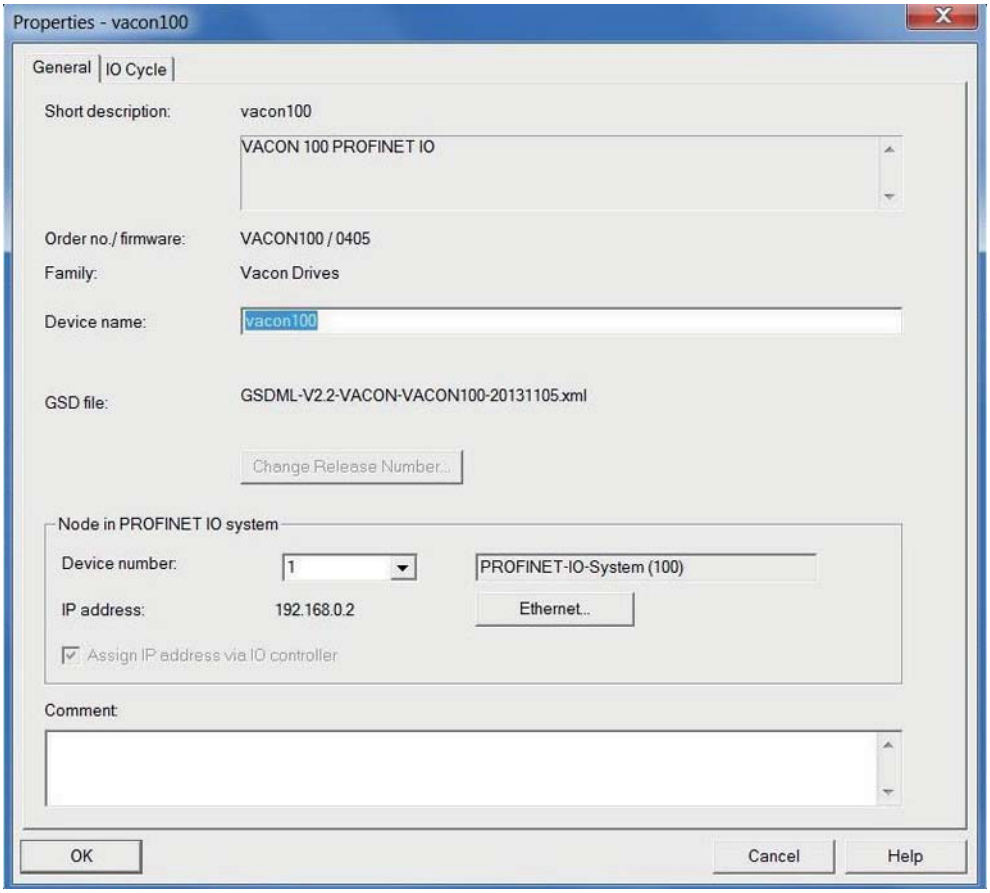
13. Change the drive properties. Give here the name you have configured to the drive via Vacon Live or instead of next step "Verify device name", use the "Assing device name" function. By default V100 drive will have a generated name in format "control-<SERIAL_NUMBER>"



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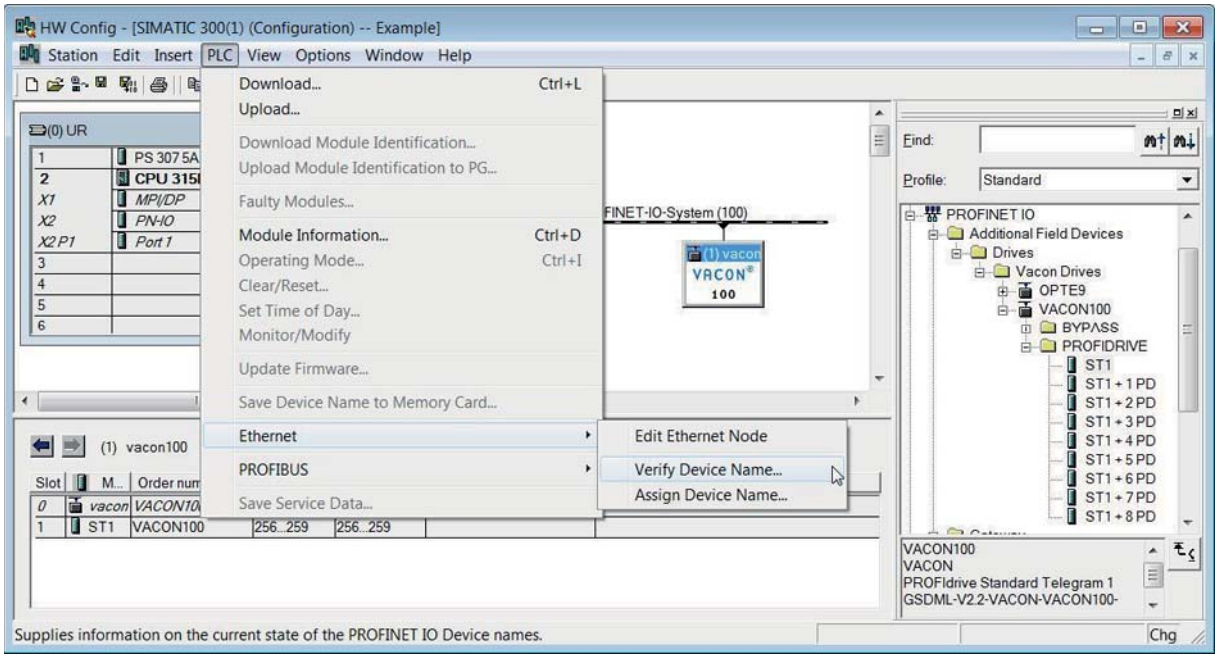
14. Assign/Verify the Device Name.



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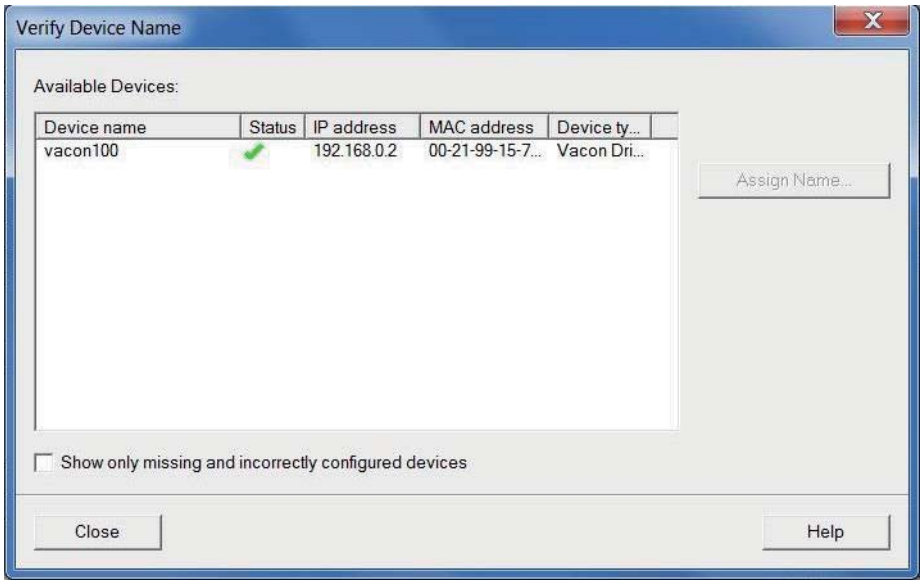
15. Name verified. Close the window.



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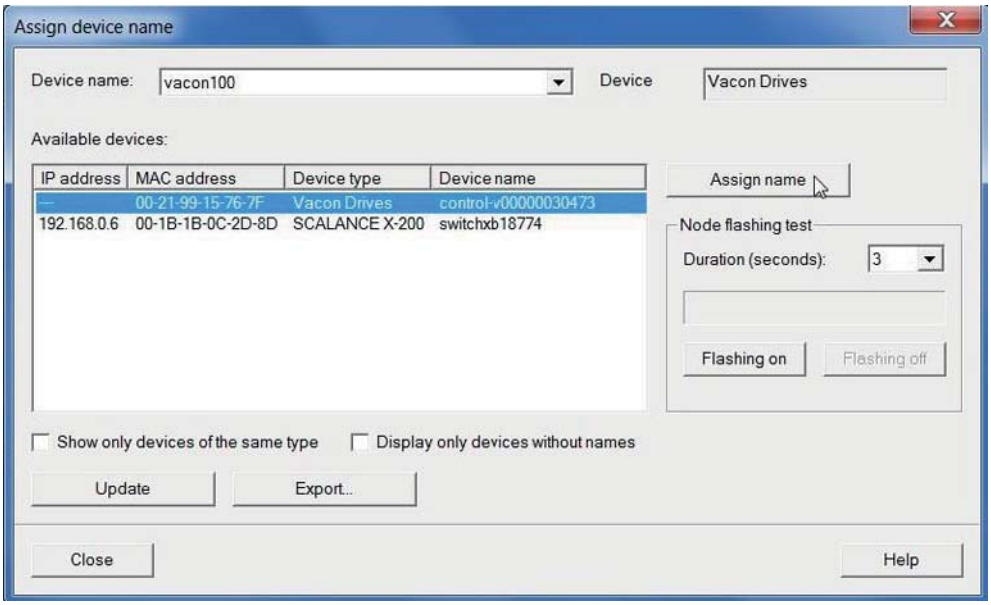
16. Select the correct drive and click the "Assing Name"-button



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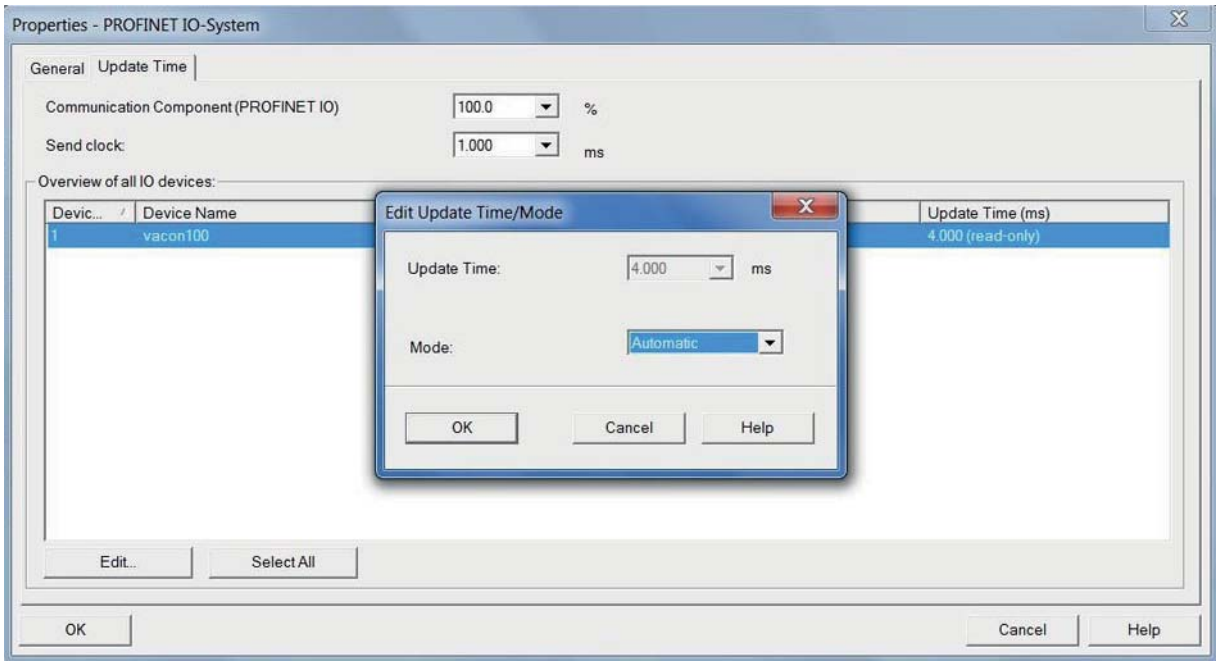
17. Change the IO cycle to 4 ms (minimum) or greater.



11710_uk

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

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