IMI NORGREN

Valve island VM10 with PROFINET Interface 8, 10, 12 or 16 stations

Engineering GREAT Solutions

PROFINET

Operation & Service Manual

IMI Precision Engineering

Change history:

The Change history reflects all changes of the User Guide, which were done after the initial release.

Index	Chapter	Change description	Date	Name
001	All	Set up initial version	30/05/2017	
002	2	New chapter added	31/05/2017	
003	All	Revision	11/08/2017	
004	All	Corrections implemented	17/07/2018	

This User Guide makes no claims of being complete as it doesn't cover all variants of the VM10 valve islands series at the moment.

Therefore this document is subject to extensions or changes.

Content

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1 About this documentation

This User Guide contains the information to set up and operate the VM10 valve island with PROFINET-Interface and to detect and resolve problems.

Note:

In addition to the specific information for the PROFINET variants, all data sheets for the VM10 valve island series are applicable and remain valid.

Refer also to the data sheets on the following web link:

- *http://cdn.norgren.com/pdf/en_5_1_100_VM10.pdf*

Refer also to the installation video on the following web link:

- *https://player.vimeo.com/video/256919212*

Further information about PROFINET is available on PI website:

- *http://www.profinet.com*
- *http://www.profibus.com/download/*

Basic information about PROFINET could be found in the following document:

- *“PROFINET Technology and Application – System ”*

Installation Guidelines could be found in the following documents:

- *“PROFINET Guideline for Cabling and Assembly”*
- *“PROFINET Guideline for Commissioning”*

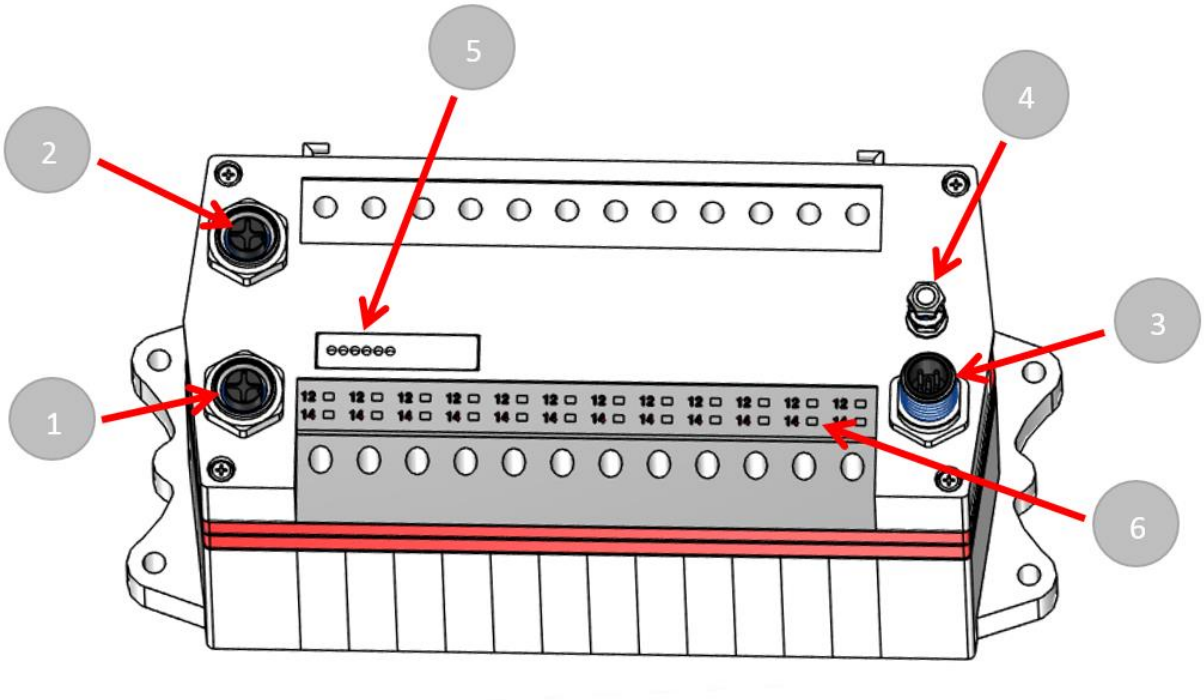
2 Important hints

2.1 Grounding and equipotential bonding

Proper grounding and equipotential bonding are very important to protect against electromagnetic interferences in PROFINET networks. In order to reduce potential impact, grounding of the PROFINET cable screen should be done at both ends of every cable (i.e. at each device). Equipotential bonding ensures that the ground potential is identical throughout the entire PROFINET network and is essential to avoid equipotential bonding currents, which could otherwise flow through the PROFINET cable screen. Please refer for further details to the “PROFINET Installation Guideline for Cabling and Assembly” provided by the PROFINET user organization (http://www.profinet.com).

For proper grounding please use the terminal for functional earth (M4) on the upper side of the valve island. For easy reference see position 4 in chapter 3.

3 Electrical connections of the VM10 valve island



1. Port 1 bus connector for PROFINET

   (4 pins M12 D-coded female connector)

2. Port 2 bus connector for PROFINET

   (4 pins M12 D-coded female connector)

3. Power supply connector

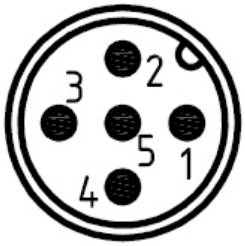
   (5-pins M12 A-coded male connector)

4. Terminal for functional earth (M4)
5. Status LEDs
6. Valve status LEDs

3.1 PROFINET Bus connectors PORT 1 & PORT 2

M12 / 4 pins / female connector / D-coded	
Pin no.	**Function**
1	Transmission Data + (TD+)
2	Receive Data + (RD+)
3	Transmission Data - (TD -)
4	Receive Data - (RD -)
Earth screw	FE (functional earth)

3.2 POWER supply connector



M12 / 5 pins / male connector / A-coded	
Pin no.	**Function**
1	L1 (VB+) 24V electronics power supply
2	N2 (VA-) 0V valves power supply
3	N1 (VB-) 0V electronics power supply
4	L2 (VA+) 24V valves power supply
5	FE (functional earth)

4 Commissioning

Note: The method of PROFINET module installation strongly depends on the configuration software. Please refer to the configuration software manual.

Note: All the examples in this document are made with Siemens TIA Portal V13.

4.1 GSDML file installation

A device description file (GSD-file) is needed for configuration of the valve island. The GSD-file is in XML Format (GSDML) and could be used for all variants VM10:

➲ *GSDML-V2.32-IMI_Norgren-Vx_IMI-JJJJMMDD.XML*

Note: ”JJJJMMDD”(JJJJ- year, MM-month, DD-day) is date of release

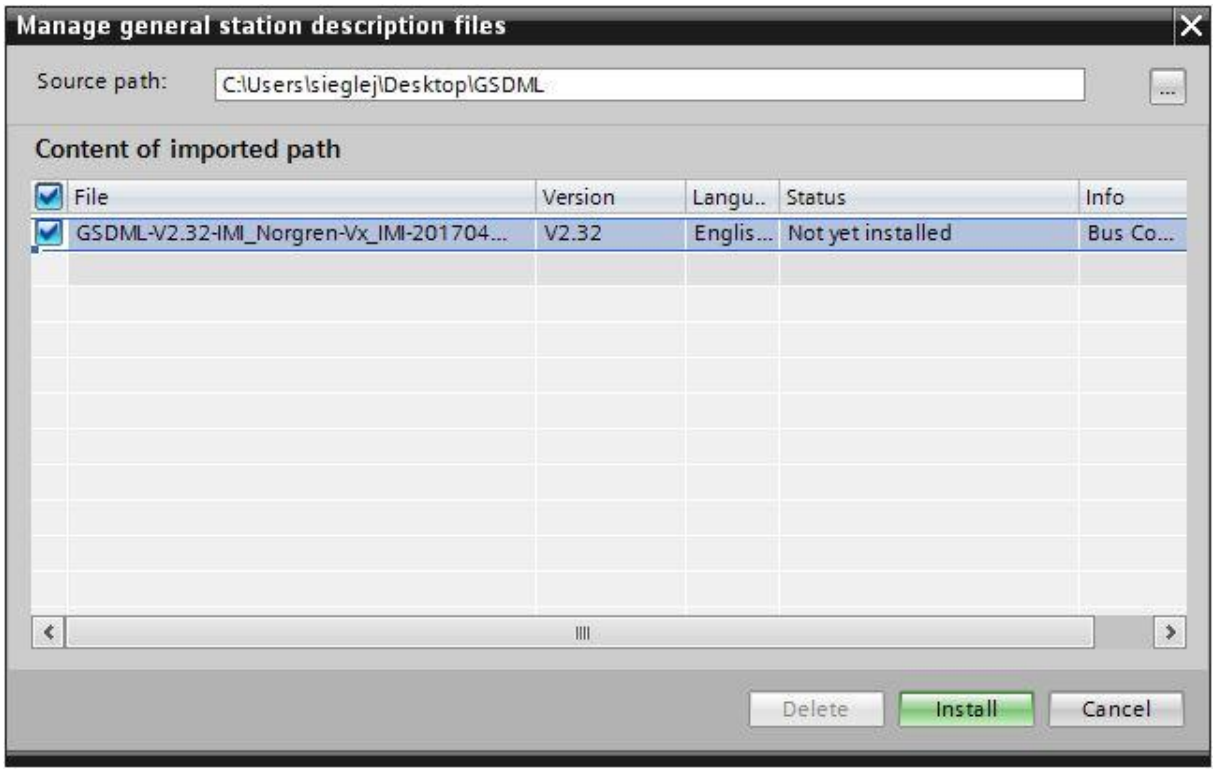
The GSDML file has to be installed inside the engineering tool of the PROFINET controller.

The symbol file is used to visualize the device in the engineering tool. XML files are provided by the device vendor and can be downloaded from:

➲ *https://www.imi-precision.com/us/en/technical-support/software*

Open GSDML-file Import editor:

“Options” -> “Manage general station description files”



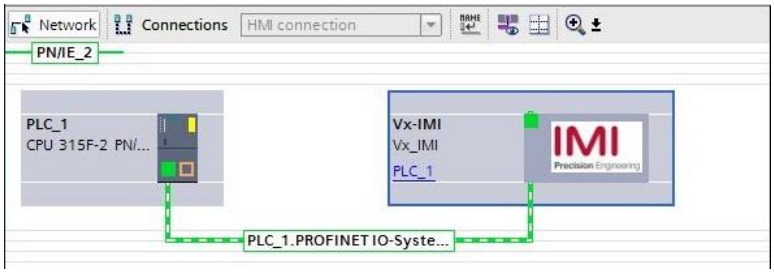
After the successful installation of the GSDML-file the VM10 is listed in the Hardware catalog.

4.2 Hardware configuration: Select valve island

After successful GSDML installation the valve island appears in category „Other field devices >…> Vx_IMI“.

Drag the Vx_IMI valve island entry and drop it into the PROFINET-IO system.

Hardware catalogue after installation of the XML file



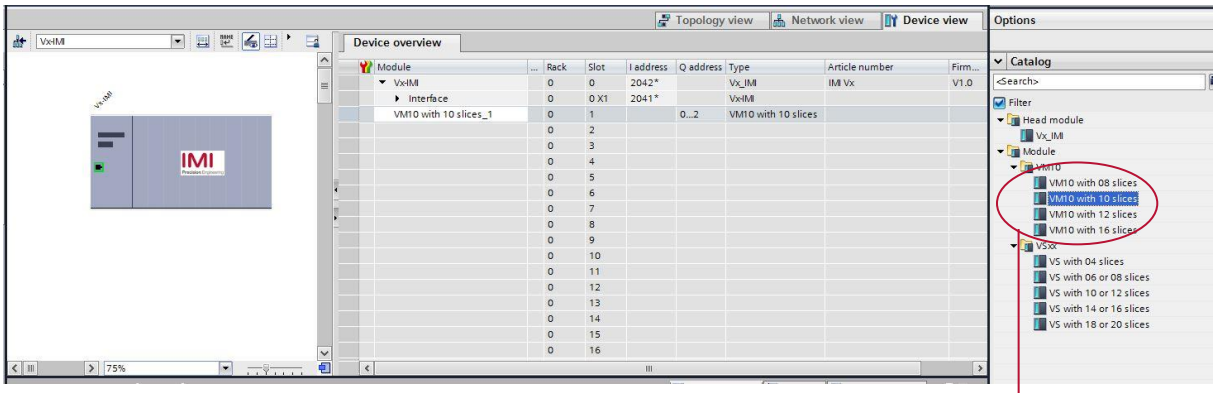
View after adding the valve island

As a next step the valve module has to be assigned to slot 1. The following table shows which valve module has to be chosen for which physical configuration.

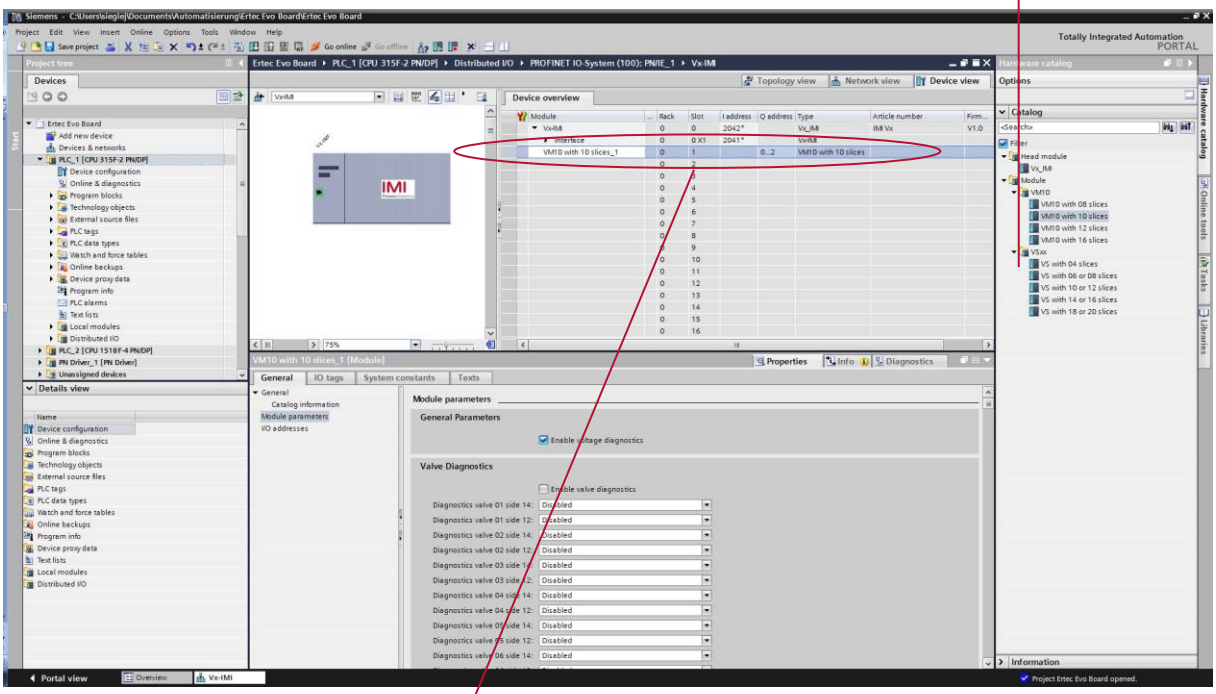
Please check the correct number of valve slices on the valve island. An empty slice is also counted as a valve slice.

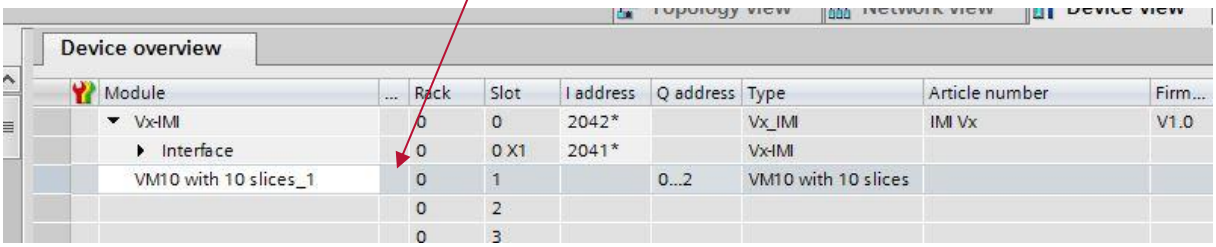
Number of valve slices	Module Name
8	„VM10 with 08 slices“
10	„VM10 with 10 slices “
12	„VM10 with 12 slices “
16	„VM10 with 16 slices “

Table: Device name assignment



The device selection



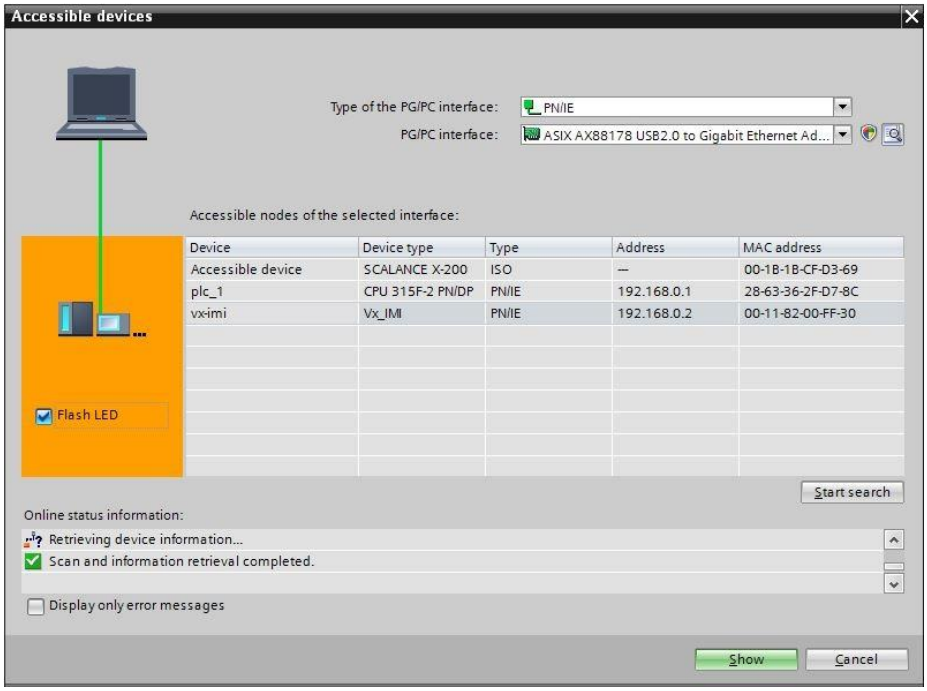


View after adding VM10 device with 10 or 12 valve stations

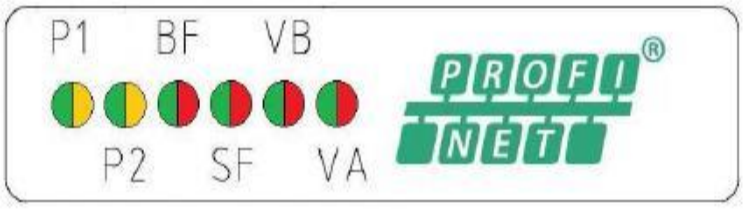
4.3 Identifying devices in the network „Blink Test“

PROFINET devices are identified by using their MAC address and device type. Use the configuration tool to identify all PROFINET modules in the network.

“Online” -> “Accessible devices”



Mark an available valve island and enable checkbox “Flash LED”. This activates the LEDs: BF, SF, VA, VB flashing in green color for 3 seconds.



4.4 Assignment of device name

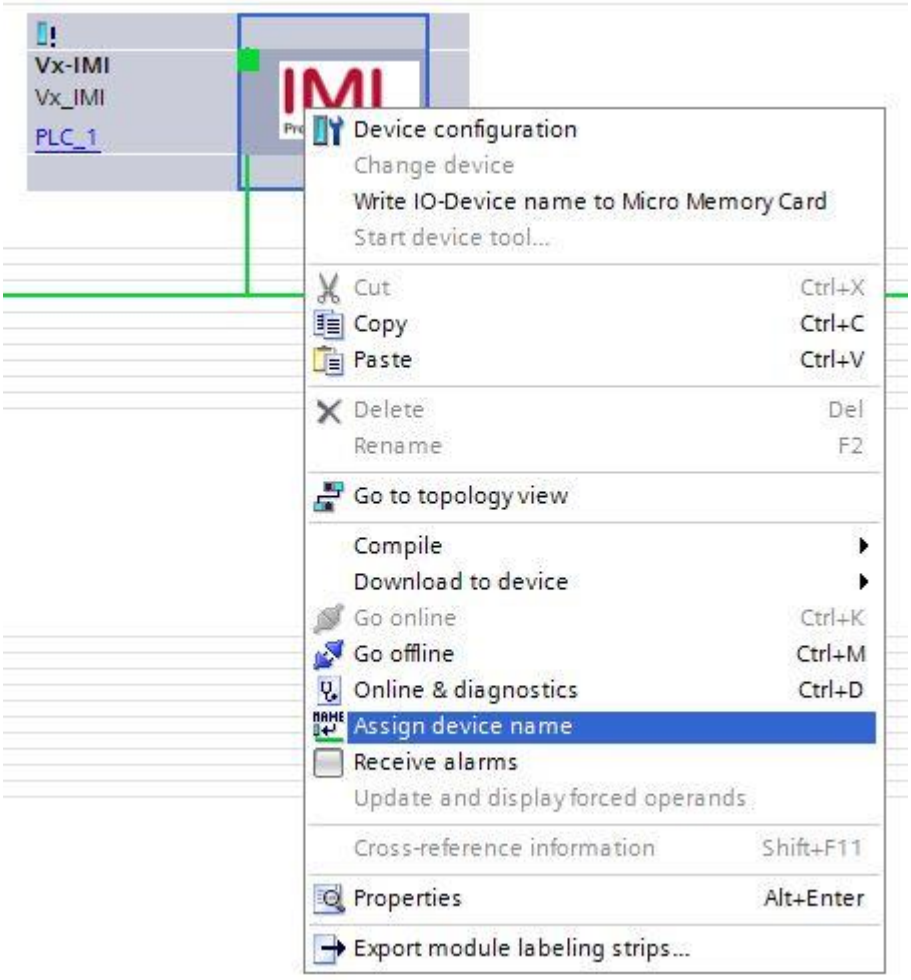
Before the PROFINET communication between PROFINET controller and valve island is able to start, a unique device name has to be assigned. The device name is stored on the valve island.

Note:

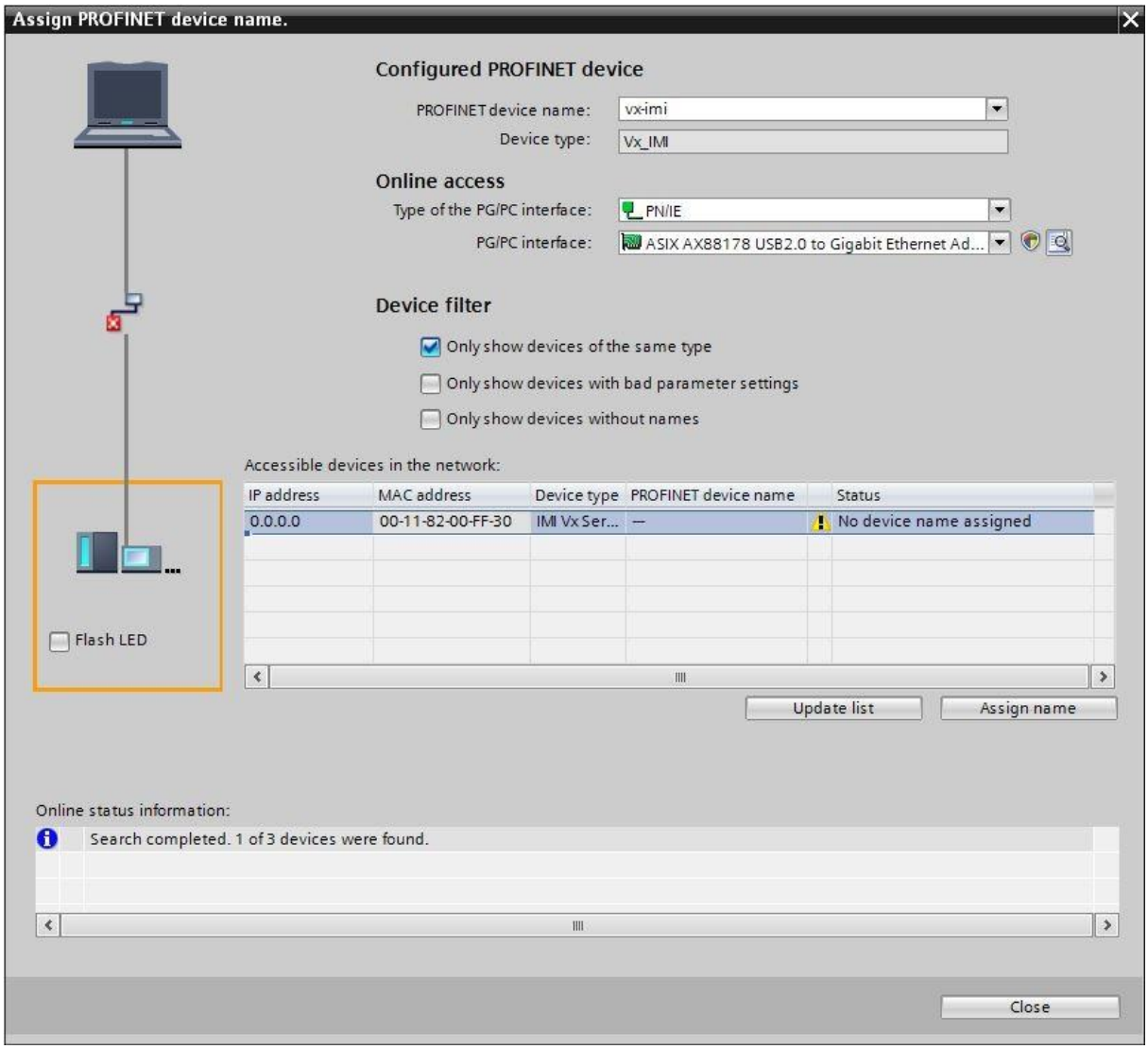
Several engineering- and service tools are able to assign PN device names (E.g. PROFINET Commander, PRONETA, TIA).

There are also different ways to assign the device name in TIA Portal.

Right Click on the valve island in the “Network View“ of TIA opens its context menu in “Online-mode”. Press “Assign device name” item to open the „Assign PROFINET device name“ dialog.

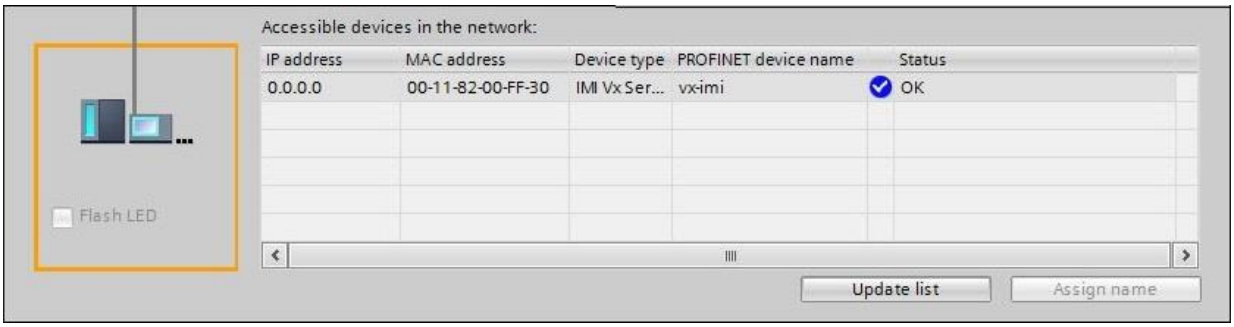


Enter a unique device name for the valve island in the “PROFINET device name” field. Push the “Assign name” button to assign the entered device name.



Assign PROFINET device name dialog

After successful name assignment the status of the valve island in the device list will change to OK.

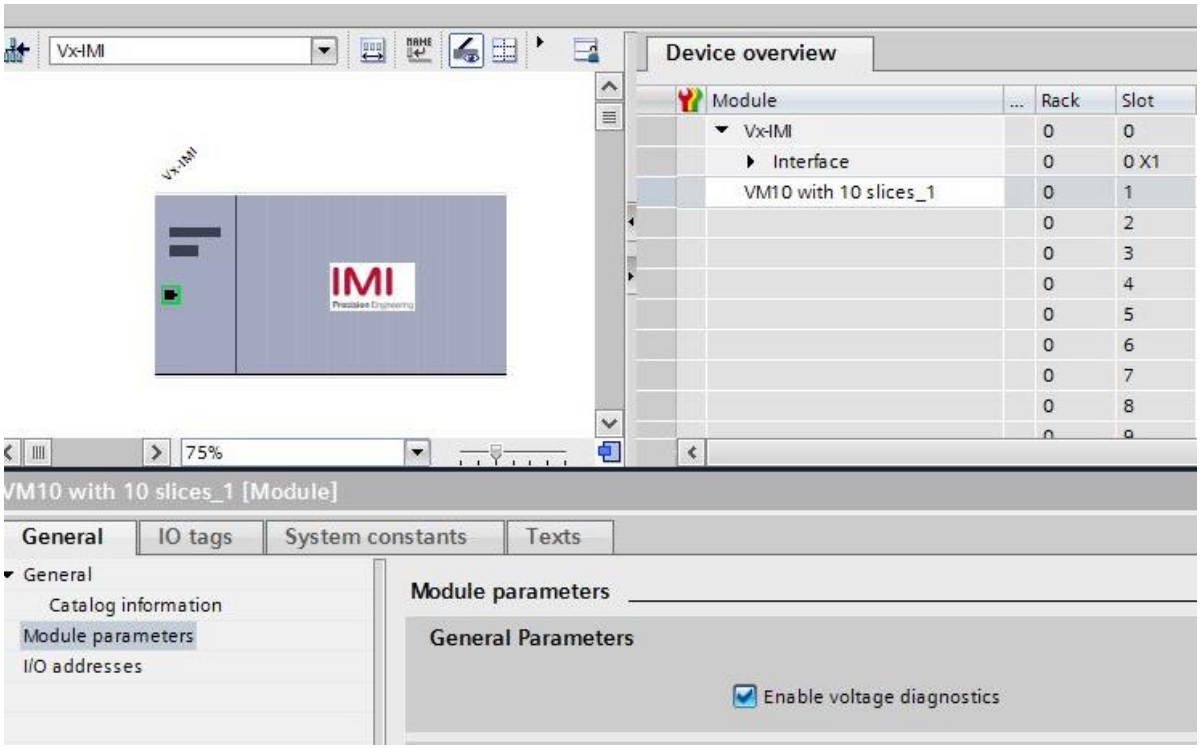


List with accessible devices in the network

4.5 Parameterization

During system startup a parameter set is loaded to the valve island by the PROFINET controller. The parameter set of the valve module is divided into the sections “General Parameters”, “Valve Diagnostics” and “Substitute behavior”.

Those parameters are accessible on the “Properties” page of the valve module using the “Device view” of TIA.

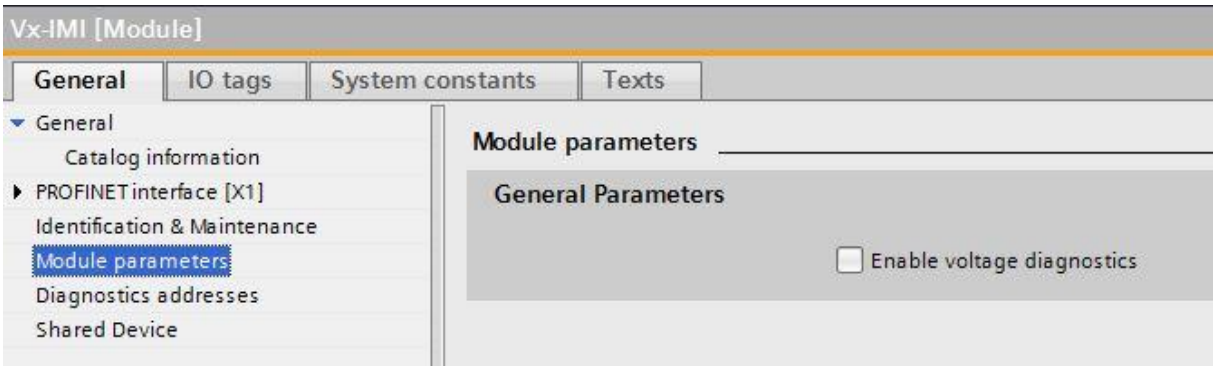


4.5.1 General Parameters

It is possible to enable/disable the voltage monitor of the valve module.

If disabled, in case of over/under voltage no PROFINET diagnostic alarm appears and the relating LEDs on the valve island don’t change from green to red color as well. Otherwise, a PROFINET module diagnostic alarm appears (error code see chapter 7) and the relating LEDs on the valve island change to red (see also chapter 6.1).

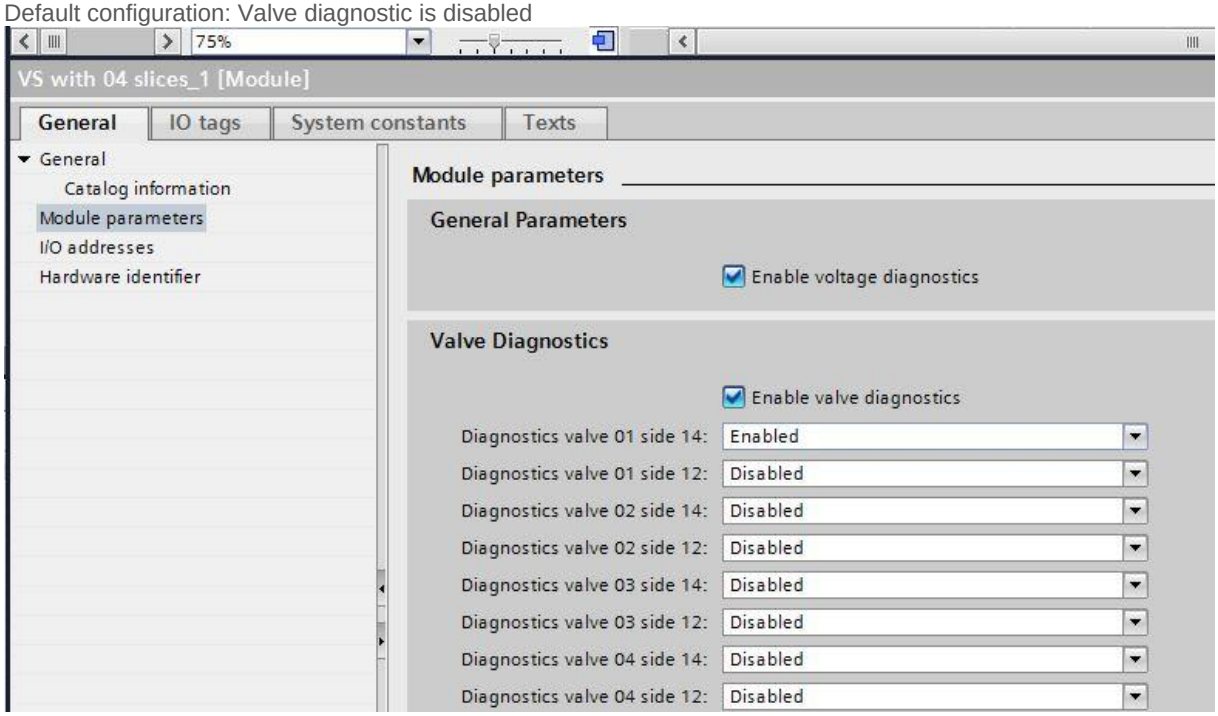
Default configuration: Voltage diagnostic is enabled



4.5.2 Valve Diagnostics

It is possible to enable/disable the valve diagnostics (channel diagnostic) in general or for each single solenoid. If disabled, in case of a wire break or a short circuit of a solenoid no PROFINET diagnostic alarm appears and the SF LED remains green as well. Otherwise a PROFINET channel diagnostic alarm appears (with error code and channel number) and the SF LED changes state (see also chapter 6.1).

Default configuration: Valve diagnostic is disabled

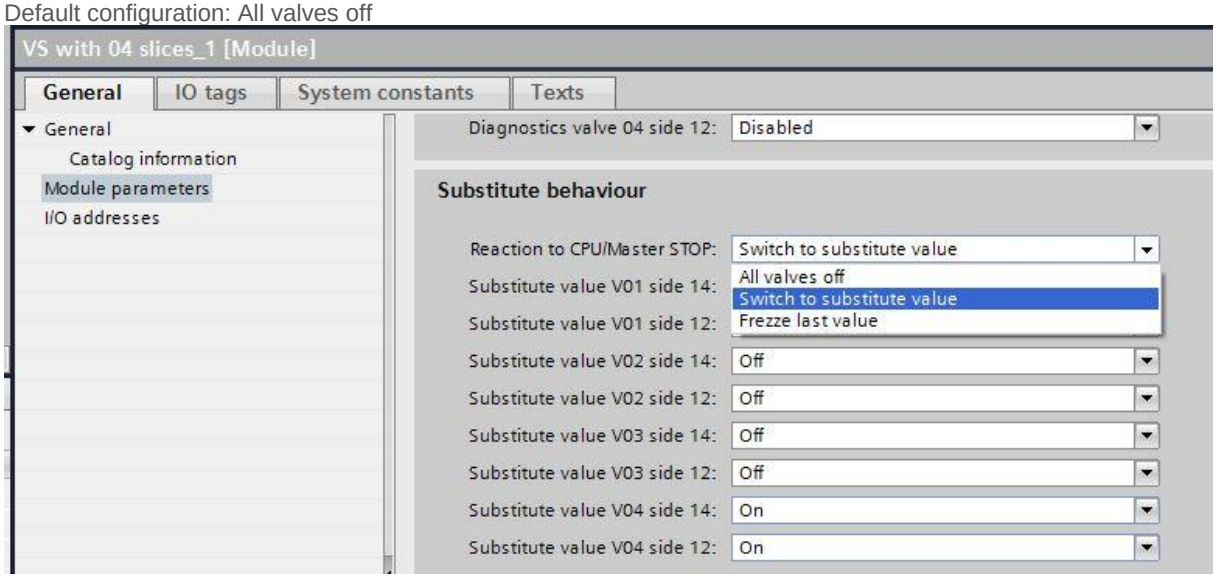


4.5.3 Substitute behavior

It is possible to define the behavior of the outputs in case of “IOPS = Bad” (PLC stopped) or broken PROFINET communication. The following states could be defined by the outputs:

- *Clear output*
- *Set output*
- *Freeze output*

Default configuration: All valves off



4.6 Compilation and download

After finished configuration please compile the project and download it to the PROFINET controller (PLC).

5 Output data

5.1 Address assignment

To calculate the length of the used output data (in bytes) for the VM10 valve configuration please use the following formula:

$$B(Bytes) = \frac{V * 2 + \big((V * 2) MOD 8\big)}{8}$$

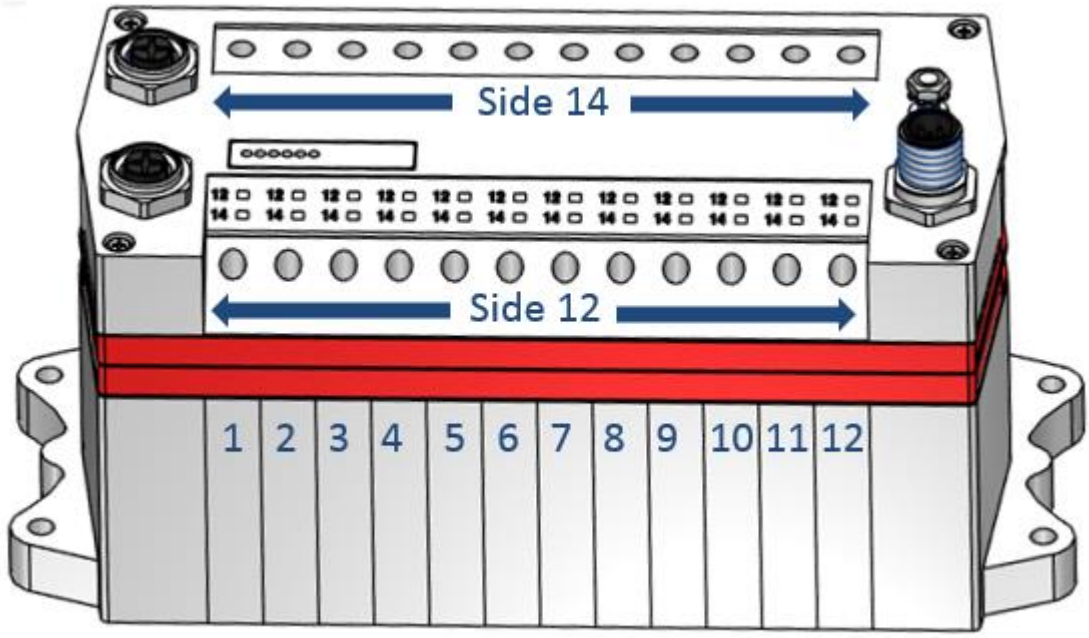
$V \in \{8, 10, 12, 16\}$.

Whereby ´V´= number of valve slices and 'MOD' = Modulo-Operator

E.g. for a valve island with 10 valve slices

$$B = \frac{10 * 2 + (10 * 2) MOD 8}{8} = \frac{20 + 20 MOD 8}{8} = \frac{24}{8} = 3$$

➲ *There are 3 bytes reserved for 10 valve slices*



The illustration below shows the assignment for maximum configuration of 16 valve slices. For every valve two bits will be reserved – one bit for solenoid 14 and one bit for solenoid 12.

byte	Bit								total valve number			
	7	6	5	4	3	2	1	0	8	10	12	16
0	V 04		V 03		V 02		V 01		X	X	X	X
	S 12	S 14	S 12	S 14	S 12	S 14	S 12	S 14				
1	V 08		V 07		V 06		V 05		X	X	X	X
	S 12	S 14	S 12	S 14	S 12	S 14	S 12	S 14				
2	V 12		V 11		V 10		V 09			X	X	X
	S 12	S 14	S 12	S 14	S 12	S 14	S 12	S 14				
3	V 16		V 15		V 14		V 13					X
	S 12	S 14	S 12	S 14	S 12	S 14	S 12	S 14				

(V = Valve no., S = Solenoid side, X = Bytes reserved)

5.2 Output behavior at power up and in fault condition

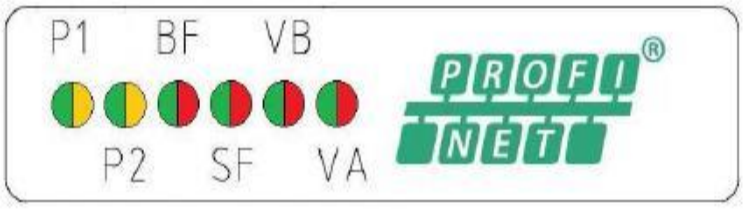
At power up all outputs are cleared. The initialization phase of the valve island is indicated by a one by one activation of the status LEDs BF, SF, VA, VB and the status LEDs of the valve stations.

In case of fault condition (broken communication, “IOPS = bad”) the outputs switch to those values which are configured in the “substitute behavior” parameter set (see also chapter 4.5.3).

6 Diagnostics and LEDs

6.1 Status LEDs

6.1.1 Status LEDs description



LED Name	Description
P1	Link Port 1 (TX/RX & Link)
P2	Link Port 2 (TX/RX & Link)
BF	Bus Error
SF	System Error
VB	Electronic Power Supply Status
VA	Valve Power Supply Status

6.1.2 Link states for Port P1 and Port P2

Link Status	LED State
Link connection established	yellow
Link communication active	flashing yellow / green
Link connection not established	off

6.1.3 Bus Error Status LED (BF)

Bus Status	LED State
No error	green
Device is offline	red
Hardware configuration and parameterization is not plausible	flashing, red
IOPS = BAD	tripple flashing, red
PROFINET Software is not initialized	off

6.1.4 Error Status LED (SF)

System-Status	LED State
No error	green
Solenoid, short circuit or open circuit	flashing, red
Error, internal communication	double flashing, red
Fatal error	tripple flashing, red
Hardware configuration is not plausible	red
Device is not initialized	off

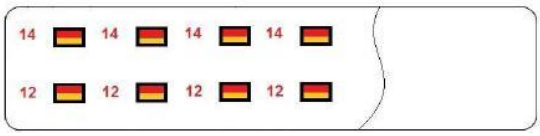
6.1.5 Electronics Power Supply Status, LED (VB)

Status	LED State
Voltage OK	green
Undervoltage	flashing red
Overvoltage	permanent red

6.1.6 Valve Power Supply Status, LED (VA)

Status	LED State
Voltage OK	green
Undervoltage	flashing red
Overvoltage	red

6.2 Valve slice Status LEDs



Each valve slice has one or two separate status LEDs depending on its configuration, which indicate the control states “14“ and “12” for the corresponding pilot valve solenoids.

Please note that an error state will only be indicated if the valve island diagnostics for the corresponding valve has been activated.

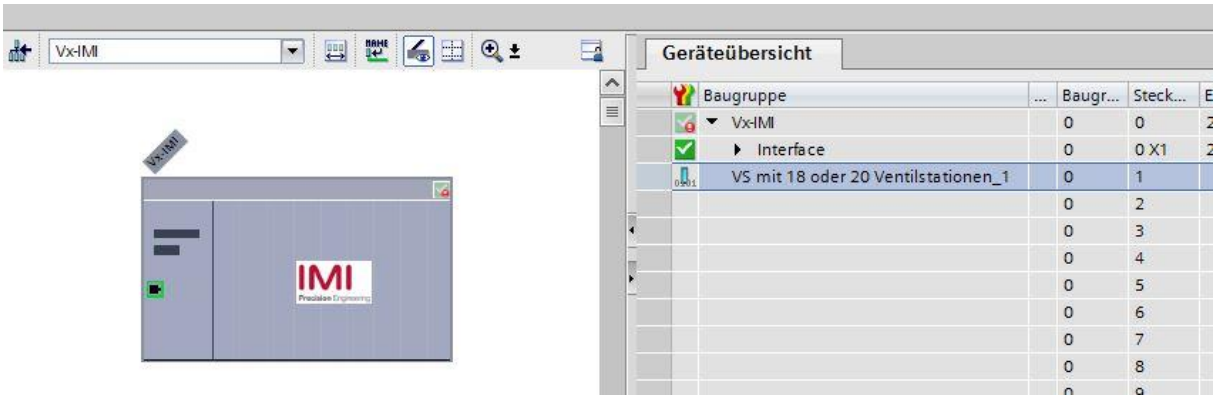
Status	LED State
Valve not powered	off
Valve powered	yellow
Valve in error state	red

6.3 Online diagnostics with Siemens TIA Portal

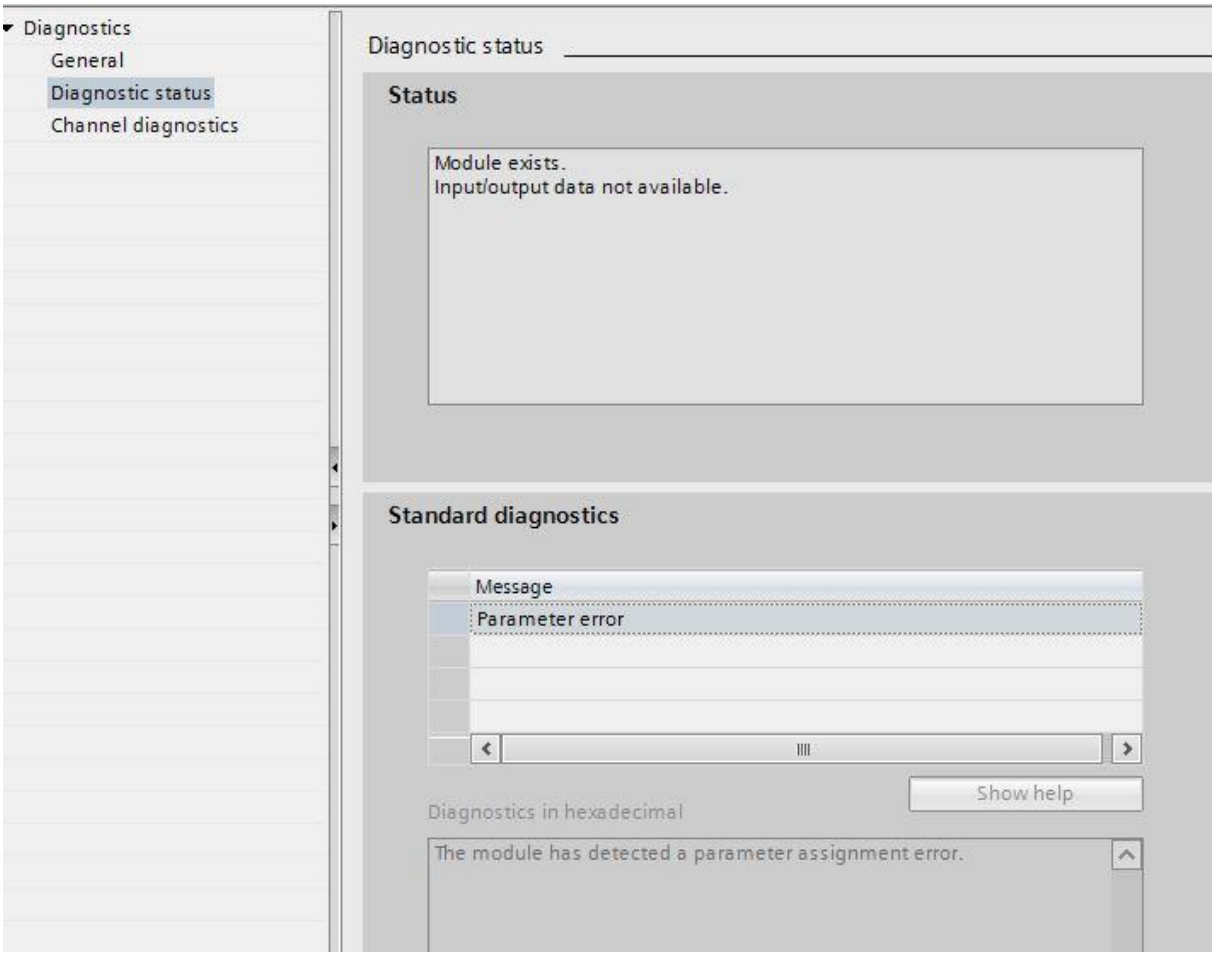
Use the “Network View“ or “Device View” and “Go online” for PROFINET diagnostics of the network or device.

6.3.1 Wrong module

In case of a mismatch between configured module and physically module on slot 1 the module is marked with a parameter error symbol in the “Device overview” of the “Device view”.

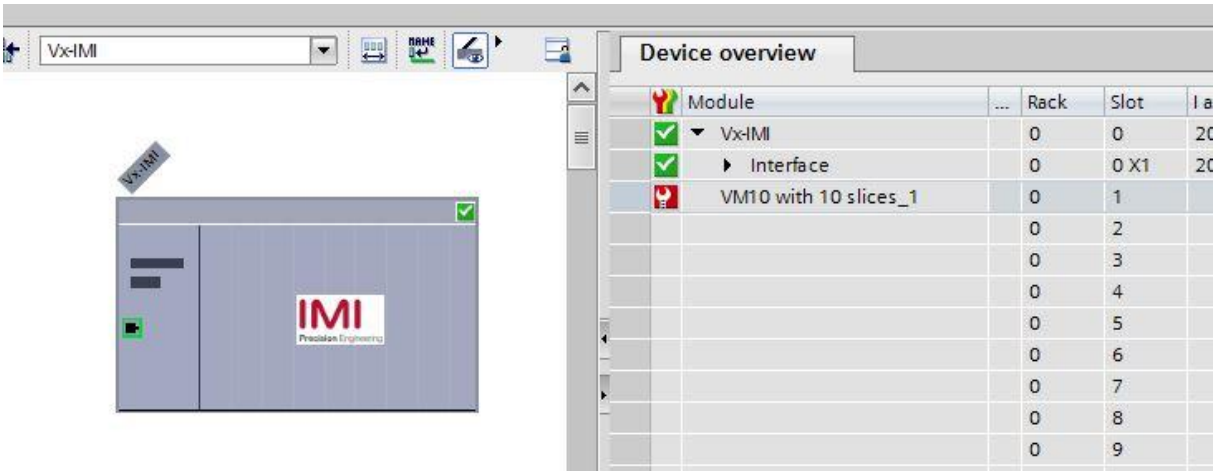


Double click the symbol to change into diagnostics view of the module. Highlight the “Diagnostic status” line to get detailed information about the pending module diagnostics

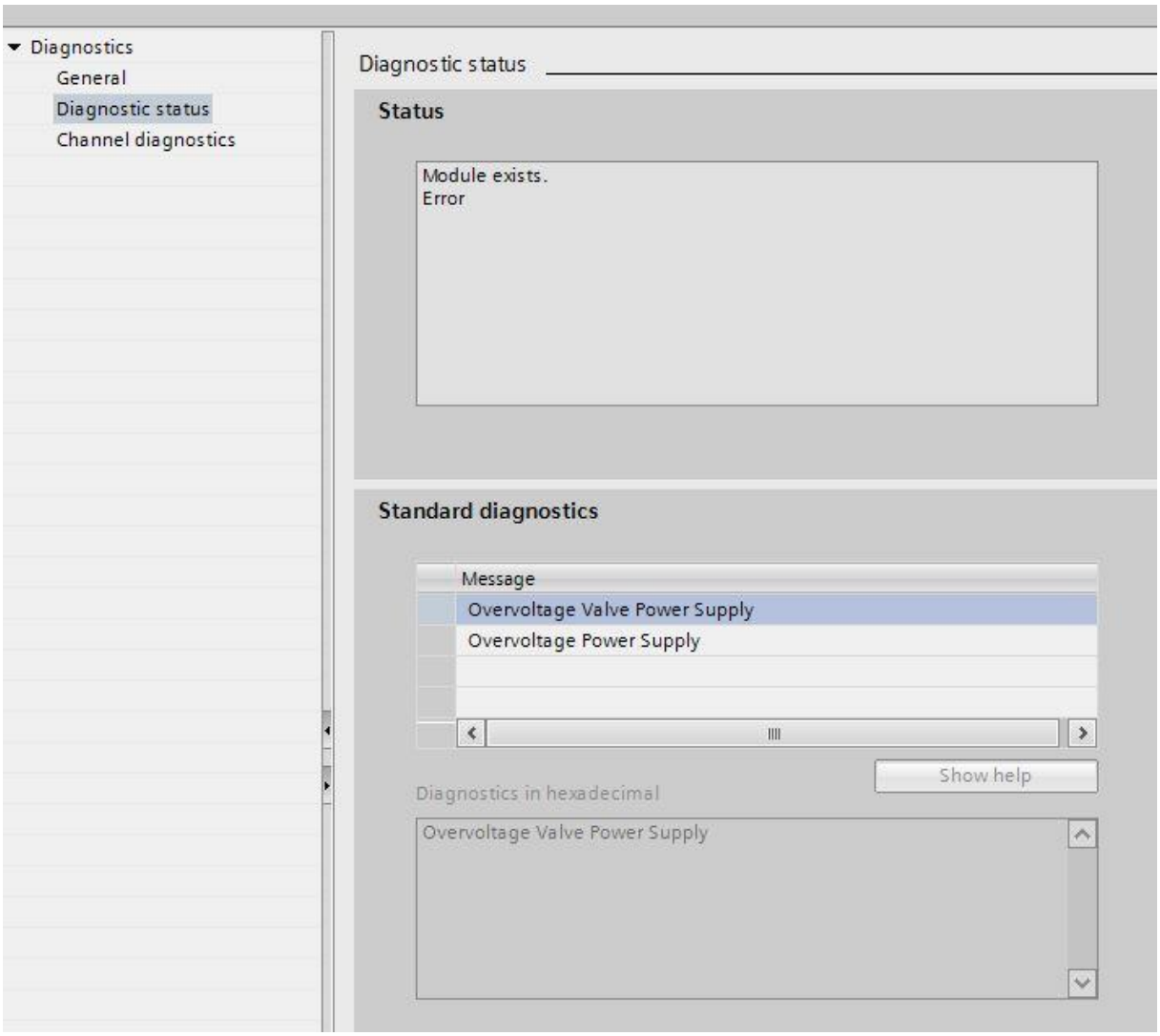


6.3.2 Module diagnostics (e.g. under/overvoltage)

In case of pending module diagnostics of the valve island (e.g. under/overvoltage) the module is marked with a red symbol in the “Device overview” of the “Device view”.

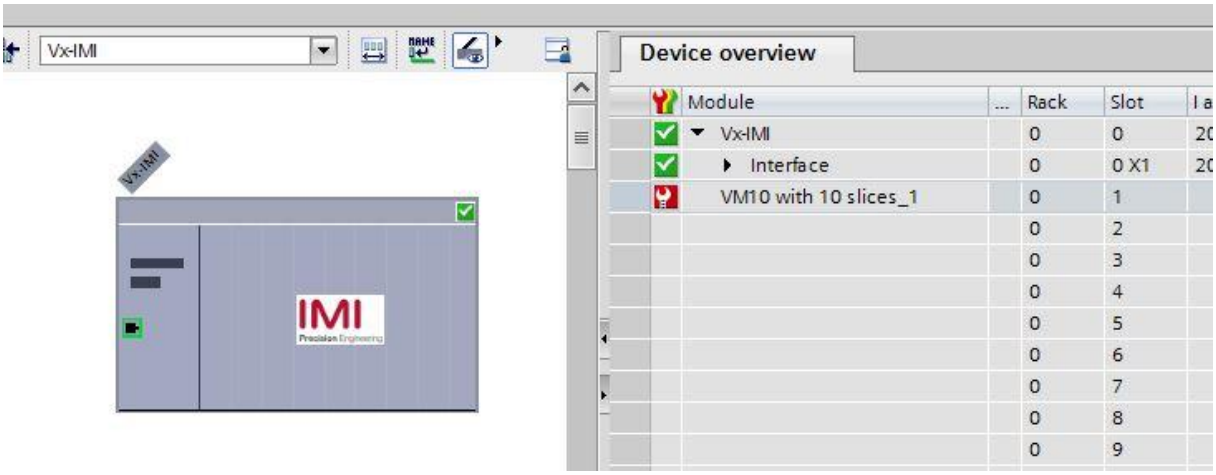


Double click the red symbol to change into diagnostics view of the module. Highlight the “Diagnostic status” line to get detailed information about the pending module diagnostics.

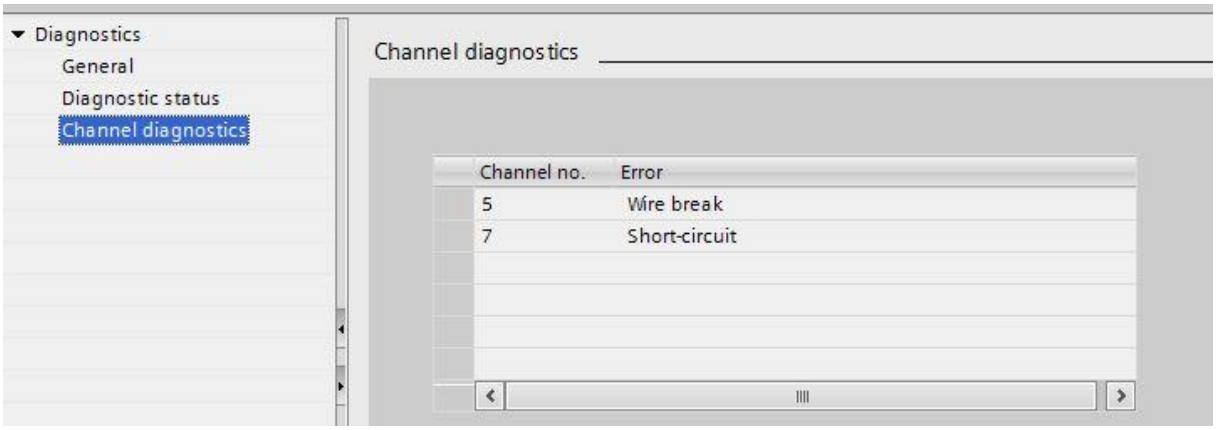


6.3.3 Channel diagnostics (e.g. wire break of solenoid)

In case of pending channel diagnostics of the valve island (e.g. wire break or short circuit of a solenoid) the module is marked with a red symbol in the “Device overview” of the “Device view”.



Double click the red symbol to change into diagnostics view of the module. The channel number and the error reason are shown in the “Channel diagnostics” table.



The allocation between channel number and solenoid is shown in the following table:

Valve 1…4	V04-12	V04-14	V03-12	V03-14	V02-12	V02-14	V01-12	V01-14
Channel number	8	7	6	5	4	3	2	1
Valve 5…8	**V08-12**	**V08-14**	**V07-12**	**V07-14**	**V06-12**	**V06-14**	**V05-12**	**V05-14**
Channel number	16	15	14	13	12	11	10	9
Valve 12…9	**V12-12**	**V12-14**	**V11-12**	**V11-14**	**V10-12**	**V10-14**	**V09-12**	**V09-14**
Channel number	24	23	22	21	20	19	18	17
Valve 13…16	**V16-12**	**V16-14**	**V15-12**	**V15-14**	**V14-12**	**V14-14**	**V13-12**	**V13-14**
Channel number	32	31	30	29	28	27	26	25

7 PROFINET error codes

Error code (hexadecimal)	Error description	Associated LED
0x00	OK, no errors	*„SF“ LED, green*
0x01	Solenoid, short circuit	*„SF“ LED, flashing red*
0x06	Solenoid, open circuit	*„SF“ LED, flashing red*
0x100	Undervoltage VB electronic supply	*„VB“ LED, flashing red*
0x101	Overvoltage VB electronic supply	*„VB“ LED, red*
0x102	Undervoltage VA valve supply	*„VA“ LED, flashing red*
0x103	Overvoltage VA valve supply	*„VA“ LED, red*

8 Properties PROFINET interface

Requirements		Comments
Number of ports	2	---
Transfer speed	100Mbit/s	---
Duplex mode	Full Duplex	---
RT mode	supported	Real Time Protocol
IRT mode	supported	Isochronous Real Time Protocol
MRP mode	supported	Media Redundancy Protocol (possible to switch between redundant transmission paths)
PROFINET (certification by PNO)	Compliant to IEC61158, Conformance Class C according to IEC61784	---
Adressing mode	DCP, LLDP + SNMP (Device exchange by the same topology)	---
GSD Language	EN + DE	---

9 Electrical data

Requirements		Comments
Valve voltage range (VA)	24VDC +/-10%	PELV
Electronics voltage range (VB)	24VDC +/-25%	PELV
Maximal currents:	VA: 150mA + n x 30mA VB: 400mA	n = number of activated valves
Voltages are galvanic decoupled	Yes	--
Protection against polarity reversal	VA, VB	--
Overcurrent protection VB, VA	irreversible	Protection against overload and short-circuit currents, fused with 2A slow-acting fuse
PE/FE/Ground connection	Earth screw (M4)	--
Electrical power supply connection	M12 / 5-pin / A-coded / male connector	M12-1: L1 (VB+) M12-2: N2 (VA-) M12-3: N1 (VB-) M12-4: L2 (VA+) M12-5: FE
Bus connection	M12 / 4-pin / D-coded / female connector	M12-1: TD+ M12-2: RD+ M12-3: TD- M12-4: RD-

10 Technical data

Medium:
Compressed air, filtered, lubricated and non-lubricated

Operational:
Solenoid pilot spool valve

Port sizes:
Ø 3 mm, 4 mm, 6 mm (1/8, 5/32, 1/4)

Operating pressure:
Maximum 8 bar (max. 116 psig)

Flow:

Serie	Function	Cv [dm³ / s * bar]	'C'	'A'	QN [l/min]	kv
VM10*5	5/2 port 1 to 2 & 4	0.44	1.77	7.1	430	0.36
VM10*5	5/2 ports 2 to 3 & 4 to 5	0.41	1.65	6.61	400	0.34
VM10*(A,B,C)	3/2 ports 1 to 2 & 1 to 4	0.36	1.44	5.78	350	0.29
VM10*(A,B,C)	3/2 ports 2 to 3 & 4 to 5	0.36	1.44	5.78	350	0.29
VM10*6	5/3 ports 1 to 2 & 4	0.36	1.44	5.78	350	0.29
VM10*6	5/3 ports 2 to 3 & 4 to 5	0.36	1.44	5.78	350	0.29

Ambient Media temperature:
-5°… +50°C (+23…+122 °F)

Air supply must be dry enough to avoid ice formation at temperature +2°C (+35°F)

Degree of protection:
NEMA 4 and IP65

Materials:
Body, end plates: Engineered PPA co-polymer

Spool: Aluminium

Seals: NBR

Customer support

Email contact: Anfragen.Ventilteam@imi-precision.com

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The data specified above only serve to describe the product.

No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of exercising judgment and verification. It must be remembered that our products are subject to a natural process of wear and ageing.

Subject to change without notice.

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