NORGREN

VR10 / VR15
With IO-Link Interface

Operation & Service Manual

IO-Link

IMI

Breakthrough Engineering

Change history:

The change history reflects all changes of the Operation & Service Manual, which were done after the initial release.

Index	Chapters	Change description	Date	Name
001	All	New Release	5-April-2021	MP

This Operation & Service Manual makes no claims of being complete as it does not cover all variants of the VR10 / VR15 valve manifolds.

Therefore, this document is subject to extensions or changes.

1 CONTENTS

2 ABOUT THIS DOCUMENTATION

This user guide contains the information to set up and operate VR10 / VR15 valve manifold with IO-Link Interface and to detect and resolve problems.

Note:

In addition to the specific information for the IO-Link variants, all data sheets and VR10 / VR15 PROTOCOL / MULTIPOLE SERIES IP65 VERSION Operation & Service Manual are applicable and remain valid.

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

- https://www.norgren.com

Refer also to the valve island installation instruction in the following document:

- "VR10 / VR15 PROTOCOL / MULTIPOLE SERIES IP65 VERSION Operation & Service Manual"

  This manual can be found on https://www.norgren.com/us/en/technical-support/installation-maintenance-instructions/valves

Basic information about IO-Link can be found in the following documents:

- "IO-Link System Description - Technology and Application.pdf"
  https://io-link.com/IO-Link_System_Description.pdf

Further information about IO-Link is available on IO-Link websites:

- https://io-link.com/
- https://io-link.com/en/Technology
- https://io-link.com/en/Download/

3 IMPORTANT HINTS

3.1 GROUNDING AND EQUIPOTENTIAL BONDING

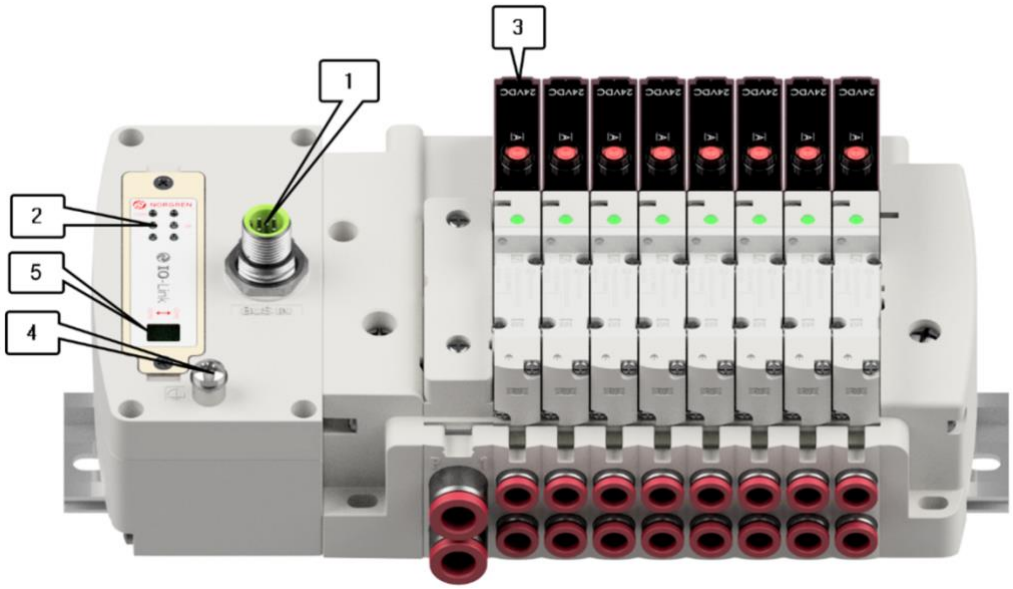
Proper grounding and equipotential bonding are very important to protect against electromagnetic interferences in IO-Link networks. In order to reduce potential impact, should the valve manifold be connected to the earth potential of the system or control cabinet via the earth connection on the control module.

For proper grounding please use the terminal for earth screw (M4) on the upper side of the valve manifold. For easy reference see item 4 in chapter 4. The cross-section of the used grounding cable should be at least 0.75mm^2.

3.2 USING AN IO-LINK MASTER

It is recommended to use an **IO-Link master with port Class B** to control VR10 / VR15 IO-Link valve manifolds. The signal wire and valve power supply wire can be connected via this 5-wire unshielded cable.

4 ELECTRICAL CONNECTIONS



1- IO-Link connector (Port Class B)

(M12 x 1 | Male | 5 – pin | A – coded)

2- Status LEDs

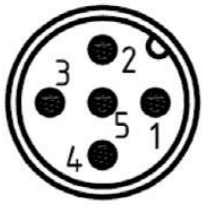
3- Valve status LEDs

4- Earth screw (M4)

5- Baud rate setting switch (COM2 & COM3)

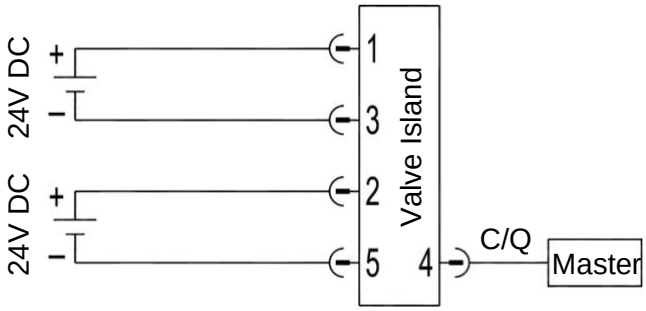
4.1 IO-LINK CONNECTOR (PORT CLASS B)

- Pin allocating of IO-Link connector



M12 / 5 pins / Male Connector / A-coded / Class B	
Pin No.	**Function**
1	L+ (VB +) 24V electronics power supply
2	2L+ (VA +) 24V valves power supply
3	L- (VB -) 0V electronics power supply
4	C/Q (COM) IO-Link communication
5	2M (VA -) 0V valves power supply

- IO-Link connector wiring diagram



4.2 ELECTRICAL DATA

Specification		Remark
Valve voltage range (VA)	24VDC +10%/-5%	PELV
Electronics voltage range (VB)	24VDC +/-10%	PELV
Maximum currents	VA: n × 40 mA VB: < 100 mA	n = number of solenoids
Voltages are galvanic decoupled	Yes	---
Protection against polarity reversal	Yes	---
Overcurrent protection VB, VA	Irreversible	---
Output polarity	PNP	---

5 SOLENOID NUMBER & VALVE STATION MAPPING

5.1 MAPPING RULES FOR VALVE STATIONS ≤ 12

- If valve stations ≤ 12, 2 solenoid numbers are always reserved for each valve station. *

Detailed allocation is shown as below:

Station	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Solenoid A (14 Solenoid)	Sol.01	Sol.03	Sol.05	Sol.07	Sol.09	Sol.11	Sol.13	Sol.15	Sol.17	Sol.19	Sol.21	Sol.23
	Output 0	Output 2	Output 4	Output 6	Output 8	Output 10	Output 12	Output 14	Output 16	Output 18	Output 20	Output 22
Solenoid B (12 Solenoid)	Sol.02	Sol.04	Sol.06	Sol.08	Sol.10	Sol.12	Sol.14	Sol.16	Sol.18	Sol.20	Sol.22	Sol.24
	Output 1	Output 3	Output 5	Output 7	Output 9	Output 11	Output 13	Output 15	Output 17	Output 19	Output 21	Output 23

Notes:
*** For valve station with single solenoid, only Solenoid A (14 Solenoid) is connected. Consider the one which is closest to control module as 1st station (Station #1)**

5.2 MAPPING RULES FOR 12 < VALVE STATIONS ≤ 24

- If 12 < valve stations ≤ 24, special rules are required since only 1 solenoid number is allocated to valve station with single solenoid:

Sequence all solenoids following the rules below by starting from 1st station which is the station closest to control module:

- If 1st station is with double solenoids, sequence solenoid A as Sol.01, solenoid B as Sol.02, following 2nd station solenoid A as Sol.03, solenoid B as Sol.04……
- If 1st station is with single solenoid, sequence solenoid A as Sol.01, following 2nd station solenoid A as Sol.02, solenoid B as Sol.03……
- If a station is originally configured as blank, always 2 solenoid numbers are allocated.
- The rest of stations should also adhere to the sequence rules above.

A 16-station 24 solenoids valve manifold example is shown below:

	Double Solenoids	Double Solenoids	Single Solenoid	Single Solenoid	Double Solenoids	Double Solenoids	Single Solenoid	Double Solenoids	Single Solenoid	Double Solenoids	Single Solenoid	Double Solenoids	Single Solenoid	Single Solenoid	Double Solenoids	Single Solenoid
Station	**#1**	**#2**	**#3**	**#4**	**#5**	**#6**	**#7**	**#8**	**#9**	**#10**	**#11**	**#12**	**#13**	**#14**	**#15**	**#16**
Solenoid A (14 Solenoid)	Sol.01	Sol.03	Sol.05	Sol.06	Sol.07	Sol.09	Sol.11	Sol.12	Sol.14	Sol.15	Sol.17	Sol.18	Sol.20	Sol.21	Sol.22	Sol.24
	Output 0	Output 2	Output 4	Output 5	Output 6	Output 8	Output 10	Output 11	Output 13	Output 14	Output 16	Output 17	Output 19	Output 20	Output 21	Output 23
Solenoid B (12 Solenoid)	Sol.02	Sol.04	--*	--*	Sol.08	Sol.10	--*	Sol.13	--*	Sol.16	--*	Sol.19	--*	--*	Sol.23	--*
	Output 1	Output 3			Output 7	Output 9		Output 12		Output 15		Output 18			Output 22	

Note:
*** For valve station with single solenoid, only Solenoid A (14 Solenoid) is allocated & connected. Consider the one which is closest to control module as 1st station (Station #1).**

6 COMMISSIONING

Notes:

1. The method of IO-Link device installation strongly depends on the configuration software. Please refer to the configuration software manual of your IO-Link master.

2. **IO-Link master configuration software should support importing IODD files and support setting IO-Link device parameters visually and graphically.**

3. For those IO-Link masters which cannot import IODD files or cannot parameterize valve island visually or graphically, alternative portable USB IO-Link master e.g. TMGTE IO-Link Device Tool can be used in conjunction with respective software for IODD files and visual & graphical setting, or consult NORGREN directly.

4. All examples in this document are made with Siemens IO-Link master ET 200eco PN with PROFINET interface / Port Class B and the configuration software SIMATIC S7-PCT Version 3.5 SP1.

5. All examples in this document are made with Siemens PLC S7-1212C and TIA Portal V15.1.

6.1 HARDWARE CONFIGURATION ON IO-LINK MASTER

As for the method of hardware configuration on Siemens IO-Link master ET 200eco PN in TIA Portal V15.1 and SIMATIC S7-PCT V3.5 SP1, please refer to the following operation manual:

- "Operating Instructions – SIMATIC Distributed I/O ET 200eco PN.pdf"
  https://support.industry.siemens.com/cs/attachments/29999018/et200eco_pn_operating_instructions_en-US_en-US.pdf?download=true

6.2 IODD FILE INSTALLATION

A device description file (known as IODD) is needed for configuration of valve manifold. The IODD files are XML based files, contains all information about the communication properties, the device parameters, identification data, process data and diagnostics data, etc. of the valve manifold. It can be used for all variants VR10 / VR15:

- "Norgren-VR1X-IL-COM2-JJJJMMDD-IODDy.z.xml"
- "Norgren-VR1X-IL-COM3-JJJJMMDD-IODDy.z.xml"

Notes:

1. "JJJJMMDD" (JJJJ-year, MM-month, DD-day) is date of release, "y.z" is version number.

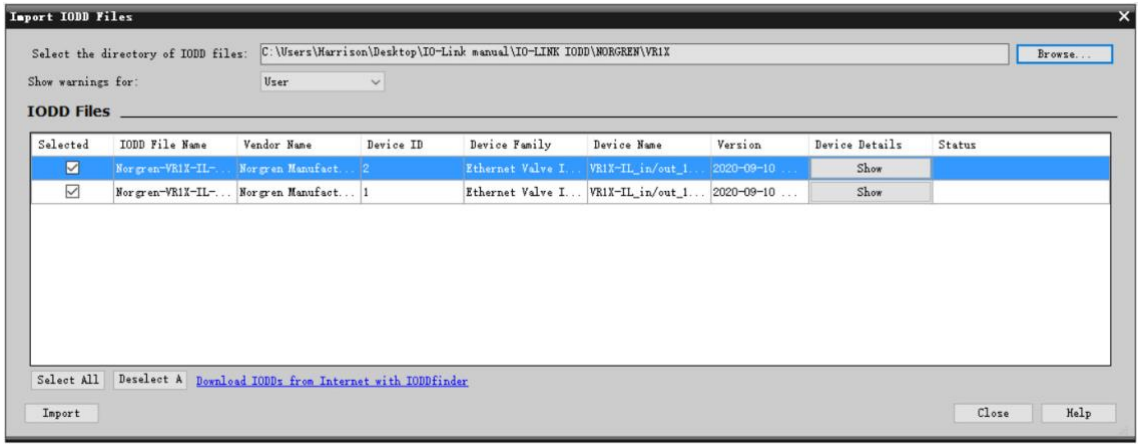
2. COM2 & COM3 are baud rates, COM2=38.4 kbps, COM3=230.4 kbps. Default setting is COM3.

3. The configuration software of IO-Link master manufacturers should support read an IODD file and display all related parameters of the valve island graphically.

4. Recommend installing the two IODD files and the IO-Link device will be found automatically whatever COM2 or COM3 is set.

The IODD file must be installed inside the IO-Link master configuration software SIMATIC S7-PCT:

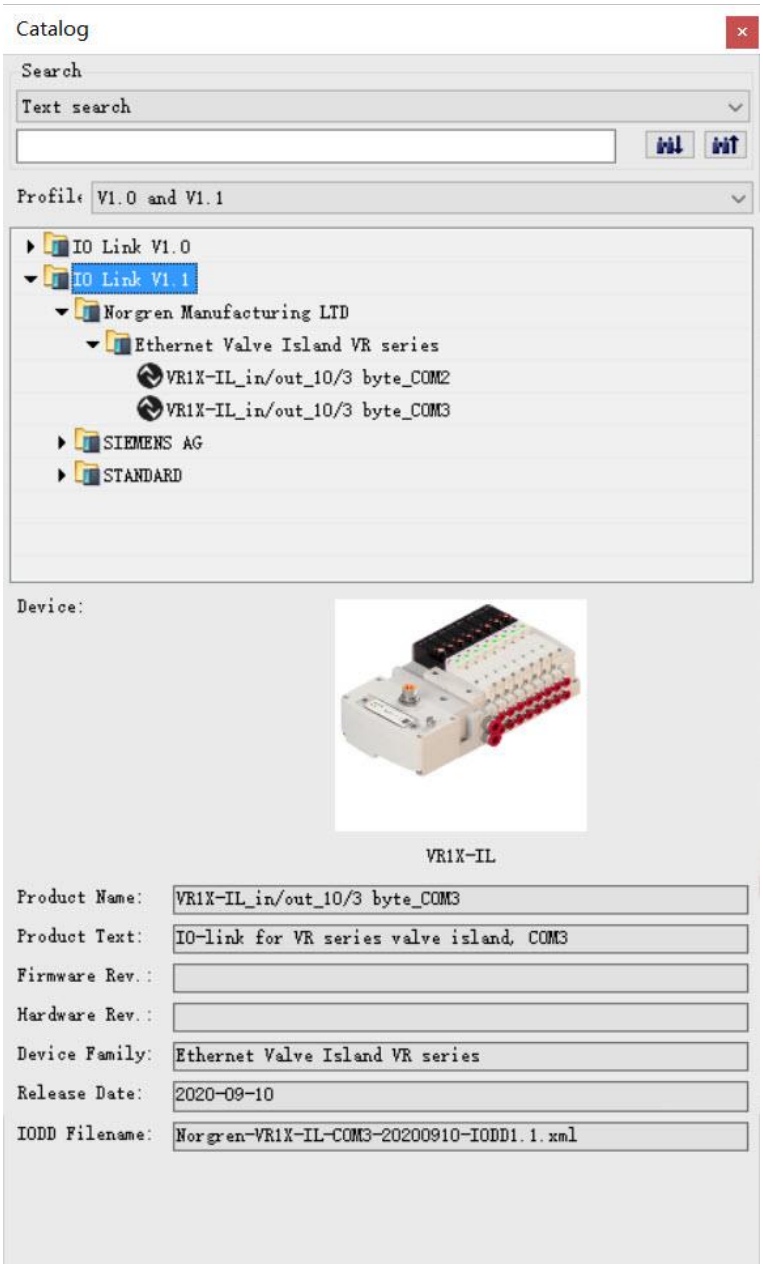
- Click “Options” -> “Import IODD…”.
- Select source path where IODD file is stored, tick the IODD file and import.



The IODD files are provided by NORGREN and can be downloaded from the following web link:

- https://www.norgren.com/us/en/technical-support/software

After the successful installation of the IODD file, the VR10 / VR15 is listed in the hardware catalog.



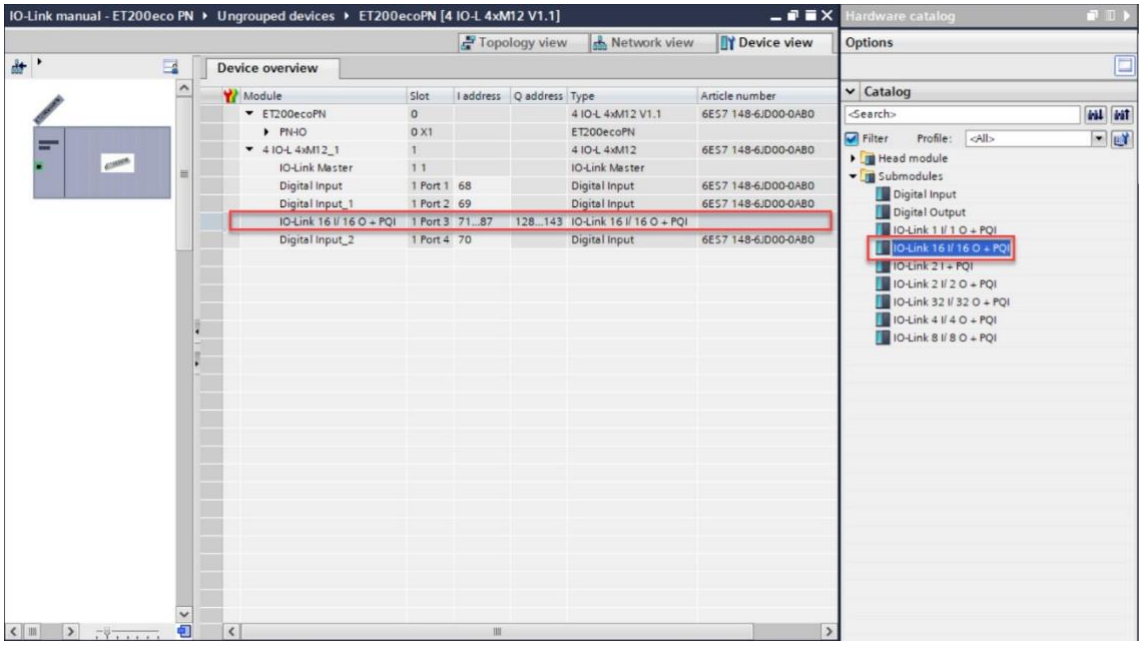
6.3 CONFIGURATION ON PORTS OF IO-LINK MASTER

6.3.1 Submodules Configuration on Ports of IO-Link Master

Before commissioning the valve manifold, the behaviour must be assigned to ports of IO-Link master.

After the successfully adding the IO-Link master and configuring the network in TIA Portal, a submodule with at least 10 bytes of IO-Link input data and at least 3 bytes of IO-Link output data must be assigned to the associated port which the valve manifold is physically connected to.

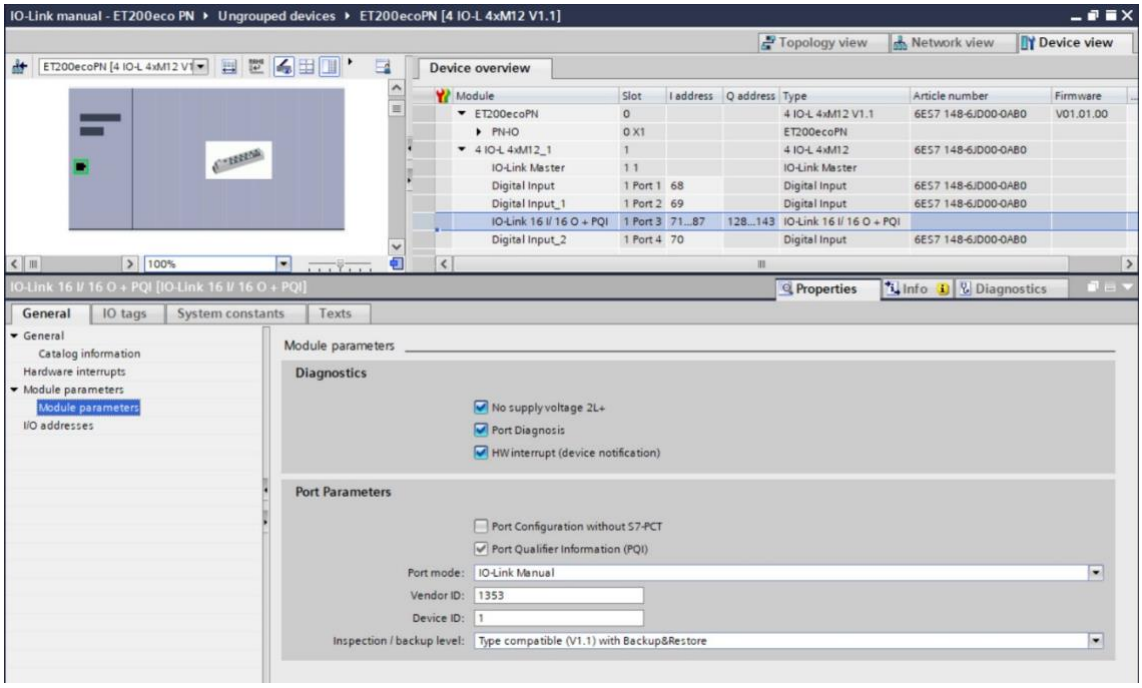
The first possible submodule in the following example is: “IO-Link 16I/ 16 O + PQI” and it is carried out as an example on port 3 of the IO-Link master.



6.3.2 Port Parameters Configuration

After successfully adding the submodule to the associated port, the port parameters need to be setting properly.

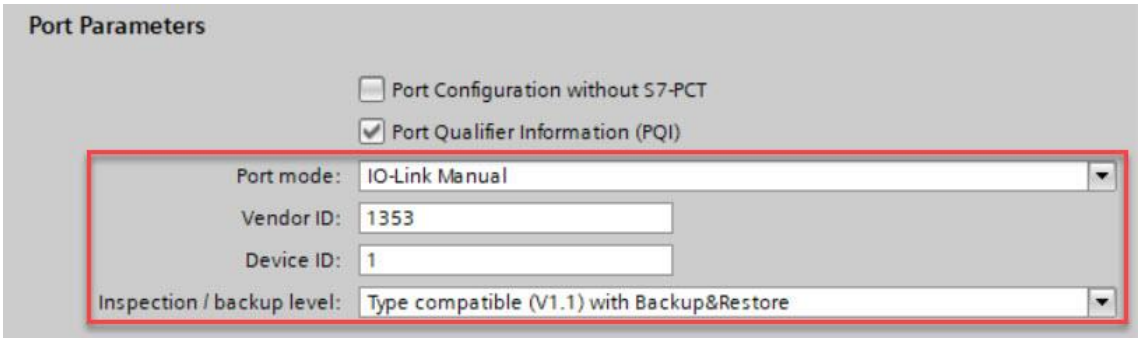
- Diagnostics parameters setting:
  - Ticking “No supply voltage 2L+”: Enabling of diagnostics in the case of missing or insufficient load voltage 2L+.
  - Ticking **“**Port Diagnosis”: Enabling of the diagnostics for the selected port.
  - Ticking **“**Hardware interrupt (device notification)”: Enabling of hardware interrupts for the selected port.
- Port parameters setting:
  - Keep “Port configuration without S7-PCT” un-ticked, which allow users to set parameters and diagnostic features of VR10/ VR15 in S7-PCT. If “Port configuration without S7-PCT” is ticked, user will not be able to set bespoke parameter and diagnostic features in S7-PCT, but digital input/output is still communicated.
  - Selecting option “IO-Link manual”: Activating parameter setting of the data storage function for the selected port.
  - Vendor ID: Manufacturer ID of connected IO-Link device, **1353** for VR10 / VR15.
  - Device ID: Device ID of connected IO-Link device, **1** for COM3, **2** for COM2.
  - If willing to execute data storage function, Vendor ID and Device ID must be set properly.
  - Inspection / backup level: Enable / disable data storage function of the port.
  - Selecting option “Type compatible (V1.1) with Backup & Restore” to enable data storage function.



6.4 DATA STORAGE FUNCTION

Valve manifold VR10 / VR15 with IO-Link Interface supports data storage function.

Make sure port parameters options are set as shown below to enable data storage function before replacing valve manifold.



Follow the steps to replace valve manifold:

- Disconnect valve island from IO-Link master.
- Connect new valve island (with same configuration) to the same port on IO-Link master.

IO-Link master will copy parameter values from the data memory to the valve manifold automatically.

Note: Data storage function is with IO-Link version 1.1 or higher.

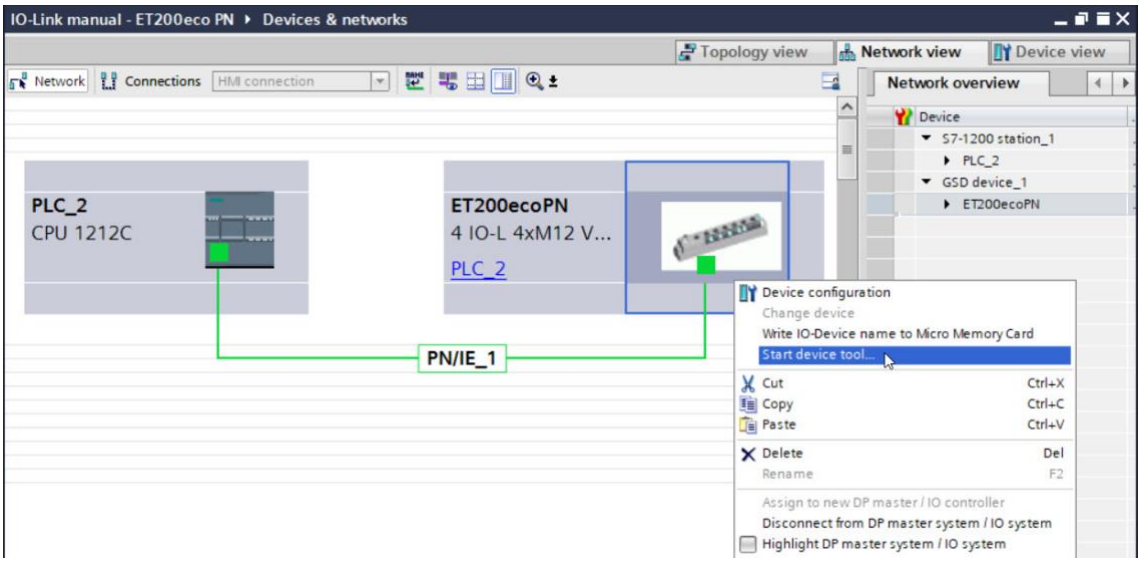
6.5 PARAMETERIZATION

Note:

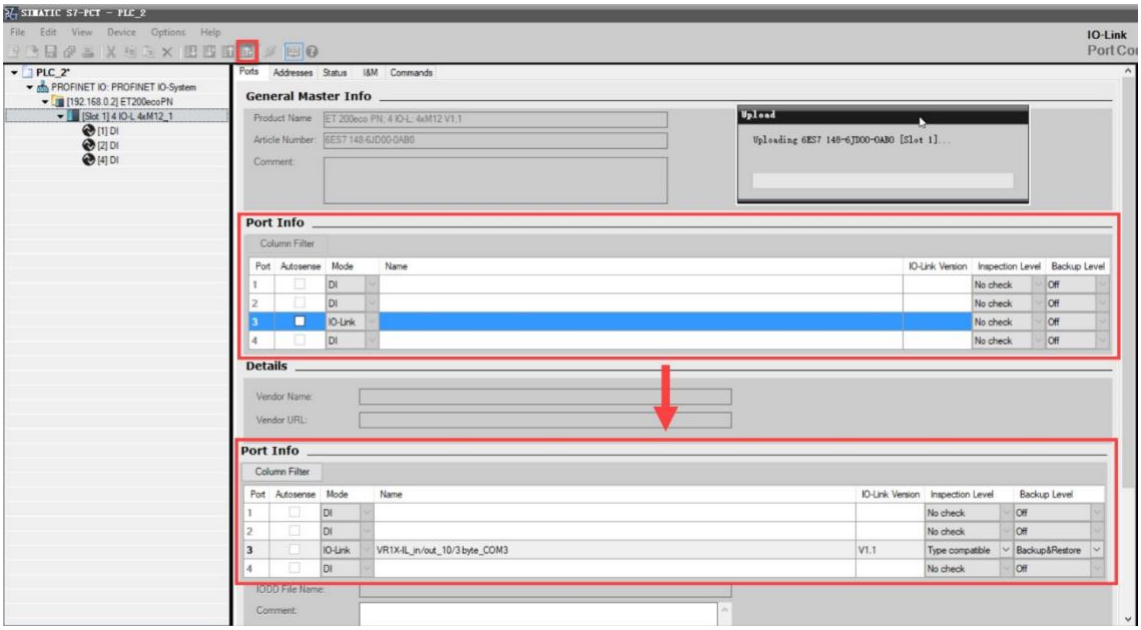
Parameterization can be carried out via the web interface (webserver integrated with IO-Link master) or via configuration tools for IO-Link master. License could be required from IO-link master manufacture.

6.5.1 Online Adding Valve Island in Configurator

- Make sure valve manifolds, IO-Link master and PLC are all connected properly and power on.
- Right click ET 200eco PN master in TIA Portal to open S7-PCT.



- Click “Load to PG with Devices” button to find devices online.
- After successfully adding devices, the valve manifolds will appear at related port.

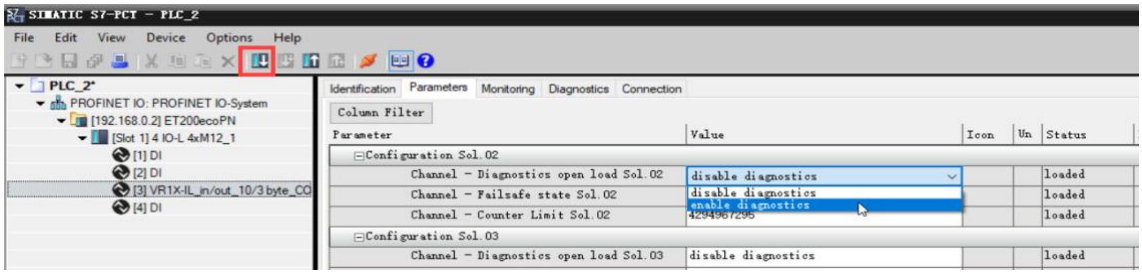


6.5.2 Open Load Diagnostics Setting

It is possible for VR10 / VR15 valve manifold to enable / disable the open load diagnostics for each solenoid. If disabled, no open load diagnostic error appears. Otherwise a status diagnostic and channel diagnostic with error description appears and SF LED on the IO-Link master change from green to red colour.

Open load diagnostic is disabled by default.

- Open “Parameters” tab and configure any solenoid in the parameter catalog.
- Select “disable diagnostics / enable diagnostics” options for open load diagnostics function.
- Click “Load” button to write data to the valve manifold.
- Solenoid number and valve station mapping relation is shown in Chapter 5.



6.5.3 Fail Safe State Setting

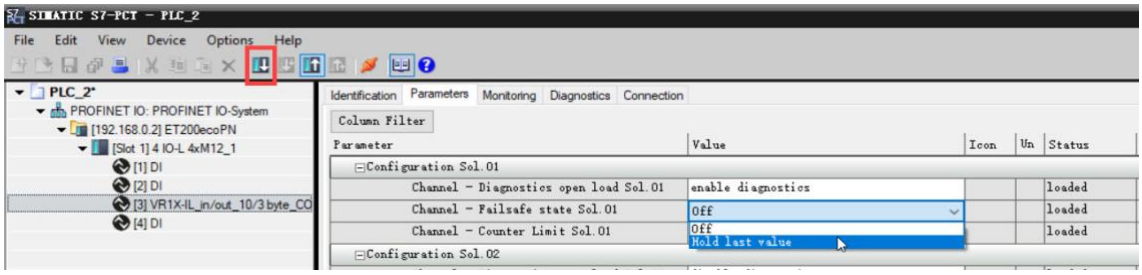
It is possible to define the behaviour of the outputs in case of broken IO-Link communication between IO-Link master and valve manifolds. The following two states can be defined by the outputs:

1) Output — Off

2) Output — Hold last value

Caution: if the electronics power and valves power are broken, fail safe state function will not work.

- Open “Parameters” tab and configure any solenoid in the parameter catalog.
- Select “Off / Hold last value” options for fail safe state function.
- Click “Load” button to write data to the valve manifold.
- Solenoid number and valve station mapping relation is shown in Chapter 5.



6.5.4 Voltage and Short Circuit Diagnostics

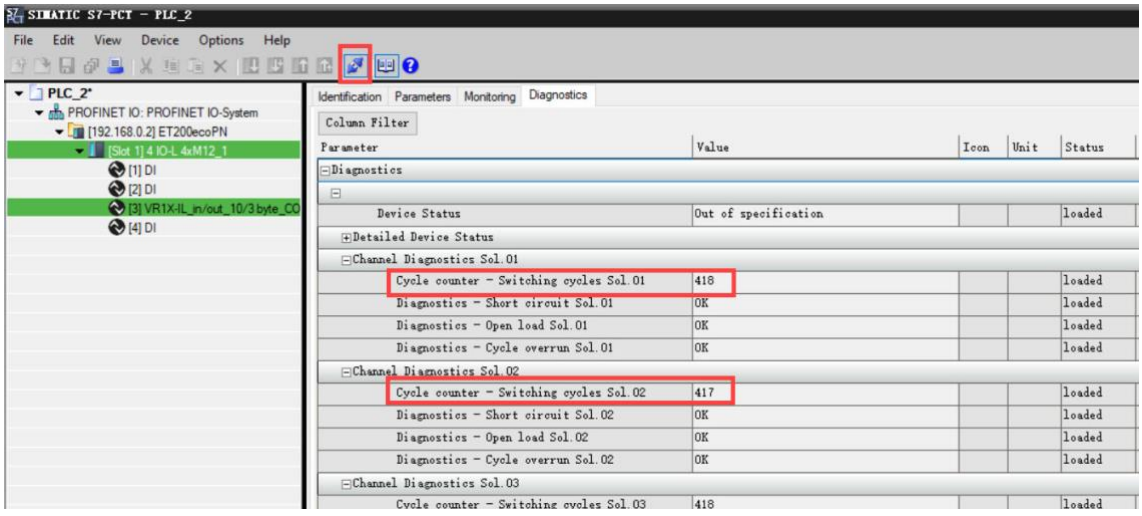
VR10 / VR15 valve manifold supports voltage diagnostics for both electronic power and valve power and short circuit diagnostics for each solenoid. These two diagnostic functions cannot be disabled.

- In case of over / under voltage, a status diagnostic with error description appears, SF LED on the IO-Link master change colour from green to red colour and the related VA / VB LEDs on the valve manifold change color from green to red (Overvoltage) / flashing red (Undervoltage).
- In case of short circuit, a status diagnostic and channel diagnostic with error description appears and SF LED on the IO-Link master change from green to red colour.

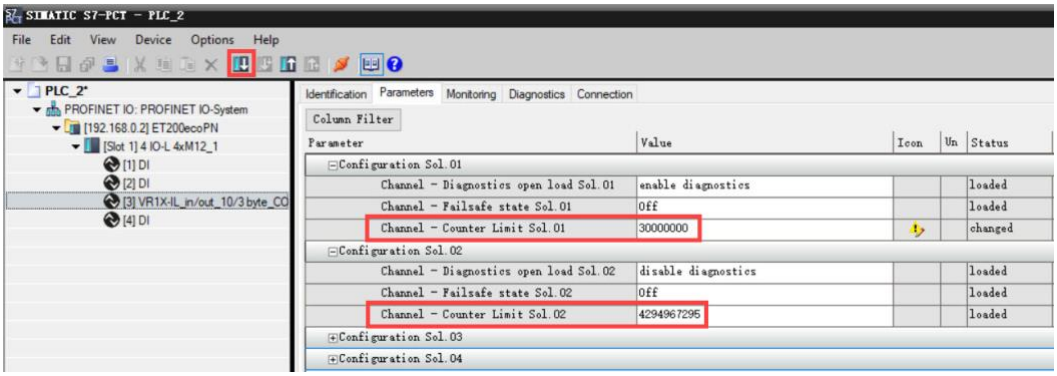
6.5.5 Cycle Counters Setting and Resetting

VR10 / VR15 valve manifold supports cycle counting, count limit set and counter reset for each solenoid.

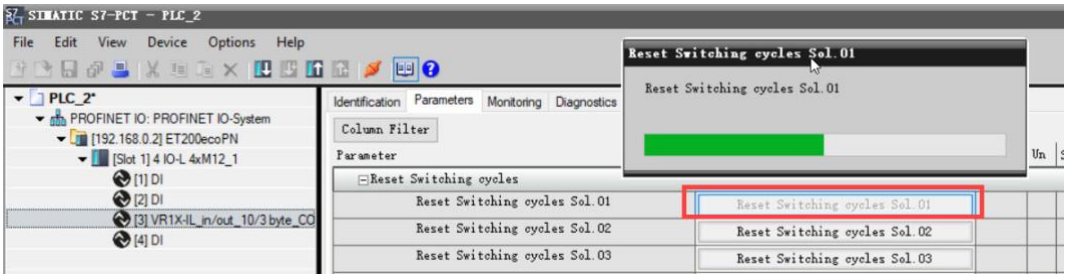
- Cycle counting
  - Click “Online” button in S7-PCT to make devices online.
  - Click the valve island and open “Diagnostics” tab to get detail cycle data.
  - Solenoid number and valve station mapping relation is shown in Chapter 5.



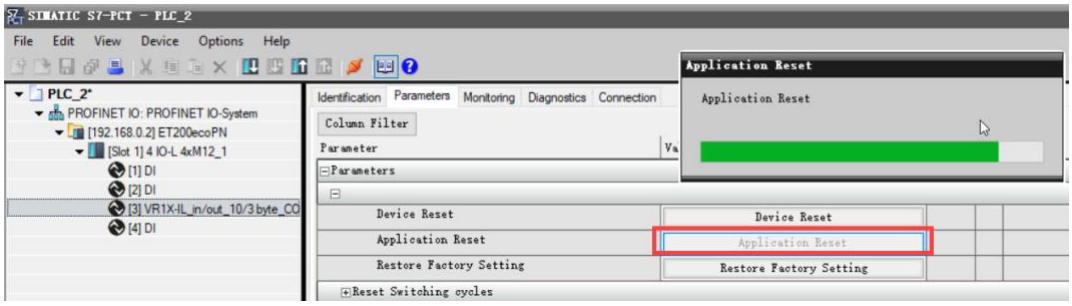
- Count limit set
  - Open “Parameters” tab and configure any solenoid in the parameter catalog.
  - Input the maximum cycles as required for count limit function.
  - The max. limit is 2^{32} in decimal and the default value is 2^{32} as well.
  - Click “Load” button to write data to the valve manifold.
  - Solenoid number and valve station mapping relation is shown in Chapter 5.



- Counter reset
  - Open “Parameters” tab and click respective “Reset switching cycles Sol.xx” button for specified valve.
  - After clicking the reset button, the cycle data will be cleared and automatic write to the valve island.
  - Solenoid number and valve station mapping relation is shown in Chapter 5.



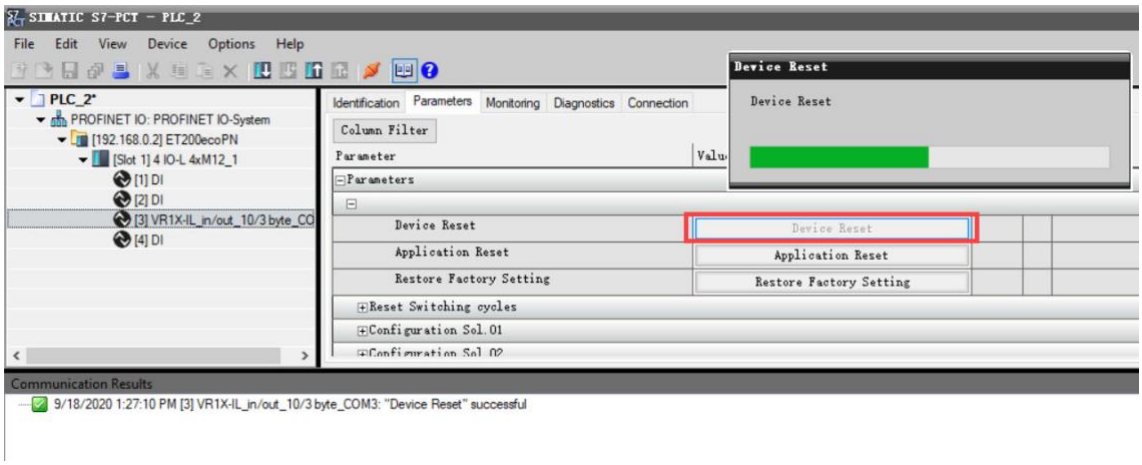
  - If wants to reset all valve cycles by one button, just click “Application Reset” button.
  - After clicking the button, the cycle data will be clear and automatic write to the valve manifold.

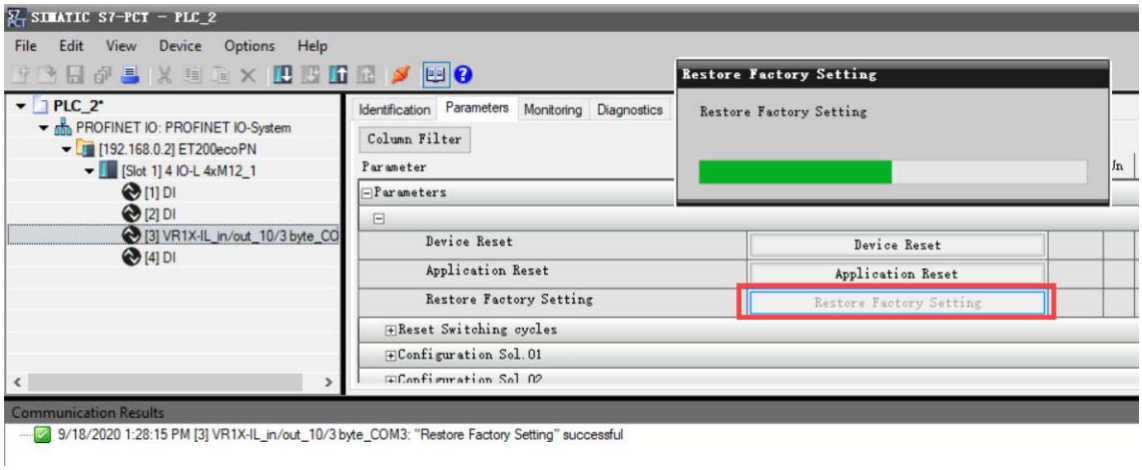


Note: Counter reset is recommended after replacing with a new valve slice.

6.5.6 Valve Manifold Device Restart & Factory Reset

- Restart valve manifold by clicking “Device Reset”.
- Set device to factory default by clicking “Restore Factory settings”.

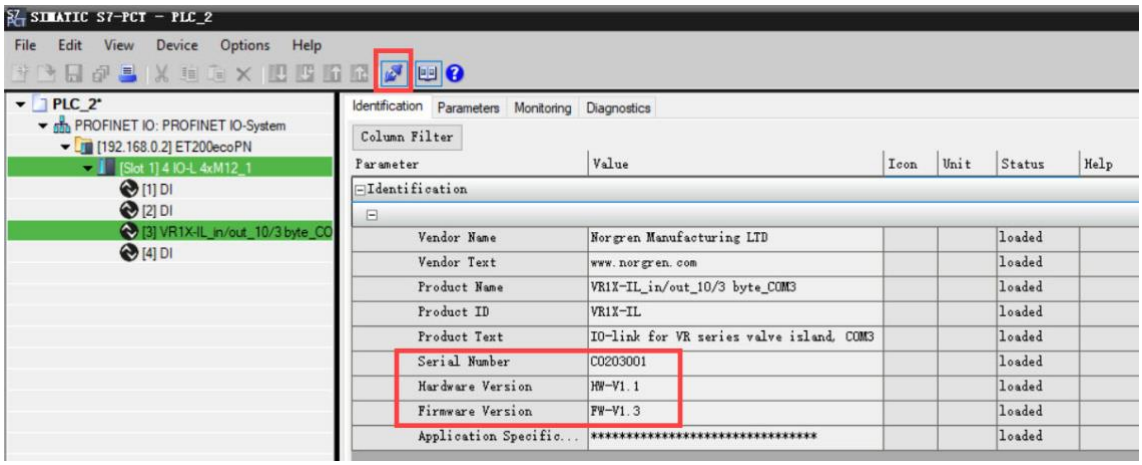




7 FIRMWARE VERSION AND SERIAL NUMBER

It is possible to read the actual installed firmware version and serial number of the device using the configuration software like S7-PCT.

- After successfully adding & going online devices, the valve manifolds firmware version and serial number will be shown in “Identification” tab.



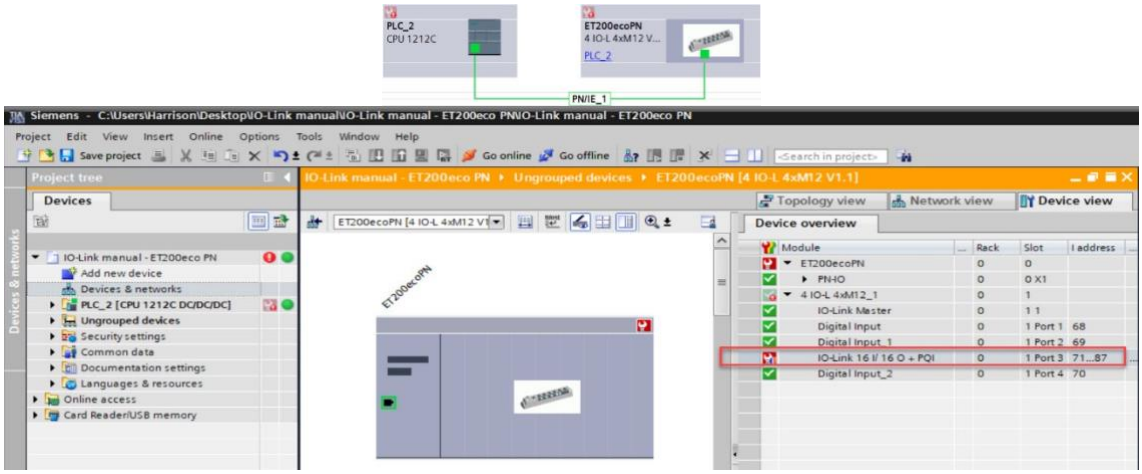
8 DIAGNOSTICS

8.1 DIAGNOSTICS INFORMATION PORTAL

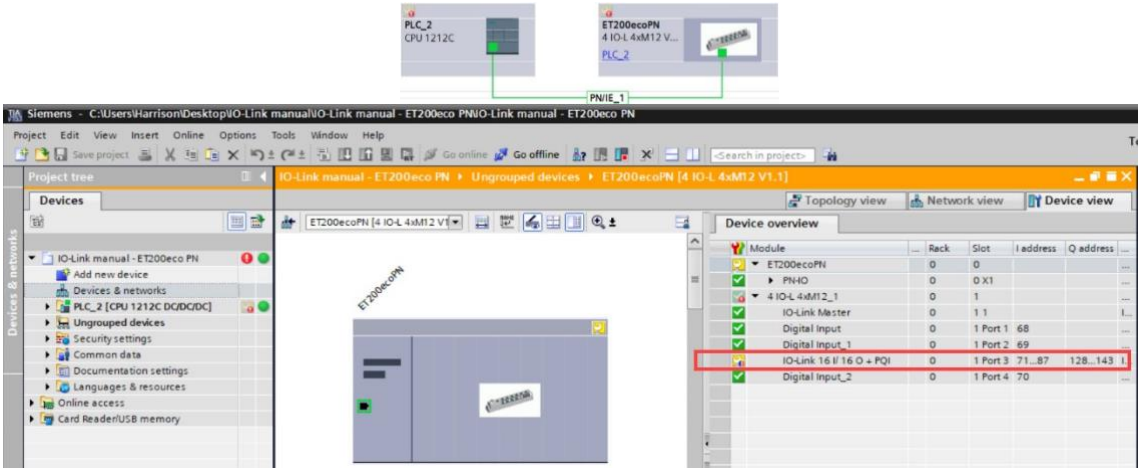
8.1.1 Go Online Portal in TIA

- Click “Go online” button to make PLC, IO-Link master and PC online.
- When error alarm symbol or warning alarm symbol appears, double click the failed IO-Link master in network view to switch to Device view.
- Double clicks alarm symbol or in front of failed port of IO-Link master to open the diagnostics window.

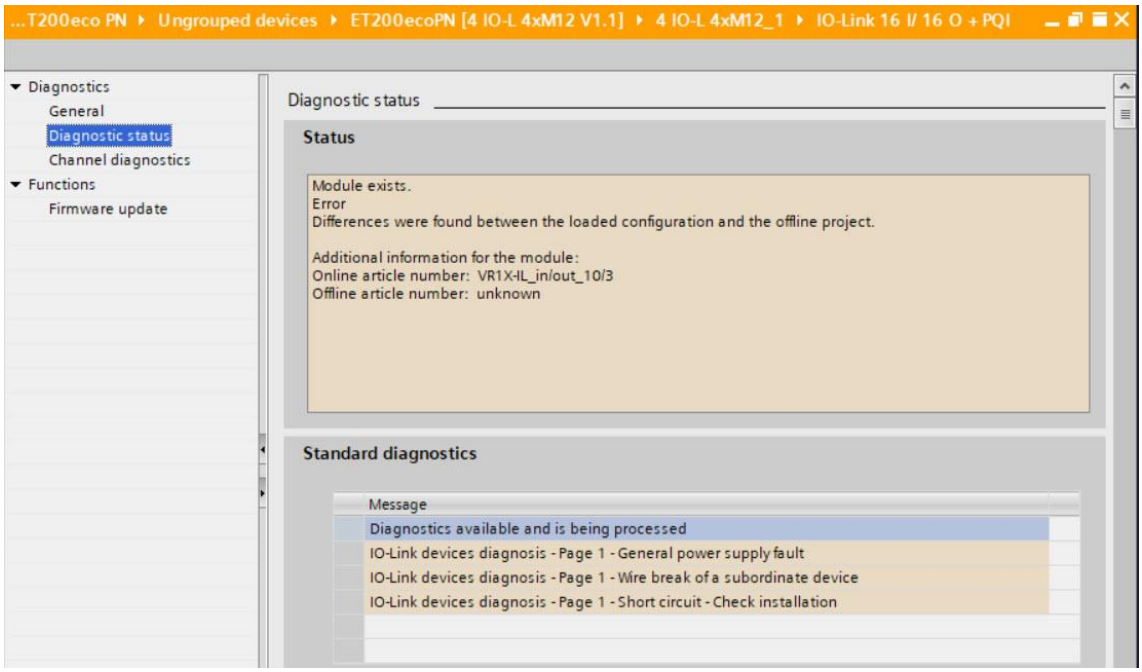
- Error alarm view:



- Warning alarm view: (Only for solenoid cycles beyond setting limit)

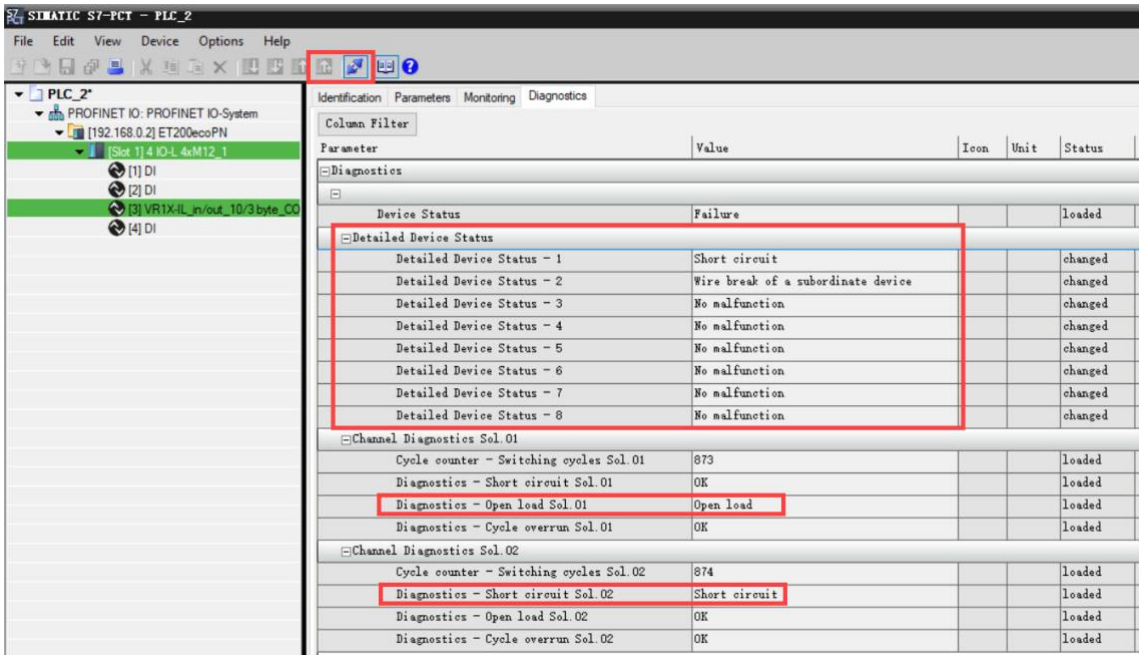


- Click “Diagnostic status” in diagnostics window to find the connected valve manifold module error details.
- As for each solenoid error details, please go to configuration software of IO-Link master to find the error details. (See section 8.1.2)



8.1.2 Configuration Software S7-PCT Portal

- Make sure valve manifolds, IO-Link master and PLC are all connected properly and power on.
- Right click ET 200eco PN master in TIA Portal to start S7-PCT.
- Click “Load to PG with Devices” button to find devices online.
- Click “Online” button in S7-PCT to make devices online.
- Click the valve island and open “Diagnostics” tab to find device status and detail error information.
- Solenoid number and valve station mapping relation is shown in Chapter 5.

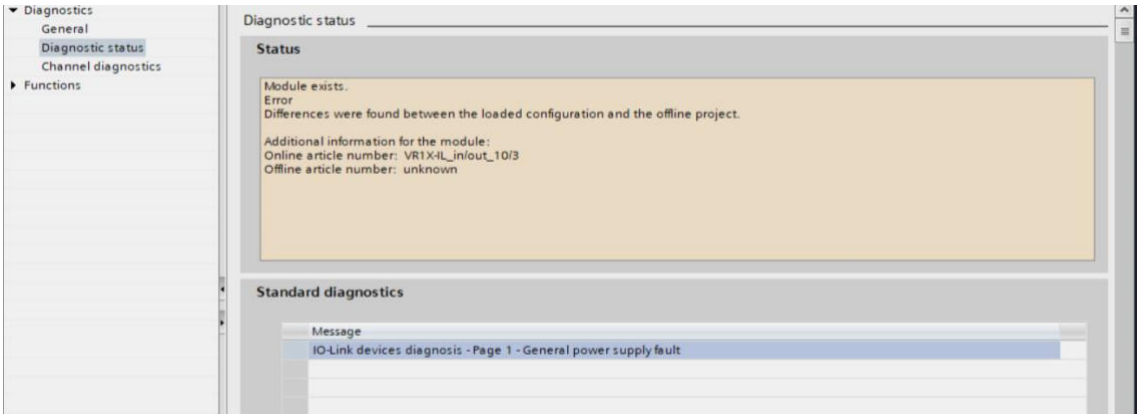


8.2 OVERALL STATUS DIAGNOSTICS

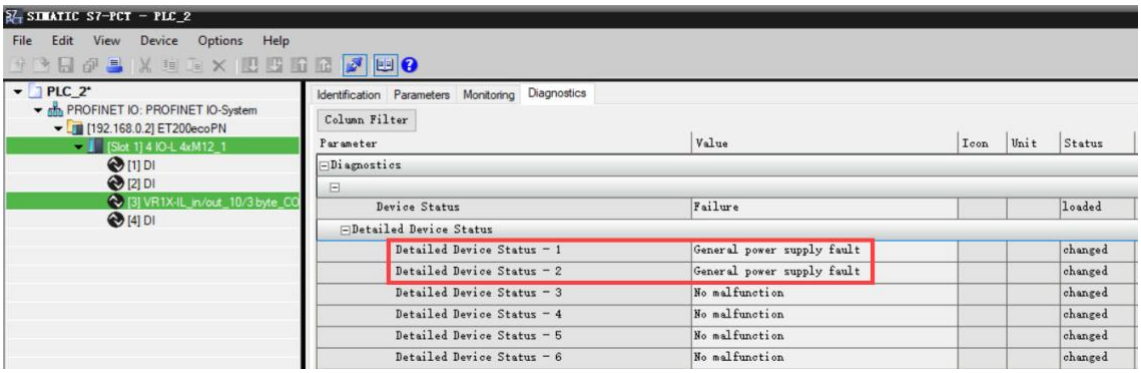
- VR10 / VR15 valve manifold module status will be shown in real-time.

- The diagnostic module status includes:
  - Over voltage diagnostics for valve power
  - Under voltage diagnostics for valve power
  - Over voltage diagnostics for electronic power
  - Under voltage diagnostics for electronic power
  - Cycle overrun diagnostics (cycles beyond the count limit)
  - Short circuit diagnostics
  - Open load diagnostics (e.g. wire break of solenoid)
- For over / under voltage fault, module diagnostic status will display like following capture and the error description “General power supply fault” will be shown both by TIA Portal & S7-PCT software:
  - The status of VA / VB LEDs on the valve manifold will clearly show Overvoltage / Undervoltage of the power supply to electronics and valves.

TIA Portal view:



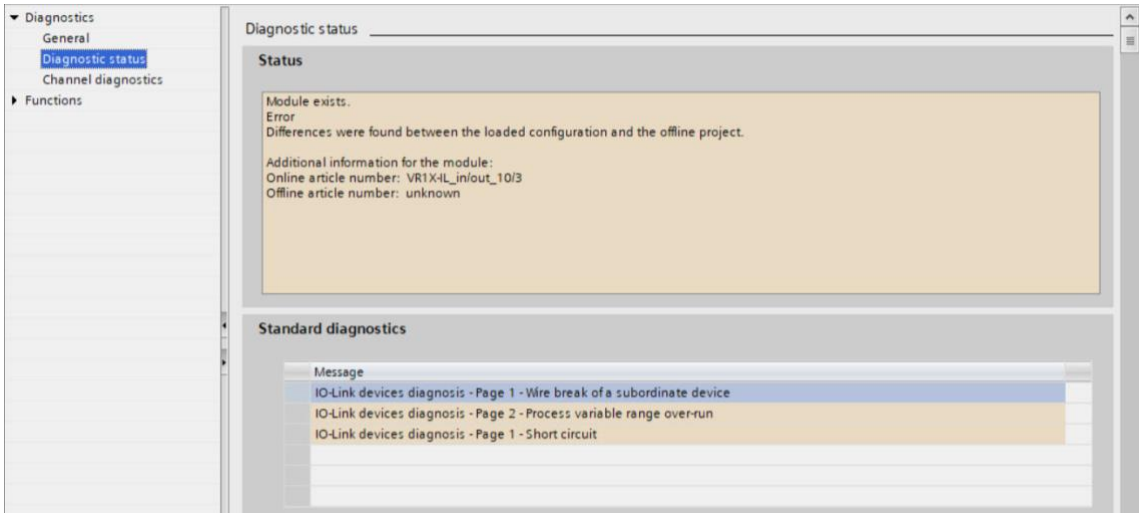
S7-PCT view:



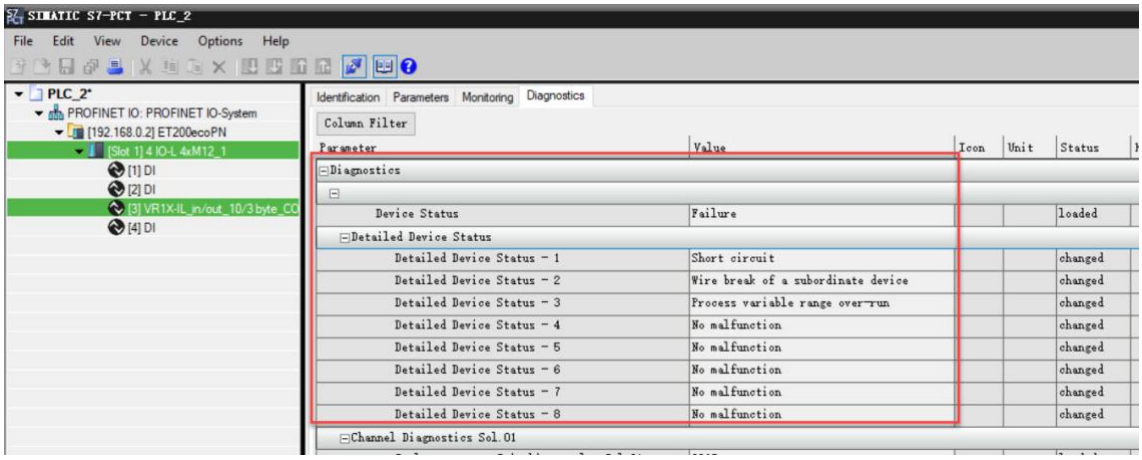
- For cycle overrun, short circuit and open load fault, module diagnostic status will follow the capture below and the error description will be shown both by TIA Portal & S7-PCT software:

- Need to go into each solenoid diagnostics in S7-PCT for detail:

TIA Portal view:



S7-PCT view:



- Fault error codes will be reported by "**Input Byte 0**".
- Fault error codes are displayed in hexadecimal.
- Common fault error codes are shown below:

Fault type	Error code	Associated LED & Remark	
Over voltage diagnostics for valve power *Abbreviation: OV-VA*	16#01	"VA" LED, red IO-Link Master "SF" LED, red	
Under voltage diagnostics for valve power *Abbreviation: UV-VA*	16#02	"VA" LED, flashing red IO-Link Master "SF" LED, red	
Over voltage diagnostics for electronic power *Abbreviation: OV-VB*	16#04	"VB" LED, red IO-Link Master "SF" LED, red	
Under voltage diagnostics for electronic power *Abbreviation: UV-VB*	16#08	"VB" LED, flashing red IO-Link Master "SF" LED, red	
Cycle overrun diagnostics *Abbreviation: COR*	16#10	IO-Link Master "SF" LED, yellow	Cycles are beyond limit Fault level: Warning
Short circuit diagnostics *Abbreviation: SC*	16#20	IO-Link Master "SF" LED, red	
Open load diagnostics *Abbreviation: OC*	16#40	IO-Link Master "SF" LED, red	Need to enable open load diagnostics

- Binary code and fault type mapping relation is shown in table below. 0 is no fault, 1 is fault found.

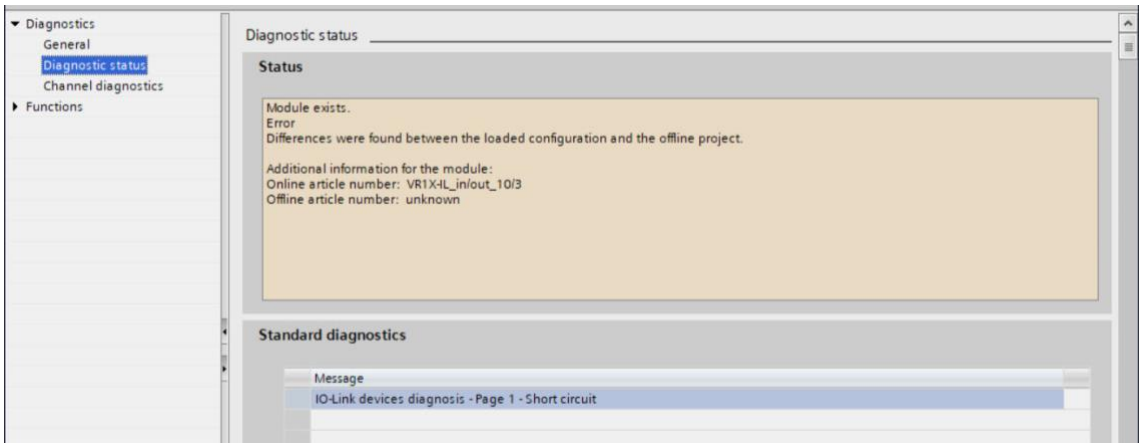
Input Byte 0								
Fault type		OC	SC	COR	UV-VB	OV-VB	UV-VA	OV-VA
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

8.3 SOLENOID STATUS DIAGNOSTICS

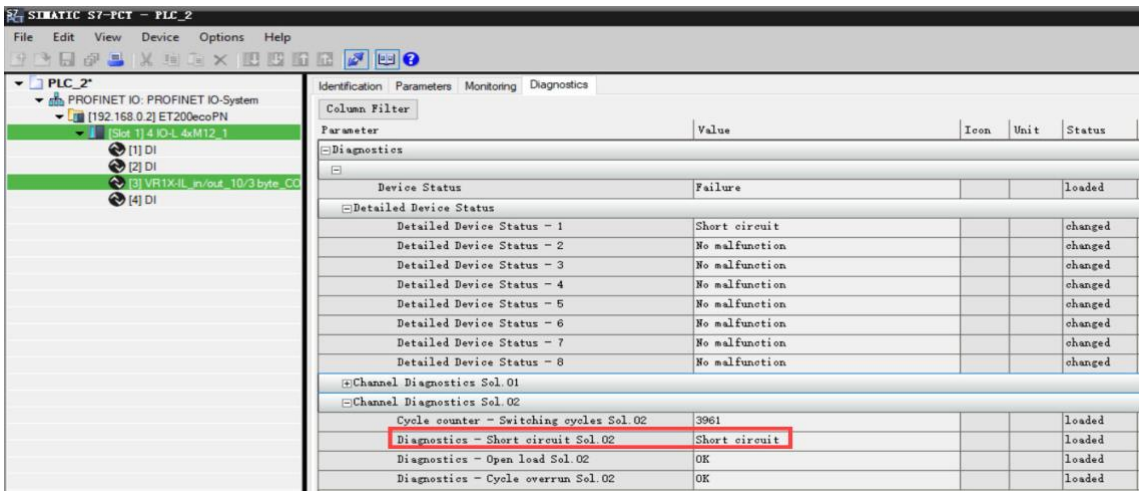
- VR10 / VR15 valve manifold channel status will be shown in real-time.
- The diagnostic channel status includes:
  - Short circuit diagnostics per solenoid
  - Open load diagnostics per solenoid (e.g. wire break of solenoid)
  - Cycle overrun diagnostics per solenoid (cycles beyond the count limit)

8.3.1 Short Circuit Diagnostics

- TIA Portal diagnostics status will alarm short circuit like following capture and the error description will be here:



- S7-PCT will alarm which solenoid short circuit like following capture and the error description will be here:



- Short circuit fault error codes will be reported by "**Input Byte 1**", "**Input Byte 2**" and "**Input Byte 3**".
- Fault error codes are displayed in hexadecimal.
- Common short circuit fault error codes are shown in table:

Byte	Solenoid	Error code
Input Byte 1	Sol.01	16#01
	Sol.02	16#02
	Sol.03	16#04
	Sol.04	16#08
	Sol.05	16#10
	Sol.06	16#20
	Sol.07	16#40
	Sol.08	16#80
Input Byte 2	Sol.09	16#01
	Sol.10	16#02
	Sol.11	16#04
	Sol.12	16#08
	Sol.13	16#10
	Sol.14	16#20
	Sol.15	16#40
	Sol.16	16#80
Input Byte 3	Sol.17	16#01
	Sol.18	16#02
	Sol.19	16#04
	Sol.20	16#08
	Sol.21	16#10
	Sol.22	16#20
	Sol.23	16#40
	Sol.24	16#80

- Binary code and solenoid number mapping relation is shown in table below. 0 is no fault, 1 is fault found.

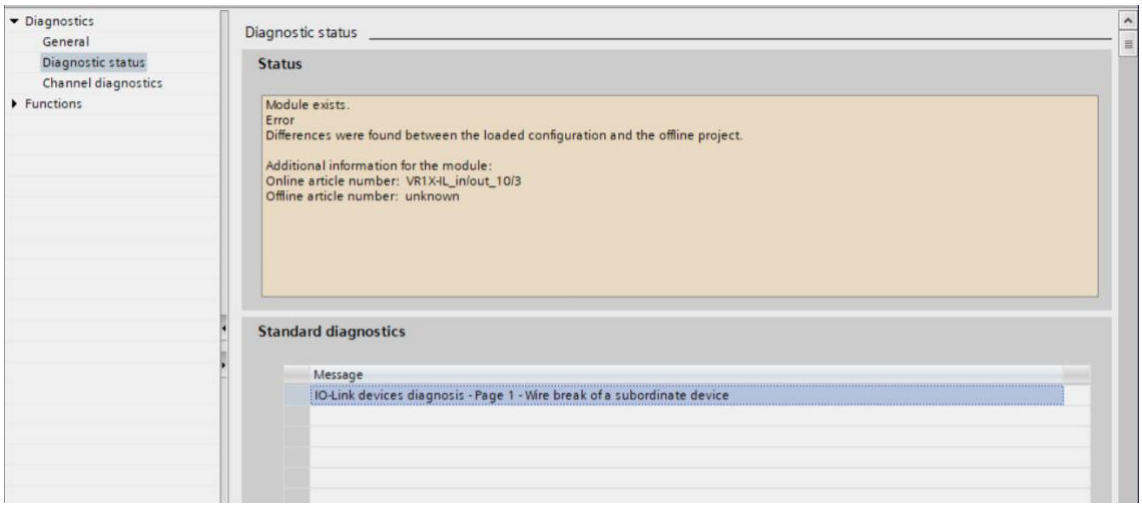
Input Byte 1								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 2								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

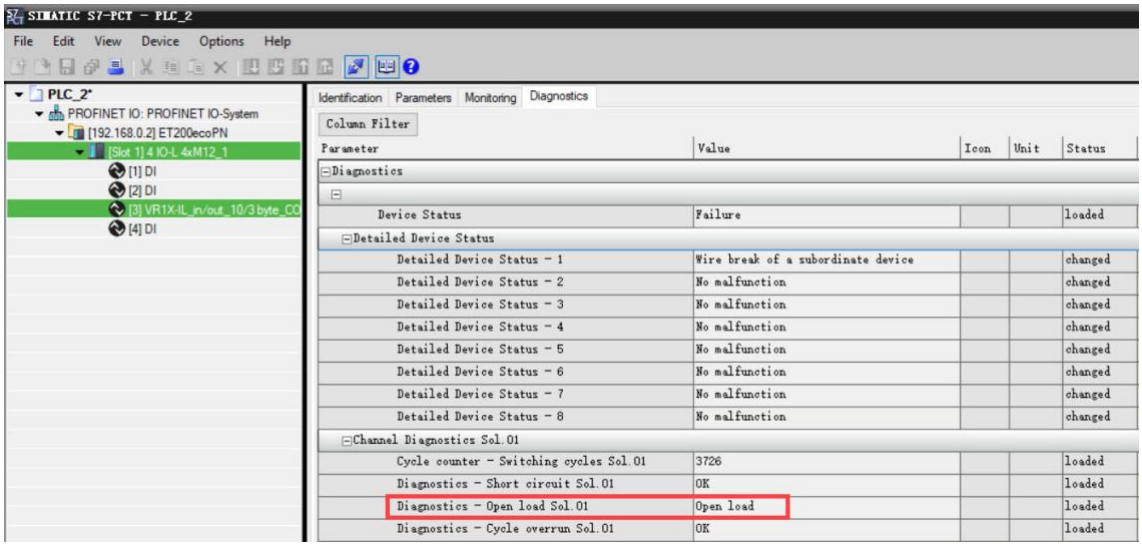
Input Byte 3								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

8.3.2 Open Load Diagnostics

- TIA Portal diagnostics status will alarm open load like following capture and the error description will be here:



- S7-PCT will alarm which solenoid open load like following capture and the error description will be here:



- Open load fault error codes will be reported by “**Input Byte 4**”, “**Input Byte 5**” and “**Input Byte 6**”.
- Fault error codes are displayed in hexadecimal.
- Need to enable open load diagnostics.
- Common open load fault error codes are shown in table:

Byte	Solenoid	Error code
Input Byte 4	Sol.01	16#01
	Sol.02	16#02
	Sol.03	16#04
	Sol.04	16#08
	Sol.05	16#10
	Sol.06	16#20
	Sol.07	16#40
	Sol.08	16#80
Input Byte 5	Sol.09	16#01
	Sol.10	16#02
	Sol.11	16#04
	Sol.12	16#08
	Sol.13	16#10
	Sol.14	16#20
	Sol.15	16#40
	Sol.16	16#80
Input Byte 6	Sol.17	16#01
	Sol.18	16#02
	Sol.19	16#04
	Sol.20	16#08
	Sol.21	16#10
	Sol.22	16#20
	Sol.23	16#40
	Sol.24	16#80

- Binary code and solenoid number mapping relation is shown in table below. 0 is no fault, 1 is fault found.

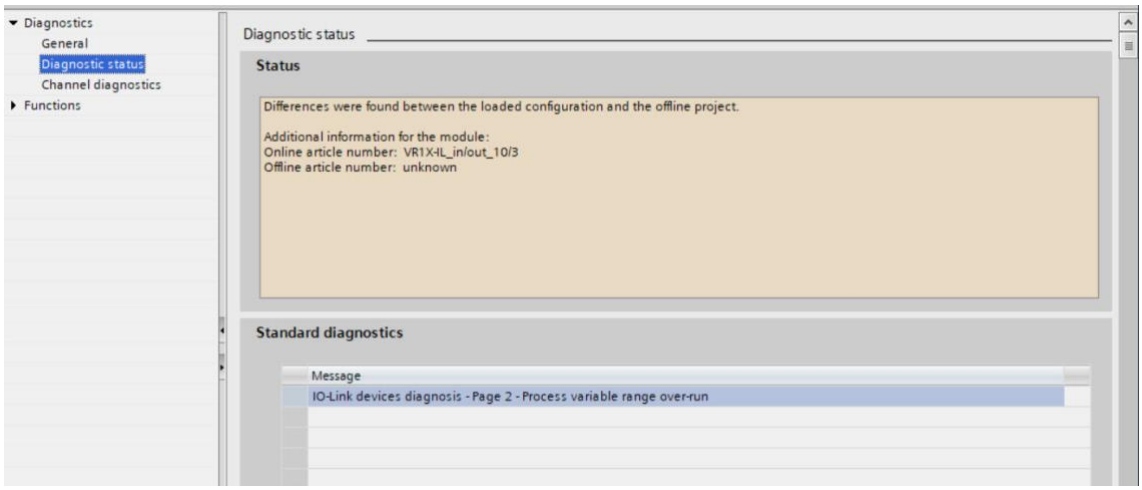
Input Byte 4								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 5								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

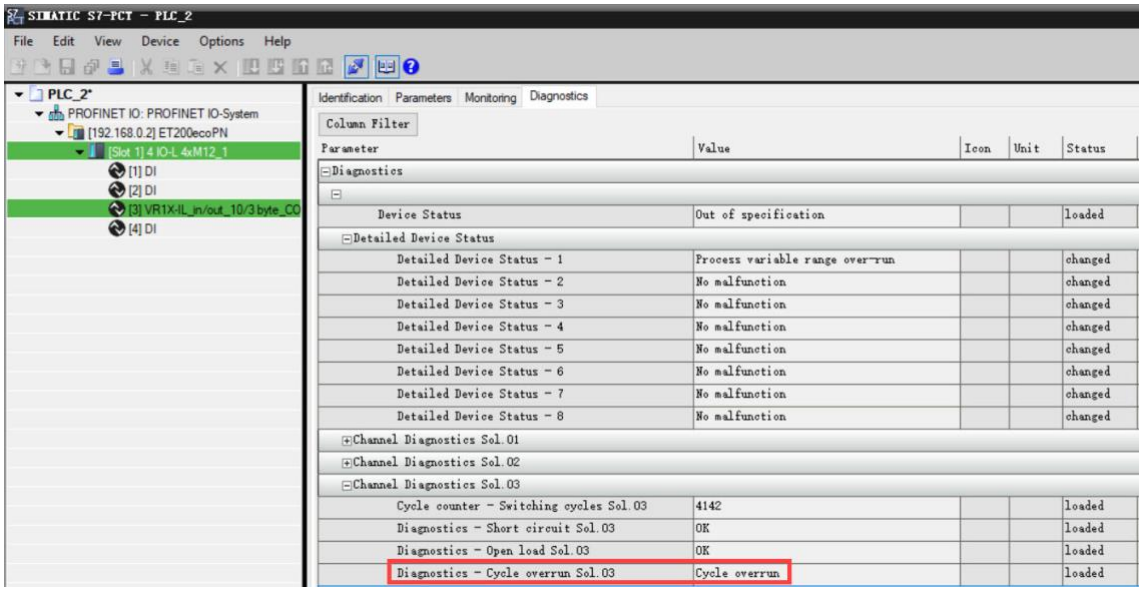
Input Byte 6								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

8.3.3 Cycle Overrun Diagnostics

- TIA Portal diagnostics status will alarm cycle overrun like following capture and the error description will be here:



- S7-PCT will alarm which solenoid cycle overrun like following capture and the error description will be here:



- Cycle overrun fault error codes will be reported by “**Input Byte 7**”, “**Input Byte 8**” and “**Input Byte 9**”.
- Fault error codes are displayed in hexadecimal.
- Need to set valid count limit so that this diagnostic function is effective.
- Common cycle overrun fault error codes are shown in table:

Byte	Solenoid	Error code
Input Byte 7	Sol.01	16#01
	Sol.02	16#02
	Sol.03	16#04
	Sol.04	16#08
	Sol.05	16#10
	Sol.06	16#20
	Sol.07	16#40
	Sol.08	16#80
Input Byte 8	Sol.09	16#01
	Sol.10	16#02
	Sol.11	16#04
	Sol.12	16#08
	Sol.13	16#10
	Sol.14	16#20
	Sol.15	16#40
	Sol.16	16#80
Input Byte 9	Sol.17	16#01
	Sol.18	16#02
	Sol.19	16#04
	Sol.20	16#08
	Sol.21	16#10
	Sol.22	16#20
	Sol.23	16#40
	Sol.24	16#80

- Binary code and solenoid number mapping relation is shown in table below. 0 is no fault, 1 is fault found.

Input Byte 7								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 8								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

Input Byte 9								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Binary code	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1	0 / 1

9 DIAGNOSTICS & OUTPUTS MAPPING OBJECT

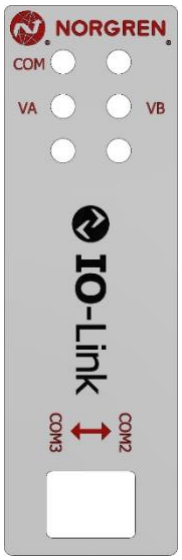
- Programming languages comply with IEC 61131-3:2013.

Overall status diagnostics	**Input Byte 0**								
	Fault type		OC	SC	COR	UV-VB	OV-VB	UV-VA	OV-VA
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Short circuit diagnostics	**Input Byte 1**								
	Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 2								
	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 3								
	Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Open load diagnostics	**Input Byte 4**								
	Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 5								
	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 6								
	Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Cycle overrun diagnostics	**Input Byte 7**								
	Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 8								
	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
	Input Byte 9								
	Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

Output Byte 0								
Solenoid	Sol.08	Sol.07	Sol.06	Sol.05	Sol.04	Sol.03	Sol.02	Sol.01
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output Byte 1								
Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Output Byte 2								
Solenoid	Sol.24	Sol.23	Sol.22	Sol.21	Sol.20	Sol.19	Sol.18	Sol.17
Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0

10 LED INDICATION AND BAUD RATE SETTING

10.1 LED INDICATION



Symbol	LED Status	Description
COM	Off	No Power
	Green on	Communication not established
	Flashing Green	Communication established
VA **(Valve Power Supply)**	Green on	Voltage OK
	Flashing red	Undervoltage
	Red	Overvoltage
VB **(Electronics Power Supply)**	Green on	Voltage OK
	Flashing red	Undervoltage
	Red	Overvoltage

10.2 BAUD RATE SETTING

- VR10/VR15 IO-Link device supports switching data rate between COM2 and COM3. Factory setting is COM3 (when DIP switch is at “ON” position).
- Remove LED window and adjust the DIP switch 2 when power off.
- Put the window back before power on.

11 IO-LINK ERROR CODES

Error code (Hexadecimal)	Error description	Associated LED
0×00	OK, no errors	None
0×5000	Hardware fault	None
0×5011	Non-volatile memory loss	None
0×7710	Solenoid, short circuit	IO-Link Master “SF” LED, red
0×7700	Solenoid, open circuit	IO-Link Master “SF” LED, red
0×5100	Undervoltage VB electronic supply	“VB” LED, flashing red IO-Link Master “SF” LED, red
0×5100	Overvoltage VB electronic supply	“VB” LED, red IO-Link Master “SF” LED, red
0×5100	Undervoltage VA valve supply	“VA” LED, flashing red IO-Link Master “SF” LED, red
0×5100	Overvoltage VA valve supply	“VA” LED, red IO-Link Master “SF” LED, red
0×8C10	Solenoid cycles beyond setting limit	IO-Link Master “SF” LED, yellow

12 TECHNICAL DATA IO-LINK INTERFACE

Specification		Remark
Interface	IO-Link Version 1.1	---
Baud rate	COM3 (230.4 kBaud) COM2 (38.4 kBaud)	---
Min. cycle time	COM3: 1 ms COM2: 5 ms	---
IO-Link port class	Class B	---
IODD Language	EN	---

13 CUSTOMER SUPPORT

Norgren operates four global centres of technical excellence and a sales and service network in 50 countries, as well as manufacturing capability in the USA, Germany, China, UK, Switzerland, Czech Republic, Mexico and Brazil.

For information on all Norgren companies visit www.norgren.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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