

VR10 / VR15 With IO-Link Interface

Operation & Service Manual









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.



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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 <u>https://www.norgren.com/us/en/technical-support/installation-maintenance-instructions/valves</u>

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

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

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 0.75mm².

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	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 \leq 12

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

Dotaliou alle	000.00				0.0							
Station	#1	#2	#3	#4	#5	#6	#7	#8	#9	#10	#11	#12
Solenoid A (14 Solenoid)	Sol.01 Output 0	Sol.03 Output 2	Sol.05 Output 4	Sol.07 Output 6	Sol.09 Output 8	Sol.11 Output 10	Sol.13 Output 12	Sol.15 Output 14	Sol.17 Output 16	Sol.19 Output 18	Sol.21 Output 20	Sol.23 Output 22
Solenoid B (12 Solenoid)	Sol.02 Output	Sol.04 Output 3	Sol.06 Output 5	Sol.08 Output 7	Sol.10 Output 9	Sol.12 Output 11	Sol.14 Output 13	Sol.16 Output 15	Sol.18 Output 17	Sol.20 Output 19	Sol.22 Output 21	Sol.24 Output 23

Detailed allocation is shown as below:

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 $12 < VALVE STATIONS \le 24$

 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.....
- \circ 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	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
(14 Solenoid)	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	Sol.02	Sol.04			Sol.08	Sol.10		Sol.13		Sol.16		Sol.19			Sol.23	
(12 Solenoid)	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" <u>https://support.industry.siemens.com/cs/attachments/29999018/et200eco_pn_operating_instructions_ons_en-US_en-US.pdf?download=true</u>

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.

ect the dir warnings f	ectory of IODD files For:	C:\Users\Harriso	on\Desktop\IO-L	ink manual\IO-LINK IOD	D\NORGREN\VR1X				Browse.
alected	IODD File Name	Vendor Name	Device ID	Device Family	Device Name	Version	Device Details	Status	
	forgren-VR1X-IL	forgren Manufact	2	Ethernet Valve I	VRIX-IL_in/out_1	2020-09-10	Show		
	forgren-VR1X-IL	Norgren Manufact	1	Ethernet Valve I	VR1X-IL_in/out_1	2020-09-10	Show		

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.

catalog		×
Search		
Text search		~
R.		thi thi
Profile V1.0 a	nd V1. 1	~
) 🛅 IO Link V	/1.0	
- 🛅 IO Link V	1.1	
🛨 🚺 Norgre	en Manufacturing LTD	
- 🚺 Etł	hernet Valve Island VR series	
0	VR1X-IL_in/out_10/3 byte_COM2	
0	VR1X-IL_in/out_10/3 byte_COM3	
SIEMEN	AG AG	
STANDA	ARD	
Device:		
Device:	VRIX-IL	
Device: Product Name:	VRIX-IL in/out 10/3 byte COM3	
Device: Product Name: Product Text:	VRIX-IL_in/out_10/3 byte_COM3	
Device: Product Name: Product Text: Firmware Rev.:	VRIX-IL_in/out_10/3 byte_COM3 IO-link for VR series valve island. COM3	
Device: Product Name: Product Text: Firmware Rev. : Hardware Rev. :	VR1X-IL_in/out_10/3 byte_COM3 IO-link for VR series valve island, COM3	
Device: Product Name: Product Text: Firmware Rev.: Hardware Rev.: Device Family:	VRIX-IL_in/out_10/3 byte_COM3 IO-link for VR series valve island. COM3 Ethernet Valve Island VR series	
Device: Product Name: Product Text: Firmware Rev.: Hardware Rev.: Device Family: Release Date:	VRIX-IL_in/out_10/3 byte_COM3 IO-link for VR series valve island, COM3 Ethernet Valve Island VR series 2020-09-10	
Device: Product Name: Product Text: Firmware Rev. : Hardware Rev. : Device Family: Release Date: IODD Filename:	VRIX-IL_in/out_10/3 byte_COM3 IO-link for VR series valve island. COM3 Ethernet Valve Island VR series 2020-09-10 Nor gr en-VRIX-IL-COM3-20200910-I0DD1.1.xml	





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.

Price Options Image: Second Sec	# D }
Image: Constraint of the second sec	
Module Slot I address Q address Type Article number Catalog •	
• ET200ecoPN 0 4 IO-4 4M12 V1.1 6E57 148-6J00-0A80 <search-< td=""> • PH+0 0 X1 ET200ecoPN Filter Frole: <ahlphall< td=""> • OLink Master 1 4 IO-4 4M12 6E57 148-6J00-0A80 <search-< td=""> Filter Frole: <ahlphall< td=""> • IO-4 ink Master 11 IO-Link Master IO-Link Master <ahlphall< a=""> Submodules</ahlphall<></ahlphall<></search-<></ahlphall<></search-<>	
PNHO 0 X1 ET200ecoPN • 4 IO-L 4xM12_1 1 4 IO-L 4xM12_6ES7 148-6J000-0AB0 Filter Frider • IO-Link Master 1 IO-Link Master IO-Link Master IO-Link Master	feit teit
IO-Link Master II IO-Link Master I	
- Submodules	
Digital Input 1 Port 1 68 Digital Input 6ES7 148-6D00-0A80	
Digital Input_1 1 Port 2 69 Digital Input 6ES7 148-6JD00-0A80 Digital Input	
IO-Link 16 I/ 16 O + PQI 1 Port 3 7187 128143 IO-Link 16 I/ 16 O + PQI Digras Output	
Digital Input_2 1 Port 4 70 Digital Input 6657 148-6J000-0A80 I IOLink 10 IS 0.0 FQI IOLink 21/32 0 - PQI IOLink 21/32 0 - PQI IOLink 21/32 0 - PQI	





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+.
 - o 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.
 - o 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.
 - o If willing to execute data storage function, Vendor ID and Device ID must be set properly.
 - \circ 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.

IO-Link manual - ET200eco PN > Ungroup	ed devices + ET200ecoPN [4 IC)-L 4xM12 V1.1]							- •	iх
					2	Topology view	📥 Network view	Dev	/ice view	
🛃 ET200ecoPN [4 10-L 4xM12 V1 💌 📰	🖌 🗄 🛄 ' 📑 🚺 Device	overview								
	2 Y M	odule	Slot	I address	Q address	Туре	Article number	F	irmware	1.
_	=	ET200ecoPN	0			4 IO-L 4xM12 V1.1	6ES7 148-6JD00-0A8	30 \	/01.01.00	
		PN-IO	0 X1			ET200ecoPN				
		4 10-L 4xM12_1	1			4 IO-L 4xM12	6E57 148-6JD00-0A	30		
E China		IO-Link Master	11			IO-Link Master				
		Digital Input	1 Port 1	68		Digital Input	6ES7 148-6JD00-0A	30		
		Digital Input_1	1 Port 2	69		Digital Input	6ES7 148-6JD00-0A	30		
		IO-Link 16 I/ 16 O + PQI	1 Port 3	7187	128143	10-Link 16 1/ 16 0 + PC	QI			
	~	Digital Input_2	1 Port 4	70		Digital Input	6ES7 148-6JD00-0A	30		
< III > 100%	·				Ш					>
IO-Link 16 // 16 O + POI ÎIO-Link 16 // 16 O	+ POI]					O Properties	i Info 👔 🖁 Dianno	ostics		-
Cananal 10 trans 1 Suntan assurtan	ate Taute						anne e congra		_	-
General 10 tags System constan	nts Texts									-
▼ General	Module parameters									
Catalog information										
Hardware interrupts	Diagnostics									
 Module parameters 		-								
Module parameters		No supply voltage 2L+								
I/O addresses		Port Diagnosis								
		HW interrupt (device not	tification)							
	Port Parameters									
1										
E		Port Configuration witho	ut S7-PCT							
		Port Qualifier Information	n (PQI)							
	Port mode:	IO-Link Manual							-	
	Vendor ID:	1353								
	Device ID:	1								
	Inspection / backup level:	Type compatible (V1.1) with	h Backup	Restore						
	inspection could prove	Color competence (+111) into								





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.

Parameters		
	Port Configuration without S7-PCT	
	Port Qualifier Information (PQI)	
Port mode:	IO-Link Manual	-
Vendor ID:	1353	
Device ID:	1	
Inspection / backup level:	Type compatible (V1.1) with Backup&Restore	

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.

Z STRATIC S7-PCT - PLC_2							
File Edit View Device Options Help					10-L		
四国×州市×田田					Por		
* PLC_2*	Ports Addresses	Status I&M Commands					
 PHOFINET IO: PHOFINET IO-system III 192, 168, 0, 21 ET200ecoPN 	General Master Info						
 [Slot 1] 4 IO-L 4xM12_1 	Product Name	ET 200eco PN: 4 IO-L: 4xM12 V1:1	Upload				
😧 [1] DI	Article Number	6ES7 148-6JD00-0AB0	Uploading 6ES7 148-6J100-0AB0	[Slot 1]			
(4) DI	Comment						
					11		
		L					
	Port Info						
	Column Filter						
	Port Autosens	e Mode Name		IO-Link Version Inspecti	ion Level Backup Level		
	1	DI		No check	k Off -		
	2	DI 😪		No chec	k Off		
	3	IO-Link		No check	k Off		
	4	DI		No chec	k Off		
	Details						
	Vendor Name						
	Vender IIRI -						
	verour onc.						
	Port Info _						
	Column Filter						
	Port Autosense	Mode Name	IO-Link Ve	rsion Inspection Level	Backup Level		
	1	DI		No check	Off		
	2	DI		No check	Off		
	3	IO-Link VR1X-IL_in/out_10/3 byte_COM3	V1.1	Type compatible	Backup&Restore ~		
	4	DI		No check	Off		
	IODD File Nam	c					
	Comment:		*				





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.

ile Edit View Device Options Help] 🖸 🎽 🛄 🕄						
PLC_2	Identification Parameters Monitoring Diagnostics Connectio	n					
PROFINET IO: PROFINET IO-System [192.168.0.2] ET200ecoPN [Islat 11.4 IO-1.4xM12_1	Column Filter						
	Parameter	Value	Icon	Un Status			
🕲 [1] DI	□Configuration Sol. 02						
🔁 [2] DI	Channel - Diagnostics open load Sol. 02	disable diagnostics	~	loaded			
	Channel - Failsafe state Sol. 02	disable diagnostics		loaded			
	Channel - Counter Limit Sol. 02	4294967295		loaded			
	⊡Configuration Sol.03						

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.

SINATIC S7-PCT - PLC_2							
ile Edit View Device Options Help 같 🕒 🕞 📮 🗶 🖮 🔍 💶 🚺	1 🗈 🎽 📖 😧						
PLC_2* PROFINET IO: PROFINET IO-System Il 192 158.0 21 ET200eco.PN	Identification Parameters Monitoring Diagnostics Connection	n					
▼ [Slot 1] 4 IO-L 4xM12_1	Parameter	Value	Icon	Un Status			
🕑 [1] DI	⊡Configuration Sol.01						
🕑 [2] DI	Channel - Diagnostics open load Sol.01	enable diagnostics		loaded			
 [3] VR1X-IL_in/out_10/3 byte_CO [4] DI 	Channel - Failsafe state Sol. 01	0ff ~		loaded			
	Channel - Counter Limit Sol. 01	Off		loaded			
	⊡Configuration Sol.02	Hold last value					





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.

A SIMATIC S7-PCT - PLC_2							
File Edit View Device Options Help Image: Comparison of the state of the stat	1 12 🗾 💷 🛛						
PIC_2* PROFINET IO: PROFINET IO-System III [192.168.0.2] ET200ecoPN IIII [192.168.0.2] ET200ecoPN IIIIII IIIIIIIIIIIIIIIIIIIIII	Identification Parameters Monitoring Diagnostics Column Filter Parameter Disgnostics	Value	Icon Unit Status				
(2) DI	B						
	Device Status	Out of specification	loaded				
	EDetailed Device Status						
	⊡Channel Diagnostics Sol.01						
	Cycle counter - Switching cycles Sol.01	418	loaded				
	Diagnostics - Short circuit Sol.01	OK	loaded				
	Diagnostics - Open load Sol.01	OK	loaded				
	Diagnostics - Cycle overrun Sol. 01	OK	loaded				
	-Channel Diagnostics Sol. 02						
	Cycle counter - Switching cycles Sol. 02	417	loaded				
	Diagnostics - Short circuit Sol. 02	OK	loaded				
	Diagnostics - Open load Sol. 02	OK	loaded				
	Diagnostics - Cycle overrun Sol. 02	OK	loaded				
	⊡Channel Diagnostics Sol.03						
	Cycle counter - Switching cycles Sol 03	418	loaded				





- Count limit set
 - Open "Parameters" tab and configure any solenoid in the parameter catalog.
 - $\circ~$ Input the maximum cycles as required for count limit function.
 - $_{\odot}$ The max. limit is 2³² in decimal and the default value is 2³² as well.
 - $\circ~$ Click "Load" button to write data to the valve manifold.
 - $\circ~$ Solenoid number and valve station mapping relation is shown in Chapter 5.

STRATIC S7-PCT - PLC_2								
File Edit View Device Options Help								
1 🖸 🔜 🗗 🛎 📜 🖉 🛄 🗹	1 🖾 🏓 📖 😯							
▼ _] PLC_2*	Identification Parameters Monitoring Diagnostics Conner	ction						
PROFINET IO: PROFINET IO:System III 192 168 0 21 ET200ecoPN	Column Filter							
[Slot 1] 4 IO-L 4xM12_1	Parameter	Value	Icon	Un Status				
🔁 [1] DI	⊡Configuration Sol.01							
🔁 [2] DI	Channel - Diagnostics open load Sol. 0	1 enable diagnostics		loaded				
[3] VR1X-IL_in/out_10/3 byte_CO	Channel - Failsafe state Sol.01	Off		loaded				
💓 [4] DI	Channel - Counter Limit Sol. 01	30000000	4	changed				
	=Configuration Sol. 02							
	Channel - Diagnostics open load Sol. 0	2 disable diagnostics		loaded				
	Channel - Failsafe state Sol. 02	Off		loaded				
	Channel - Counter Limit Sol. 02	4294967295		loaded				
	■Configuration Sol. 04							

- 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.
 - o Solenoid number and valve station mapping relation is shown in Chapter 5.

A SIMATIC S7-PCT - PLC_2			
File Edit View Device Options Help 같은 문화 문화 문화 분 분 분 같이 X 또 한 문화 문화	ì 🗈 🍠 🛄 😧	Reset Switching cycles Sol.01	
	Identification Parameters Monitoring Diagnostics Column Filter Parameter	Reset Switching cycles Sol. 01	Un :
🛞 [1] DI	Reset Switching cycles		-
🔁 [2] DI	Reset Switching cycles Sol.01	Reset Switching cycles Sol. 01	TT
[3] VR1X-IL_in/out_10/3 byte_CO	Reset Switching cycles Sol. 02	Reset Switching cycles Sol. 02	
· 14.5	Reset Switching cycles Sol.03	Reset Switching cycles Sol. 03	

- o 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.

File Edit View Device Options Help		
9 🖰 🖬 🖉 👗 🗶 🗉 🖻 🗶 🛄 🖺	1 🗈 🥖 🛄 🕄	Application Reset
PIC. 2* PROFINET IO: PROFINET IO-System [192.168.0.2] ET200ecoPN [Slot 1] 4 IO-L 4xM12_1 [Slot 1] 4 IO-L 4xM12_1	Identification Parameters Monitoring Diagnostics Connection Column Filter Parameter V Parameters	Application Reset
🔁 [2] DI	Β	
[3] VR1X-IL_in/out_10/3 byte_CO [4] DI	Device Reset	Device Reset
	Application Reset	Application Reset
	Restore Factory Setting	Restore Factory Setting
	Image: Reset Switching cycles	

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".

SILMITE ST TEL Z					
ile Edit View Device Options Help					
1 🖸 🛛 🖉 🕹 X 🗉 🕮 X 💷 🕼 🖸	🗈 🎽 💷 😧	Device Rese	t		
•] PLC_2*	Identification Parameters Monitoring Diagnostics Connection	Device Res	et		
PROFINET IO: PROFINET IO-System	Column Filter				
 Lim [192.168.0.2] ET200ecoPN Slot 11.4 IO-L 4xM12_1 	Parameter	Valu			
	-Parameters				
😢 [2] DI	E				
[3] VR1X-IL_in/out_10/3 byte_CO	Device Reset	Devi	ce Reset		
	Application Reset	Applica	ation Reset		
	Restore Factory Setting	Restore Fa	actory Setting		<u> </u>
	+Reset Switching cycles				
	■Configuration Sol. 01				
	Econfiguration Sol 02				
9/18/2020 1:27:10 PM [3] VR1X-IL_in/out_10/3 by STEATIC S7-PCT = BIC 2	te_COM3: "Device Reset" successful				
 9/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 by SIEATIC S7-PCT - PLC_2 Edit View Device Options Help 	re_COM3: "Device Reset" successful	_	_	_	_
9/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SIEATIC S7-PCT - PLC_2 e Edit View Device Options Help Image: Simple State Stat	ie_COM3: "Device Reset" successful	Restore Factory S	Setting	_	_
9/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help Image: Ima	Le_COM3: "Device Reset" successful	Restore Factory S Restore Factory S	Setting Setting	-	
9/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help Image: Imag	Le_COM3: "Device Reset" successful	Restore Factory S Restore Factory S	Setting Setting	_	
Ø/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help PLC_2* PROFINET IO: PROFINET IO-System • [132,158.0.2] ET200ecoPN [Slot 1] 4 IO-L 4xM12_1 © [1] DI [2] DI	te_COM3: "Device Reset" successful	Restore Factory S Restore Factory S	Setting Setting	-	
Ø/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help Image: Ima	e_COM3: "Device Reset" successful	Restore Factory S	Setting Setting Device Reset		
Ø /18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help PLC_2* PROFINET IO: PROFINET IO-System [12,188.0.2] ET200ecoPN [132,188.0.2] ET200ecoPN [12,188.0.2] ET200ecoPN [13,01 1] 4 IO-L 4xM12_1 [12,01 [13,01 1] 4 IO-L 4xM12_1 [12,01 [13,01 1] 4 IO-L 4xM12_1	e_COM3: "Device Reset" successful	Restore Factory S	Setting Setting Device Reset Application Reset		
Ø /18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help PLC_2* PROFINET IO: PROFINET IO-System [12, 158.0.2] ET200ecoPN [130, 134.0.2] ET200ecoPN [Slot 1] 4 IO-L 4xM12_1 [12, 158.0.2] ET200ecoPN [Slot 1] 4 IO-L 4xM12_1 [12] DI [2] DI [3] VR1X-IL_in/out_10/3 byte_C [4] DI	e_COM3: "Device Reset" successful dertification Parameters Monitoring Diagnostics Column Filter Parameters Parameters Device Reset Application Reset Restore Factory Setting	Restore Factory S	Setting Setting Device Reset Application Reset Settore Factory Sett	ing	
Ø/18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byf SILATIC S7-PCT - PLC_2 e Edit View Device Options Help PLC_2* PROFINET IO: PROFINET IO-System [192.188.0.2] ET200ecoPN [192.188.0.2] ET200ecoPN [192.188.0.2] ET200ecoPN [192.180.0.2] ET200ecoPN [192.180.0.2] ET200ecoPN [192.180.0.2] ET200ecoPN [201 [3101 J] 4 IO-L 4xM12_1 [2101 [3101 J] VR1X-IL_in/out_10/3 byte_C [32 IB	e_COM3: "Device Reset" successful	Restore Factory S	Setting Setting Device Reset Application Reset Restore Factory Sett	ing	
Ø /18/2020 1:27:10 PM [3] VR1X-IL_n/out_10/3 byt SILATIC S7-PCT - PLC_2 e Edit View Device Options Help PLC_2* PROFINET IO: PROFINET IO-System [192.168.0.2] ET200ecoPN [Stot 1] 4 IO-L 4xM12_1	e_COM3: "Device Reset" successful	Restore Factory S	Setting Setting Device Reset Application Reset Restore Factory Sett	ing (
Ø 9/18/2020 1:27:10 PM [3] VR1X-IL_in/out_10/3 byt STLATIC S7-PCT - PLC_2 le Edit View Device Options Help PLC_2 PROFINET IO: PROFINET IO:System [192.168.0.2] ET200ecoPN [192.168.0.2] ET200ecoPN [101] [101] [101] [21] 0I [3] VR1X-IL_in/out_10/3 byte_C [4] DI	e_COM3: "Device Reset" successful dentification Parameters Monitoring Diagnostics Column Filter Parameter Parameter Parameter Device Reset Application Reset Restore Factory Setting tReset Switching oycles tConfiguration Sol. 01 Decemption Sol. 01	Restore Factory S	Setting Setting Device Reset Application Reset Sestore Factory Sett	ing	

9/18/2020 1:28:15 PM [3] VR1X-IL_in/out_10/3 byte_COM3: "Restore Factory Setting" successful





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.

🔀 SIMATIC S7-PCT - PLC_2									
File Edit View Device Options Help Image: Ima	II 🛃 🖽 🚱								
✓ □ PLC_2*	Identification Parameters Monitoring	Diagnostics							
PROFINET IO: PROFINET IO-System	Column Filter								
 [Slot 1] 4 IO-L 4xM12_1 	Parameter	Value	Icon Unit	Status	Help				
💓 [1] DI	-Identification								
Q [2] DI	8								
(3) VR1X-IL_in/out_10/3 byte_C0	Vendor Name	Norgren Manufacturing LTD		loaded					
C [4] DI	Vendor Text	www.norgren.com		loaded					
	Product Name	VR1X-IL_in/out_10/3 byte_COM3		loaded					
	Product ID	VRIX-IL		loaded					
	Product Text	IO-link for VR series valve island, COM3		loaded					
	Serial Number	C0203001		loaded					
	Hardware Version	HW-V1.1		loaded					
	Firmware Version	FW-V1.3		loaded					
	Application Specific	*****		loaded					





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 a or warning alarm symbol appears, double click the failed IO-Link master in network view to switch to Device view.
- Double clicks alarm symbol P or in front of failed port of IO-Link master to open the diagnostics window.
- Error alarm view:

		PLC_2 CPU 1212C PVUE_1	TEREDA					
Siemens - C:\Users\Harrison\Deskto	pVO-Link m	anualVO-Link manual - ET200eco PNVO-Link manual - ET200eco PN						
ject Edit View Insert Online	Options To	ols Window Help	-	no la companya da companya				
Save project 👜 🔏 🖄 🖉	× -)= (~ 🗆	Cearch in projects	-10			
Project tree		O-Link manual - ET200eco PN > Ungrouped devices > ET200e	ecorn [4 IO-L 4xM12 V1.1]				
Devices				Topology view	Metw	ork view	Devic	ce view
Tak		🛃 ET200ecoPN [4 IO-L 4xM12 VI 🔹 🔛 🐨 🌆 🔛 🛄 🔍 🛓		Device overview				
			^	Module		Rack	Slot	I address
IO-Link manual - ET200eco PN	•••	<u>حم</u>		ET200ecoPN		0	0	
Add new device	and the second	- KORT	=	PN-IO		0	0 X1	
Devices & networks		2000		₩ 4 10-L 4xM12_1		0	1	
PLC_2 [CPU 1212C DC/DC/DC]	E9 🗢	e.		IO-Link Mas	ter	0	11	
Ungrouped devices				Digital Inpu	rt.	0	1 Port 1	68
Security settings				Digital Inpu	1_1	0	1 Port 2	69
Common data				10-Link 161	160+PQI	0	1 Port 3	7187
 Documentation settings 				Digital Inpu	t_2	0	1 Port 4	70
Languages & resources		1000						
Online access								
Card Reader/USB memory								

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

PLC_2

mens . C-\Users\Harrison\Desktor	NO-Link ma	oualVO-Link manual - FT200	PN/IE_1					_	_	_
t Edit View Insert Online (Options Too	ls Window Help								-
🖁 🗔 Save project 🔠 🐰 💷 🛅	X Dt C	** 5 10 10 2 4 /	Ga online 🚀 Go offline 🛔 🖪	×=	Search	in project>				
oject tree	0 4 10	0-Link manual - ET200eco I	N > Ungrouped devices > ET2	00ecoPN [4 IO-L	4xMI	2 V1.1]				
Devices						Topology view	A Netwo	ork view	De De	vice viev
	11 2 d	ET200ecoPN [4 IO-L 4xM12	vi 🗉 🖾 🔏 🖽 🛄 🔍 ±	-	Devi	ce overview				
			A CONTRACT OF A	~	-	Module	Reck	Slot	Laddress	O addre
IO-Link manual - ET200eco PN	0 0					 ET200ecoPN 	0	0		1.4
Add new device		OF		=	2	PN-IO	0	0 X1		
n Devices & networks		. 20 ⁰⁶⁻			-	▼ 4 IO-L 4xM12_1	0	1		
PLC_2 [CPU 1212C DC/DC/DC]		0			~	IO-Link Master	0	11		
La Ungrouped devices					~	Digital Input	0	1 Port 1	68	
 Security settings 					~	Digital Input_1	0	1 Port 2	69	
Common data					100	IO-Link 16 I/ 16 O + PQI	0	1 Port 3	7187	1281
Documentation settings					1	Digital Input_2	0	1 Port 4	70	
Languages & resources										
Online access			C. Berne							

etzooecoPN





- 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)

 Diagnostics General 	Diagnostic status	-
Diagnostic status Channel diagnostics	Status	
 Channel diagnostics Functions Firmware update 	Module exists. Error Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VRIX-IL_in/out_10/3 Offline article number: unknown	
	Standard diagnostics	
	• Message	
	Diagnostics available and is being processed	
	IO-Link devices diagnosis - Page 1 - General power supply fault	
	IO-Link devices diagnosis - Page 1 - Wire break of a subordinate device	





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.

SIEATIC S7-PCT - PLC_2							
File Edit View Device Options Help							
PIC_2 PROFINET IO PROFINET IO Surtem	Identification Parameters Monitoring Diagnostics						
 Internet to Phototeco System Internet to System 	Column Filter						
[Slot 1] 4 IO-L 4xM12_1	Parameter	Value	Icon	Unit	Status		
🔁 [1] DI	Diagnostics						
🔁 [2] DI	Ξ						
[3] VR1X-IL_in/out_10/3 byte_CO	Device Status	Failure		1	loaded		
😋 [4] DI	Detailed Device Status						
	Detailed Device Status - 1	Short circuit			changed		
	Detailed Device Status - 2	Wire break of a subordinate device			changed		
	Detailed Device Status - 3	No malfunction		[]	changed		
	Detailed Device Status - 4	No malfunction			changed		
	Detailed Device Status - 5	No malfunction			changed		
	Detailed Device Status - 6	No malfunction			changed		
	Detailed Device Status - 7	No malfunction			changed		
	Detailed Device Status - 8	No malfunction		1	changed		
	Channel Diagnostics Sol.01						
	Cycle counter - Switching cycles Sol.01	873			loaded		
	Diagnostics - Short circuit Sol.01	OK			loaded		
	Diagnostics - Open load Sol. 01	Open load			loaded		
	Diagnostics - Cycle overrun Sol.01	OK			loaded		
	-Channel Diagnostics Sol. 02						
	Cycle counter - Switching cycles Sol. 02	874			loaded		
	Diagnostics - Short circuit Sol. 02	Short circuit			loaded		
	Diagnostics - Open load Sol. 02	OK			loaded		
	Diagnostics - Cycle overrun Sol.02	OK			loaded		





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
 - o 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:

 Diagnostics General 	Diagnostic status	-
Diagnostic status Channel diagnostics	Status	
Functions	Module exists. Error Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VRTXHL_infout_10/3 Offline article number: unknown	
	Standard diagnostics	
	• Message	
	IO-Link devices diagnosis - Page 1 - General power supply fault	

S7-PCT view:

🔀 SIMATIC S7-PCT - PLC_2					
File Edit View Device Options Help					
PROFINET IO: PROFINET IO-System PROFINET IO: PROFINET IO-System Profile 1192 168.0 21 ET200ecoPN	Identification Parameters Monitoring Diagnostics Column Filter				
[Slot 1] 4 IO-L 4xM12_1	Parameter	Value	Icon Unit Status		
 € [1] Di € [2] Di € [3] VB1X-II, pr/ord, 10/3 inder CO 	⊡Diagnostics ⊡	stics			
[4] DI	Device Status Detailed Device Status	Fallure			
	Detailed Device Status - 1	General power supply fault	changed		
	Detailed Device Status - 2	General power supply fault	changed		
	Detailed Device Status - 3	No malfunction	changed		
	Detailed Device Status - 4	No malfunction	changed		
	Detailed Device Status - 5	No malfunction	changed		
	Detailed Device Status - 6	No malfunction	changed		

• 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:

Diagnostics General	Diagnostic status
Diagnostic status Channel diagnostics	Status
Functions	Module exists. Error Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VR1X4L_in/out_10/3 Offline article number: unknown
	Standard diagnostics
	• Message
	IO-Link devices diagnosis - Page 1 - Wire break of a subordinate device
	IO-Link devices diagnosis - Page 2 - Process variable range over-run
	IO-Link devices diagnosis - Page 1 - Short circuit

S7-PCT view:

SILATIC S7-PCT - PLC_2					
File Edit View Device Options Help	I II 🖉 🖽 🛛				
PLC_2* BPOFINET IO: PROFINET IO-System Ging [192-168.0.2] ET200ecoPN	Identification Parameters Monitoring Diagnostics Column Filter	w.1	1	11.1.	Ch. tur
[Slot 1] 4 IO-L 4xM12_1	farsheter	Value	lcon	Unit	Status
	- Diagnostics		_		
SILVELX-II in/out 10/3 byte CI		n 17		_	2 1 1
(A1 D)	Device Status	Failure			Loaded
•	Detailed Device Status				
	Detailed Device Status - 1	Short circuit			changed
	Detailed Device Status - 2	Wire break of a subordinate device			changed
	Detailed Device Status - 3	Process variable range over-run			changed
	Detailed Device Status - 4	No malfunction		-	changed
	Detailed Device Status - 5	No malfunction			changed
	Detailed Device Status - 6	No malfunction			changed
	Detailed Device Status - 7	No malfunction			changed
	Detailed Device Status - 8	No malfunction			changed
	⊡Channel Diagnostics Sol.01	l.	-	_	





- 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	e IO-Link		
Under voltage diagnostics for valve power Abbreviation: UV-VA	16#02	"VA" LED, flashing red IO-Link Master "SF" LED, red	e IO-Link		
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 <i>Abbreviation: UV-VB</i>	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:

Diagnostic status	
Status	
Module exists. Error Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VR1X4L_in/out_10/3 Offline article number: unknown	
Standard diagnostics	
Message 10-Link devices diagnosis - Page 1 - Short circuit	
	Diagnostic status Status Module exists. Error Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VR1X4L_infout_10/3 Offline article number: unknown Standard diagnostics Message IOLink devices diagnosis - Page 1 - Short circuit

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

₹ SIMATIC S7-PCT - PLC_2								
File Edit View Device Options Help	1 12 🖉 🖽 🕄							
PLC_2* PROFINET IO: PROFINET IO-System U192-168.0.2] ET200ecoPN	Identification Parameters Monitoring Diagnostics Column Filter Parameter	Value	Icon	Unit	Status			
	Diamostics	1		1	1			
(2) DI	-							
[3] VR1X-IL_in/out_10/3 byte_CC	Device Status	Failure		1	loaded			
🕑 [4] DI	-Detailed Device Status							
	Detailed Device Status - 1	Short circuit		1	changed			
	Detailed Device Status - 2	No malfunction			changed			
	Detailed Device Status - 3	No malfunction			changed			
	Detailed Device Status - 4	No malfunction			changed			
	Detailed Device Status - 5	No malfunction			changed			
	Detailed Device Status - 6	No malfunction			changed			
	Detailed Device Status - 7	No malfunction			changed			
	Detailed Device Status - 8	No malfunction			changed			
	⊕Channel Diagnostics Sol.01							
	-Channel Diagnostics Sol. 02							
	Cycle counter - Switching cycles Sol.02	3961			loaded			
	Diagnostics - Short circuit Sol. 02	Short circuit			loaded			
	Diagnostics - Open load Sol. 02	OK			loaded			
	Diagnostics - Cycle overrun Sol. 02	OK			loaded			





- 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
	Sol.01	16#01
	Sol.02	16#02
	Sol.03	16#04
Input Byte 1	Sol.04	16#08
	Sol.05	16#10
	Sol.06	16#20
	Sol.07	16#40
	Sol.08	16#80
	Sol.09	16#01
	Sol.10	16#02
	Sol.11	16#04
Input Byte 2	Sol.12	16#08
	Sol.13	16#10
	Sol.14	16#20
	Sol.15	16#40
	Sol.16	16#80
	Sol.17	16#01
	Sol.18	16#02
	Sol.19	16#04
Input Byte 3	Sol.20	16#08
input Dyte e	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:

General	Diagnostic status
Diagnostic status	Status
Channel diagnostics	
Functions	Module exists. Error Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VR1X4L_in/out_10/3 Offline article number: unknown
	Standard diagnostics
	Message
	IO-Link devices diagnosis - Page 1 - Wire break of a subordinate device

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

A SIMATIC S7-PCT - PLC_2				
File Edit View Device Options Help	1 R 🖉 🖽 9			
 PLC_2* PROFINET IO: PROFINET IO-System [192.168.0.2] ET200ecoPN [Slot 1] 4 IO-L 4xM12_1 	Identification Parameters Monitoring Diagnostics Column Filter Parameter	Value	Icon Uni	: Status
🕑 [1] DI	Diagnostics			
[2] DI	8	1		1
ALDI	Device Status	Failure		loaded
	Detailed Device Status			
	Detailed Device Status - 1	Wire break of a subordinate device		changed
	Detailed Device Status - 2	No malfunction		changed
	Detailed Device Status - 3	No malfunction		changed
	Detailed Device Status - 4	No malfunction		changed
	Detailed Device Status - 5	No malfunction		changed
	Detailed Device Status - 6	No malfunction		changed
	Detailed Device Status - 7	No malfunction		changed
	Detailed Device Status - 8	No malfunction		changed
	Channel Diagnostics Sol.01			
	Cycle counter - Switching cycles Sol.01	3726		loaded
	Diagnostics - Short circuit Sol.01	OK		loaded
	Diagnostics - Open load Sol. 01	Open load		loaded
	Diagnostics - Cycle overrun Sol.01	OK		loaded





- 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
	Sol.01	16#01
	Sol.02	16#02
	Sol.03	16#04
Input Byte 4	Sol.04	16#08
	Sol.05	16#10
	Sol.06	16#20
	Sol.07	16#40
	Sol.08	16#80
	Sol.09	16#01
	Sol.10	16#02
	Sol.11	16#04
Input Byte 5	Sol.12	16#08
	Sol.13	16#10
	Sol.14	16#20
	Sol.15	16#40
	Sol.16	16#80
	Sol.17	16#01
	Sol.18	16#02
	Sol.19	16#04
Input Byte 6	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	ł			
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:

	Diagnostic status
General	
Diagnostic status	Status
Channel diagnostics	
Functions	Differences were found between the loaded configuration and the offline project. Additional information for the module: Online article number: VRIX4L_in/out_10/3 Offline article number: unknown
	Standard diagnostics
	Message
	IO-Link devices diagnosis - Page 2 - Process variable range over-run

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

🚰 SIMATIC S7-PCT - PLC_2				
File Edit View Device Options Help				
9 9 9 8 8 X 8 8 X 8 9 9 9	li 🛙 🖉 💷 🕄			
▼] PLC_2*	Identification Parameters Monitoring Diagnostics			
PROFINET IO: PROFINET IO-System	Column Filter			
 [192.168.0.2] ET200ecoPN 	Provention	Y-1	T	Sector
Slot 1] 4 IO-L 4xM12_1	i ar ameter	Aarde	1 con onit	Status
	EDIagnostics			
I 31 VR1X-IL in/out 10/3 byte C	D Purior Status	loss formal films have		1
(4) DI	Device Status	Out of specification		Loaded
	-Detailed Device Status	In 113		1
	Detailed Device Status - 1	Process variable range over-run		changed
	Detailed Device Status - 2	No malfunction		changed
	Detailed Device Status - 3	No malfunction		changed
	Detailed Device Status - 4	No malfunction		changed
	Detailed Device Status - 5	No malfunction		changed
	Detailed Device Status - 6	No malfunction		changed
	Detailed Device Status - 7	No malfunction		changed
	Detailed Device Status - 8	No malfunction		changed
	Channel Diagnostics Sol. 01			
	+Channel Diagnostics Sol. 02			
	Channel Diagnostics Sol. 03			
	Cycle counter - Switching cycles Sol.03	4142		loaded
	Diagnostics - Short circuit Sol.03	OK		loaded
	Diagnostics - Open load Sol. 03	OK		loaded
	Diagnostics - Cycle overrun Sol.03	Cycle overrun		loaded





- 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
	Sol.01	16#01
	Sol.02	16#02
	Sol.03	16#04
Input Byte 7	Sol.04	16#08
	Sol.05	16#10
	Sol.06	16#20
	Sol.07	16#40
	Sol.08	16#80
	Sol.09	16#01
	Sol.10	16#02
	Sol.11	16#04
Input Byte 8	Sol.12	16#08
	Sol.13	16#10
	Sol.14	16#20
	Sol.15	16#40
	Sol.16	16#80
	Sol.17	16#01
	Sol.18	16#02
	Sol.19	16#04
Input Byte 9	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				Inpu	it Byte 0					
status	Fault type		OC	SC	COR	UV-VB	OV-VB	UV-VA	OV-VA	
diagnostics	Bit	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0	
	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	
Short	Input Byte 2									
circuit	Solenoid	Sol.16	Sol.15	Sol.14	Sol.13	Sol.12	Sol.11	Sol.10	Sol.09	
ulagnostics	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	
	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	
Open load	Input Byte 5									
diagnostics	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	
	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	
Cycle	Input Byte 8									
overrun	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



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		
0x8C10	Solenoid cycles beyond setting limit	IO-Link Master "SF" LED, yellow		



12 TECHNICAL DATA IO-LINK INTERFACE

Spe	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	



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