CONTINENTAL HYDRAULICS
a member of DAIKIN group

DUPLOMATIC
MOTION SOLUTIONS

Proportional Valve with On Board Electronics and Digital Interface

Start-up manual

Index

GENERAL INFO

This document is valid for proportional valves with on board electronics.

This manual contains information about programming parameters with LinBus connection.

Depending on the valve configuration, different programming tools should be used:

- VEA-PB7-D for standard electronics valves
- VEA-PBL-A for compact electronics valves
- VEA-PB12-A for electronics with fieldbus communication valves

Appendixes contain information about IO-Link interface and fieldbus communication valves.

Should you have any questions concerning valves, please contact Duplomatic MS S.p.A., indicating the description, the code and the serial number written in the label on case side.

Please refer to VEA-PB*ID manual and EBC Config manual.

For installation, start-up, commissioning and maintenance use only skilled workers and materials fit for purpose, as recommended.

Before installation read this file and follow strictly what is indicated.

Continental Hydraulics and Duplomatic MS disclaims any liability for damage to person or property resulting from noncompliance of rules and instructions here declared, from misuse or incorrect use or from tampering of provided valves.

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Led description

Boards with IO Link interface are equipped with two led **L1** and **L2**:

L1

- **Green blinking:** communication established with master device
- **Red blinking:** communication link broken

L2

- **Green solid:** valve running
- **Green blinking:** valve stopped by the user
- **Red blinking:** valve stopped because of an error, resuming allowed
- **Red solid:** valve stopped, critical error (board reset needed)

EBC configurator software

This is the software for OBE valves configuration.

EBC software is a graphical interface for digital communication, diagnostic task and parameterization.

It offers advanced diagnostic programs and an oscilloscope with measure functions and allows to save and import parameters sets. This is useful for fast card replacement and for the reduction of start-up time of the system.

The software is available under request at the contacts area of the web site:

https://www.duplomaticmotionsolutions.com/en/linpc-usb.html

https://continentalhydraulics.com/product_items/motion-control-2/#1588883269888-c6b1a734-05a4e03b-013d

System Requirements & Settings

The EBC software can be installed on every machine equipped with Microsoft OS: Windows 7, 8 and 10, a free USB port to connect the communication cable (standard cable type USB A – micro–USB B).

Launch the setup file and follow the guided procedure to install the program and USB drivers. Complete driver setup and restart the machine if requested before connecting the module to the PC.

At the end of installation, a security alert could appear, asking to define permissions for firewall, depending on your OS and notebook configuration.

See software literature (inside software pack) for EBC configuration software.

We strongly recommend checking for last software version on our website.
New features may not be visible if you use older software versions.

PARAMETERS

At software launch, the parameters are displayed in read only mode.

Parameter configuration is structured with different access levels.
To access “UserW” parameter config in the EBC software you need to log in with the following case-sensitive credentials:

Login: **USR** Pwd: **Dol732**

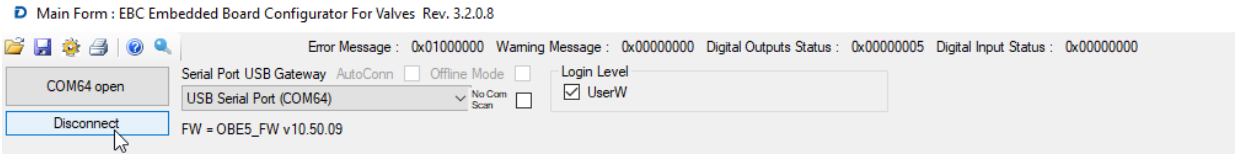


Figure 1 -Password ICON

All displayed but **not changeable** parameters will be marked as **RO (Read Only)**

Summary

Parameter	Default value	Range	User level
SIGNAL_TYPE	According with ordered code	0…10V | 4…20mA (1 solenoid valve) +/-10V | 4…12…20mA (1 solenoid valve or DX valves)	User
SIGNAL_OFFSET	0.00	-3.000…+3.000 V -4.000…+4.000mA Unit according with signal type	User
SIGNAL_GAIN	1.000	0.400…10.000	User
RAMP_UP **RAMP_DOWN**	0 0	0 – 20000 ms	User
RAMP_UP_A **RAMP_DOWN_A** **RAMP_UP_B** **RAMP_DOWN_B**	0 0 0 0	0 – 20000 ms	User
ADJ_MIN **ADJ_MAX** **ADJ_TRIGGER**	According with version 100% 1.5%	0 – 50% ADJ_MIN – 120% 0 – 20%	User
ADJ_MIN_A **ADJ_MAX_A** **ADJ_TRIGGER**	According with version 100% 1.5%	0 – 50% ADJ_MIN_A – 120% 0 – 20%	User

ADJ_MIN_B **ADJ_MAX_B**	According with version 100%	ADJ_MIN_B – 120% 0 – 50%	

ADJ_MIN, ADJ_MAX parameters can be displayed in both absolute (mA) and percentage unit. This option can be set by the proper check box in the configuration software.

ADJ_TRIGGER can be displayed in absolute unit only (mA).

Configuration

SIGNAL_OFFSET

Command	Parameters	Unit	User Level/Group	Default
SIGNAL_OFFSET	-3.000/+3.000 -4.000/4.000	V mA	User	0.00
SIGNAL1_OFFSET **SIGNAL2_OFFSET**	-3.000/+3.000 -4.000/4.000	V mA	User	1.000

SIGNAL_GAIN

Command	Parameters	Unit	User Level/Group	Default
SIGNAL_GAIN	0.400-10.00	-	User	0.00

SIGNAL_TYPE

Command	Parameters	Unit	User Level/Group	Default
SIGNAL_TYPE	E0: 0…10 (1 solenoid valves) E1: 4…20 (2 solenoids valves) E0: ±10 (1 solenoid valves or DX) E1: 4…12…20 (2 solenoids valves or DX) USR: ±10 (2 solenoids valves or DX) USR: ±20 (2 solenoids valves or DX)	V mA V mA V mA	User	According with ordered code

Signal scaling example:

With valve the available signal type is -10…0…+10V.

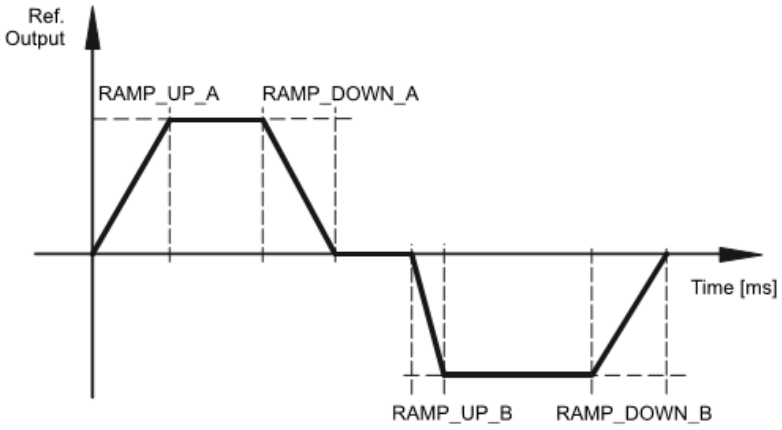
Ifapplicationsignalis0…2.5…5Vthismeans:

- 0% signal for the valve must be moved from 2.5V (application 0%) to 0 V - > SIGNAL_OFFSET = Standard Offset – Application Offset = 0 - 2.5 = - 2.5 V
- Signal input must be scaled from 2.5V to Standard Full Scale of 10V - > SIGNAL_GAIN = Standard F.S. / Application F.S. = 10 / 2.5 = 4.0

RAMPS

Command	Parameters	Unit	User Level/Group	Default
RAMP_UP **RAMP_DOWN**	0-20000	ms	User	0
RAMP_UP_A **RAMP_DOWN_A** **RAMP_UP_B** **RAMP_DOWN_B**	0-20000	ms	User	0

Entered ramp time is related to 100% of signal variation.



Output signals

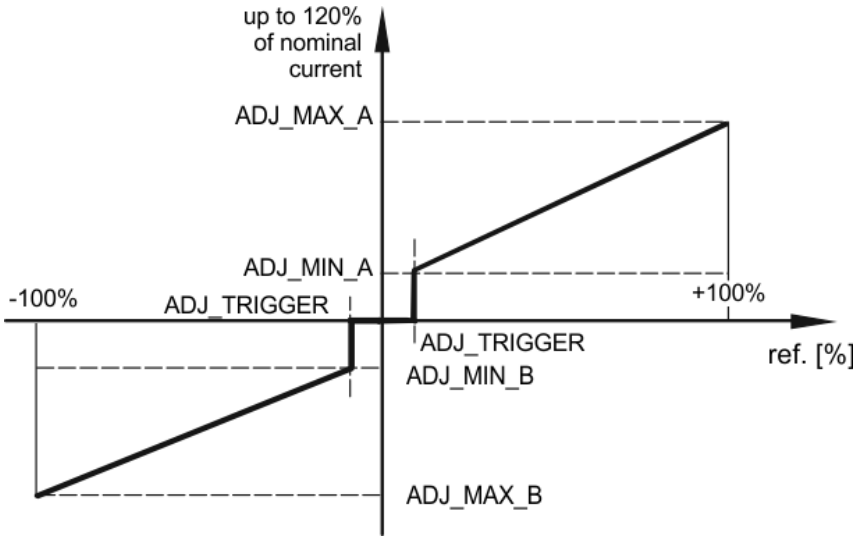
CURVE ADJUSTMENT

Command	Parameters	Unit	User Level/Group	Default
ADJ_MIN **ADJ_MAX** **ADJ_TRIGGER**	0-50 ADJ_MIN – 120 0-20	%	User	0 100 1.5
ADJ_MIN_A **ADJ_MAX_A** **ADJ_TRIGGER** **ADJ_MIN_B** **ADJ_MAX_B**	0-50 ADJ_MIN_A – 120 0-20 0-50 ADJ_MIN_B – 120	%	User	0 100 1.5 0 100

With these commands, the **output signal is adjusted to the valve characteristics.**

The unit is percentage of nominal current (defined by CURRENT parameter).

The output signal (the maximum valve current) will be defined with the 'MAX' value. The overlap (dead band of the valve) will be compensated with the 'MIN' value. Via the TRIGGER the activation point of the MIN function is set and so a non-sensitive range around the zero-point can be specified.



PROCESS DATA (monitoring)

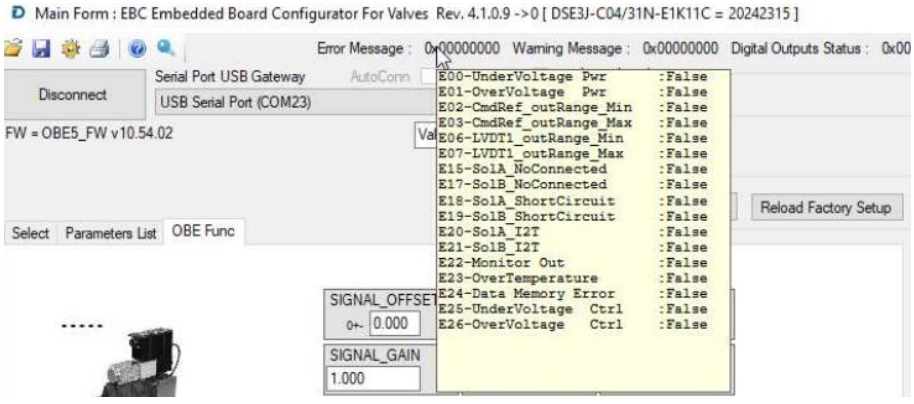
The process data are the variables which can be continuously observed on the monitor or on the oscilloscope.

Command	Description	Unit
SIGNAL	Command value after input scaling	mA - V %
CURRENT **CURRENT_A** **CURRENT_B**	Output current of solenoid Output current of solenoid A (CH1) Output current of solenoid B (CH2)	mA
CURRENT_ERR **CURRENT_ERR_A** **CURRENT_ERR_B**	Current error solenoid CH1 Current error solenoid A (CH1) Current error solenoid B (CH2)	%
LVDT_ERR	Error of the position or pressure transducer	%
TEMP_BOARD	Temperature of the board	°C
TEMP_PWRSTG	Temperature of the power stage of the board	°C
V_CTRL	Supply voltage	V
V_PWRSTG	Power stage voltage	V

DIAGNOSTIC

Valve error detection should be performed using configurator through the error message.

A list of the error messages appears as showed in the picture below.



For E1 valves with output monitor function on pin F, in case of error detected, the output current value is set to a value lower than 3 mA (this is valid if valve is not connected with LinPC).

APPENDIX 1: I/O Link Communication Interface

This appendix is valid for the following products:

- PROPORTIONAL directional control valves
- PROPORTIONAL pressure control valves

The parametrization of the valve should be done using the Master IO-Link tool according to the IO-Link specification. Typical Master IO-link devices are power strip, remote or main PLC.

Reference

IO-Link is a serial digital communication protocol intended to be used in automation technology. It connects sensors or actuators to a programmable logic controller (PLC). IO-Link is defined in the international standard IEC 61131-9. IO-Link is not just another bus system, but a point-to-point connection between the IO-Link device and a link device, namely an IO-Link master.

IO Link Installation Guide

The point-to-point connection is set up between an IO-Link master and an IO-Link valve (actuator) using a shielded five-core cable, this connection type is called Port Class B. Pin 4 (C/Q) is used for communication, Pin 1 (1L+) for power supply to the device electronics and Pin 3 (1L-) as the common reference potential, Pin 2 (2L+) power supply to the actuators and Pin 5 (2L-) conductor with a separated galvanically isolated reference potential. Care must be taken to ensure that the maximum line length of 20 m between the IO-Link master and the IO-Link devices defined in the IO-Link specification is not exceeded. Regarding the power supply, make sure that a sufficient supply voltage is available at the device. As a voltage drop occurs along every supply cable, the entire cable route from the power supply unit to the IO-Link device must be taken into account.

IO Link Device Descriptor IODD

The IO-Link device uses the IO-Link protocol to provide access to process data and variables of the devices. The device-specific variables are defined in the IODD file. IODD contains:

- Information regarding communication properties
- Information regarding device parameters
- Identification, process, and diagnostic data
- Image of the device
- Manufacturer's logo

The master manufacturer's IO-Link configuration tools are able to read an IODD and display the device described therein.

IO Link protocol

IO link protocol exchanges two types of data, cyclic data (Process data inputs and Process data outputs), and acyclic data (Variables).

Process Data Input PDI

Process Data Input PDI are sent from valve to process Master IO-link devices through Fieldbus.

Total Process Data Input length is 4 octets (32 Bits) according to table below:

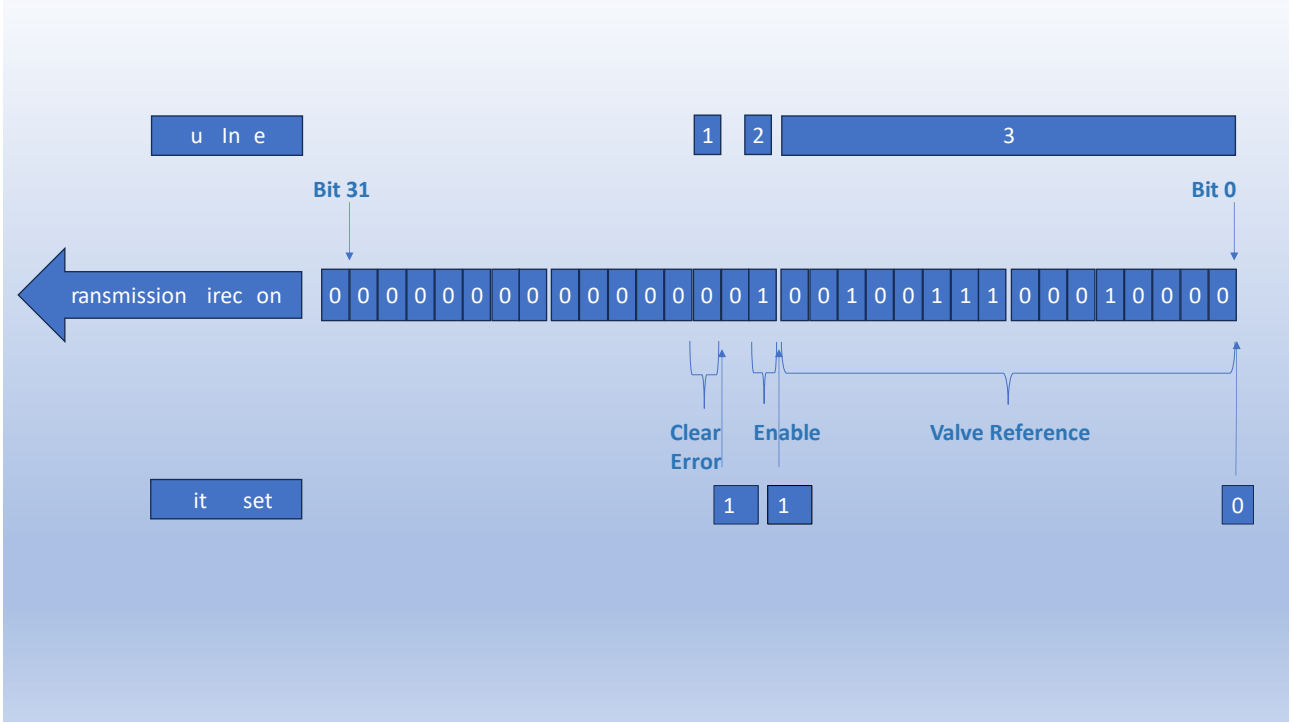
Bit Offset	Sub Index	Bit Length	Name				Data Type	Value Range	Description
			No Feedback		with Feedback				
			1- sol	2-sol	1-sol	2-sol			
30	1	1	V1_HasWarning	V1_HasWarning	V1_HasWarning	V1_HasWarning	BooleanT	0 = No Warning 1 = Warning	Warning just give an alert, the valve follow run.
24	2	1	V1_HasError	V1_HasError	V1_HasError	V1_HasError	BooleanT	0 = No Error 1 = Error	When error is executed it throws an exception that must be investigate
16	3	1	V1_state	V1_state	V1_state	V1_state	BooleanT	0 = Disabled 1 = Enabled	State of the valve
0	4	16	V1_Monitor		V1_Monitor		UIntegerT	0, +10000	Expressed in 0.01%
				V1_Monitor		V1_Monitor	IntegerT	-10000, +10000	

Process Data Output PDO

Total Process Data Input length is 4 octets (32 bits) according to table below:

Bit Offset	Sub Index	Bit Length	Name				Data Type	Value Range	Description
			No Feedback		With Feedback				
			1 - sol	2 - sol	1 - sol	2 - sol			
18	1	1	Reset Error	Reset Error	Reset Error	Reset Error	BooleanT	0 = No action 1= Clear error	Acknowledgment of the error. If the error still appears it cannot be cleared.
16	2	1	Valve Enabled	Valve Enabled	Valve Enabled	Valve Enabled	BooleanT	0 = Disabled 1 = Enabled	Command to the valve is executed
0	3	16	V1_Reference		V1_Reference		UIntegerT	0, 10000	The reference command to valve. Expressed in 0.01 %
				V1_Reference		V1_Reference	IntegerT	-10000, 10000	

As follow an example explaining the bit offset and sub index position within the PDO according to the IO-Link specification IO-Link Interface and System Specification Version 1.1.2 July 2013.



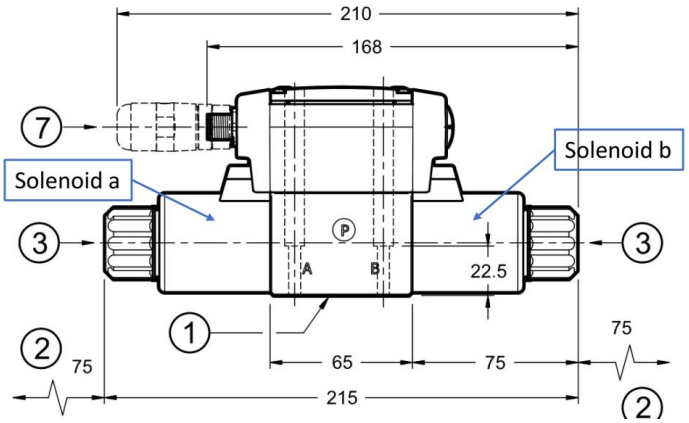
Variables

Variable Names (i)	Alias	Menu	Index	Length	Access Policy	Description	Value range (min, max) and Default value	1-solenoid no Feedback	2-solenoid no Feedback	1 solenoid with Feedback	2-solenoid with Feedback
VN_RequestsFlags	Request Flags	Parameter/ Configuration	80	16	rw	Bitfield, can be written to request some tasks: bit0 = 1 (TOGGLE ↑) -> Update configuration bit1 = 1 (TOGGLE ↑) -> Save configuration to EEprom		X	X	X	X
VN_R_MaxP	R_MaxP	Parameter/ Configuration	81	16	rw DATA STORAGE	Reference 1 Max positive [0, 100%] Unit 0,01%	0, 10000 Default 10000	X	X	X	X
VN_R_MinP	R_MinP	Parameter/ Configuration	82	16	rw DATA STORAGE	Reference 1 Min positive [0, 100%]	0, 10000 Default 0	X	X	X	X
VN_R_Trigger	R_Trigger	Parameter/ Configuration	83	16	rw DATA STORAGE	Reference 1 Trigger [0, 100%]	0, 10000 Default 150	X	X	X	X
VN_R_MinN	R_MinN	Parameter/ Configuration	84	16	rw DATA STORAGE	Reference 1 Min negative [0, 100%]	0, 10000 Default 0	--	X	--	X
VN_R_MaxN	R_MaxN	Parameter/ Configuration	85	16	rw DATA STORAGE	Reference 1 Max negative [0, 100%]	0, 10000 Default 10000	--	X	--	X
VN_R_RuP	R_RupP	Parameter/ Configuration	86	16	rw DATA STORAGE	Time [ms] for 0 to 100% sweep	0, 20000 Default 0	X	X	X	X
VN_R_RdwP	R_RdwP	Parameter/ Configuration	87	16	rw DATA STORAGE	Time [ms] for 100% to 0% sweep	0, 20000 Default 0	X	X	X	X
VN_R_RupN	R_RupN	Parameter/ Configuration	88	16	rw DATA STORAGE	Time [ms]	0, 20000 Default 0	X	X	X	X
VN_R_RdwN	R_RdwN	Parameter/ Configuration	89	16	rw DATA STORAGE	Time [ms]	0, 20000 Default 0	--	X	--	X
V_TempActual	Current temperature	Diagnosis	90	16	ro	H-Bridge (power stage) temperature [0.1°C]	-60, 150 --	X	X	X	X
V_TempMin	Minimum temperature	Diagnosis	191	16	ro	Min Temperature measured [0.1°C]	-60, 150 --	X	X	X	X
V_TempMax	Maximum temperature	Diagnosis	192	16	ro	Max Temperature measured [0.1°C]	-60, 150 --	X	X	X	X
V_ControlStageVoltage	Control Stage Voltage	Diagnosis	91	16	ro	Control stage power supply voltage [mVolt]	0, 50 --	X	X	X	X
VN_PowerStageVoltage	Power Stage Voltage	Diagnosis	92	16	ro	Power stage power supply voltage [mVolt]	0, 50 --	X	X	X	X
VN_Sol1Current	Sol1 Current	Diagnosis	93	16	ro	Solenoid a current (mA)	-2, 7000 --	X	X	X	X
VN_Sol2Current	Sol2 Current	Diagnosis	94	16	ro	Solenoid b current (mA)	-2, 7000 --	--	X	--	X

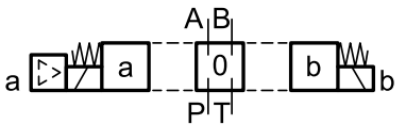
VN_Hours_powered	Hours power ON	Diagnosis	100	32	ro	Totally hours powered of valve [h]	0, 10000000 Default 0	X	X	X	X
VN_Hours_Sol1_On	Hours Sol1 ON	Diagnosis	101	32	ro	Totally hours powered of solenoid a [h][sec	0, 10000000 Default 0	X	X	X	X
VN_Hours_Sol2_On	Hours Sol2 ON	Diagnosis	102	32	ro	Totally hours powered of solenoid b [h]	0, 10000000 Default 0	--	X	--	X
VN_Errors	Errors	Diagnosis	200	32	ro	Errors – see table		X	X	X	X
VN_Warnings	Warnings	Diagnosis	201	32	ro	Warnings – see table		X	X	X	X

Note (i)
Variables, indicate as rw, can be modified by Master IOLINK and become operative only after requesting a configuration update through the 'RequestFlags' register (bit0 = 1 (GGLE ↑ on rising edge)). In order to avoid the loss of data changed on the valve, for example at power-off, it is necessary to make a save to EEprom through the 'RequestFlags' register (it1 = 1 (GGLE ↑ on rising edge)).
At power-on the Master IO-Link store ata in icate as " a ta storage" to the valve; in this mode the device change, accordingly to specification IOLINK V1.1 is supported because the parameterization can be implemented automatically by Master IO-Link.

olenoi "a" an olenoi " " are referre to the following figure.



For 1-solenoi valves, solenoi "a" refer to the only solenoi availa le, in epen ently if valve is type SA or SB. For 2-solenoids valve, the hydraulic function is according to the Spool Type, check catalogue for further details:



Errors		
LSB	0	Undervoltage of the power stage - Hbridges
	1	Overvoltage of the power stage - Hbridges
	2	Command Reference 0 - Out of range minimum
	3	Command Reference 0 - Out of range maximum
	4	Command Reference 1 - Out of range minimum
	5	Command Reference 1 - Out of range maximum
	6	Feedback 0 - Out of range minimum
	7	Feedback 0 - Out of range maximum
	8	Feedback 1 - Out of range minimum
	9	Feedback 1 - Out of range maximum
	10	-
	11	-
	12	-
	13	-
	14	-
	15	-
	16	solenoid not connected - channel 1
	17	solenoid not connected - channel 2
	18	short circuit - channel 1
	19	short circuit - channel 2
	20	I2T error sol. 1
	21	I2T error sol. 2
	22	-
	23	uP OverTemperature Error
	24	HBridge OverTemperature Error
		-
MSB	31	-

APPENDIX 2: PROFINET COMMUNICATION INTERFACE

This appendix is valid for the following products:

- PROPORTIONAL directional control valves
- PROPORTIONAL pressure control valves

Reference

Profinet is the standard for industrial ethernet based on IEEE 802.xx. Profinet is based on the 100 Mb/s-version of full-duplex and switched Ethernet. Profinet IO is designed for the fast data exchange between Ethernet-based controllers (master functionality) and field devices (slave functionality).
Hydraulic valves with Profinet communication interface can e operate as evice ("I - evice"). Reference according to the international standard IEC 61784-2, only CC-A class support.

Profinet installation guide

The Profinet IO field devices are connected exclusively via switches as network components. A Profinet IO network can be set up in star, tree, line or ring topology. Profinet IO is based on the Fast Ethernet standard transmission with 100 Mbit/s. The transmission media are copper cables CAT5.
For the IP20 environment in the control cabinet, the RJ45 connector CAT5 according to EN 50173 or ISO/IEC 11801 is used. The pin assignment is compatible with the Ethernet standard (ISO/IEC 8802-3).
The connection between Profinet participants is called Profinet Channel. In most cases, Profinet channels are built with copper cables to IEC 61784-5-3 and IEC 24702. The maximum length of a Profinet channel, which is constructed with copper cables, is 100 m.

Profinet assignment

All Profinet IO slave devices need name and IP address to initiate communication.
Both are assigned to the device by the Profinet-IO-controller (PLC). The device name of the Profinet IO device is stored in persistent memory in the device. It can be modified by a Profinet IO supervisor, e.g. the programming system of the belonging PLC.

Default:

Name:	
IP Address:	0.0.0.0
Subnet-Mask:	0.0.0.0
IP Address Gateway:	0.0.0.0

Example:

Name:	dms-valve
IP Address:	192.168.1.111
Subnet-Mask:	255.255.255.0
IP Address Gateway:	192.168.1.111

Device Data File (GSDML)

The characteristics of an IO device are described by the device manufacturer in a General Station Description (GSDML) file.
The language used for this purpose is the GSDML (GSD Markup Language) - an XML based language.
For I/O data, the GSDML file describes the structure of the cyclic input and output data transferred between the Programmable Controller and the Profinet IO device.
Any mismatch between the size or structure of the input and output data and the actual internal device structure generates an alarm to the device.
In the configuration of transmission data select 20 bytes for input and 20 bytes for output.

Cyclic Data - Process IO data exchange

The IO controller exchange data on each IO device in accordance with GSDML file. PDO consists of the following bytes:

Input from Fieldbus – 20 Bytes

Byte	Function	Type	Bit Length	Unit
0..7	Reserved	Octet String	64	-
8-9	Control Word	Unsigned16	16	-
10-11	Control Reference	Signed16	16	-10000, +10000 expressed in 0.01%
12-15	Reserved	Unsigned32	32	-
16-17	Reserved	Unsigned16	16	-
18-19	Reserved	Unsigned16	16	-

Description of the **Control Word**

Latest valve default configuration is delivered with EXT digital enable at pin 3. Valves run directly to ENABLED status if 24V is enabled at pin 3 and go to Disabled (or Reset Error) state if pin 3 is lowered at 0V (or errors occurs). For valve with enable set by bus (not a standard configuration), control word is defined as follow:

Hex	Name	Description	Type
0x0000	Disabled + Reset Error	This word initialize the device condition to READY status if no error occurs, otherwise it run directly to ERROR status.	Word

0x0007	Enable (*)	Device can run directly to ENABLED status if no error occurs, otherwise it run directly to ERROR status.	Word

Data sent to Fieldbus – Byte20

Byte	Function	Type	Bit Length	
0..7	Reserved	Octet String	64	-
8-9	Status Word	Unsigned16	16	-
10-11	Monitor	Signed16	16	-10000, +10000 expressed in 0.01%
12-15	SSI	Unsigned32	32	It Depends on sw scaling
16-17	Analogue Transducer 1	Unsigned16	16	-
18-19	Analogue Transducer 2	Unsigned16	16	-

SSI configuration has to be performed by software according to the data sheet of the measurement instrument. In order to activate the SSI data transmission, it need to activate the power voltage for device by software (a power cycle needed after the data saving).
Analogue transducers scaling (analogue channel offset and gain) has to be set by software according to the data sheet of the instrument.

Status Word Table

Name	Description	Value
Error	Valve detects Error	`0x00`
Ready	Valve Ready, need to be enabled to run	`0x08`
Enabled	Valve Enabled, valve actuates hydraulic according to reference	`0x0F`

APPENDIX 3: ETHERCAT COMMUNICATION INTERFACE

This appendix is valid for the following products:

- PROPORTIONAL directional control valves
- PROPORTIONAL pressure control valves

Reference

ETHERCAT (EtherNET for Control Automation Technology) is an EtherNET based fieldbus system, the standard based on IEC 61158, using full-duplex Ethernet physical layers.

EtherCAT installation guide

The EtherCAT network consists of one master and one or more slave devices. ErherCAT supports three different physical media, 100BASE-TX 100 Mbit/s full-duplex transmission on copper cable (up to 100 m distances), 100BASE-FX, 100 Mbit/s full-duplex transmission on fiber optics (up to several km distances) and LVDS, 100 Mbit/s full-duplex transmission on backplane connections. An EtherCAT network can be set up in star, tree, line or daisy chain topology.

Device Data File (XML)

The characteristics of an IO device are described by the device manufacturer in a ESI (EtherCAT Slave Information) file.
The language used for this purpose is the XML language. For I/O data, the XML file describes the structure of the cyclic input and output data transferred between the Programmable Controller and the EtherCAT IO device.
Any mismatch between the size or structure of the input and output data and the actual internal device structure generates an alarm to the device.
In the configuration of transmission data selects 4 bytes for input and 8 bytes for output.

Cyclic Data - Process IO data exchange

The IO controller exchange data on each IO device in accordance with XML file. Data from master to slave named TxPDO, data from slave to master named RxPDO.

TxPDO

The structure of the PDO is according to the table below (8 Bytes):

Index	Sub-Index	Name	Length	DATA TYPE	Value Range	Description
6041	0	Status Word	16	UINT	See table below	-
6312	0	Valve Position	16	INT	From -10000 (0xD8F0) to 10000 (0x2710)	Command value equals to -100% to 100%
6401	0	Value SSI-	32	UDINT	Signed 32 bit	According to SSI data sheet

The device state condition and device state transitions of valve are accordingly with following scheme:

Bit Number	Name	Description	Type
0	Ready to switch on/ Operation Enabled	0 = Ready with no error 1 = Valve active	Bool
8	Fault	0 = Valve OK 1 = Valve alarmed	Bool

Example: SW

SW Status	Description
0x00	Power out to solenoid is switched off
0X0100	Valve alarmed
0x01	Valve is active

RxPDO

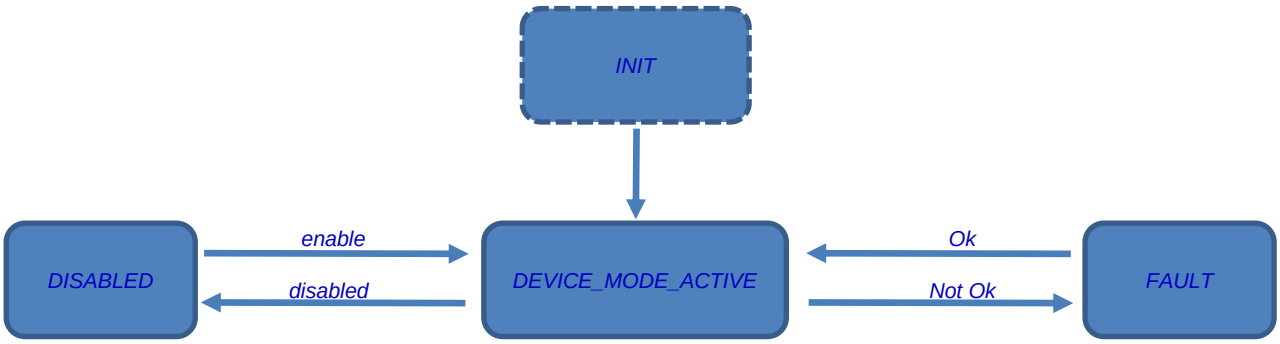
The structure of the PDO is according to the table below (4 Bytes):

Index	Sub-Index	Name	Length	DATA TYPE	Value Range	Description
6040	0	Control Word	16	UINT	See table below	
6311	0	Reference1	16	INT	From -10000 (0xD8F0) to 10000 (0x2710)	Command value equal to -100% to 100%

For valve with enable set by bus (not a standard configuration), control word is defined as follow:

Bit Number	Name	Description	Type	Default
0	Enable/Disable	The bit determines the enable or disable condition of valve	Bool	0
1-15	Reserved		Bool	0

The device state condition and device state transitions of valve are accordingly with following scheme:



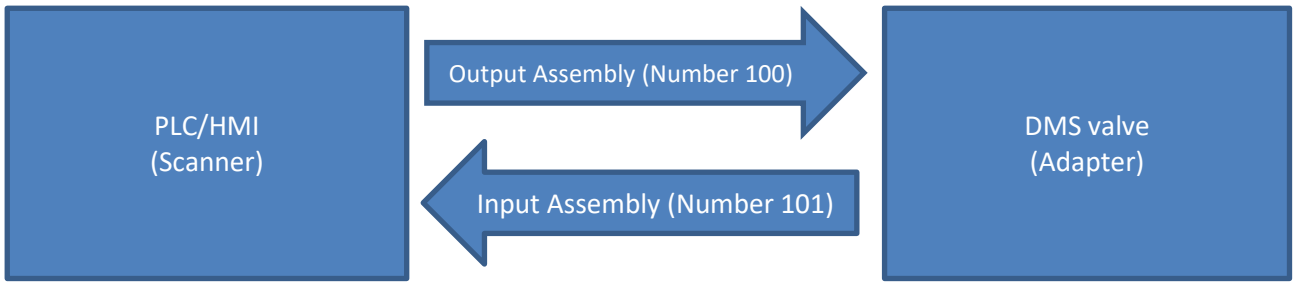
APPENDIX 4: ETHERNET/IP COMMUNICATION INTERFACE

This appendix is valid for the following products:

- PROPORTIONAL directional control valves
- PROPORTIONAL pressure control valves

Reference

Ethernet/IP is the name given to Common Industrial Protocol (CIP) as implemented over standard Ethernet (IEEE802.3 and the TCP/IP protocol suite). Hydraulic valves with Ethernet/IP communication interface can be operated as adapter and provides data to a scanner device (Implicit Message).



Device Data File (EDS)

The Ethernet-IP features are described in an Electronic Data Sheet, so called EDS files, it is an ASCII text file used by software tools for device and network connection configuration. The EDS file of valve provide the identity information required for a network tool to recognize the valve and specify the Input and Output Message produced and consumed by the Adapter.

Producing Assembly

Output Assembly according to table below (Assembly Number 100), size in byte 16

Byte	Function	Type	Bit length	Unit/Note
0-1	Status Word	Int16	16	See Status Word
2-3	Monitor	Int16	16	-10000, +10000 expressed in 0.01%
4-7	Error	Int32	32	See Error message

8-11	SSI Out	Int32	32	Depend on sw scaling (*)
12-13	AN1 OUT	Int16	16	Depend on sw scaling (*)
14-15	AN2 OUT	Int16	16	Depend on sw scaling (*)

(*) Little Endian

Description of the **Status Word**

Name	Description	Value
Disabled	Power out to solenoid is switched off	0x09
Fault	Valve alarmed	0x21
Device Mode active enable	Valve is active	0x0F

Description of the **Error Message**, if true the error is active, false no error.

Bit Number	Error Name	Description
0	UNDERVOLTPWR	Undervoltage of the power stage - Hbridges
1	OVERVOLTCTPWR	Overvoltage of the power stage - Hbridges
2	OUTRANGEMINCMD0	Command Reference 0 - Out of range minimum
3	OUTRANGEMAXCMD0	Command Reference 0 - Out of range maximum
4	OUTRANGEMINCMD1	Command Reference 1 - Out of range minimum
5	OUTRANGEMAXCMD1	Command Reference 1 - Out of range maximum
6	OUTRANGEMINFBK0	Feedback 0 - Out of range minimum
7	OUTRANGEMAXFBK0	Feedback 0 - Out of range maximum
8	OUTRANGEMINFBK1	Feedback 1 - Out of range minimum
9	OUTRANGEMAXFBK1	Feedback 1 - Out of range maximum
10	-	-
11	-	-
12	-	-
13	-	-
14	-	-
15	-	-

16	SOL1_OPEN	solenoid not connected - channel 1
17	SOL2_OPEN	solenoid not connected - channel 2
18	SHORT_CH_1	short circuit - channel 1
19	SHORT_CH_2	short circuit - channel 2
20	I2T_1	I2T error sol. 1
21	I2T_2	I2T error sol. 2
22	EF_AN_MONITOR	Analog monitor fault
23	OVERTEMPUP	uP OverTemperature Error
24	OVERTEMPHBRIDGE	HBridge OverTemperature Error
25	EEPROM_ERROR	EEProm error
26	UNDERVOLT_CTRL	Undervoltage of the power stage - Hbridges
27	OVERVOLT_CTRL	Overvoltage of the power stage - Hbridges
28	-	-
29	-	-
30	-	-
31	-	-

Consuming Assembly

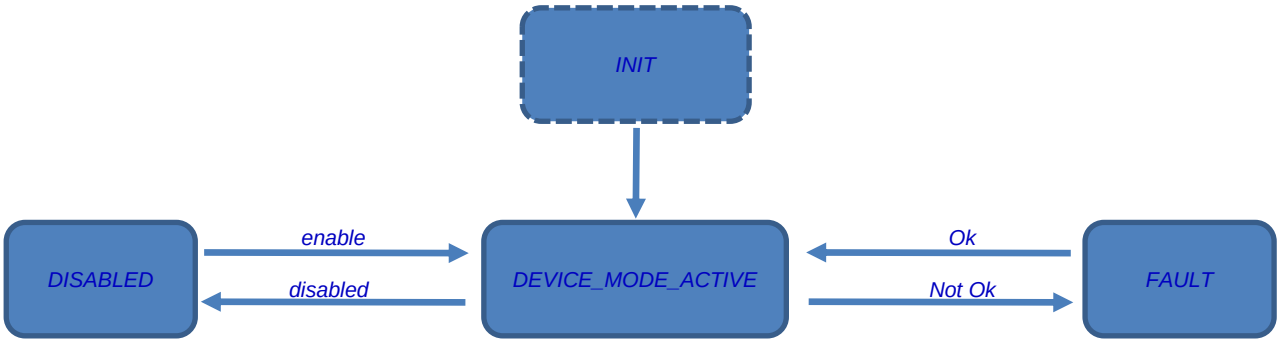
Input Assembly according to table below (Assembly Number 101) size in byte 16

Byte	Function	Type	Bit Lenght	
0..1	Control Word	Int16	16	See Table
2-3	Reference	Int16	16	-10000, +10000 expressed in 0.01%
4-7	Reserved	Int32	32	-
8-11	Reserved	Int32	32	-
12-13	Reserved	Int16	16	-
14-15	Reserved	Int16	16	-

Description of the **Control Word**

Bit Number	Name	Description	Type	Default
0	Disabled	This bit determines the device condition	Bool	0
1-15	Reserved		Bool	0

The device state condition and device state transitions of valve are accordingly with following scheme:



Led Description

Boards with Ethernet IP interface are equipped with five LEDs, the meaning of these LEDs according to table below:

Number	Name	Function	Colour	Status	Meaning
L1	SYS	System Status	Green	On	Operating System Running
			Green/Yellow	Blinking Green/Yellow	Bootloader is waiting for Firmware
			Yellow	Static	Bootloader is waiting for Software
			-	Off	Power Supply for the device is missing or hardware defect
L2	MS	Module Status	Green	On	OK
			Red	Off	Error
L3	NS	Network Status	Green	On	Connected: If the device has at least one established connection (even to the Message Router), the network status indicator shall be steady green.
				Flashing	Not Connections: If the device has no established connections, but has obtained an IP address, the network status indicator shall be flashing green.
			Red	On	Duplicate IP: If the device has detected that its IP address is already in use, the network status indicator shall be steady red.
				Flashing	Connection Timeout: If one or more of the connections in which this device is the target has timed out, the network status indicator shall be flashing red. This shall be left only if all timed out connections are reestablished or if the device is reset.
			Green/Red	Blinking Green/Red	Self-Test: While the device is performing its power up testing, the network status indicator shall be flashing green/red
			-	Off	Not powered, no IP Address: If the device does not have an IP address (or is powered off), the network status indicator shall be steady off.
L4	Eth CH0	LINK	Green	On	A connection to the Ethernet exists
				Off	The device has not connection to the Ethernet
		ACT	Yellow	Flashing	The device sends/receives Ethernet frames
L5	Eth CH1	LINK	Green	On	A connection to the Ethernet exists
				Off	The device has not connection to the Ethernet
		ACT	Yellow	Flashing	The device sends/receives Ethernet frames

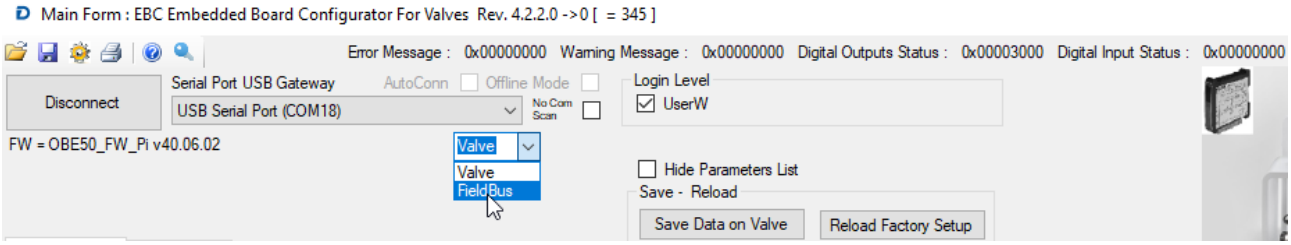
IP Address Setting

In order to Set IP Address uses the EtherNET Device Configurator, do not disconnect the LAN cable and execute a power cycle.

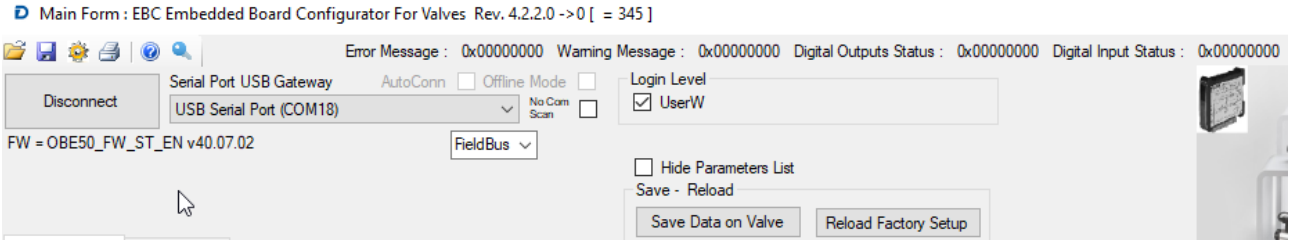
APPENDIX 5: TRANSDUCER CONFIGURATION AT PIN X7 AND X4

Transducer configuration is made by using the Ebc Configurator sw and VEA-PB12-A kit.

First of all the connection with valve should be initialized (please refer to manual of the Ebc Configurator), after it is possible to select Fieldbus on the scroll window:



Select Disconnect and Connect, the connection to Fieldbus is displayed:



The X7 and X4 parameterization should be done according to following table:

ID	Name	Default Value	Range	Description	Note
P005	EncoderKind	SSI	SSI COUNT	SSI = SSI COUNT = Encoder	-
P006	EncoderPwrVolt	OFF	OFF 24V 5V	Encoder power supply Volt	-
P007	SSI_BitsLen	25	1-32	Encoder kind	-
P008	SSI_Encoding	GRAY	GRAY BINARY	Encoder SSI encoding	-
P009	SSI_BitInvert	NO	NO YES	Encoder SSI invert bit	-
P010	SSI_Endianess	BIG	BIG SMALL	Enc. SSI MSB/LSB first	-
P011	Transd1_Scale	GAIN = 1.830 OFFSET= 2.21 TYPE= SEL_TYPE_10_10V	GAIN MAX 20 OFFSET MAX 105 TYPE: SEL_TYPE_10_10V SEL_TYPE_4_20MA	Transducer 1 scaling at pin 2-3	In case of voltage type selection the scaling is -10_10V ⇔ -1000_1000 In case of 4-20 mA type selection the scaling is 4-20 mA ⇔ 400-2000 using: GAIN = 10 OFFSET= 6.08 TYPE= SEL_TYPE_4_20MA

P012	Transd2_Scale	GAIN = 1.830 OFFSET= 2.21 TYPE= SEL_TYPE_10_10V	GAIN MAX 20 OFFSET MAX 105 TYPE: SEL_TYPE_10_10V SEL_TYPE_4_20MA	Transducer 2 scaling at pin 4-3	In case of voltage type selection the scaling is -10_10V ⇔ -1000_1000 In case of 4-20 mA type selection the scaling is 4-20 mA ⇔ 400-2000 using: GAIN = 10 OFFSET= 6.08 TYPE= SEL_TYPE_4_20MA

Execute a power cycle in order to apply change to these parameters.