

# P2M Node 24 DO

P2M2HBVT12400

Ether**CAT**®



USER MANUAL



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### Important !

Before carrying out any service work, ensure that the valve and manifold have been vented. Remove the primary supply air hose to ensure total disconnection of the air supply before dismantling valves or blank connection blocks.



### NB !

All technical data in this catalogue is typical only. The air quality is decisive for the valve life: see ISO 8573.



### WARNING

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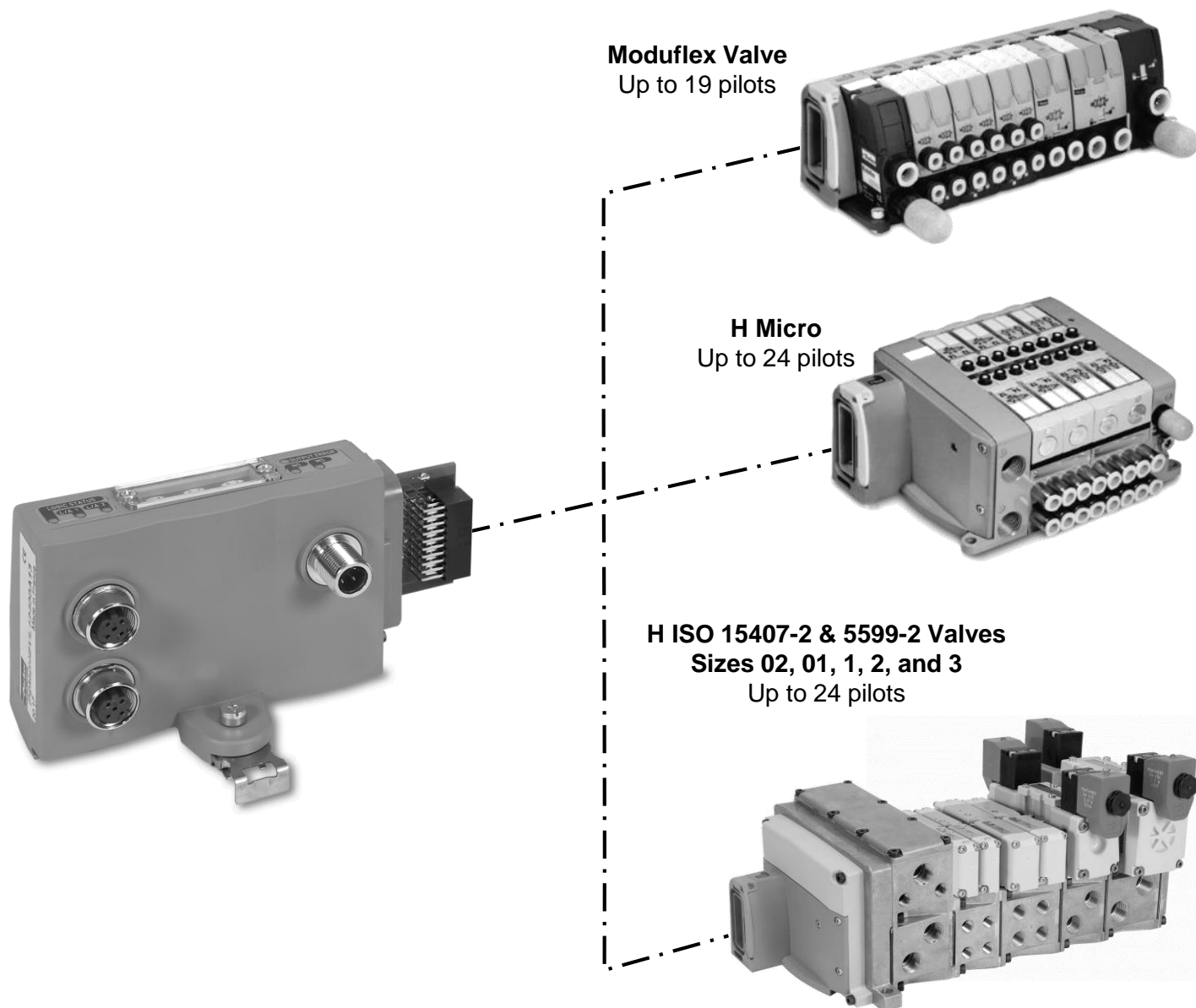
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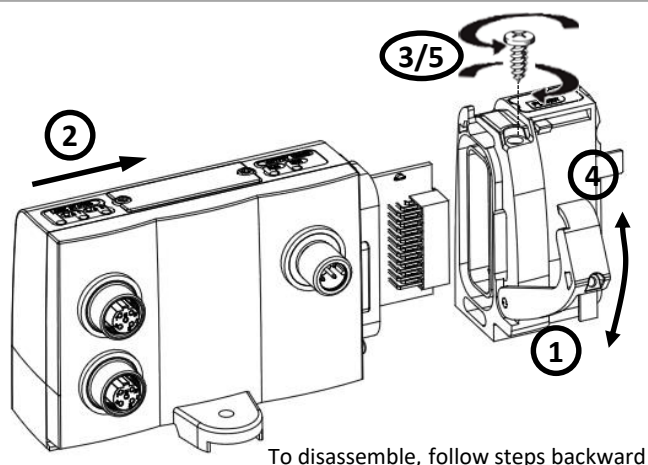
## Product general overview

### Purpose of the P2M Node 24 DO

The P2M Node 24DO can be used with either the Moduflex Valve System, H Micro or H ISO 15407-2 and 5599-2 Valves Series. Depending on the valve series the module is connected to, it can control up to 24 pilot solenoid valves, as shown on the illustration below:



### Module assembly / disassembly



For details on appropriate valve adaptor to use, please refer to the respective valve series technical catalogue and instruction sheets.

### Technical Data

#### P2M Node 24DO electrical specifications

Description	Value
Network power supply	24 Vdc +/- 10%
Speed communication	According to EtherCAT standard (100Mbit/s)
Auxiliary power supply	Voltage 20,4 Vdc to 26,4 Vdc
	Current limit per channel 150 mA
	Max. current limit 2 A
Polarity inversion protection	YES
Short circuit protection	YES
Operating temperature	0°C to +55°C
Storage temperature	-25°C to +70°C
Shock	According to IEC 60068-2-27:2008
Vibration	According to IEC 60068-2-6:2007
EMC	According to EN 55011 & EN 61000-4-2 up to -4-6

#### Auxiliary power consumption calculation

Depending on the valve range the module is connected to, the pilot solenoids differ in power consumption. In order to determine the minimum required power to supply, the table below may be used:

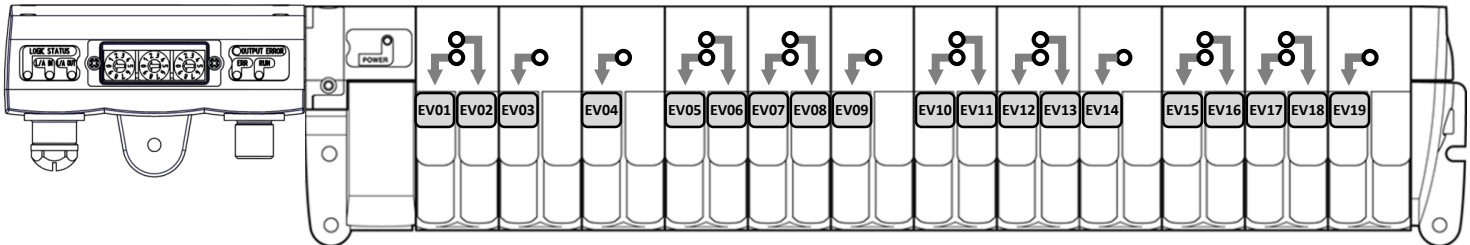
Valve Range	Number of Pilots simultaneously powered	Power	Total
Moduflex Valve System		x 40 mA	mA
H Micro		x 40 mA	mA
H ISO - 15407-2 - Sizes 02 & 01		x 40 mA	mA
H ISO - 5599 - Sizes 1, 2 & 3 (Energy Efficiency Coils)		x 54 mA	mA
H ISO - 5599-2 - Sizes 1, 2 & 3 (Standard Coils)		x 133 mA	mA
<b>Total :</b>			<b>mA</b>

**NOTE:** it is recommended that the total outputs current consumption does not exceed 2A

### Solenoid Pilots addressing and Process Data mapping

#### P2M Node 24DO addressing used with Moduflex Valve System

The P2M Node 24DO used with Moduflex Valve System can handle up to 19 pilot solenoid valves. Addressing is as shown below:



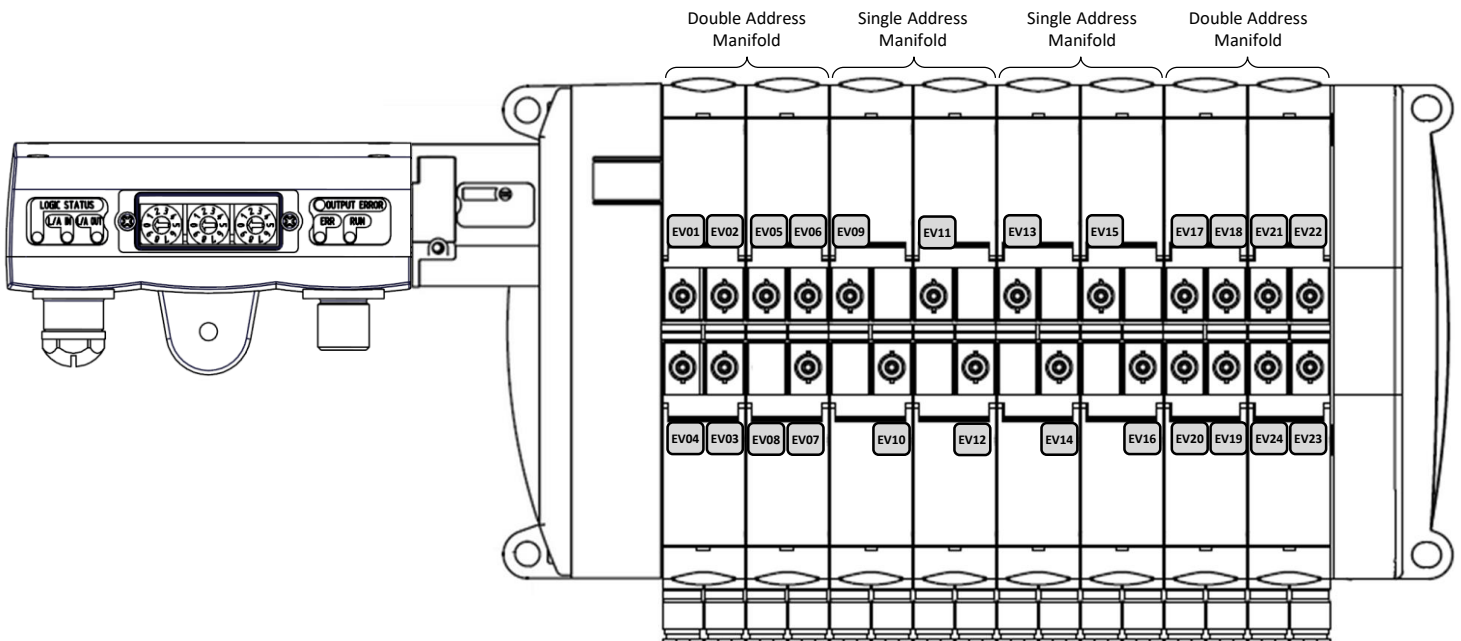
PLC Process outputs data mapping

Byte 1	EV08 ..... EV01
Byte 2	EV16 ..... EV09
Byte 3*	EV24 ..... EV20 EV19 ... EV17

\* Byte 3 / Bits 3 to 7 are not connected to valves with Moduflex Valve Range

#### P2M Node 24DO addressing used with H Micro Valve Series

The P2M Node 24DO used with H Micro Valve Series can handle up to 24 pilot solenoid valves. Addressing is as shown below:

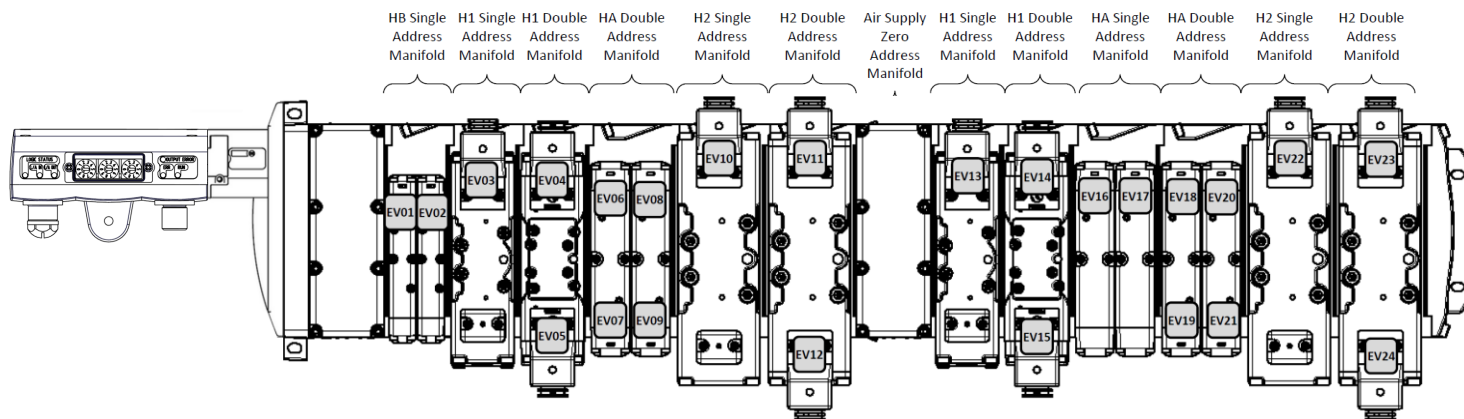


PLC Process outputs data mapping

	7 ..... 0
Byte 1	EV08 ..... EV01
Byte 2	EV16 ..... EV09
Byte 3	EV24 ..... EV17

### P2M Node 24DO addressing used with H Universal ISO Series – 15407-2 & 5599-2

The P2M Node 24DO used with H ISO Series – 15407-2 – sizes 02 & 01 and 5599-2 – sizes 1, 2 & 3 – can handle up to 24 pilot solenoid valves. Addressing is as shown below (on H Universal manifold):



PLC Process outputs data mapping

	7	.....	0
Byte 1	EV08	.....	EV01
Byte 2	EV16	.....	EV09
Byte 3	EV24	.....	EV17

## P2M Node 24DO Electrical Connections

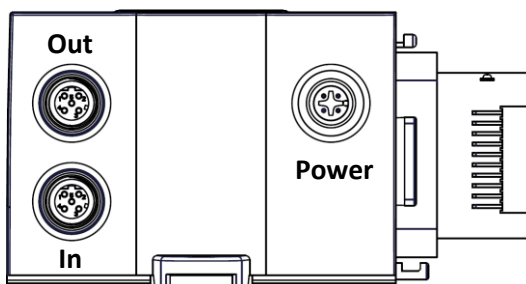
### Network Communication and Auxiliary power connection

**Network Communication:** Standard Female M12 D-Coded connectors – 4 pins

**Auxiliary Power Supply:** Standard Male M12 A-Coded connector – 4 pins

*Use of standard manufactured cables available from usual electrical supplier is recommended.*

Network In & Out M12 D-Coded		
	PIN #	Description
	1	TxData +
	2	RxData +
	3	TxData -
	4	RxData -



Auxiliary Power M12 A-Coded		
	PIN #	Description
	1	Logic Power +
	2	AUX Power -
	3	Logic Power -
	4	AUX Power +



### P2M Node 24DO connected to SAFE power supply for Auxiliary Power

The P2M Node 24DO Auxiliary Power for valves can be supplied from a SAFE 24Vdc auxiliary source in PP or PM mode, as well as from Output Switching Signals Device Failsafe Digital Outputs (OSSD FDO).

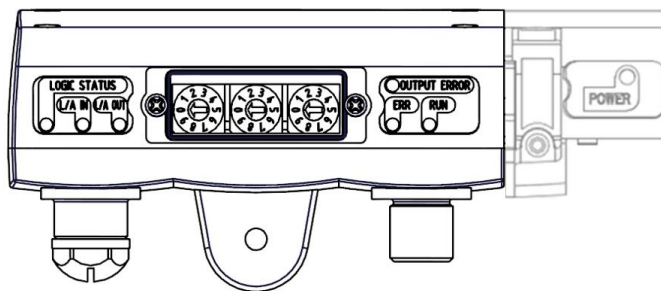
**Note :** Please check max. power available from the source. Refer to the “Auxiliary power consumption calculation” section



## Local Visual Diagnostic

The P2M Node 24DO module offers local diagnostics through 6 LED's status with interpretation described in the table below:

LOGIC STATUS Green / Red LED			L/A IN L/A OUT Green LEDs			ERR Red LED			RUN Green / Red LED		
LED Status	Description	Troubleshooting	LED Status	Description	Troubleshooting	LED Status	Description	Troubleshooting	LED Status	Description	Troubleshooting
OFF ○	Logic lines not powered	Check power supply (pin's 2 & 4 on Power M-12)	OFF ○	Not link, no activity	Check connection to the Network	OFF ○	No error	N/A	OFF ○	Initialization	N/A
ON GREEN ○	Logic Power OK	N/A	ON GREEN ○	Link sensed, no activity	N/A	Blinking ✱	Invalid configuration	Check register or object settings	ON GREEN ○	Operational	N/A
ON RED ●	Presence of any fault requiring acknowledge	Fix the issue and acknowledge error/ power cycle the module	Blinking GREEN ✱	Link sensed, activity	N/A	Single Flash ✱	Unsolicited state change	Reset module (power OFF/ON)	Blinking GREEN ✱	Pre-operational	N/A
Blinking G/R ○	Firmware Version error	Contact technical support or change the module				Double Flash ✱	Sync manager watchdog timeout	Reset module (power OFF/ON)	Single Flash GREEN ○	Safe-operational	N/A
						ON ●	Allocation controller failure	Reset module (power OFF/ON) If also RUN LED turns RED, change the module	Flashing GREEN ✱	BOOT	N/A
						Flicker ✱	Bootling error detected	Firmware exception Change the module	RED ●	Fatal event	If also ERR turns RED, change the module



OUTPUT ERROR Red LED		
LED Status	Description	Troubleshooting
OFF ○	Standard mode (No error active)	N/A
ON RED ●	One (or more) active "outputs stage failure"	Check diagnostic message through the Network and relative troubleshooting

## Diagnostic through network via Object "Module Error Input"

The P2M Node 24DO module offers diagnostic data transmitted to the PLC as Process Data Input or via the Manufacturing Specific Object "Module Error Input":

Index	Name	Data Type	Access
0x2009	Module Error Input	UINT	Read

Byte 0	Diag 7 . . . . . Diag 0
Byte 1	Reserved

Bit #	Error Name	Error Description
Diag 0	Ack-Required	Set if any major fault active. Outputs are switched OFF and acknowledge is required to restart the module to normal operation
Diag 1	Auxiliary Voltage Warning	Set if Auxiliary Voltage in warning range. Module keeps normal operation
Diag 2	Auxiliary Voltage Failure	Auxiliary Voltage in Error range. Outputs are switched OFF and acknowledge is required to restart the module to normal operation
Diag 3	Temperature Warning	Set if a temperature increase above warning levels is detected by the output drivers
Diag 4	Output Driver Channel Error	Set if a major fault is detected at the output stage – solenoid short circuit. Outputs are switched OFF and acknowledge is required to restart the module to normal operation
Diag 5	Module Error	Set if an internal communication error is active. Depending on the fault the module might require acknowledgment.
Diag 6	Outputs Stage Not Available	Set if auxiliary power is missing. No acknowledge is required
Diag 7-15	Reserved	These bits will be always set as 0

**NOTE:** Errors caused by solenoid(s) must be fixed first and then the error must be acknowledged by either one of the following actions:

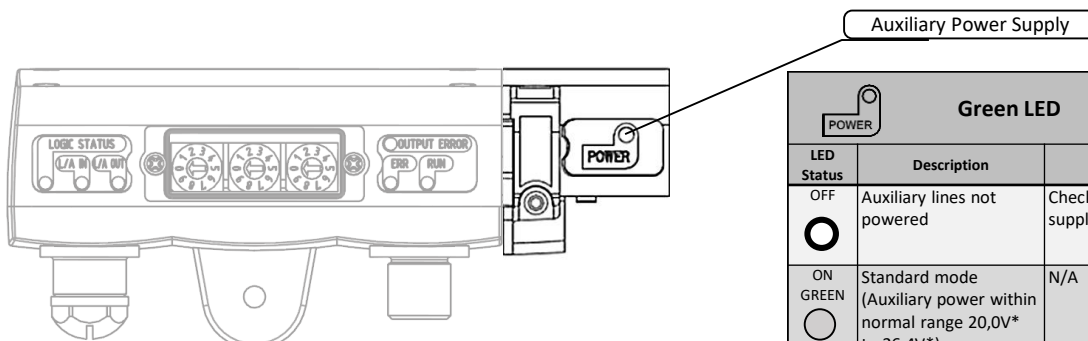
- switching OFF/ON Auxiliary power supply (once error is fixed)
- sending the "Acknowledge Error" command **\*\*SEE Manufacturing Specific Object "System Command"**




## Auxiliary Power Management






## Power supply diagnostic through LED

The P2M Node 24DO monitors the auxiliary power supply voltage and manages two levels of diagnostics; warning and error range. The normal range can be modified through Manufacturing Specific Objects.



### LED function details:

- “Auxiliary power” error is active from 9 to 18 Vdc or above 28,5 Vdc
- When “Auxiliary power error” is active,  LED is solid red

Green LED		
LED Status	Description	Solving
 OFF	Auxiliary lines not powered	Check Auxiliary power supply
 ON GREEN	Standard mode (Auxiliary power within normal range 20,0V* to 26.4V*)	N/A
 Blinking Green 	Auxiliary power in Warning range	Check Auxiliary power supply Check/reset adjusted values
 ON RED	Auxiliary power in Error range. Module in Failsafe status	Check and restore Auxiliary power supply, then acknowledge the error

\* Warning level values could have been modified by the user!

## Power supply diagnostic through Network and Process Data mapping

		7	6	5	4	3	<b>2</b>	<b>1</b>	0
PLC mapping Process input	Byte 0	Diag 7 .....						Diag 0	

- Diag 1 : Auxiliary Voltage in Warning range. The limits of the Warning range can be adjusted via the Objects "AUX Voltage Warning Low Limit" and AUX Voltage Warning High Limit"
- Diag 2 :Auxiliary Voltage failure. If AUX Voltage < 18 Vdc or > 28,5 Vdc. Module goes into Failsafe Status. Acknowledge is required to restart the module. Values cannot be adjusted.

### Auxiliary Voltage Reading

The auxiliary voltage measured by the module can be accessed via the Object "AUX Voltage". The displayed value is in mV.

Index	Data Type	Access	Name	Min Value	Max Value	Default
0x2004	UINT	Read	AUX Voltage	0	36300	N/A

### Auxiliary power supply range adjustment

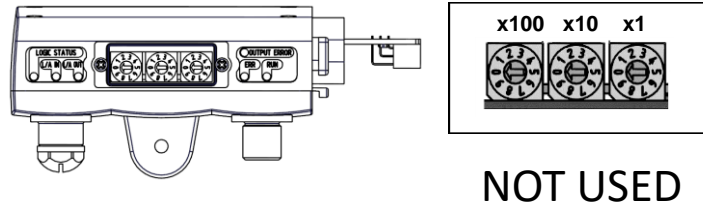
Normal auxiliary power supply voltage range is set by default as  $20,0V < \text{Aux power supply} < 26,4V$   
The low and high limits of the Voltage Warning levels are adjustable via the Manufacturing Specific Object  
“AUX Voltage Warning Low Limit” and “AUX Voltage Warning High Limit”

Values shown in mV.

Index	Data Type	Access	Name	Min Value	Max Value	Default
0x200B	UINT	Read / Write	AUX Voltage Warning Low Limit	18000	24000	20000
0x200C	UINT	Read / Write	AUX Voltage Warning High Limit	24000	28500	26400

## Rotary Switches

The rotary switches are not used.



## P2M Node Configuration File

The ESI file, documentation and Function Blocks can be downloaded from the P2M Node 24DO web site:

- [www.parker.com/pde/P2M\\_IE](http://www.parker.com/pde/P2M_IE)

## Mapping of I/O Process Data

### Process Output Data Mapping:

RPDO Byte	Mapped Object (Index   Sub-Index)	Name
0	0x2008   0x00	System Commands
1	0x2001   0x01	Solenoids (Channel 1 to 8)
2	0x2001   0x02	Solenoids (Channel 9 to 16)
3	0x2001   0x03	Solenoids (Channel 17 to 24)

### Process Input Data Mapping:

TPDO Byte	Mapped Object (Index   Sub-Index)	Name
0	0x2009   0x00	Module Error Input (LSB)
1		Module Error Input (MSB)
2	0x2006   0x01	Channel Error (Channel 1 to 8)
4	0x2006   0x02	Channel Error (Channel 9 to 16)
5	0x2006   0x03	Channel Error (Channel 16 to 24)
6	0x2007   0x00	Module Info Flags (LSB)
7		Module Info Flags (MSB)

## Manufacturer Specific Objects

The manufacturer object are:

Index	Subindex	Type	Access	Name
0x2001	0x00	USINT	RO	Number of entries (0x03)
0x2001	0x01	USINT	RW	Solenoids (Channel 1 to 8) **
0x2001	0x02	USINT	RW	Solenoids (Channel 9 to 16) **
0x2001	0x03	USINT	RW	Solenoids (Channel 17 to 24) **
0x2002	0x00	USINT	RO	Number of Entries (0x18)
0x2002	0x01	UDINT	RO	Switching Cycles (Channel 1)
...	...	...	...	...
0x2002	0x18	UDINT	RO	Switching Cycles (Channel 24)
0x2003	0x00	USINT	RO	Number of Entries (0x03)
0x2003	0x01	USINT	RW	Clear Switching Cycle (Channel 1 to 8)
0x2003	0x02	USINT	RW	Clear Switching Cycle (Channel 9 to 16)
0x2003	0x03	USINT	RW	Clear Switching Cycle (Channel 17 to 24)
0x2004	0x00	UINT	RO	AUX Voltage Reading
0x2005	0x00	UINT	RO	Module Error
0x2006	0x00	USINT	RO	Number of Entries (0x03)
0x2006	0x01	USINT	RO	Channel Error (Channel 1 to 8) **
0x2006	0x02	USINT	RO	Channel Error (Channel 9 to 16) **
0x2006	0x03	USINT	RO	Channel Error (Channel 17 to 24) **
0x2007	0x00	UINT	RO	Module Info Flags **
0x2008	0x00	USINT	RW	System Commands **
0x2009	0x00	UINT	RO	Module Error Input **
0x200B	0x00	UINT	RW	AUX Voltage Warning Limit Low
0x200C	0x00	UINT	RW	AUX Voltage Warning Limit High
0x200D	0x00	UINT	RW	Output State Behavior

**\*\* These objects are available as Process Data Inputs or Outputs**

## Process Data Outputs

### Manufacturer Specific Object “Solenoids”

The Manufacturing Specific Object “Solenoids” contains the process output data for controlling the valves. A value of 1 assigned to a bit in the Object data, indicates that the associated solenoid shall be energized, whereas zero indicates that the power at the solenoid shall be off.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2001	USINT	0x01 to 0x03	Read / Write	Solenoids	0	0xFF 0xFF 0xFF	0

## Process Data Outputs

The 24 solenoids are represented by one bit each and they are grouped in 3 Bytes. The LSB (Least Significant Bit) is associated with Solenoid-1 and the MSB (Most Significant Bit) is associated with Solenoid-24.

Byte	3 (Index 0x2001   Subindex 0x03)				2	1 (Index 0x2001   Subindex 0x01)			
Bit #	23 (MSB)	22	21	...	...	...	2	1	0 (LSB)
Example Output Data	1	0	1	...	...	...	0	1	0
Controlled Output	Out_23 HIGH	Out_22 LOW	Out_21 HIGH	...	...	...	Out_2 LOW	Out_1 HIGH	Out_0 LOW
Solenoid Energized	Solenoid_24 ON	Solenoid_23 OFF	Solenoid_22 ON	...	...	...	Solenoid_3 OFF	Solenoid_2 ON	Solenoid_1 OFF

### Manufacturer Specific Object “System Command”

The Manufacturing Specific Object “System Command” is used for specific functions, such as: “Leave Failsafe / Error Acknowledgment” and “Store Switching Cycles Counters”, as detailed in the table below. In order to execute the desired function the specific value associated with the command has to be written in the Object.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2008	USINT	0x00	Read / Write	System Command	0	0xFF	0

The System Command Byte supports the commands as defined in the table below.

Command Value	Command Name	Description
0x01	Leave Failsafe State (Acknowledge Error)	<p>This command allows the module to leave failsafe state* (acknowledge error). Meaning that, if no error is pending at the time the Leave Failsafe State command is executed, then the device returns to normal operation and the outputs are set according to process data.</p> <p>* If Failsafe state is reached, then it is not automatically left if the error conditions are no longer existent.</p>
0x02	Store Switching Cycle Counters	<p>When this command is executed, the current values of the switching cycle counters are stored into EEPROM. This command is intended to be used before powering off the device.</p>

## Status / Diagnostic Data and Parameters

### Manufacturer Specific Object “Switching Cycles”

The Manufacturing Specific Object “Switching Cycles” contains the 24 switching cycle counters for the valves. The counters values are automatically stored by the module every 30 minutes.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2002	Array of UDINT	0x01 to 0x18	Read	Switching Cycles	0	*	0

\* Max value for each counter is circa 4,3 billion (UDINT max representable value). Once that the max value is reached, this is held in memory and additional cycles are not recorded.

## Status / Diagnostic Data and Parameters

### Manufacturer Specific Object "Clear Switching Cycles"

The Manufacturing Specific Object "Clear Switching Cycles" allows the switching cycle counter for the solenoids to be reset to zero. The counter for each solenoid can be reset individually by setting the associated bit on the object – i.e.: for each bit set to 1 in the object, the associated counter is set to zero.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2003	USINT	0x01 to 0x03	Read / Write	Clear Switching Cycles	0	0xFF 0xFF 0xFF	0

\* The Read service for this Object always returns all zeros.

### Manufacturer Specific Object "AUX Voltage"

The Manufacturing Specific Object "AUX Voltage" contains the measured value of the Auxiliary Voltage  
Values shown in mV

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2004	UINT	0x00	Read	AUX Voltage	0	36300	N/A

### Manufacturer Specific Object "AUX Voltage Warning Low Limit"

This Manufacturing Specific Object contains the value for the AUX Voltage Warning Low Limit, in millivolts – i.e.: the (low) AUX Voltage value that will trigger the AUX Voltage Warning diagnostic

Values shown in mV

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x200B	UINT	0x00	Read/Write	AUX Voltage Warning Low Limit	18000	24000	20000

### Manufacturer Specific Object "AUX Voltage Warning High Limit"

This Manufacturing Specific Object contains the value for the AUX Voltage Warning High Limit, in millivolts – i.e.: the (high) AUX Voltage value that will trigger the AUX Voltage Warning diagnostic

Values shown in mV

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x200C	UINT	0x00	Read/Write	AUX Voltage Warning High Limit	24000	28500	26400

### Manufacturer Specific Object "Channel Error"

In case an error occurs in the outputs stage (e.g.: short circuit or over-temperature), the Manufacturing Specific Object "Channel Error" provides information about which channel caused the error. The bits corresponding to the outputs that caused the fault are set to 1 in the Manufacturing Specific Object.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2006	USINT	0x01 to 0x03	Read	Channel Error	0x00 0x00 0x00	0xFF 0xFF 0xFF	0x00 0x00 0x00

## Status / Diagnostic Data and Parameters

### Manufacturer Specific Object “Module Info Flag”

The Manufacturing Specific Object “Module Info Flag” contains information about possible module states and faults / errors that might affect the module. The faults identified in the module error flag are not recoverable; therefore a power cycle is required to clear them. If the faults are still present following a power cycle the module has to be replaced. The message headers and flag definitions associated with each bit in the Manufacturing Specific Object are detailed in the table below.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2007	UINT	0x00	Read	Module Info Flags	0	0xFF 0xFF	0

Bit #	Module Error Header	Fault Description
0	Watchdog Valve $\mu$ C	Set if the watchdog caused the last reset of the output stage
1	EEPROM Error	Set if any of the (expected) data stored in the EEPROM has been detected as not-valid
2-7	Reserved	
8	Watchdog COM $\mu$ C	Set if the watchdog caused the last reset of the communication stage
9	Heartbeat Not Toggling	Heartbeat is currently not toggling whilst it should
10	Heartbeat State	Used to troubleshoot the cause of the “Heartbeat Not Toggling” error
11-15	Reserved	

### Manufacturer Specific Object “Output State Behaviour”

The Manufacturing Specific Object “Output State Behavior” applies in case of communication lost (between Controller and P2M Node) and determines the outputs behavior in case of loss of communication, as follow:

Object Value = 0 → Outputs are set to “0”

Object Value = 1 → Outputs are hold to last valid state

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x200D	USINT	0x00	Read/Write	Output State Behavior	0	1	0

## Status / Diagnostic Data and Parameters

### Manufacturer Specific Object "Module Error Input"

The Manufacturing Specific Object "Module Error Input" contains user-friendly diagnostics (in case of errors or faults) provided as Process Data Input.

Index	Data Type	Subindex	Access	Name	Min Value	Max Value	Default
0x2009	UINT	0x00	Read	Module Error Input	0	0xFF 0xFF	0

Bit #	Module Error Header	Fault Description
0	Ack Required	Set if a major fault requiring acknowledgment is detected. All outputs are set to 0. If this bit is set, then a "Leave Failsafe Command" is required to restart the module.
1	AUX Voltage Warning	Set if the Auxiliary Voltage is outside Normal range and within Warning range.
2	AUX Voltage Error	Set if the Auxiliary Voltage is outside Warning and within Error range. The outputs are switched off and an acknowledge is required to restart the module.
3	Temperature Warning	Set if a temperature warning (in one of the output driver chips) is detected. Outputs are switched off and an acknowledge is required to restart the module.
4	Output Driver Channel Error	Set if an over current / short-circuit error has occurred. Outputs are switched off and an acknowledge is required to restart the module.
5	Module Error	Depending on the source of the fault, this error either requires acknowledge or is unrecoverable.
6	Output Stage Not Available	Set if no Auxiliary Power is available. No acknowledge is required
7-15		Reserved



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P2M Node 24DO EtherCAT 

User Manual

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