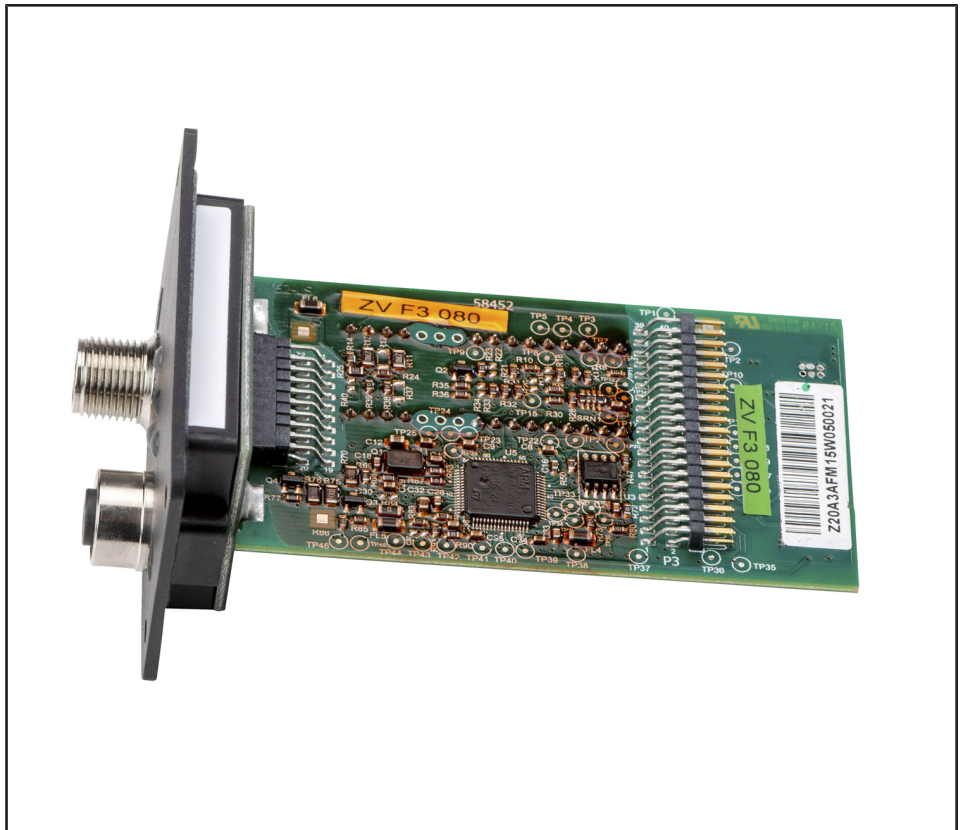Field Bus Module

BACnet MS/TP Gateway

PumpDrive 2

Supplementary Operating Manual

Legal information/Copyright

Supplementary Operating Manual BACnet MS/TP Gateway

Original operating manual

Contents

1 Supplementary Operating Manual

1.1 General

This supplementary operating manual accompanies the installation/operating manual. All information contained in the installation/operating manual must be observed.

Table 1: Relevant operating manuals

Type series	Reference number of the operating/installation manual
PumpDrive 2	4074.81

1.2 Function

The BACnet MS/TP module is used to connect the frequency inverter to a BACnet MS/TP network. A BACnet MS/TP module is required for monitoring and open-loop or closed-loop control purposes for each frequency inverter in single-pump or multiple pump configurations of up to 2 pump sets.

- BACnet = Building Automation and Control Networks
- MS/TP = Master-Slave/Token Passing

Interface The BACnet MS/TP module has a BACnet MS/TP interface.

Communication protocol	BACnet MS/TP
Bus terminator	External interface EIA-485 (RS 485)
Transmission rate	9600 baud, 19200 baud, 38400 baud, 57600 baud, 115200 baud
Device type	B-ASC

Information and downloads on BACnet are available online at http://www.big-eu.org.

The BACnet MS/TP EIA-485 network cable should have the following properties:

- Flexible
- Shielded
- Twisted wires for the data line
- The wave impedance should be between 100 and 130 ohms.
- For more details, see ANSI/ASHRAE standard 135, "Physical Layer" section.

Information on BACnet MS/TP and downloads for BACnet MS/TP are available online at www.bacnet.org. For additional accessories for the BACnet MS/TP module (i.e. M12 connectors and terminating resistors), see the type series booklet.

EDE lists

KSB provides an EDE file on the KSB web site for exchanging PumpDrive-specific BACnet information. The EDE lists document all inbound and outbound objects with the associated defined properties.

1.3 Field bus module connections

The field bus modules are plug-in modules.
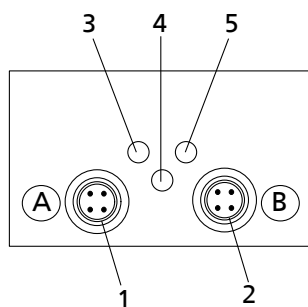
Fig. 1: Field bus module

Table 2: Field bus module

Position	Component	Description
1	M12 connector A	B-coded, 5-pole
2	M12 socket B	B-coded, 5-pole
3	Amber LED signal lamp	Device-internal bus communication OK (heartbeat detected)
4	Green LED signal lamp	Communication: Valid data package received
5	Red LED signal lamp	Token loss (token timeout)

- Can be retrofitted
- Internal T-connector (bus looped through); uninterruptible even in the event of a frequency inverter power failure
- Connector for self-assembly

1.4 Installing the field bus module

The field bus module can be fitted in an available slot of the frequency inverter.

Blind cover

Fig. 2: Blind cover

1	Blind cover

1. Unscrew the cross recessed head screws in the blind cover.
2. Remove the blind cover.

Field bus module

1. Carefully insert the field bus module into the open slot. The plug-in module is guided on rails until it engages in the contact.

Fig. 3: Inserting the field bus module

2. Secure the field bus module using the 4 cross recessed head screws. IP55 enclosure protection is not provided until the screws have been tightened.

Fig. 4: Securing the field bus module

	CAUTION
	Incorrect assembly
	Impairment of protection provided by the enclosure (protection may be compromised)!
	▷ Cover unused M12 connections with a cap (included in the scope of supply).

1.5 Connecting the field bus module

Observe the following when connecting the field bus module:

- Before the bus connection is established among the nodes, potential equalisation must have been implemented and checked.
- For high-frequency shielding, use shielded cables and assemble according to EMC requirements.
- A minimum distance of 0.3 metres is recommended between such cables and other electric conductors.
- Do not use the bus cable to make any further connections in addition to the field bus module (for example, 230 V alert and 24 V start).
- A cable specified for the field bus module must be used as the connecting cable.

	CAUTION
	Incorrect installation
	Damage to the field bus module!
	▷ Never supply power to the field bus module via the M12 connections.
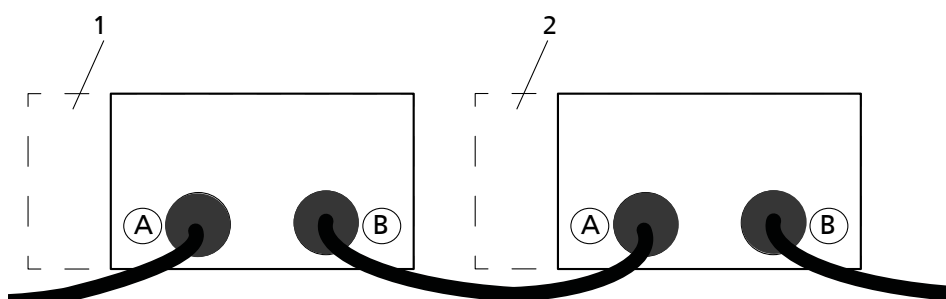
Fig. 5: Connecting the field bus module

Table 3: Connecting the field bus module

Item	Device	M12 connector
1	Frequency inverter 1	M12 connector A: Coming M12 socket B: Going
2	Frequency inverter 2	M12 connector A: Coming M12 socket B: Going

The illustration shows a redundant version with one module for each pump set. For non-redundant versions, the second BACnet module can be omitted.
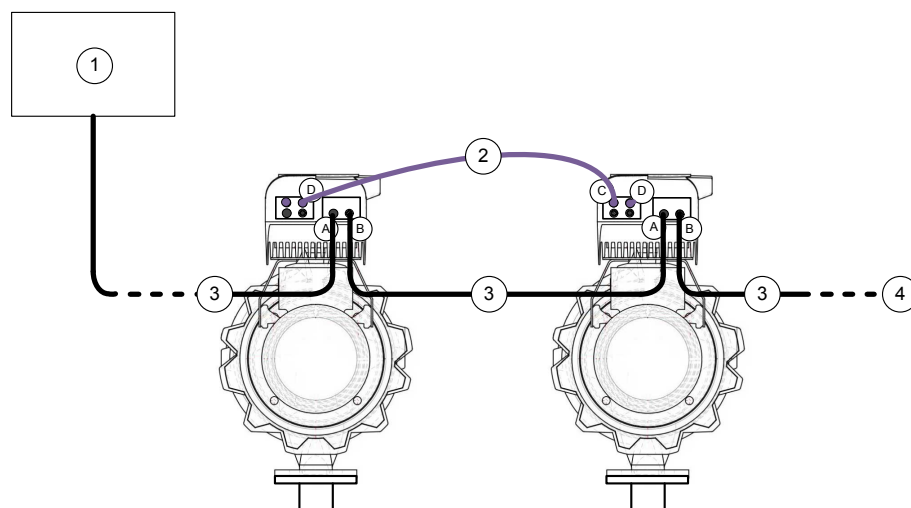
Fig. 6: Connecting a dual-pump system to the BACnet network (example)

1	BACnet A device
2	M12 cable for dual-pump configuration
3	M12 cable, BACnet MS/TP
4	Additional subscribers to BACnet
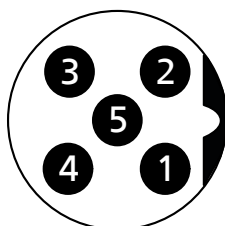
a)   b)
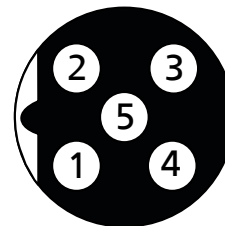
Fig. 7: Pin assignment: a) Module contact arrangement b) Connector contact arrangement

Table 4: Pin assignment

Pin	Conductor colour code, line (CAN open)	Conductor colour code, line (DIN 47100)	Assignment of M12 connector/ M12 socket (B-coding)	Signal
1	-	-	VP (+5 V output)	+5 V
2	Blue	Brown	D-	RS-485 A/data-
3	Black	Green	GND	GND
4	White	White	D+	RS-485 A/data+
5	-	-	Shielding	Shielding
Thread	-	-	Shielding	Shielding

BACnet MS/TP Gateway
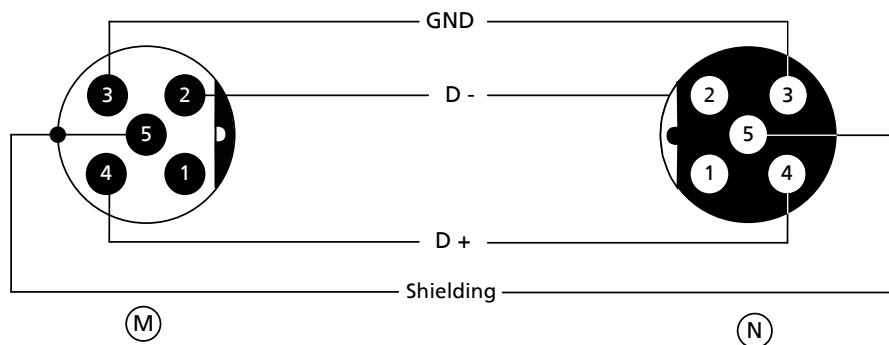
Fig. 8: User-configured cable

Ⓜ	M12 connector	Ⓝ	M12 connector
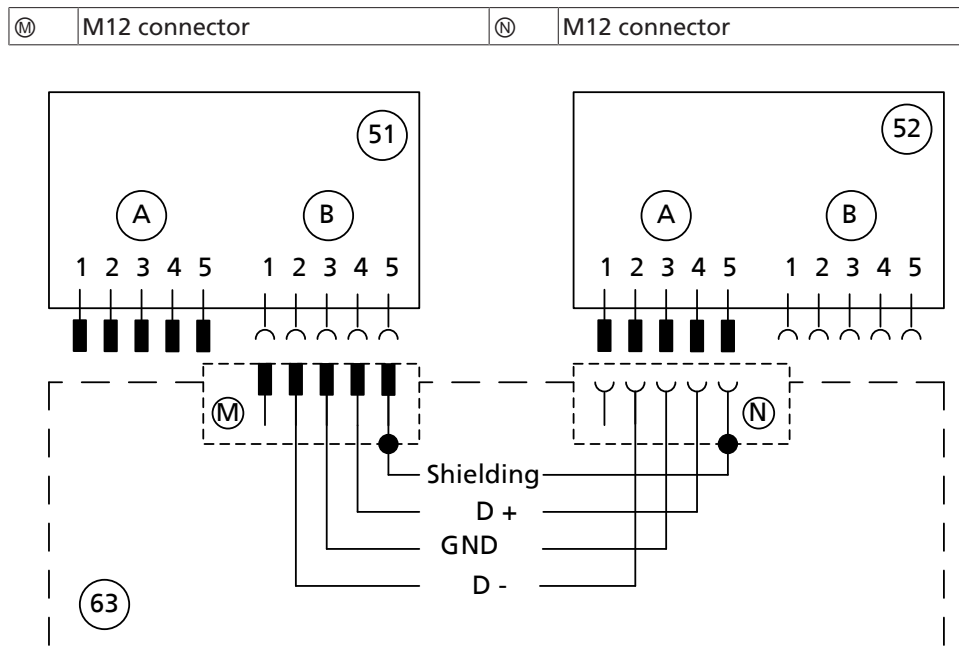
Fig. 9: Wiring diagram

Bus terminator Bus system termination is implemented as follows in line with the BACnet standard:
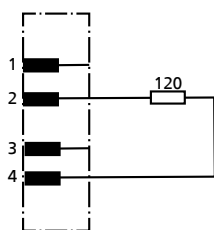
Fig. 10: Bus terminator

Bus termination with polarisation is implemented at the start of the MS/TP bus in line with the BACnet standard (typically at the BACnet router).

> **NOTE**
>
> The frequency inverter is reset when a field bus module is replaced or retrofitted. Menu 3-12 for setting the parameters of the field bus module is then enabled in the control panel.

1.6 Setting the parameters of the field bus module

Field bus control must be activated in the frequency inverter when using the field bus module.

Settings for the slave address and the control point are made at the control panel of the frequency inverter.

Table 5: Parameters for BACnet MS/TP module

Parameter	Description	Possible settings	Factory setting
3-6-2	Control Point *Activating the field bus as control point. Digital inputs and analog inputs have the highest priority. The actual value source must be configured separately.*	▪ Local ▪ Field Bus	Local
3-6-3	Actual Value Source *Selecting the source for the actual value: Activating the field bus as the actual value source. Analog inputs or PumpMeter have the highest priority.*	▪ Local ▪ Field Bus	Local
3-12-5-1	Device Identification *Device Object Instance Number*	0-4194303	Generated value
3-12-5-2	MS/TP MAC Address *Network address in accordance with MS/TP frame format*	1-254	254
3-12-5-3	Baud Rate *Baud rate of the BACnet slave*	▪ 9600 ▪ 19200 ▪ 38400 ▪ 57600 ▪ 115200	38400
3-12-5-4	Pump Number *Unique number of the pump in the multiple pump system* *Only required when a single gateway is used in a multiple pump system. Only required when pump values are to be read by several drives via one gateway.* **NOTE! If pump number 1-2 is not assigned in the multiple pump system, the pump values of the drive in which the gateway is located are automatically displayed at PD2-1-###### and PD2-2-###### .**	▪ 0 = disabled 1 = pump values are displayed at PD2-1-###### 2 = pump values are displayed at PD2-2-######	0
3-12-5-5	Communication Failure Monitoring Time *If the BACnet module is not in the token cycle of the MSTP network for a longer period of time, a broken wire is reported.*	0...60 s	20 s
3-12-5-6	Device Name *Device name for device identification in the network*	Configuration via configuration tool, maximum of 32 characters	KSB PumpDrive
3-12-5-7	Device Description *Device description for device identification in the network*	Configuration via configuration tool, maximum of 32 characters	KSB PumpDrive
3-12-5-8	Installation Location *Installation location of the BACnet subscriber*	Configuration via configuration tool, maximum of 32 characters	KSB PumpDrive

> **NOTE**
>
> If the field bus is only used for monitoring purposes, the Control Point parameter *(3-6-2)* is set to Local.

1.7 Operation of frequency inverter with BACnet MS/TP

The frequency inverter fulfils device profile B-ASC as per BACnet standard ANSI/ASHREA135-2010. All BACnet characteristics required for the device type and interoperability range are fulfilled. Additional properties are also supported. All supported capabilities of the BACnet module are listed in the "Protocol Implementation Conformance Statement" (PICS).

Data exchange The data sharing objects used and mapping of the PresentValue characteristics to frequency inverter parameters are summarised in the following table.

Table 6: Data sharing objects in the frequency inverter: System parameters (PD2-A-…)

Object name	Object type	Unit/StateText table	KSB menu number	Description	Value range	Comment
PD2-A-RemoteControl	5 (BV)	2	3-6-2	Control Point	0 = Local	The control point selected via the HMI has equivalent priority with the field bus (the value written last is valid); the control point selected via the digital input has higher priority.
					1 = Field Bus	
PD2-A-RemoteFeedback	5 (BV)	2	3-6-3	Actual Value Source	0 = Local	The actual value source selected via the HMI has equivalent priority with the field bus (the value written last is valid); the analog input actual value source has higher priority.
					1 = Field Bus	
PD2-A-StartStop	5 (BV)	2	1-3-1	System Start / Stop	0 = Stop	The control point must reference the field bus for writing.
					1 = Start	
PD2-A-Feedback	2 (AV)	PERCENT	1-2-3-1	If actual value source = field bus	-	The actual value source must reference the field bus for writing.
PD2-A-Setpoint	2 (AV)	PERCENT	1-3-2	Setpoint (Closed-loop Control)	-	The control point must reference the field bus for writing.
PD2-A-ControlPoint	2 (AV)	PERCENT	1-3-3	Control Value (Open-loop Control)	-	-
PD2-A-ControllerMode	19 (MV)	3	3-6-1	Type of Control	1 = Open-loop Control	The HMI has equivalent priority with the field bus (the value written last is valid).
					2 = Discharge Pressure	
					3 = Inlet Pressure	
					4 = Differential Pressure	
					5 = Differential Pressure (Sensorless)	
					6 = Flow Rate	
					7 = Temperature (Cooling)	

Object name	Object type	Unit/StateText table	KSB menu number	Description	Value range	Comment
PD2-A-ControllerMode	19 (MV)	3	3-6-1	Type of Control	8 = Temperature (Heating)	The HMI has equivalent priority with the field bus (the value written last is valid).
					9 = Fill Level/Draining	
					10 = Fill Level/Filling	
					11 = Flow Rate (Sensorless)	
PD2-A-DynamicPressureComp	19 (MV)	19	-	Dynamic pressure compensation function	1 = OFF	The HMI has equivalent priority with the field bus (the value written last is valid).
					2 = Speed	
					3 = Flow Rate	
PD2-A-DischargePressure	0 (AI)	BARS	1-2-3-3	System Discharge Pressure	-	-
PD2-A-SuctionPressure	0 (AI)	BARS	1-2-3-2	System Suction Pressure	-	-
PD2-A-DifferentialPressure	0 (AI)	BARS	1-2-3-4	System Differential Pressure	-	-
PD2-A-Flow	0 (AI)	CUBIC-METERS-PER-HOUR	1-2-3-5	Flow System	-	-
PD2-A-Temperature	0 (AI)	DEGREES-CELSIUS	1-2-3-7	Temperature	-	-
PD2-A-Level	0 (AI)	METERS	1-2-3-6	System Level	-	-
PD2-A-MaxPumps	2 (AV)	NO-UNITS	3-7-2	maxAllowedPumps	-	The HMI has equivalent priority with the field bus (the value written last is valid).
PD2-A-ExecPumpChange	5 (BV)	2	1-3-5	execute PumpChange	-	-
PD2-A-ExecPipeFlush	5 (BV)	2	1-3-7	Immediate Pipe Flushing	-	-
PD2-A-CombinedAlarm	13 (BI)	5	-	Collective alert, system	-	-
PD2-A-CombinedWarning	13 (BI)	1	-	Collective warning, system	-	-

	NOTE
!	In the object name, # must be replaced with the pump number of the respective pump set; see menu 3-12-5-4. If pump number 1-2 is not assigned in the multiple pump system, the pump values of the drive in which the gateway is located are automatically displayed at PD2-1-###### and PD2-2-###### .

Table 7: Data sharing objects in frequency inverter: Pump parameters (PD2-#-…)

Object name	Object type	Unit/StateText table	KSB menu number	Description	Value range	Comment
PD2-#-PumpState	13 (MI)	5	1-7-10	PumpState	1 = Not Connected	-
					2 = Stopped	
					3 = Running	
					4 = Running Down	
					5 = Starting Up	
					6 = Disabled	
					7 = Disabled In Operation	
					8 = Idle Mode	
					9 = Disabled, Starting Up	
					10 = Disabled, Running Down	
PD2-#-CombinedAlarm	3 (BI)	1	-	Collective alert, frequency inverter	-	-
PD2-#-CombinedWarning	3 (BI)	1	-	Collective warning, frequency inverter	-	-
PD2-#-OperatingMode	19 (MV)	18	1-3-8	Operating mode	1 = OFF	The control point must reference the field bus for writing.
					2=M	
					3=AUTO	
PD2-#-ControlPointMan	0 (AI)	REVOLUTIONS-PER-MINUTE	1-3-4	Control Value (Manual)	-	The control point must reference the field bus for writing.
PD2-#-Speed	0 (AI)	REVOLUTIONS-PER-MINUTE	1-2-1-1	Speed	-	-
PD2-#-ShaftPower	0 (AI)	KILOWATTS	1-2-1-3	Pump Input Power	-	-
PD2-#-PowerConsumption	0 (AI)	KILOWATTS	1-2-1-4	Pump Set Input Power	-	-
PD2-#-MotorCurrent	0 (AI)	AMPERES	1-2-1-5	Motor Current	-	-
PD2-#-MotorVoltage	0 (AI)	VOLTS	1-2-1-6	Motor Voltage	-	-
PD2-#-Frequency	0 (AI)	HERTZ	1-2-1-7	Output Frequency	-	-
PD2-#-DcLinkVoltage	0 (AI)	VOLTS	1-2-1-8	DC Link Voltage	-	-
PD2-#-Torque	0 (AI)	NEWTON-METERS	1-2-1-11	Motor Torque	-	-
PD2-#-SuctionPressure	0 (AI)	BARS	1-2-2-1	Pump Suction Pressure	-	-
PD2-#-DischargePressure	0 (AI)	BARS	1-2-2-2	Pump Discharge Pressure	-	-

BACnet MS/TP Gateway

Object name	Object type	Unit/StateText table	KSB menu number	Description	Value range	Comment
PD2-#-DiffPressure	0 (AI)	BARS	1-2-2-3	Pump Differential Pressure	-	-
PD2-#-Flow	0 (AI)	CUBIC-METERS-PER-HOUR	1-2-2-4	Pump Flow Rate	-	-
PD2-#-kWhCounter	0 (AI)	KILOWATT-HOURS	1-4-1-1	Energy Meter (kWh)	-	-
PD2-#-OperatingTimeFC	0 (AI)	HOURS	1-4-2-1	Frequency Inverter Operating Hours	-	-
PD2-#-OperatingTimePump	0 (AI)	HOURS	1-4-2-3	Pump Operating Hours	-	-
PD2-#-PowerOnCount	0 (AI)	NO-UNITS	1-4-2-5	Number of Starts	-	-
PD2-#-NextMainenance	0 (AI)	HOURS	1-6-1	Time to Service	-	-
PD2-#-DigitalOutputs	3 (BI)	2	1-2-4-7	Digital Outputs	-	-
PD2-#-ExecFunctionRun	5 (BV)	2	1-3-2	executeFunctionRun	-	-
PD2-#-ResetFault	5 (BV)	2	-	Fault acknowledgement/ reset	-	-

Table 8: Properties of data sharing objects

Data Sharing Object	Properties
Event_State	As the PumpDrive does not support event reporting, the Event_State is always "NORMAL".
Out_Of_Service	Can be controlled from the BACnet side. If Out_Of_Service TRUE (1), the parameter is no longer overwritten by BACnet and Present_Value is no longer updated from the PumpDrive side.
Reliability	If process values are formed via analog inputs and the analog outputs are outside the measuring range, Reliability is set to "UNRELIABLE_OTHER" (13). Otherwise, Reliability is "NO_FAULT_DETECTED" (1).
Status flags	
IN_ALARM	FALSE (0) if Event_State = NORMAL (0), otherwise TRUE (1)
IN_FAULT	FALSE (0) if Reliability = "NO_FAULT_DETECTED", otherwise TRUE (1)
OVERRIDDEN	TRUE (1) indicates that Present_Value cannot be accepted by BACnet services.
OUT_OF_SERVICE	Set in relation to the Out Of Service property; used only on the BACnet side.
Relinquish_Default	Standard value if all priority values for Present_Value have the value ZERO. If the OVERRIDDEN status flag = TRUE, the active value is accepted in PumpDrive.

Data Sharing Object	Properties
COV_Increment	COV_Increment indicates the minimum required change to the Present_Value property for a COVNotification to be sent to the respectively configured COVClients.
Notification_Class	FALSE (0): COV is deactivated
	TRUE (1): COV is activated.

BACnet MS/TP Gateway

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