

# USER MANUAL

FOR OPAT

## ONBOARD PROFIBUS AMPLIFIER TWIN SOLENOID

### For Model Type:

BTN, SDE, XS

EX eb ib mb IIC T4 Gb

EU TYPE CERTIFICATE: Presafe 14 ATEX 5271X

IECEX CERTIFICATE: IECEX PRE 14.0036X



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## INTRODUCTION

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OPAT is an electromechanical control unit for proportional directional and pressure relief valves. It can control two separate solenoids with total power consumption of up to 800 Ma, but not simultaneously.

OPAT is ATEX and IECEx approved according to NS-EN60079 (IECEX 60079) for use in potentially explosive atmospheres.

The unit is primarily intended for use with Hawe PM pilot valves. Units with model codes BTN or SDE feature a built-in solenoid, whereas units with model code XS have a separate connection housing for an external solenoid. The power consumption of external solenoid must not exceed 800 mA

The control system communicates with Profibus or CANbus, depending on type. All types have a series of analogue inputs for use when bus communication is not required.

The unit has been manufactured in compliance with applicable regulations and standards, see Declaration of Conformity for details. As the unit has been type approved according to these standards, any alteration or modification of the unit which is not specifically described in this User Manual will void the type approval, and relieve the manufacturer/distributor of any responsibility.

This User Manual is intended for personnel with relevant training, and it is essential that any person installing, commissioning or adjusting the unit has in-depth knowledge of the contents of the User Manual and the following technical data sheets:

Doc. No	Title	Revision
1435693	Technical Manual	A1
1435696	Profibus Manual	A1

## KEY DATA

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<b>Type Approval:</b>	Presafe 14 ATEX 5271X, <b>CE</b> 2460 IECEX PRE 14.0036X
<b>Identification:</b>	II 2G Ex eb ib mb IIC T4 Gb
<b>Temperature Range:</b>	Ambient: -40 to +55°C (-4 to +131°F)
<b>IP Class:</b>	IP67
<b>Max. Current:</b>	1 [A]
<b>External Fuse:</b>	10 [A]
<b>Max. Voltage:</b>	24 VDC SELV DC supply with max. 24VDC +10%
<b>BUS Protocols:</b>	Profibus DP V2 CANbus (proprietary, internal communication between the units)

## ATEX, IECEX – POTENTIALLY EXPLOSIVE ENVIRONMENT

OPAT has been type approved according to the following EX Standards:

EN 60079-0:2012, EN 60079-7:2015, EN 60079-11:2012, EN 60079-18:2015

IECEX:

IEC 60079-0:2011, IEC 60079-7:2015 IEC 60079-11:2011, IEC 60079-18:2014

## EMC

The unit complies with the following standards for EMC compatibility:

DIN EN 61000-4-2	Electrostatic Discharges
DIN EN 61000-4-3	Radiated, Radio-frequency, EM field
DIN EN 61000-4-4	Electrical Fast Transient / Burst Immunity
DIN EN 61000-4-5	Surge Immunity
DIN EN 61000-4-6	Immunity to Conduct Disturbances, Induced by RF Field
DIN EN 61000-6-3	Radio Disturbances
Germany Lloyd VI – Part 7 2003	Terminal Voltage
	Radio Disturbances



Exterior Dimensions

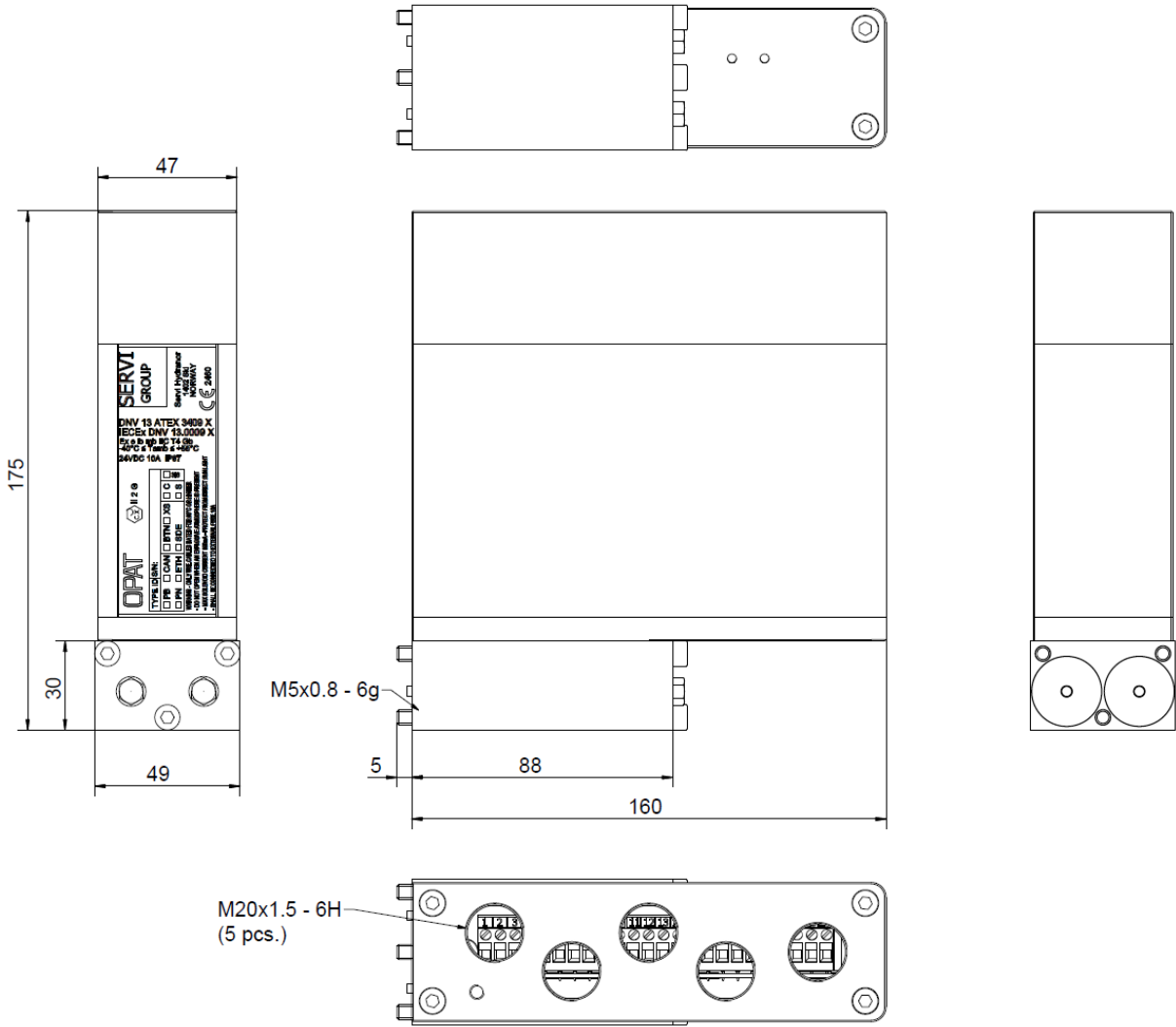


Figure 2

## SDE - COMPONENT OVERVIEW

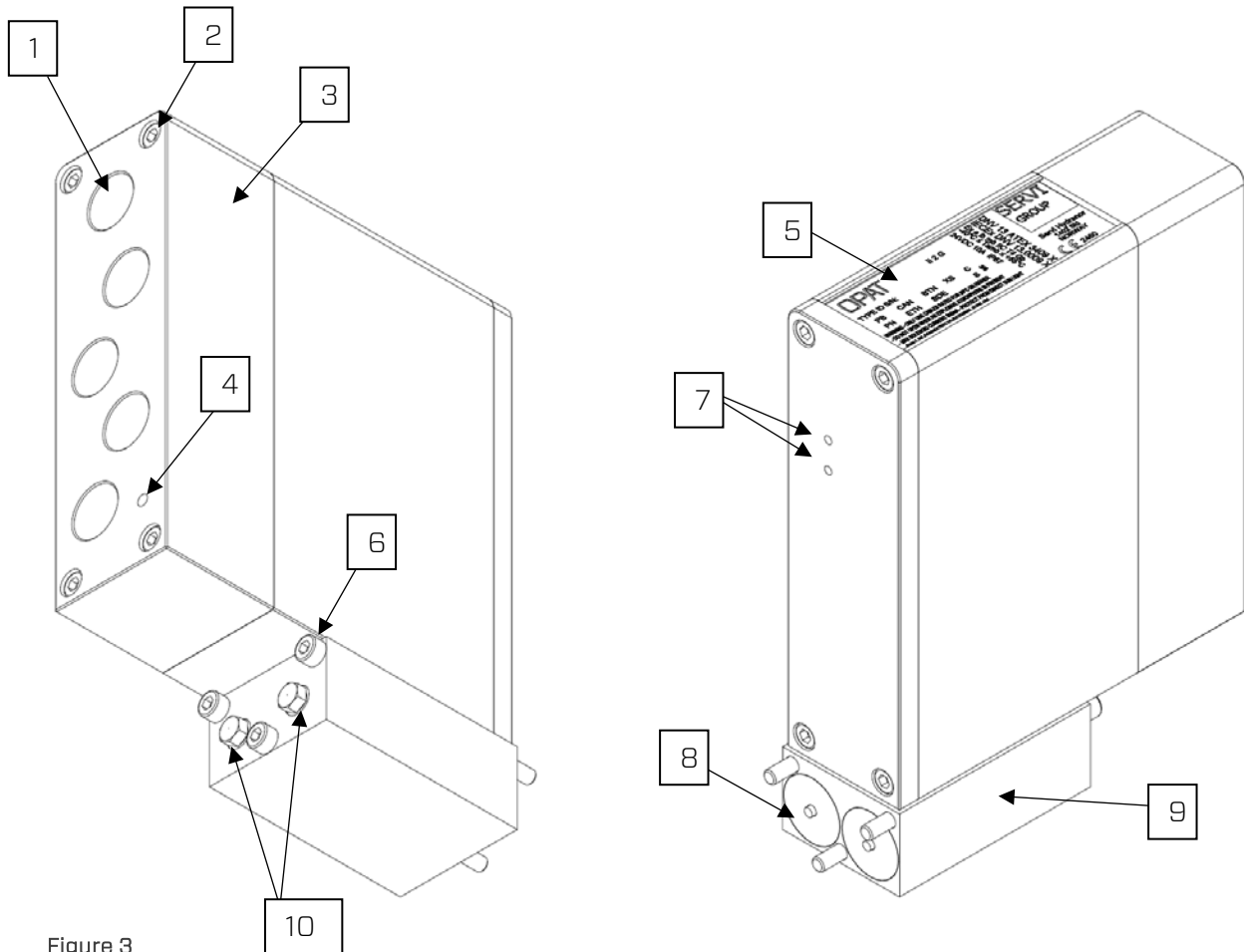


Figure 3

Pos	Component	Torque
1	Threaded cable entry M20x1.5	See Nipple Manual
2	Fastening screws for top cover	6 Nm
3	Top cover	
4	Earthing connection M5, 10 mm depth	6 Nm
5	Name plate	
6	Fastening screws for OPAT	5,5 Nm
7	LED status lamps	
8	Attachment surface, OPAT to valve	
9	Solenoid	
10	Emergency controls	6 Nm





## XS - COMPONENT OVERVIEW

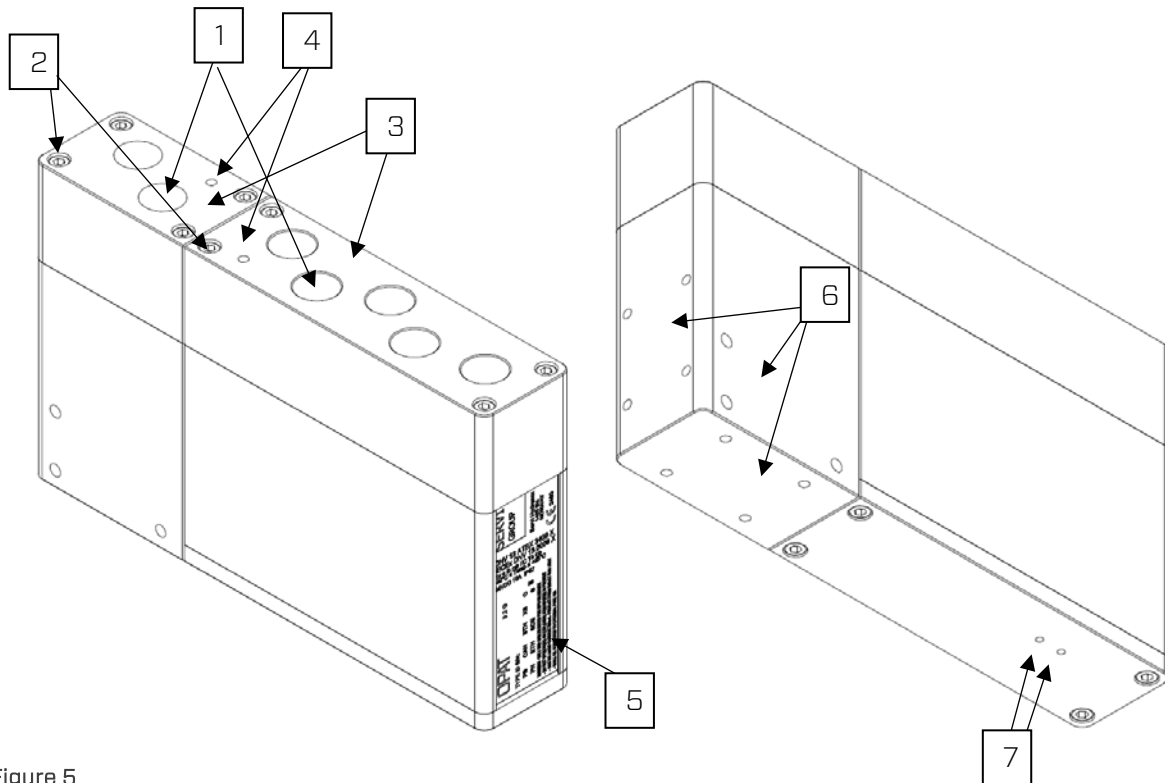


Figure 5

Pos	Component	Torque
1	Threaded cable entry M20x1.5	
2	Fastening screws for top cover	6 Nm
3	Top cover	
4	Earthing connection M5, 10 mm depth	6 Nm
5	Name plate	
6	Fastening holes OPAT	See Installation
7	LED status lamps	



## CABLES, CABLE ENTRIES AND EARTHING

All cables used with the unit must as a minimum withstand a temperature of 90°C (194°F). Always adhere to the cable manufacturer's instructions regarding bending radius etc. When using Profibus, a Profibus approved cable is recommended.

The required cable cross-section depends on the load on the cable, the number of units etc., and must be considered carefully. The largest permissible cross-section in the connection clamps is 2.5 mm<sup>2</sup>.

Electric cables must meet all applicable regulatory requirements of the countries in which the unit is used.

The threads in the cable entries are M20X1.5, with a total of 5 entries on BTN and SDE, and 7 entries on XS. The thread depth is 15 mm.

Any cable bushings or connection blocks used with the unit must be approved for the EX zone in which the unit is installed. The cable entries must withstand a temperature of 90°C (194°F).

If any of the threaded cable entries are not used, they must be sealed off with an EX approved plug.

The unit is fitted with earthing connections on the inside of the top cover (Pos 3, Figure 1 and 3). These must be used for earthing shielded cables, unless special cable entries for shielded cables are used. Use only screws and spring washers in AISI 316 stainless steel.

Internal earthing:

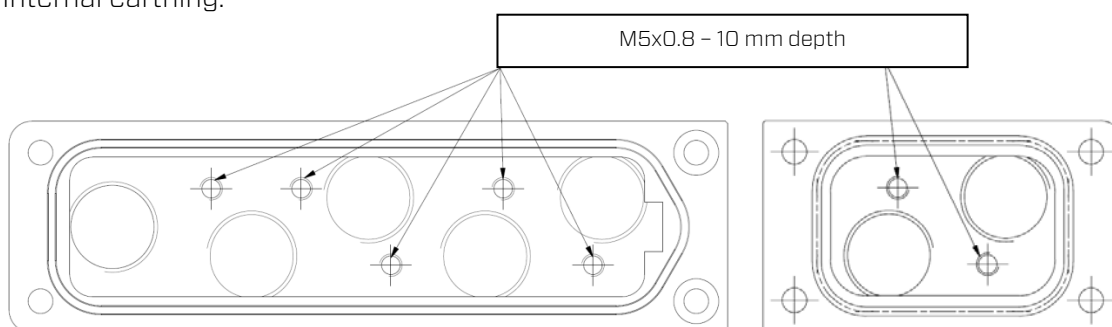


Figure 7

The unit may be connected to an exterior earthing system using the unit's external earthing connection (Pos 4 in Figure 1 and 3). **If the screw in the external earthing connection is replaced, a M5 x 10 screw and spring washer in min. A4-70 (AISI 316) quality must be used.** The spring washer is required to maintain the ATEX certification. The unit must be earthed using minimum 4 mm<sup>2</sup> cable and suitable cable terminals.

## MARKING

The name plate must not be removed or painted over.

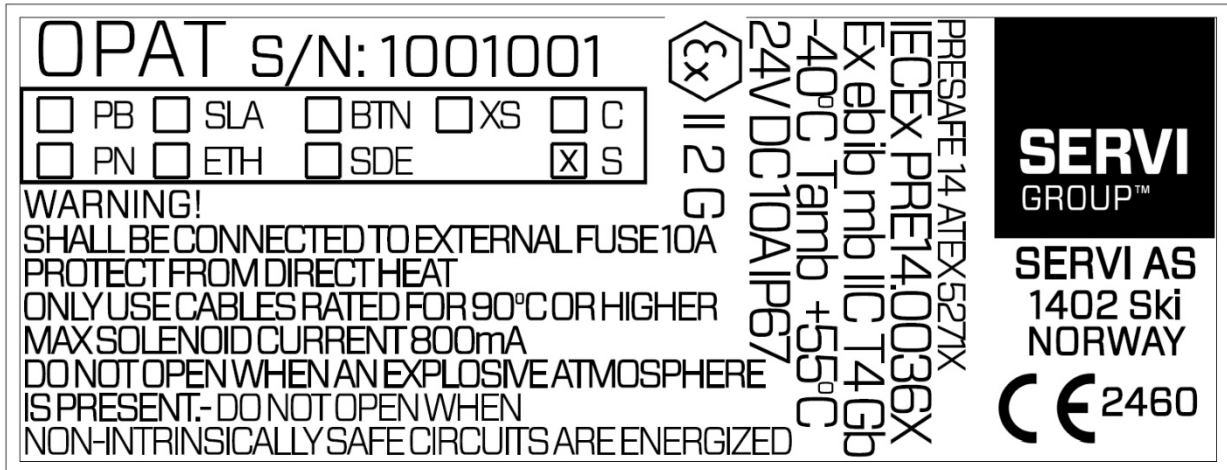


Figure 8

Model and specifications are indicated by ticking the boxes under TYPE ID on the name plate:

ID	Modelltype
PB	Profibus DP V1
SLA (CAN)	Slave (CANbus -proprietary)
BTN	Bottom-mounted solenoid, see <a href="#">Figure 1</a>
PN	Profinet (future version)
ETH	Ethernet (future version)
SDE	Side-mounted solenoid, see <a href="#">Figure 3</a>
XS	OPAT for external solenoid, see <a href="#">Figure 5</a>
C	Terminal for cable connection has spring clamps.
S	Terminal for cable connection has screw clamps.

## SAFE USE

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If an error occurs that is not described in this manual or the Technical Manual, immediately take the unit out of operation, and contact the manufacturer/distributor.

**Do not open /dismount the cover in a potentially explosive atmosphere. The unit is constructed in compliance with Protection Class IP67, but this only applies if the lid is correctly installed.**

All work performed on the unit, such as installation, maintenance, replacements or similar, shall be performed by personnel with the required training and qualifications according to applicable regulations in the country of use. The personnel must also have sufficient knowledge of the unit, to ensure that no errors occur due to faulty mounting, connection, adjustment, or similar.

Changing the parameters of the unit during operation shall only occur if the operator carrying out the modification has the necessary training, to ensure correct functioning of the unit. The operator shall also ensure that the change in parameters does not cause unwanted movement of the machine on which the unit is installed, resulting in personal injuries or damage to property. See separate manual for bus communication and parameter adjustment. **Note especially that all changes in parameters will have immediate effect, also during operation.**

**The unit must under no circumstance be opened or dismantled in a potentially explosive atmosphere.** A so-called «hot permit» or similar must be issued at the operator's own risk and responsibility.

The safety instructions given in the Technical Manual (adjustment manual) for the control board must be followed at all times.

Do not try to remove or puncture the moulding inside the unit with a sharp object. The moulding is soft, and this may damage the electronics on the control board.

Protect the LED lamps from sharp objects, and do not try to insert anything into the openings.

The unit has the following surface treatment:

Solenoid:     DIN 50979 Fe//ZnNi8//Cn//TO  
Other:        Anodising

According to IEC 60079-0 2011, Chap. 7.4, it is not permitted to paint the unit with a paint layer thicker than 0.2 mm.

## INSTALLATION

In order to avoid personal injury or damage to equipment and property, the installation must comply with NS-EN 60079-0 (ISO 60079-0) in addition to the requirements set out in this manual.

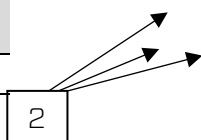
The unit must be mounted in such a way that it is protected against external heat sources which can make the surrounding temperature exceed the permissible temperature. In particular, heat sources emitting radial heat (e.g. direct sunlight) must be taken into consideration.

Do not install the unit so that it carries more weight than its own. Cables must be fastened using suitable equipment (cable ducts etc.).

**The supply voltage must be SELV DC with a maximum outlet voltage of 24 VDC +10%.**

Install a 10 Amp fuse in the safe zone on the power supply of the first unit (Master) in the assembly.

Pos	Component	Torque
1	OPAT	
2	Fastening screws	5.5 Nm
3	Hawe SLF 5	



Attach the unit to the valve with the screws in Pos. 10 (Figure 7). Use only the original screws included in the delivery of the unit.

Make sure the O-rings around the pilot valves are in place – follow the instructions from the valve manufacturer.

Connect the unit according to the wiring diagram on the next page. See the Technical Manual for details.

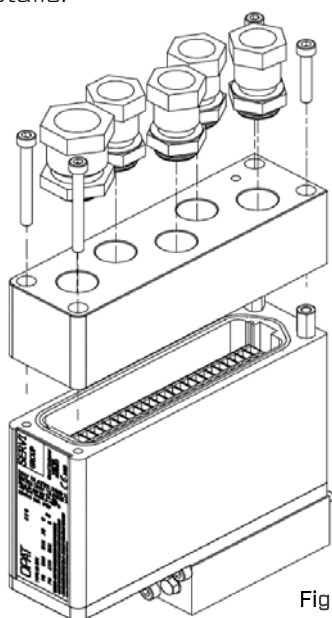


Figure 9

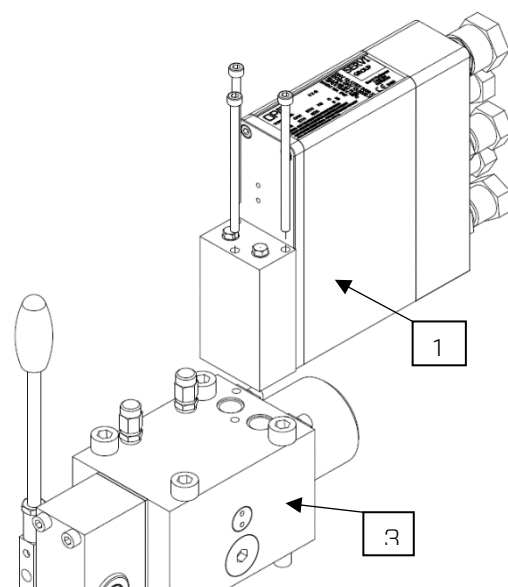


Figure 10 - Example of installation on Hawe SLF 5

Install the cover when the unit is connected. Make sure that no cables are trapped during the installation.

## XS - EXTERNAL SOLENOID

Type XS has a connection housing for an external solenoid. A Hawe Twin Solenoid or other solenoid with a **max.** current of 800 mA may be used.

Ensure that the external valve's EX approval meets the requirements of the zone in which you are installing the valve.

The external solenoids are to be connected in the additional module for OPAT XS. Dismount Position 4 in Figure 11 to access the connection clamps.

**The unit is not a barrier. Solenoids requiring such equipment cannot be used without making further adjustments.**

The total power consumption of the solenoid must not exceed 800 mA. It is possible to use two solenoids with a current of 800 mA each, but they cannot be activated simultaneously. This limitation is also applied in the control board.

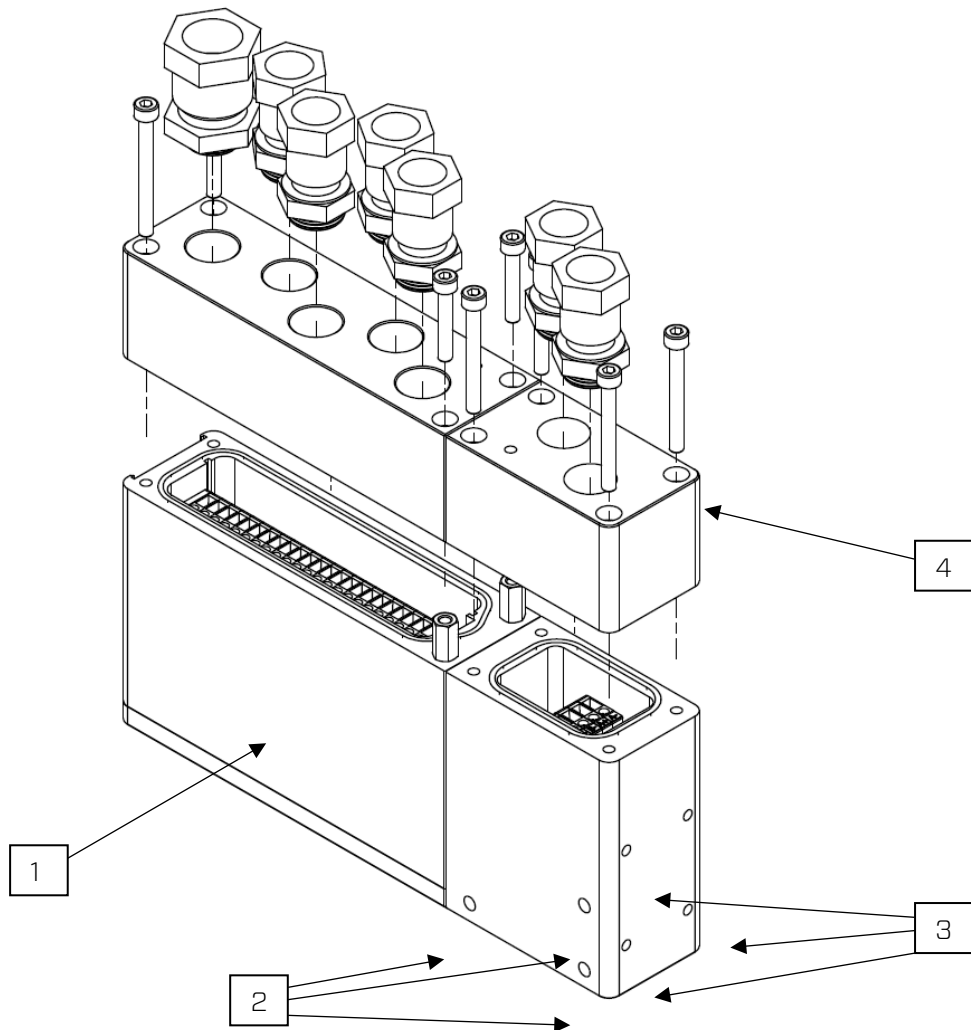


Figure 11

Pos	Component
1	OPAT
2	Fastening holes, throughgoing Ø5,5
3	Fastening holes, threaded M5x0.8 - 6mm depth



## WIRING DIAGRAM

Connecting cables:

For type S: Strip the cable 9 mm from the end, torque 0.4 – 0.5 Nm.

For type C: Strip the cable 10 mm from the end.

The wiring diagram can also be found in the Technical Manual.

### Opat BTN/SDE - PB

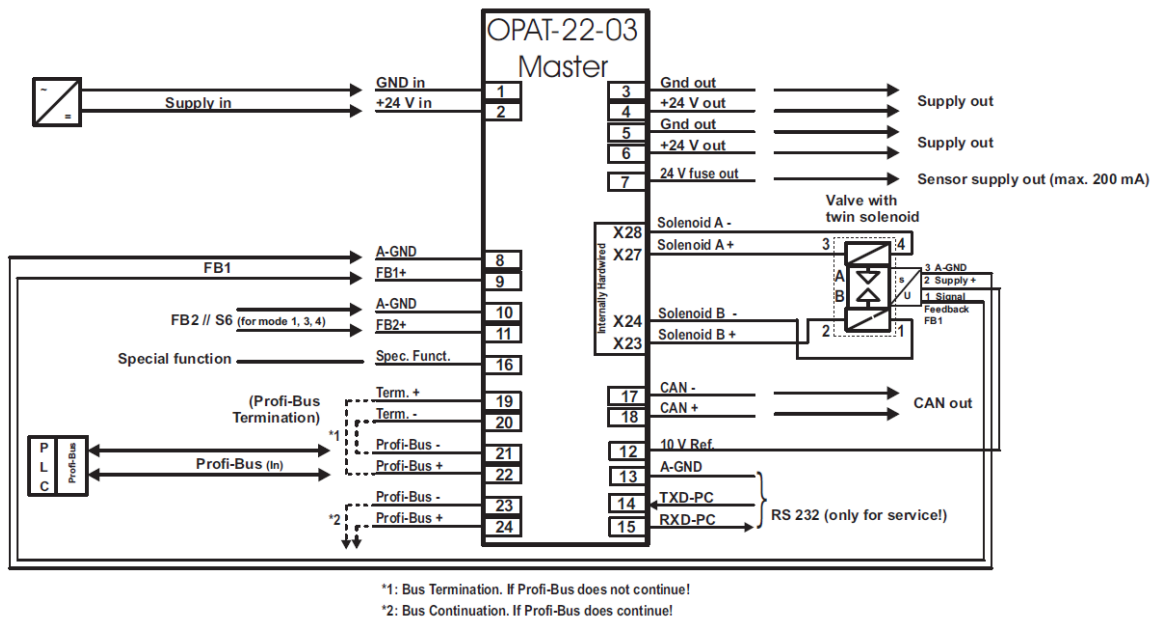


Figure 12

### Opat BTN/SDE - CAN

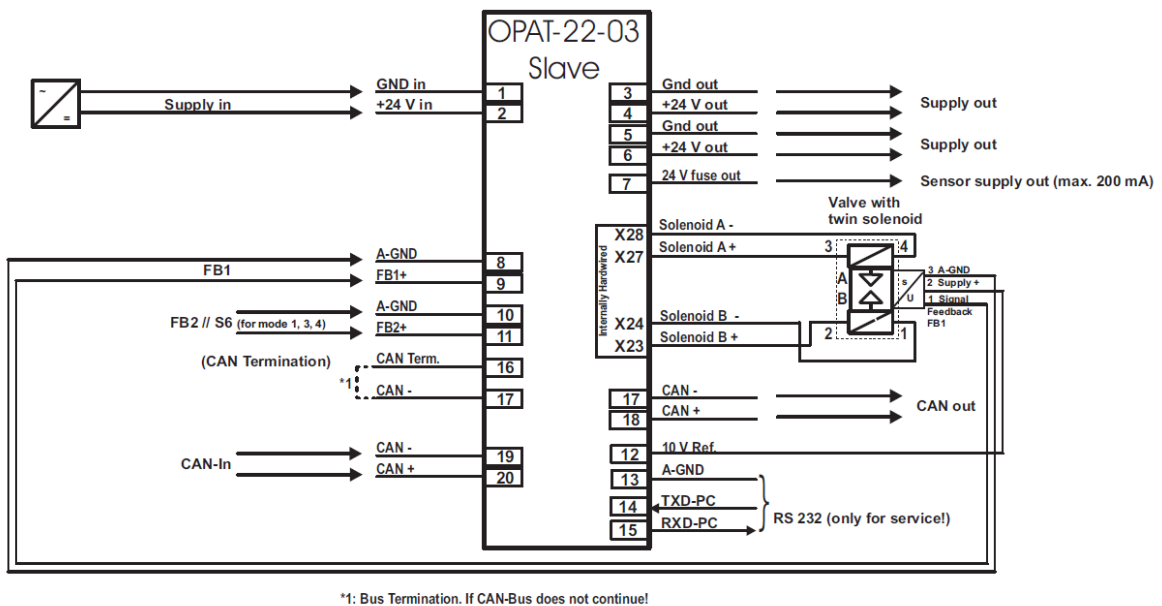


Figure 13

### Opat XS - PB

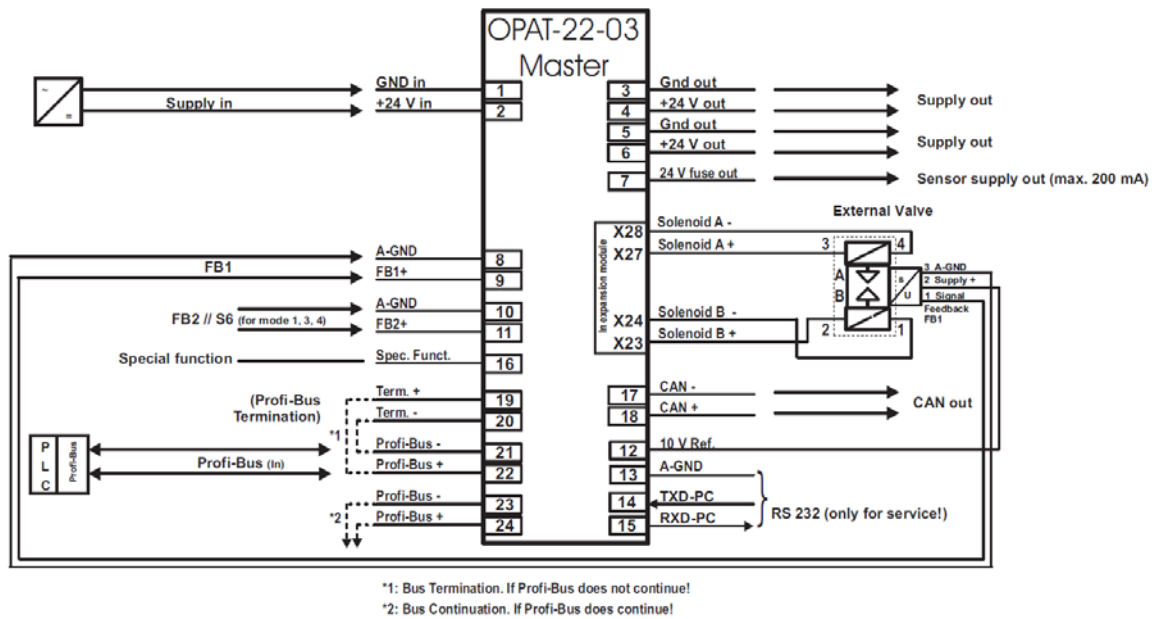


Figure 14

### Opat XS - CAN

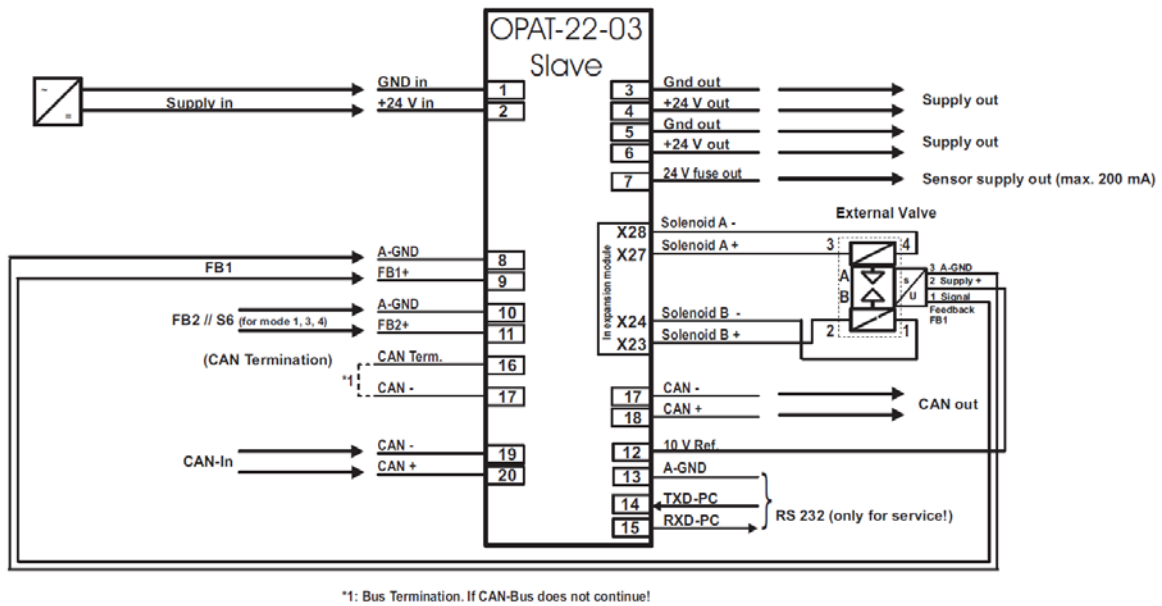


Figure 15

## Profibus topology

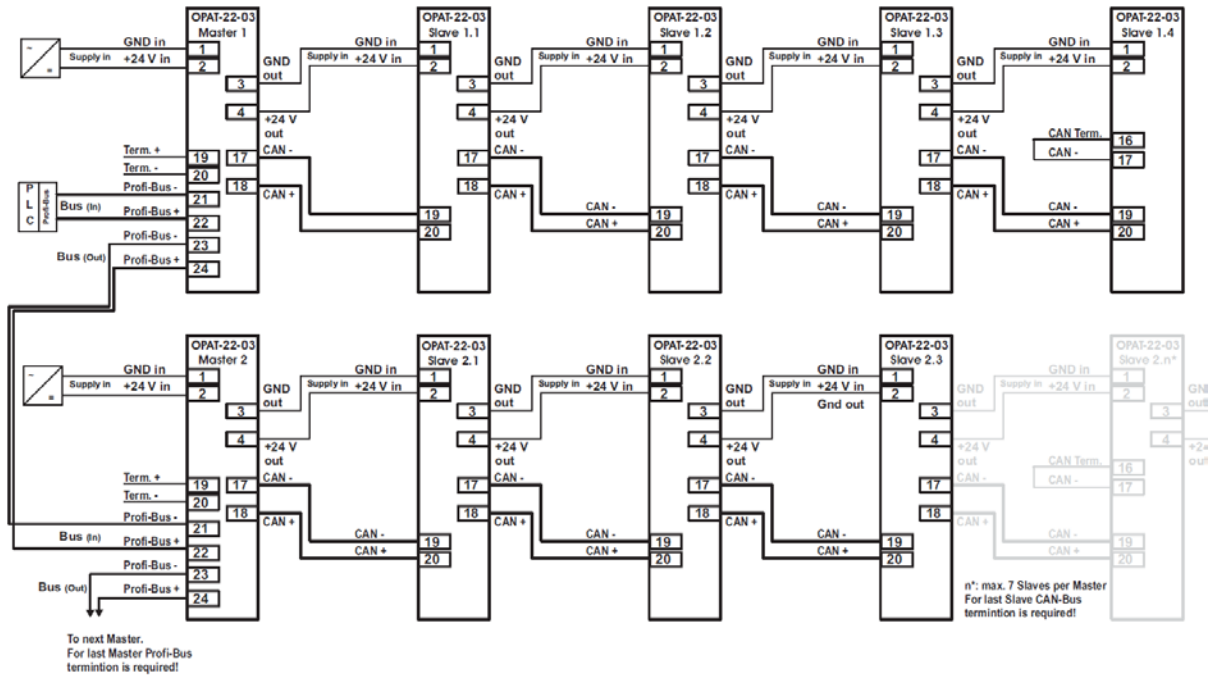


Figure 16

The CANbus protocol that is used in the CAN edition of the unit is a proprietary protocol and cannot be used with CANopen or similar. A PB version is functioning as master on the CANbus network. Commands to the CAN units are sent to the CAN master via Profibus.

If you are using the unit in a Profibus network, or other bus network, see the separate manual for bus communication, addressing and related information.

GSD files for communication with Profibus can be obtained by request from the distributor.

## EXTERNAL SENSOR

When OPAT is used with an external sensor, it is important to ensure that the sensor meets the EX requirements for the zone in which it is installed. Also pay close attention to the ambient temperature. Always follow the manufacturer's instructions for the sensor.

**The unit is not a barrier. Solenoids requiring such equipment cannot be used without making further adjustments.**

The sensor's maximum power consumption must not exceed 100 mA.

Compatible signal types are 0-20mA, 4-20mA,  $\pm 10$ VDC.

## START-UP AND COMMISSIONING

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Starting the unit for the first time after maintenance or new installations, must be done with caution, so that it is possible to stop quickly if errors should occur, in order to avoid personal injury or damage to equipment or property.

Before the unit is put into operation, the parameters in the control board software must be adjusted. If the unit is connected to a valve, it should be started before the hydraulic system is started.

**Please note that when an external sensor is calibrated using HCS Tool auto-calibration tool, any command to the connected valve may cause unwanted movement of the machine. Follow the on-screen instructions and be careful!**

**Pay special attention to polarity errors in the position sensor(s), which may cause an unwanted activation of the valve.** When running the valve for the first time, set the control board to «Open-loop». Then check in the HCS Tool monitor screen that the sensor has the correct polarity, before activating «Closed-loop». You also need to do this if you have replaced the sensor or performed maintenance on the system.

The signals given over the bus network should also be checked before the unit is put into operation. This is done in the HCS Tool monitor screen. See further details in the Technical Manual.

When using an external solenoid, it is important to connect the right solenoid to the right control board output. Misconnection can cause unwanted movement. Ensure that everything is correctly connected before putting the machine into operation. See wiring diagram for more details.

## MAINTENANCE INSTRUCTIONS

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The unit must not be covered with anything that may insulate its surface. The unit may be cleaned gently with a high-pressure hose using tempered water.

**If the unit shows signs of heavy corrosion, mechanical damage or other problems, remove from operation immediately and contact the distributor.**

If the moulding inside the unit has been damaged, the unit must be taken out of operation.

**If the gasket on the cover is damaged, the whole cover must be replaced.** Use only the original screws included in the delivery. The cover may only be replaced by qualified personnel. Also check the surface of the gasket in the main housing for damage/corrosion.

**Repair of the unit must be performed by authorised personnel or distributor representatives,** and only as and when approved by the manufacturer.

## PERIODIC MAINTENANCE

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There are no specific requirements for periodic maintenance of this unit. However, if the unit has been exposed to a corrosive environment, powerful vibrations or other external influences which may shorten its lifespan, it is necessary to assess the risk of damage and, if required, develop a plan for periodic inspection. Pay particular attention to the risks which may damage the unit's EX protection. In case of doubt, contact your OPAT distributor.

## STORAGE

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For long-term storage (more than 24 months), the unit should be placed in an antistatic bag in a tempered room (+5 to +25°C). Recommended humidity is 20 – 50% RH.

Storage for less than 24 months requires no special measures.

## WASTE DISPOSAL

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The unit shall be handled as EE waste.





POWER AND MOTION CONTROL

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