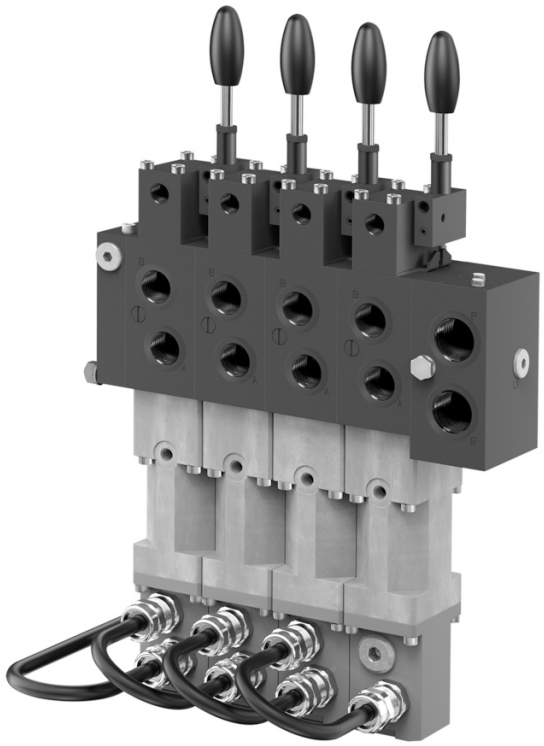
Directly mounted CAN-EX controls

Product documentation

for proportional directional spool valve

- Type PSL and PSV (series connection)
- Type PSLF and PSVF (manifold mounting)



D 7700-CAN-EX
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HAWE HYDRAULIK

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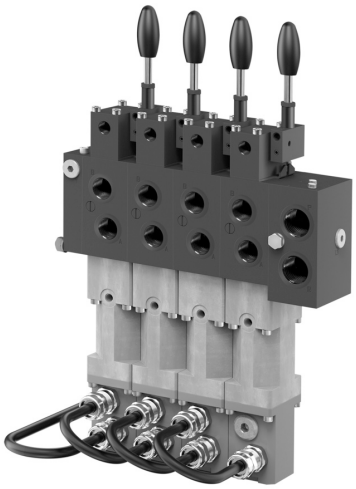
1 Overview of directly mounted CAN-EX controls

Proportional directional spool blocks are used to control the direction of movement and the infinite adjustment of the movement speed of the hydraulic consumers independent of the load.

This allows multiple consumers to be run at the same time and independently of each other at different speeds and pressures, as long as the sum of the partial flow rates required for this is covered by the total delivery flow on the pump side.

The electrical connection between the valve segments is established via a daisy chain cable connection (power supply and CAN bus).

Thanks to its pressure-encapsulated design and extensive certifications, the CAN-EX can be used in potentially explosive atmospheres.



Proportional directional spool valve type PSL CAN-EX

Features and advantages

- CAN communication
- Simple wiring
- Hysteresis minimisation through closed-loop spool valve position control
- High repeat accuracy due to linearised characteristic lines
- Pressure-encapsulated design
- Approved for mining and gas and dust environments

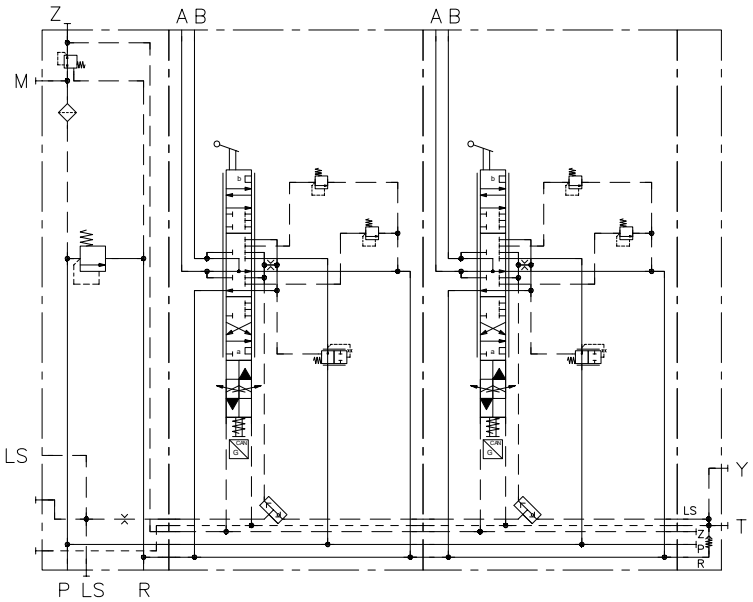
Areas of application

- Chemical plants
- Underground mining
- Oil and gas production and processing

Versions

- Actuation option for series connection sizes 3 and 5
- Actuation option for manifold mounting sizes 3, 5 and 7

Circuit example



2 Available versions

Ordering example

PSV 5 1 /320-3	-32 H 63/63	**/EA** **/EA** **/EA**	**CANEX-C** **CANEX** **CANEX-T**	-E4	**-IECEX**

2.3 "Cable type"

2.2 "CAN-EX actuation"

2.1 "Electrical actuation"

INFORMATION

For further information see D 7700-3, D 7700-5, D 7700-F and D 7700-7F.

2.1 Electrical actuation

Coding	Description
EI	Electro-hydraulic
EA	Electro-hydraulic with hand lever
EIH	Electro-hydraulic with additional hydraulic actuation
EAH	Electro-hydraulic with hand lever and additional hydraulic actuation

2.2 CAN-EX actuation

Coding	Description
CANEX	CAN-EX actuation head with integrated displacement transducer, spool valve position control, minimised hysteresis and linearised characteristic line
CANEX-C	CAN-EX connection actuation head with integrated protective circuit
CANEX-T	CAN-EX connection actuation head with integrated protective circuit and 120 Ω end resistor
CANEX-E	CAN-EX actuation head. Mandatory as the last actuation head in valve banks with more than one CAN-EX section

2.3 Cable type

Coding	Description
IECEX	Daisy chain standard cable for applications that must comply with ATEX and IECEx requirements
MA	Daisy chain standard cable for applications that must comply with MA and CCC requirements

2.4 Combination options (examples)

	Description
PSL 5 1 /320-3 -32 H 63/63/EACANEX-C -32 H 63/63/EACANEX -32 H 63/63/EACANEX-E -E 4-IECEX	Fitting on the first section End element on the last section Area of application (oil): Gas and dust applications
PSL 5 1 /320-3 -ZPL 33/5 EX -32 H 63/63/EACANEX-T -32 H 63/63/EACANEX -ZPL 33/5 EX -E 4-IECEX	Fitting with integrated 120 Ω resistor on the first section End element on the last section Area of application: Underground mining
PSL 5 1 /320-3 -ZPL 33/5 EX -32 H 63/63/EACANEX-C -ZPL 33/5 EX -E 4-IECEX	Fitting on the first section Valve bank with one CAN-EX section with no end element Area of application: Underground mining

WARNING

For the use of size 3 valves with CAN-EX actuation in mining applications in accordance with ATEX I M2 Ex db I Mb or IECEx Ex db I Mb, an additional intermediate plate SL3-ZPL 33/5 EX must be installed before the first and after the last section with CAN-EX actuation.

INFORMATION

Sections with CAN-EX actuation and other actuations can be combined within the valve bank.

Sections with different sizes can be combined within the valve bank.

3 Parameters

3.1 General data

Designation	CAN-EX
Material	CAN-EX head: Machine steel, zinc-nickel coated Cable fitting: Brass, zinc-nickel coated
Installation position	As desired
Temperatures	Environment: approx. -25 to +55 °C; storage: -40 to +80 °C; hydraulic fluid: -25 to +70°C, ensure the correct viscosity range.
Maximum number of sections / valve bank	10

3.2 Weight

Size	
3	= approx. 3.4 kg
5	= approx. 5.45 kg
7	= approx. 5.45 kg

3.3 Electrical data

Operating voltage U_B	19 V DC to 30 V DC, protected against reverse polarity
Valve bank operating current	max. 10 A
Nominal current I_N	max. 800 mA (24 V DC)
Nominal power P_{20}	19.2 Wd
Duty cycle	S1
Protection class	IP 66/67 when connected

Electrical connection

Plug type	**Terminal assignment**
Molex Micro-Fit+ 2x2, no. 206461-0400	1: GND 2: U_{Bat} 3: CAN-L 4: CAN-H
CAN ID	1 to 127

3.4 Communication

CAN protocol	CANopen, J1939
CAN bit rate	50, 100, 125, 250, 1,000 kbit/s
CAN ID	1 to 127

INFORMATION
For further information, see B 7700 CAN Manual.

3.5 Acceptance tests and environmental tests

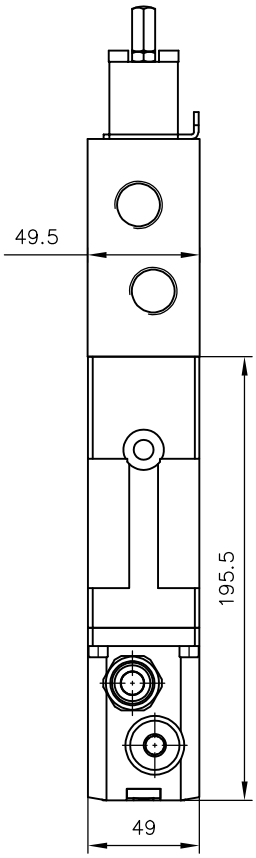
EMC	2014/30/EU
RoHS	2011/65/EU
ATEX	2014/34/EU ▪ II 2G Ex db IIB T4 Gb ▪ II 2D Ex tb IIIC T135°C Db ▪ I M2 Ex db I Mb
IECEx	▪ Ex db IIB T4 Gb ▪ Ex tb IIIC T135°C Db ▪ Ex db I Mb
MA	▪ EX db I Mb
CCC	▪ EX db I Mb

4 Dimensions

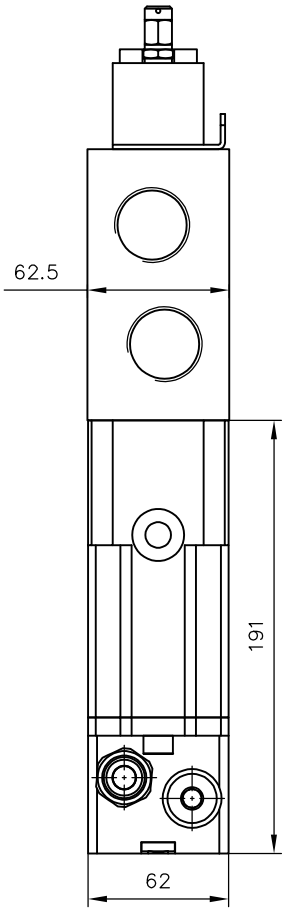
All dimensions in mm, subject to change.

Series connection

Size 3

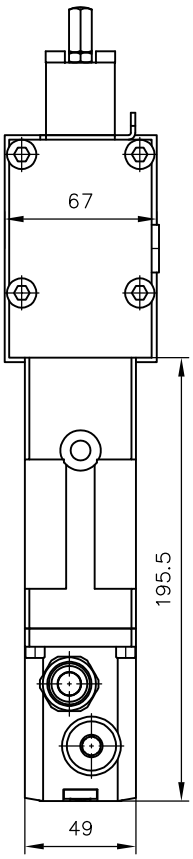


Size 5

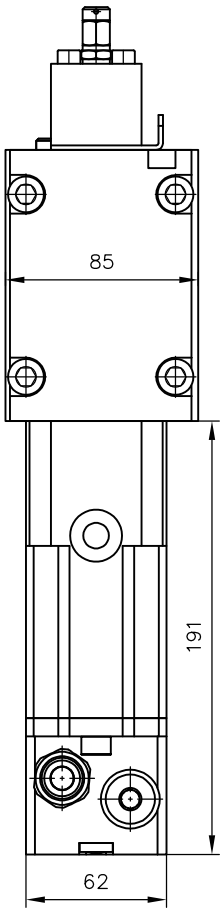


Manifold mounting

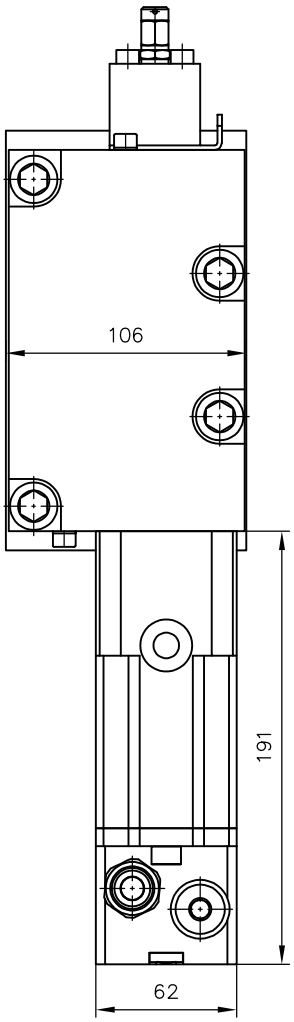
Size 3



Size 5



Size 7



5 Installation, operation and maintenance information

Observe the safety precautions and warnings in the B 7700 CAN Manual documentation and B CANEX.

Observe the document B 5488 “General operating instructions for assembly, commissioning, and maintenance.”

5.1 Intended use

This product is intended exclusively for hydraulic applications (fluid technology).

The user must observe the safety measures and warnings in this document.

Essential requirements for the product to function correctly and safely:

- ► All information in this documentation must be observed. This applies in particular to all safety measures and warnings.
- ► The product must only be assembled and put into operation by specialist personnel.
- ► The product must only be operated within the specified technical parameters described in detail in this document.
- ► All components must be suitable for the operating conditions when using an assembly.
- ► The operating instructions for the components, assemblies and the specific complete system must also always be observed.

If the product can no longer be operated safely:

1. Remove the product from operation and mark it accordingly.
   ✓ It is then not permitted to continue using or operating the product.

5.2 Assembly information

The product must only be installed in the complete system with standard and compliant connection components (screw fittings, hoses, pipes, fixtures etc.).

The product must be shut down correctly prior to disassembly (in particular in combination with hydraulic accumulators).

⚠ **DANGER**

Sudden movement of the hydraulic drives when disassembled incorrectly

Risk of serious injury or death

- ► Depressurise the hydraulic system.
- ► Perform safety measures in preparation for maintenance.

Attachment

The valve bank must be mounted to the frame or base of the machine in such a way that no stress is induced.

Three screws and elastic washers between the bank and the frame are recommended for attachment.

5.3 Installation information

To ensure safe operation of the PSL/PSV CAN-EX valve nodes and to avoid shortening the service life of the product through improper operating conditions, the following instructions must be observed:

- The electromagnetic compatibility of the entire system must be ensured by the system manufacturer!
- Avoid installing the valves near machine parts and assemblies that produce lots of heat .
- Radio equipment must be a sufficient distance away.
- An emergency shut-off must be provided for the power supply. The emergency stop switch must be installed on the machine (vehicle) where it is easily accessible by the machine/system operator. The machine (vehicle) manufacturer must ensure that a safe state is produced when the emergency stop switch is actuated.

- One of the mechanisms supported by the device to protect against bus interruptions (node guarding, heartbeat and/or setpoint timeout) must be used.
- Earth lines must be dimensioned in accordance with the maximum currents flowing to them. The reference potential for all CAN bus nodes connected to a single line should vary as little as possible from device to device and be identical with the earth connection for the power supply.
- All valve nodes must be unplugged in the event of electric welding work.
- Connectors used to connect the valve battery must be properly secured against water ingress by fitting all the necessary seals.
- Bus lines suitable for CAN bus networks must be used. Lines should ideally be twisted and shielded. The surge impedance must be approx. 120 Ω.
- There must be 120 Ω terminating resistors at both ends of the CAN bus network.
- When replacing the valve spool or the spool block, ensure correct reassembly and sealing.
- Maintain a sufficient distance from sources of magnetic fields, e.g. strong permanent magnets, eddy-current brakes etc. (> 0.5 m).

The following must also be observed during operation:

- If the device detects internal overheating, restricted operation (i.e. at reduced power) is possible within a certain temperature range.
- If the temperature of the CAN-EX actuation head exceeds the specified maximum temperature, a fuse is triggered to prevent dangerous temperatures.
- Increased surface temperature and burning on contact can particularly occur at the magnet block.
- The power supply must be within the specified working range. High or constant deviation may damage the electronics.

5.4 Operating instructions

Observe product configuration and pressure/flow rate.

The statements and technical parameters in this document must be strictly observed.
The instructions for the complete technical system must also always be followed.

NOTICE

- ► Read the documentation carefully before usage.
- ► The documentation must be accessible to the operating and maintenance staff at all times.
- ► Keep documentation up to date after every addition or update.

CAUTION

Overloading components due to incorrect pressure settings.

Risk of minor injury. Parts may burst or fly off, and uncontrolled leakage of hydraulic fluid.

- Pay attention to the maximum operating pressure of the pump, valves and fittings.
- Always monitor the pressure gauge when setting and changing the pressure.

Purity and filtering of the hydraulic fluid

Fine contamination can significantly impair the function of the product. Contamination can cause irreparable damage.

Examples of fine contamination include:

- Swarf
- Rubber particles from hoses and seals
- Dirt due to assembly and maintenance
- Mechanical debris
- Chemical ageing of the hydraulic fluid

NOTICE

New hydraulic fluid from the manufacturer may not have the required purity.

Damage to the product is possible.

- ► Filter new hydraulic fluid to a high quality when filling.
- ► Do not mix hydraulic fluids. Always use hydraulic fluid that is from the same manufacturer, of the same type, and with the same viscosity properties.

For smooth operation, pay attention to the cleanliness level of the hydraulic fluid (cleanliness level see Chapter 3, "Parameters").

Additionally applicable document: D 5488/1 oil recommendations

5.4.1 CAN bus control unit

General information

The CAN bus (Controller Area Network) is an asynchronous, serial bus system requiring just two wires for data transmission. In accordance with ISO 11898-2 (High-Speed Medium Access Unit), twisted-pair cables with a surge impedance of 108 to 132 Ω are recommended as a bus medium.

Common data transmission formats are the CANopen 2.0 A & B and J1939 protocols, based on 11-bit or 29-bit address data.

Design of CAN bus systems

In general, a linear network topology should be aimed for and stub lines should be avoided. If this is not possible, the following maximum stub line lengths apply:

Transfer rate	Bus length	Max. length of stub line
100 kbit/s	600 m	25 m
125 kbit/s	500 m	20 m
250 kbit/s	250 m	10 m
500 kbit/s	100 m	5 m
1000 kbit/s	< 20 m	1 m

Short bus lines with a low EMC load do not require the CAN line to be shielded.

For major network expansion or environments with EMC loads, screening of the CAN line with corresponding grounding should be applied. Twisted bus cables are a compromise solution that are easier to implement in cable harnesses. There must not be a shift in potential between the individual CAN nodes.

Device earths for all CAN node devices must be sufficiently dimensioned and should be brought together at a common neutral point.

The power supply and the CAN bus are passed from section to section by means of an internal cable connection. The connection cable contains four wires: power supply (U_{Bat}, GND) and CAN bus (CAN high, CAN low). The recommended terminating resistor is not necessary for short spur lines.

5.5 Maintenance information

Check regularly (at least once a year) by visual inspection whether the hydraulic connections are damaged. If external leakages are found, shut down and repair the system.

Clean the surface of the device regularly (at least once a year) (dust deposits and dirt).

References

Application

- Proportional directional spool valves types PSL/PSV/PSM, size 3: D 7700-3
- Proportional directional spool valve, type PSL, PSM and PSV size 5: D 7700-5
- Proportional directional spool valve type PSLF, PSVF and SLF: D 7700-F
- Proportional directional spool valve banks type PSLF and PSVF size 7: D 7700-7F

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