Freewheeling valve Hägglunds VFWCB 600

Includes valves for ATEX environment

RE 15380
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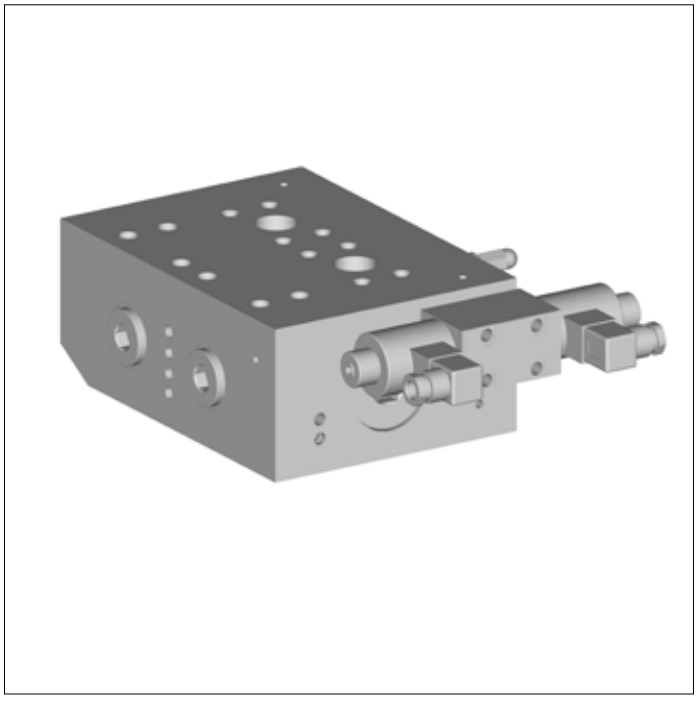

- Valid for: Hägglunds motors CA, CB, CBM
- Maximum flow 1000 l/min (264 gpm)
- Nominal 600 l/min (159 gpm)
- For closed and open loop hydraulic system

Features

- Compact and robust design
- Multifunctional
- Mounted directly on Hägglunds motors
- Detent function on pilot valve
- Possible for remote control

Contents

1 Preface

Warning signs
In this manual you will find the following signs which indicate a potential hazard, which can or will cause personal injury or substantial property damage. Depending on the probability if the hazard, and how serious the injury or property damage could be, there are three levels if classification.

Warning sign (warning triangle):	Draws attention to the hazard
Signal word:	Identifies the degree of hazard
Type of risk:	Specifies the type or source of the hazard
Consequences:	Describes the consequences of non-compliance
Precautions:	Specifies how the hazard can be prevented

The signal words have the following meaning:

Warning sign, signal word	Meaning
⚠ **DANGER**	Indicates a dangerous situation which will cause death or severe personal injuries if not avoided.
⚠ **WARNING**	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided.
⚠ **CAUTION**	Indicates a dangerous situation which may cause minor or medium personal injuries if not avoided.
NOTICE	Material damage: the product or its environment could be damaged.

⚠ WARNING

Load drop
Danger to life or risk of injury, damage to equipment!
- Valve version VFWCB 600 XXX7, spring return to freewheel position, is not allowed to be used in suspended load application

2 Ordering code

In order to identify Hägglunds equipment exactly, the following ordering code is used. These ordering codes should be stated in full in all correspondence e.g. when ordering spare parts. Example: Valve VFWCB 600:

VFWC	B		600		E		1		U		6		0		00		00
01	02		03		04		05		06		07		08		09		10

01	**Free wheeling valve**	
		VFWC

02	**Version**	
		B

03	**Nominal flow (l/min)**	
	600	**600**

04	**Operation**	
	Electrical operated	**E**
	Hydraulic operated	**H**
	Manual operated	**M**

05	**El data voltage**	
	No	**0**
	12 VDC (only standard design)	**1**
	24 VDC	**2**
	100 VAC (only standard design)	**3**
	230 VAC (only standard design)	**4**

06	**Pilot pressure suppl**	
	Internal pilot	**U**
	External pilot	**Q**

07	**Main spool**	
	Spring return to drive position	**6**
	Spring return to freewheel position **Note! See ⚠ warning page 2!**	**7**

08	**Explosive environment**	
	Non explosive environment	**0**
	Explosive environment [3)]	**1**

09	**Modification [1)]**	
		0-9

10	**Design**	
	Standard	**00**
	Pilot valve with sea water protection (only 24 VDC)	**01**
	Hydraulic operated pilot control valve. Internal pilot valve supply . Main spool spring return to drive or free-wheel position[2)]	**03**
	Other special index [1)]	**04-99**

1) To be filled in by Bosch Rexroth DC-IA/EHD
2) Only valid for VFWCB 600 H 0 U 6 0 0, VFWCB 600 H 0 U 7 0 0, VFWCB 600 H 0 U 6 1 0 and VFWCB 600 H 0 U 7 1 0
3) Only valid for attribute 05 code 2 and attribute 10 code 00 and 03

3 Functional description

General
All Hägglunds Compact motors can be operated in free-wheeling mode by retracting the pistons and allowing the cylinder block to freely rotate on its bearings.
The valve is designed for use with Compact motors CA, CB and CBM and provides free-wheeling of the motor by means of disconnecting the motor from the main lines and connecting both motor ports to T which has to be drained to tank The valve can be mounted directly onto the motor and can be used in both open and closed loop applications. Maximum operating pressure is 350 bar (5076 psi) and maximum flow 1000 l/min (264 gpm). Nominal flow is 600 l/min (156 gpm)

The valve is available in three main configurations:

1. VFWCB 600 E Free-wheeling valve electrically operated
2. VFWCB 600 H Free-wheeling valve hydraulically operated
3. VFWCB 600 M Free-wheeling valve manually operated

Various options are available referring to the order code.

☞ **Notice!**
Only one valve is to be used on the Hägglunds CBM. For more than one valve, contact Bosch Rexroth DC-IA/EHD.

Function
A system is required to ensure that the motor is in stationary position before switching from free wheeling position into drive position. Free-wheeling is achieved by maintaining pressure into the motor case causing the piston to be lift off the cam ring and pushed in to the cylinder block. The rotating section of the motor comprising the cylinder block, pistons and cam rollers can then rotate on the main bearings without oil flow through the motor main ports. This case pressure is generated by ensuring that there is a flow through the motor case. The case pressure shall be controlled with a pressure relief valve on the motor case drain line, maintaining a pressure of 1,0 bar (14,5 psi) to 1.5 bar (22 psi), (one of the D ports). A typical response for a Hägglunds CA210 motor with casing flow of 60 l/min (16 gpm) would be 1 seconds to change into free-wheeling mode.

Before the motor is put into free-wheeling the pilot control valve (3) is operated, which switches the main spool (1) and connects the motor ports AM and Cm to T. T has to be connected to tank.
The shuttle valve (2) allows pilot pressure to be selected from the high pressure motor line.
Shifting from free-wheeling into operation during running will not be allowed due to risk for motor damage. For this reason the pilot control valve (3) has a detent function in order to avoid unintentional shifting during operation if for example there is a power failure to the solenoid.
When using the internal pilot valve it is important to ensure that minimum pilot pressure is available, so that drive or free-wheeling mode is fully engaged before driving the motor. External pilot pressure via Px or Pa and Pb is recommended for open loop system.
For additional information regarding free wheeling see data sheet, section technical data, for respective motor.

NOTICE

Shifting from free wheeling position into drive position during running of motor
Damage on piston parts and camring
- Shifting from free-wheeling position into drive position must only be carried out when the motor is standing still

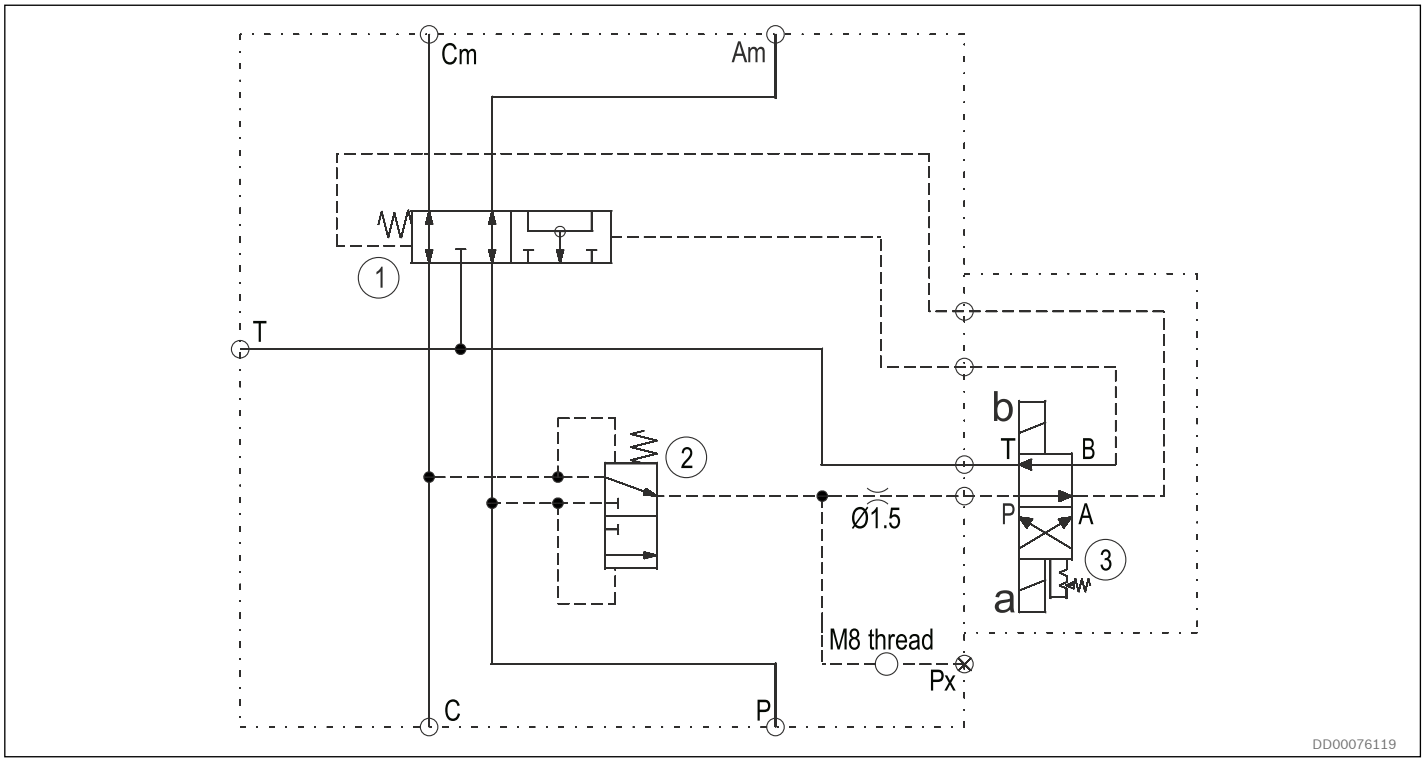

Fig. 1: Hydraulic Circuit for VFWCB 600 E 2 U 6. Electrically operated pilot control detented valve. Internal pilot valve supply. Main spool spring return to drive position.

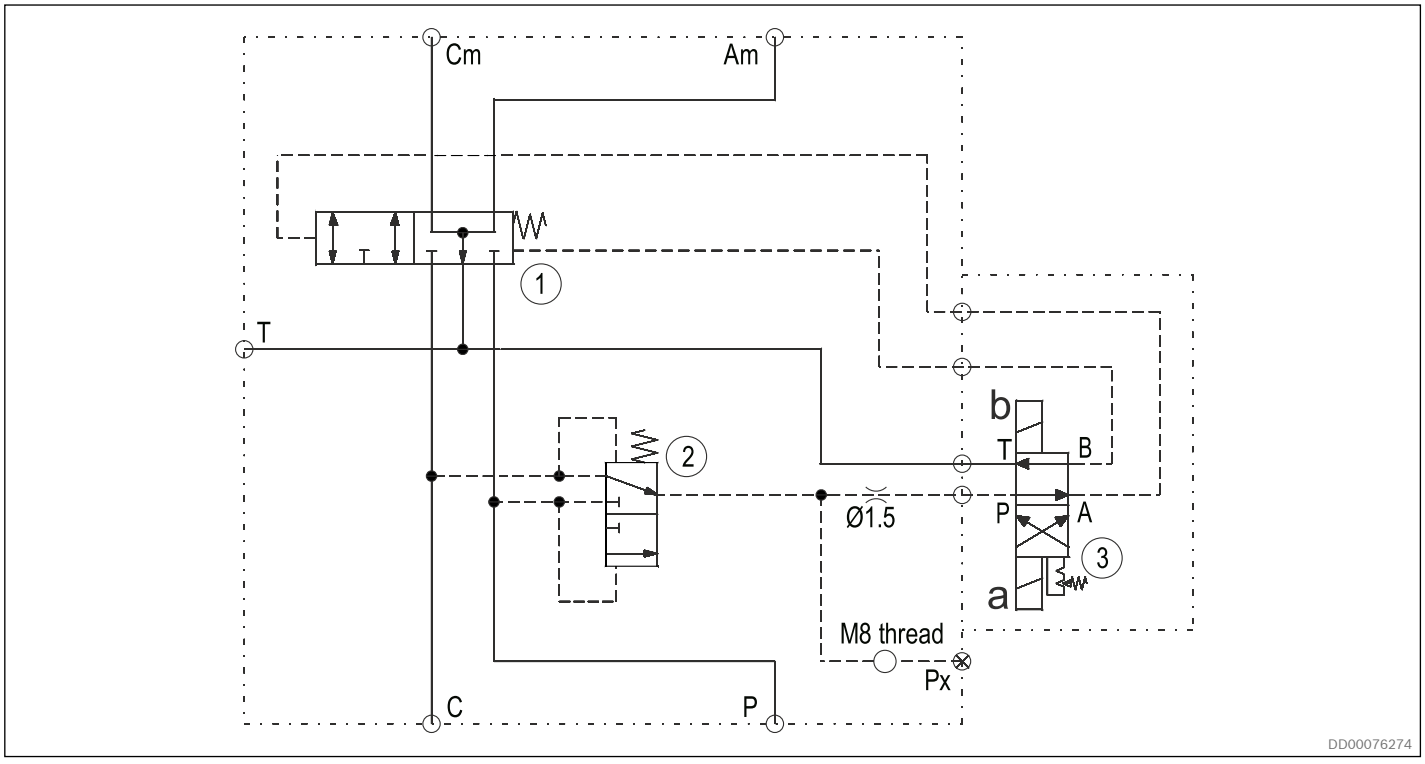

Fig. 2: Hydraulic Circuit VFWCB 600 E 2 U 7. Electrically operated pilot control detented valve. Internal pilot valve supply. Main spool spring return to free-wheel position

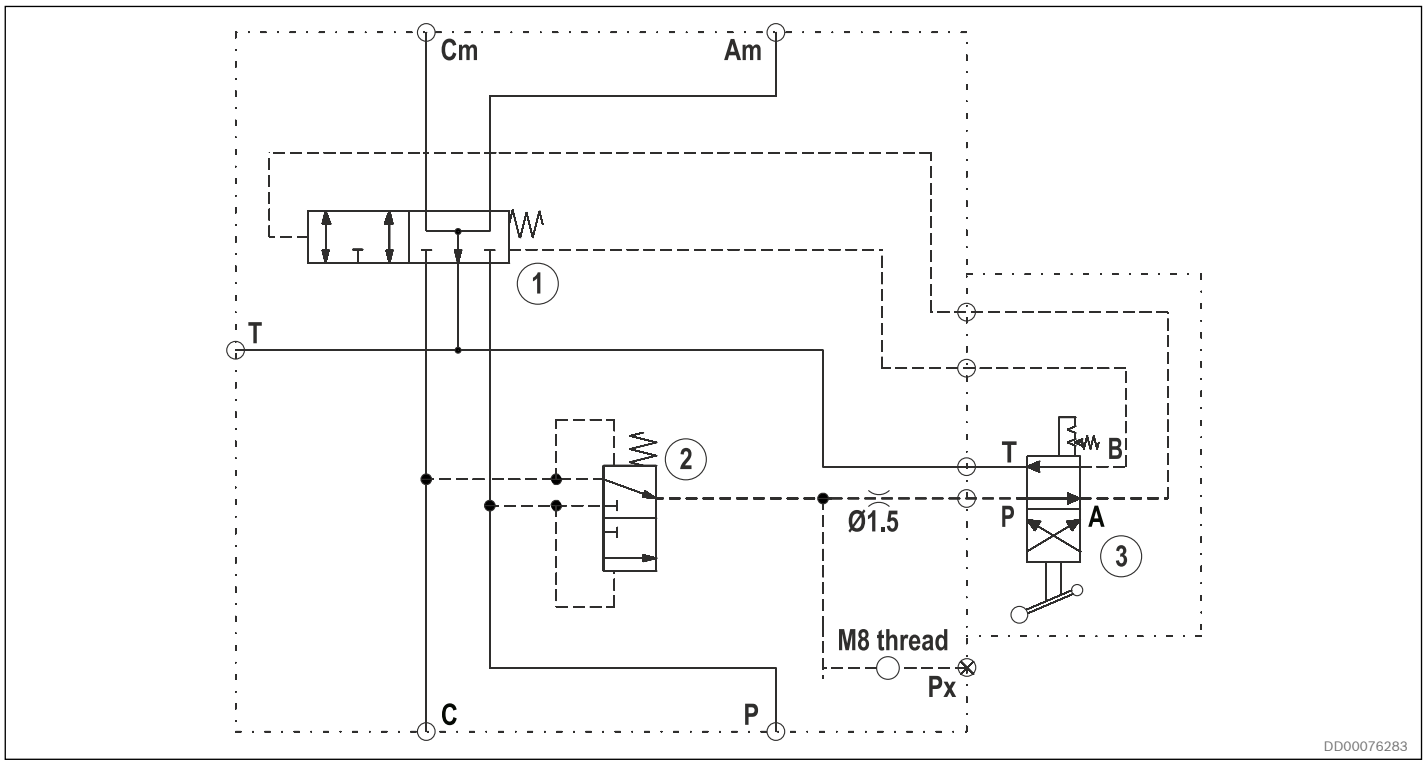

Fig. 3: Hydraulic Circuit for VFWCB 600 M U 7. Manually operated pilot control detented valve. Internal pilot valve supply. Main spool spring return to free-wheel position

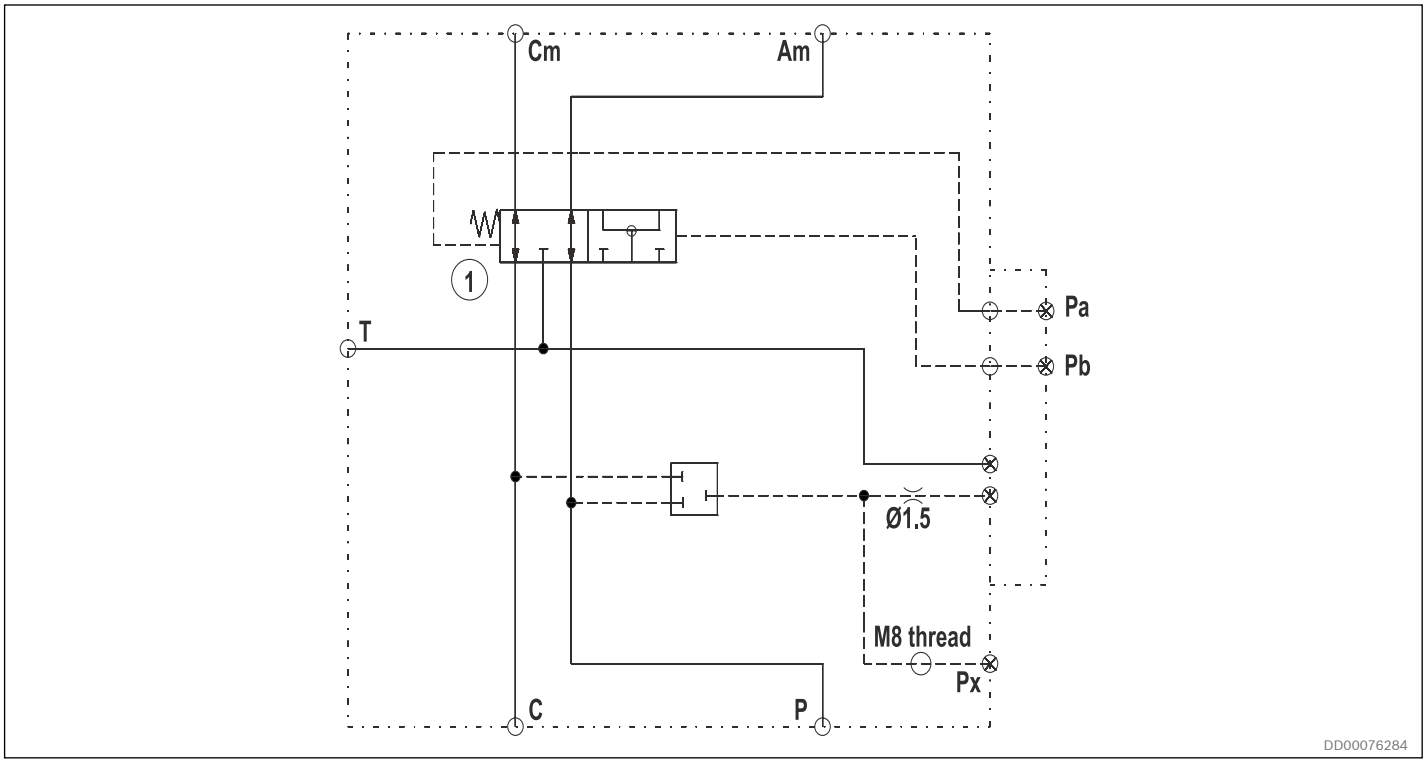

Fig. 4: Hydraulic Circuit for VFWCB 600 H Q 6. Direct hydraulic control of main spool. Main spool spring return to drive position.

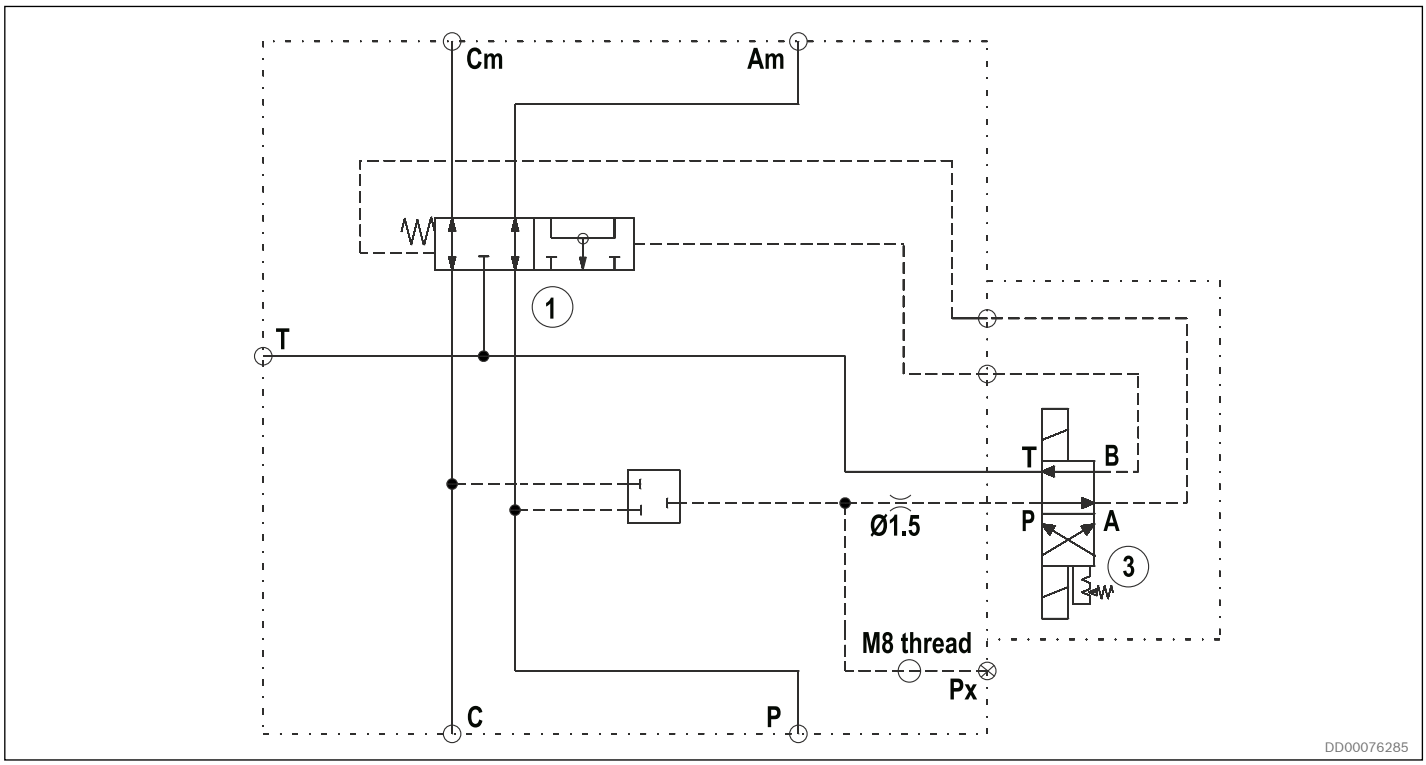

Fig. 5: Hydraulic circuit for VFWCB 600 E 2 Q 6. Electrically operated pilot control detented valve. External pilot valve supply. Main spool spring return to drive position

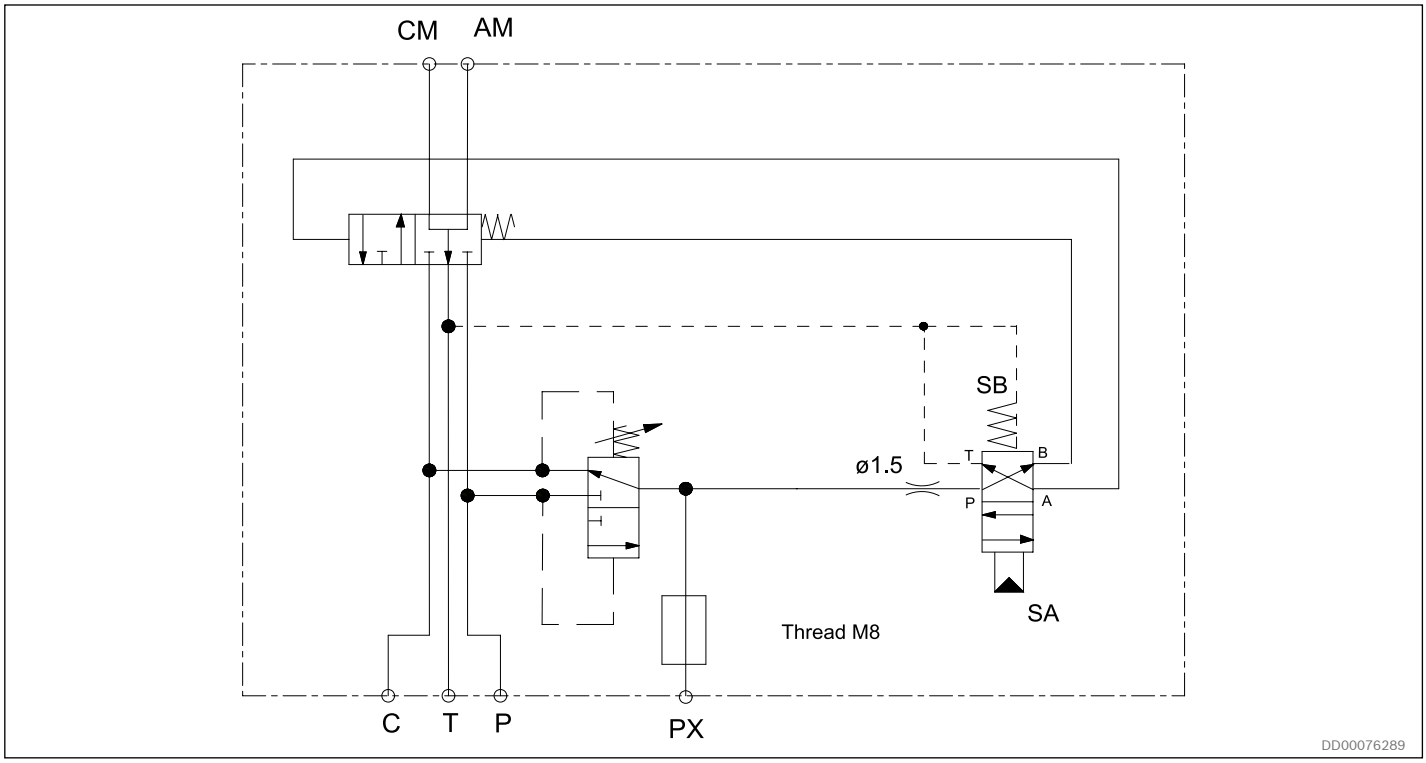

Fig. 6: Hydraulic circuit for VFWCB 600 H 0 U 7 0 0 03. Hydraulic operated pilot control valve. Internal pilot valve supply . Main spool spring return to free-wheel position

4 Technical data

4.1 General data

Table 2: General data VFWCB 600

	Metric	US
Mechanical specification		
Maximum Operating Pressure	350 bar	5 076 psi
Pilot pressure (to shift main spool)	7 min. to 350 max. bar	101 min. to 5076 max. psi
Drain pressure (to retract piston assemblies) (the motor case drain must go via a pressure relief valve to tank)	1 to 1.5 bar	14,5 to 22 psi
Maximum Flow	1000 l/min	264 gpm
Nominal flow (see *5 Pressure loss diagram page 10*)	600 l/min	159 gpm
Hydraulic Fluid (*refer to Data sheet RE 15414 Hydraulic fluid quick reference*)		
Maximum Fluid Temperature	+70°C	+158°F
Minimum Fluid Temperature	-25°C	-13°F
Maximum Viscosity Range	380 cSt	1760 SSU
Minimum Viscosity Range	20 cSt	98 SSU
Recommended Operating Viscosity	40 cSt	187 SSU
Pilot valve interface	CETOP 03	CETOP 03
Weight		
Free-wheeling valve typical VFWCB 600	40 kg	88 lb
Pilot valve: Connectors EN 175301-803 / Sea water protected		
Supply voltage	24 VDC	
Solenoid power	30 W	
Solenoid current	1.25 A	
Solenoid protection class (EN 175301-803)	IP65	
Solenoid protection class	IP65 (sea water protective)	
Cable area	min 1 mm²	
Cable size	Ø 10–14 mm	
Connection pin 1 pin 2	24 VDC 0 VDC	

4.2 Explosion protection information, hydraulic operated VFWCB 600

Table 1: Explosion protection information hydraulic VFWCB 600

Area of application according to ATEX directive 2014/34/EU	IM2, II2G, II2D, II3G, II3D
Protection of the valve by liquid immersion according to and constructional safety according to	k (EN 13463-8) c (EN 13463-5)
Maximum surface temperature	+ 100 ºC (+212 ºF)
Temperature class	T4
Conforms to “Equipment and components intended for use in potentially explosive atmospheres and in underground mines”	EN 1710
ATEX Classification of valve	II 2 G D c k T4 / I M2 c k T4
Ambient temperature range	-25.....+50 ºC (-13....+122 ºF)

4.3 Explosion proof information, pilot valve electrical operated

Table 3: Electrical operated / data

Voltage	24 VDC
Voltage tolerance	± 10%
Nominal power at ambient temperature +20 ºC (68 ºF)	17 W
Maximum power with 1,1 x nominal voltage and ambient temperature +20 ºC (68 ºF)	20,6 W
Protection class	IP66

Table 4: Explosion protection information

Area of application according to directive 2014/34/EU	II 2G
Type of protection valve	C (EN 13463-5)
Maximum surface temperature	135 ºC (275 ºF)
Temperature class	T4
Type of protection valve solenoid according to EN 60079-7 / EN 60079-18	Ex eb mb IIC T4 Gb
Type examination certificate solenoid	KEMA 02ATEX2240 X
IECEx Certificate of Conformity solenoid	IECEx DEK 12.0068X
Ambient temperature range	-20...+70 ºC (-4....158 ºF)

5 Pressure loss diagram

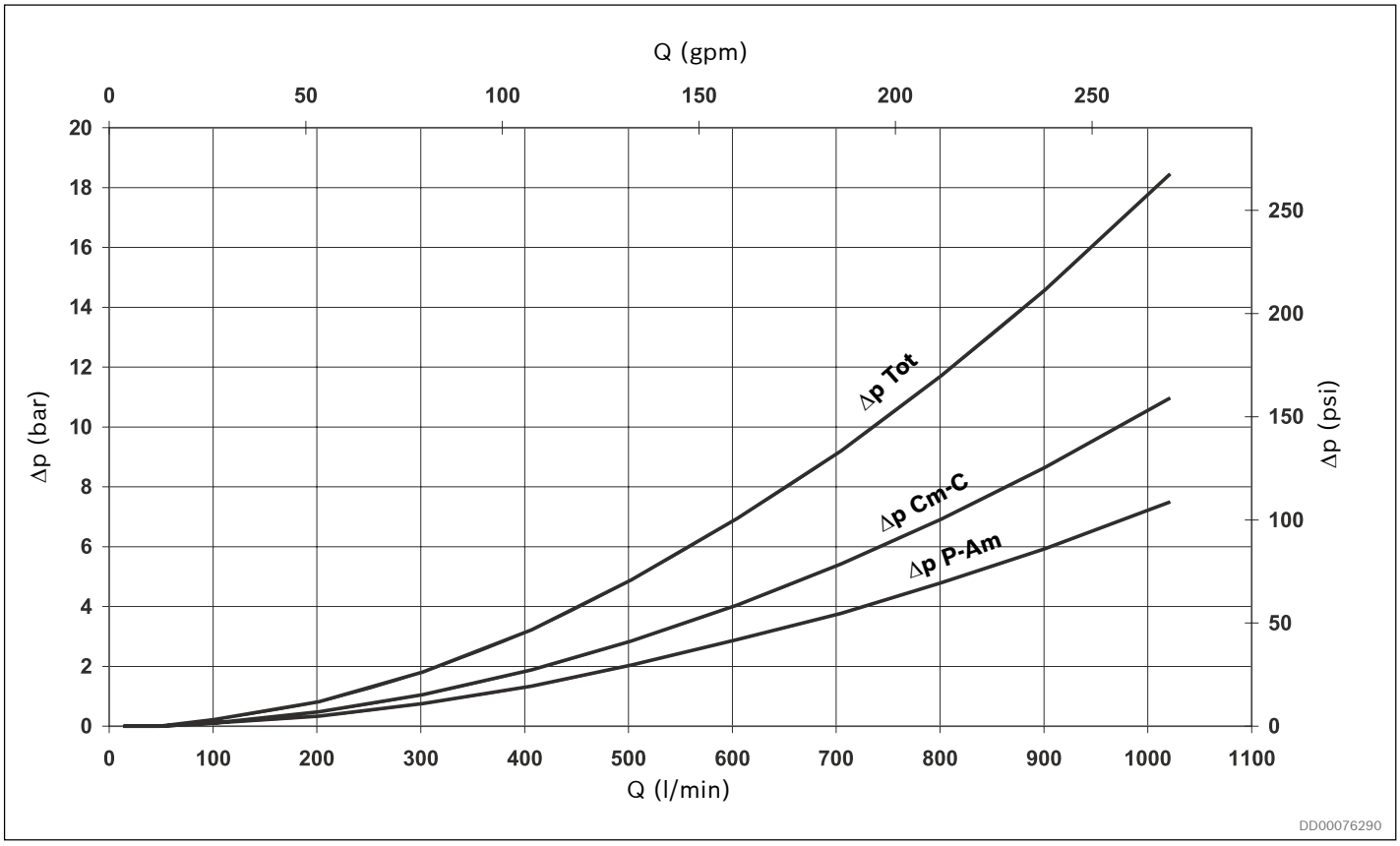

Fig. 7: Pressure loss diagram - P to Am, Cm to C Viscosity 40 cSt/187 SSU.

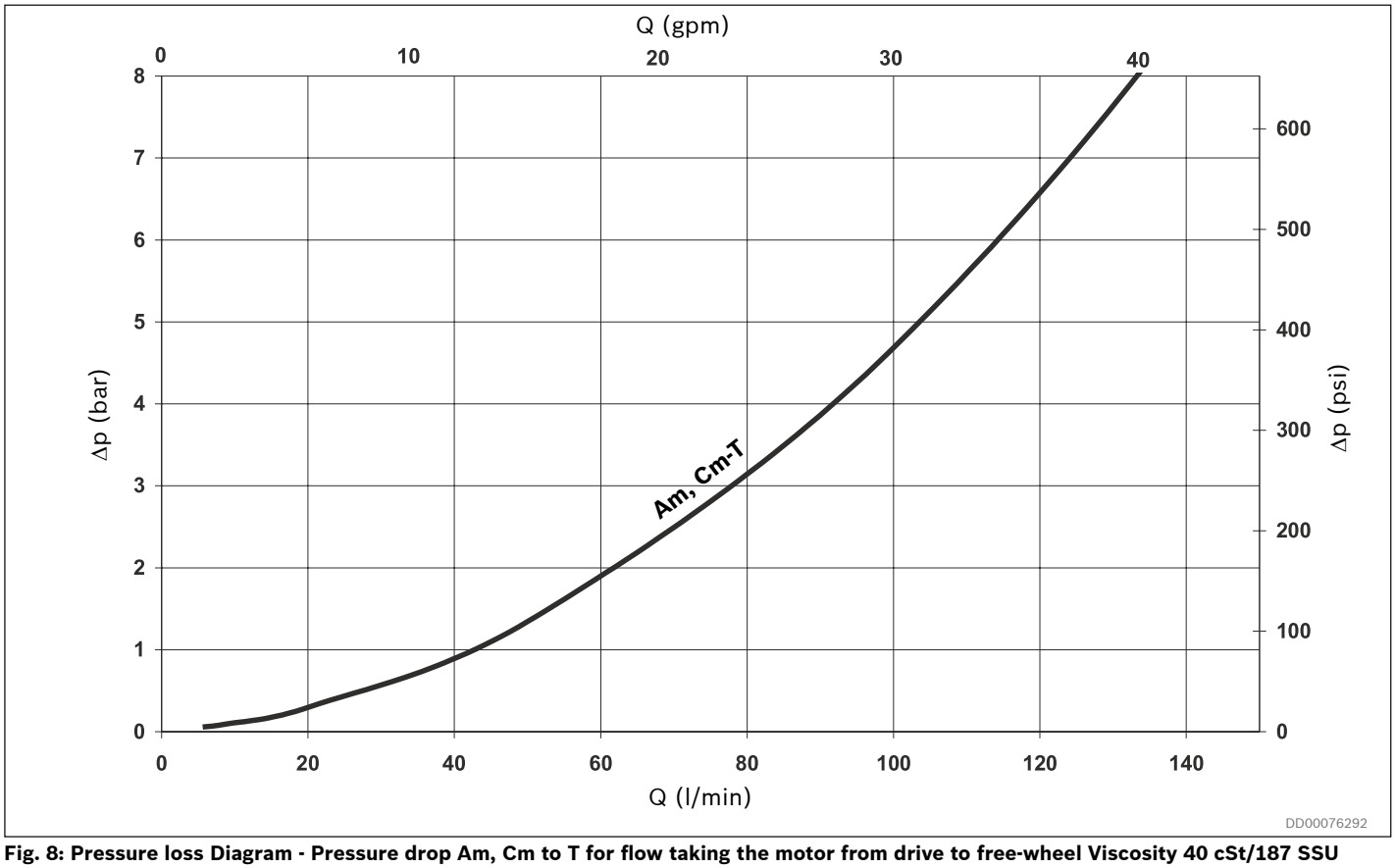

Fig. 8: Pressure loss Diagram - Pressure drop Am, Cm to T for flow taking the motor from drive to free-wheel Viscosity 40 cSt/187 SSU

6 Dimensions / Interface

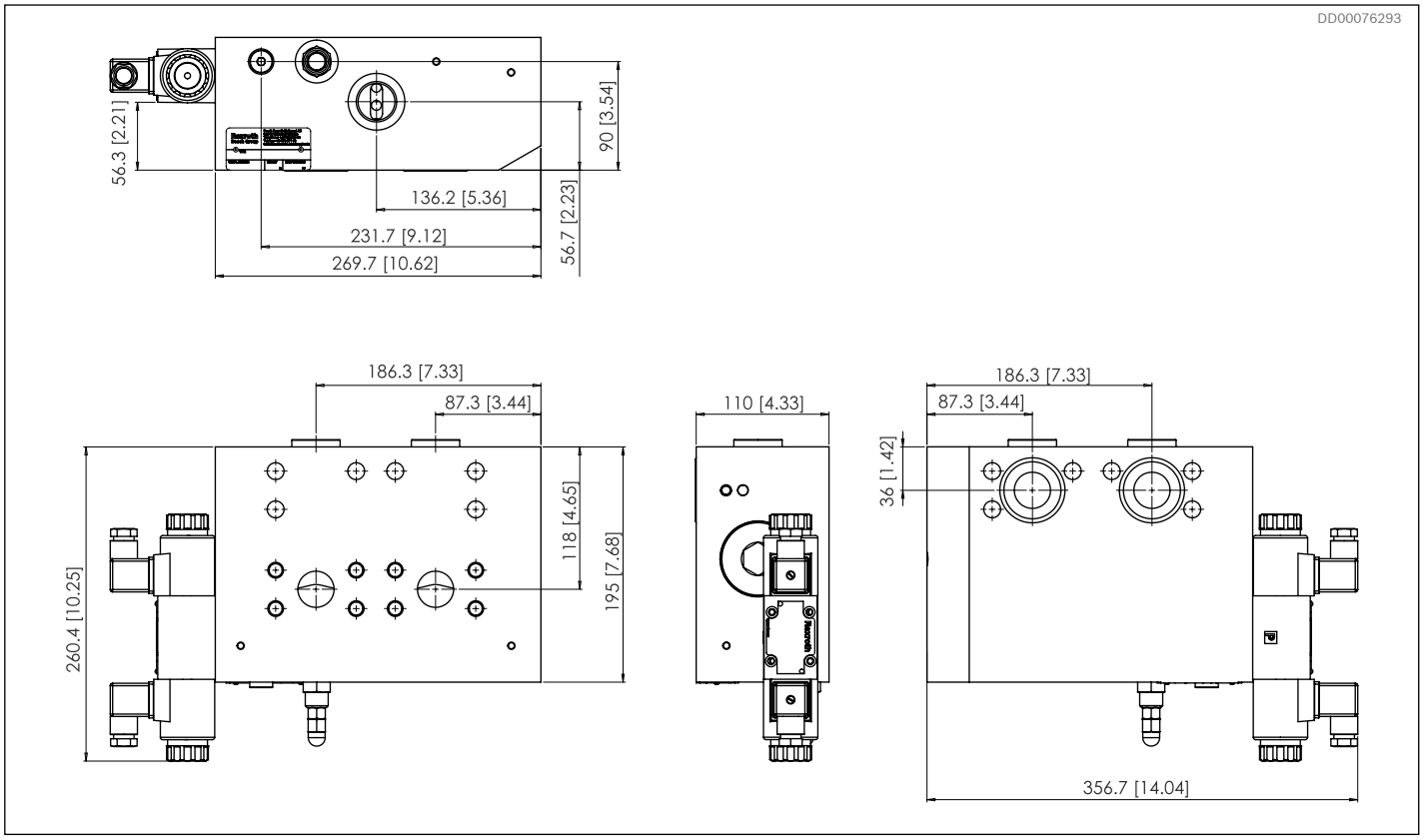

Fig. 9: Dimensions VFWCB 600 E

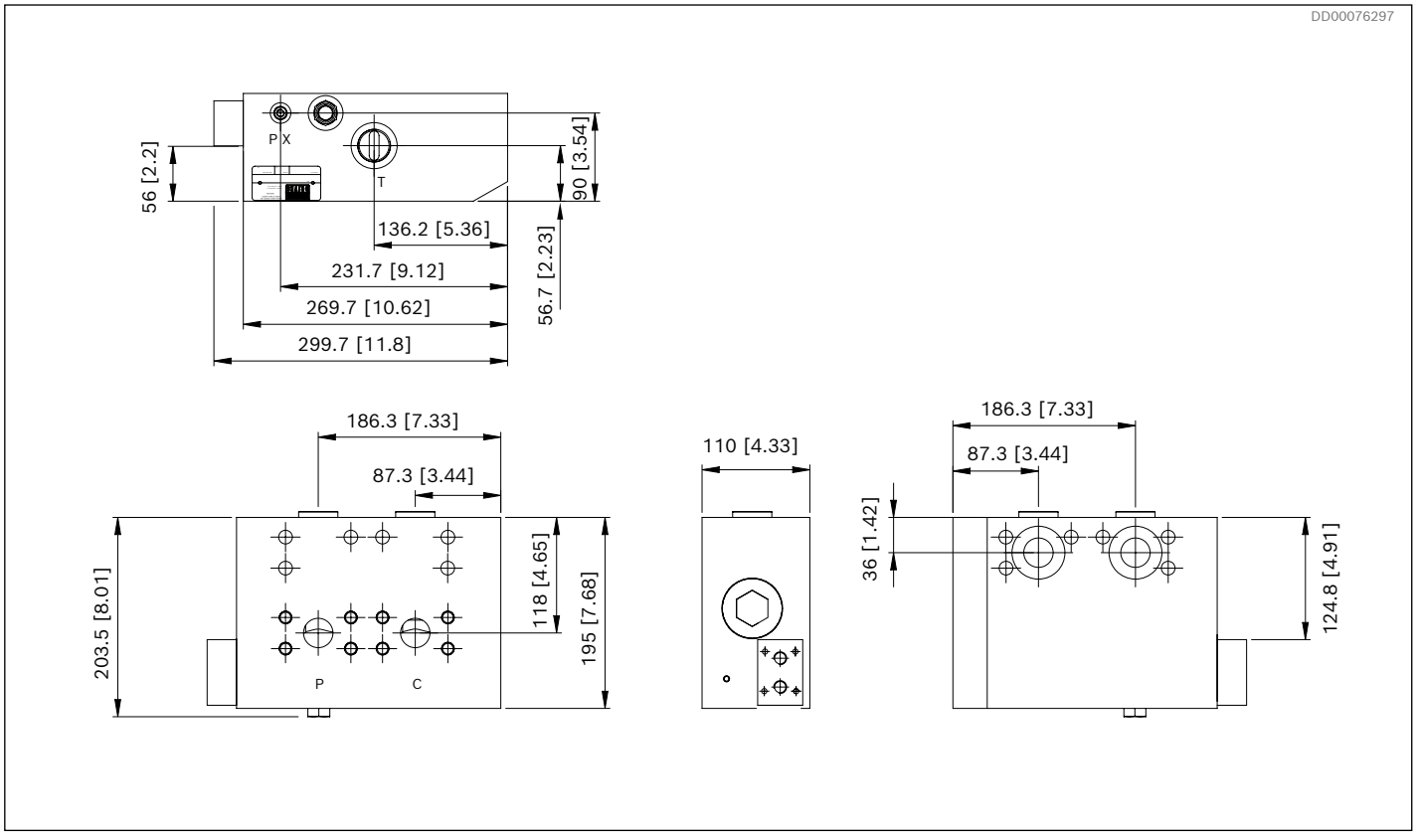

Fig. 10: Dimensions VFWCB 600 H, VFWCB 600 H Ex

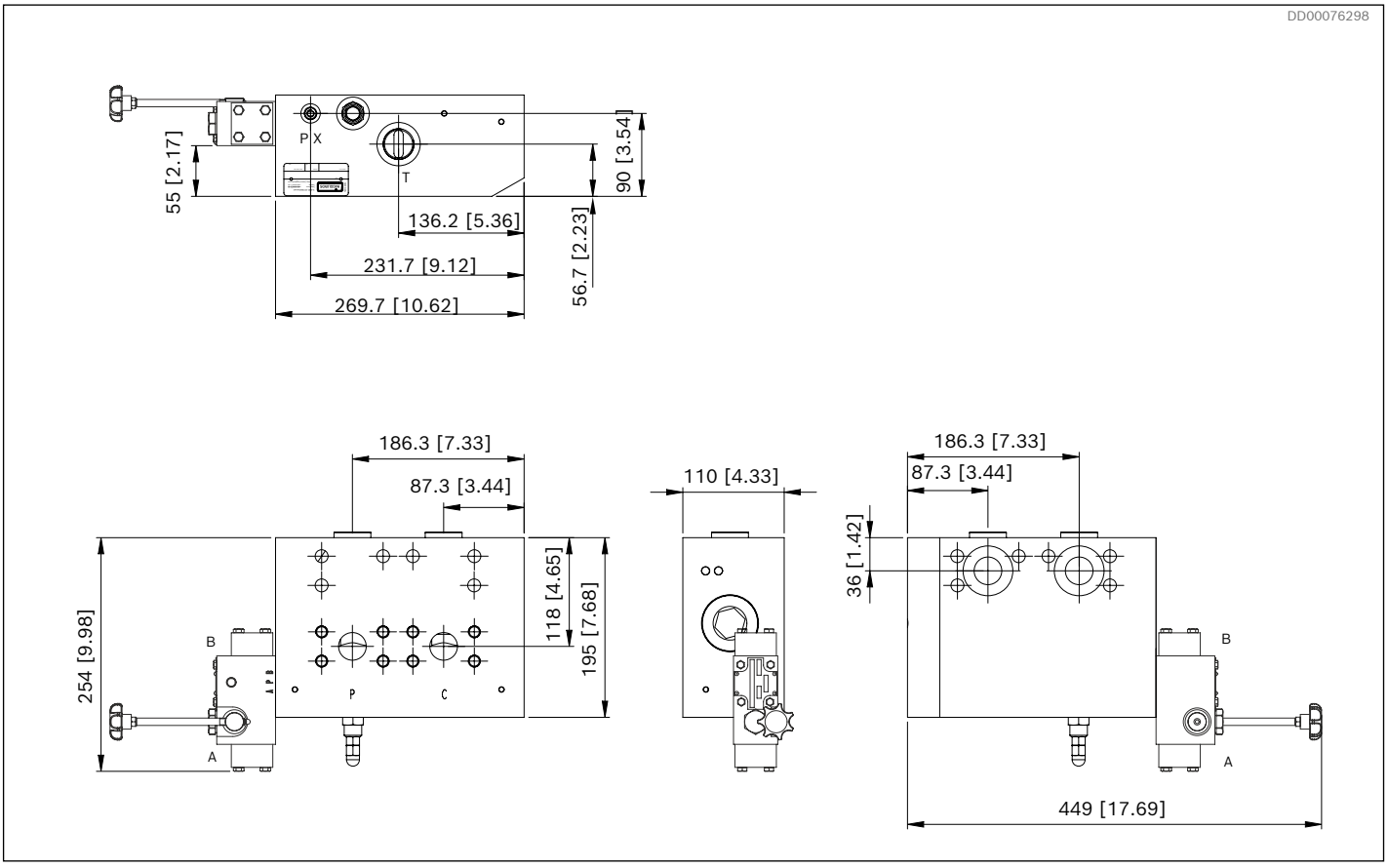

Fig. 11: Dimensions VFWCB 600 M

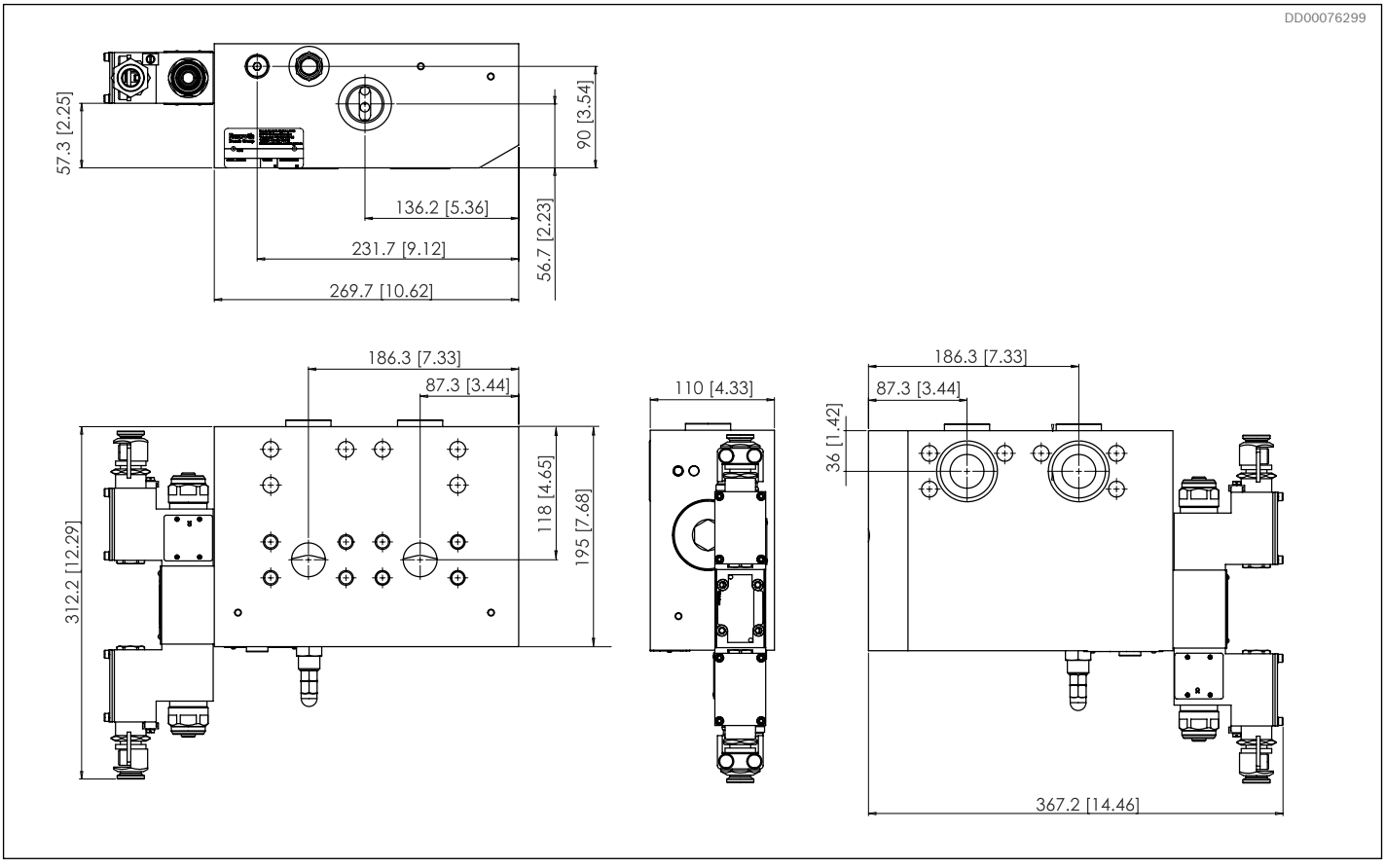

Fig. 12: Dimensions VFWCB 600 E Ex

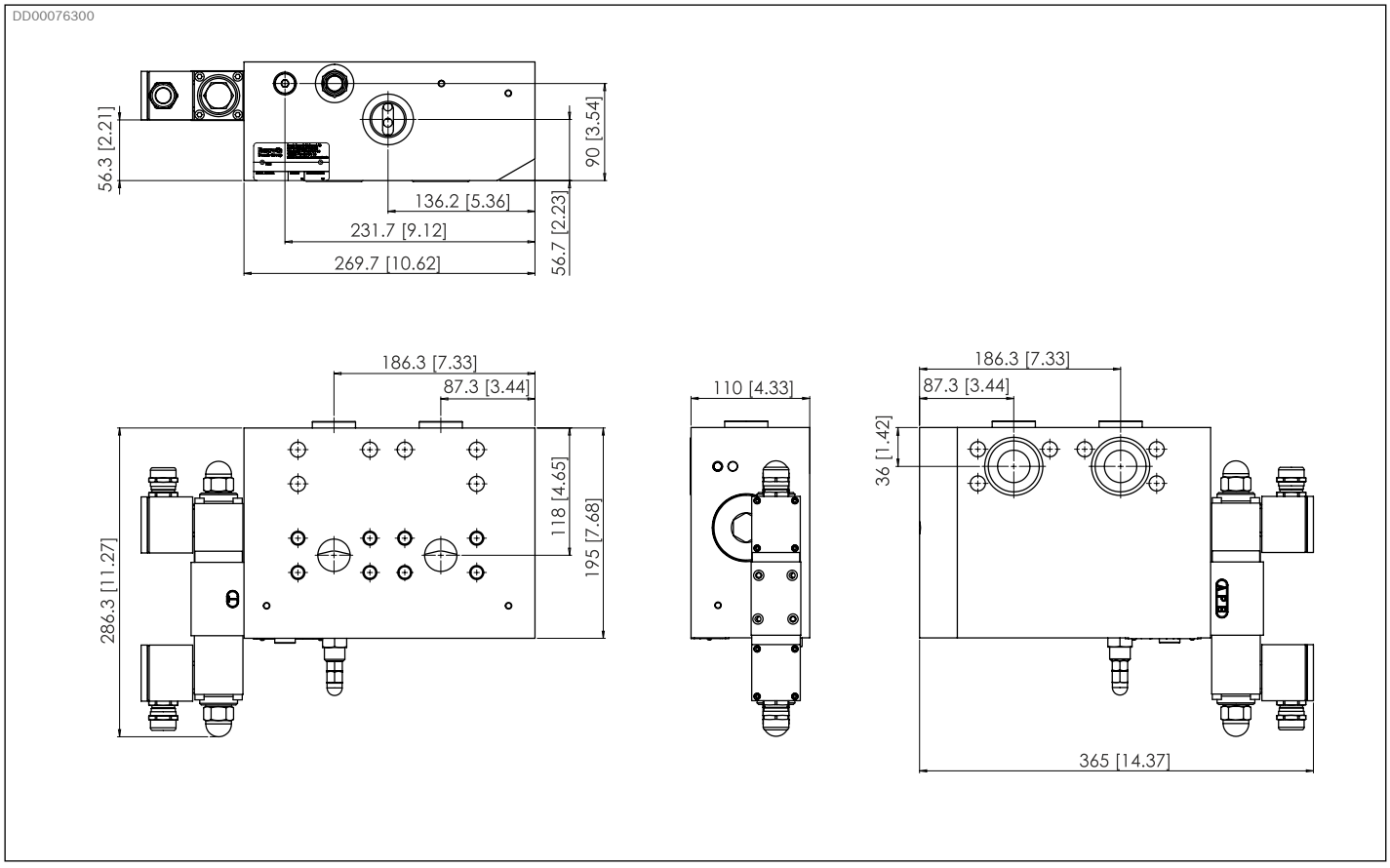

Fig. 13: Dimensions VFWCB 600 E, Sea water protected pilot valve

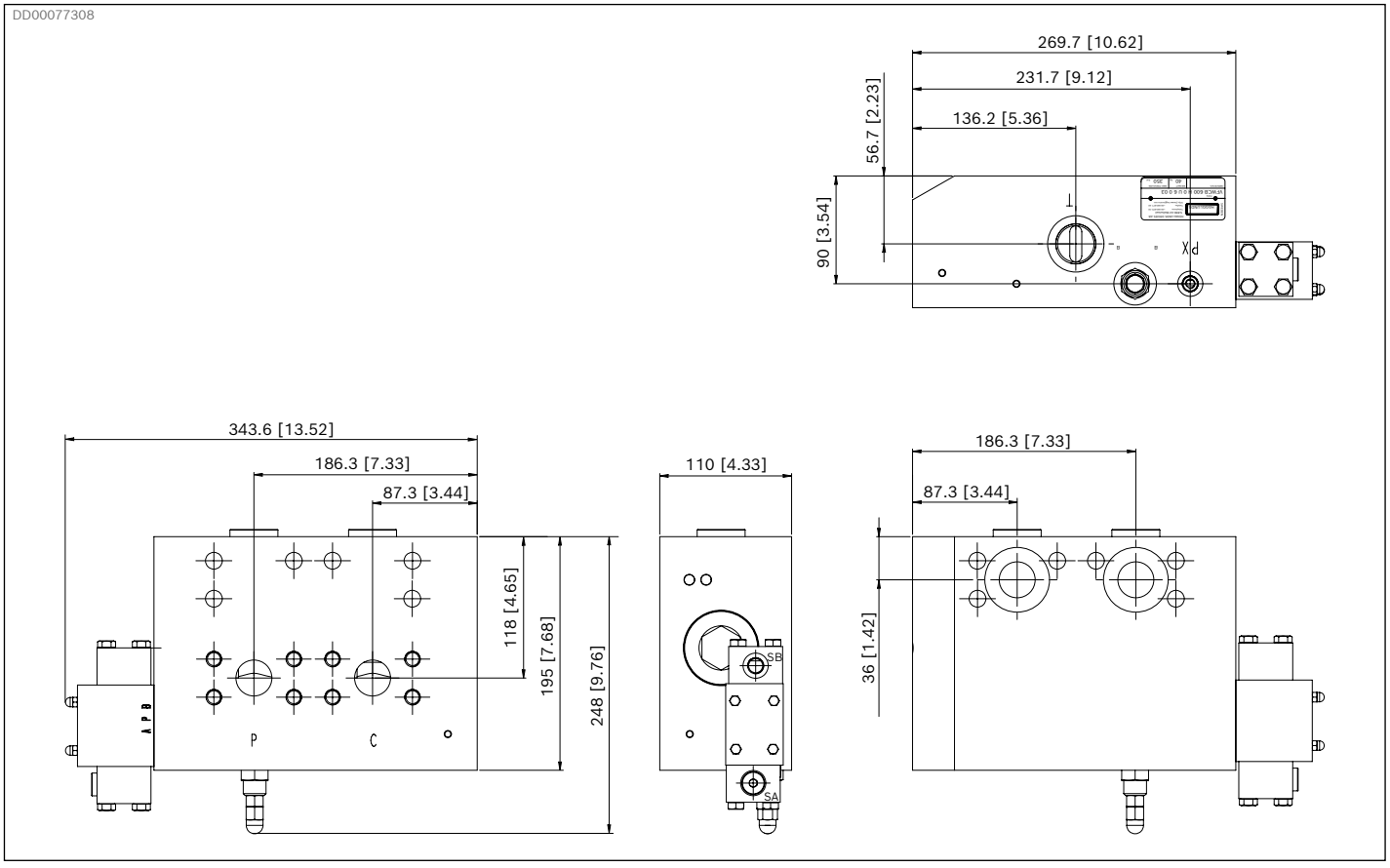

Fig. 14: Dimensions VFWCB 600 H, special index 03

7 Safety and installation instruction

7.1 Safety instructions

7.1.1 General safety instructions

⚠ DANGER

Danger from excessively high pressure!
Danger to life or risk of injury, damage to equipment!
Using the valve above the permissible maximum pressure can cause valve burst and hydraulic fluid to escape under high pressure.
- Use the valve within the permissible maximum pressure

Pressurized valve
Danger to life risk of injuries when working on valve in system not being depressurized
- Protect the system against being energized.
- Make sure that the system is depressurized.
- Do not disconnect any line connection, ports and components when the system is pressurized

7.1.2 Safety instructions for ATEX environment

⚠ DANGER

Unsafe work on the valve
Danger to life or risk of injury, damage to equipment!
- Before carrying any work on the valve, firstly make sure that a potentially explosive atmosphere cannot occur during the period of the work

⚠ WARNING

Escaping oil mist!
Risk of explosion, fire health hazard, environmental pollution.
- Depressurize the system including valve and repair the leak.
- Keep open flames an ignition sources from the Hägglunds valve

Static discharge
Cleaning the valve with a dry rug may lead to explosions through electrostatic dis-charge that may cause severe injuries and even death
- Do not use a dry rug for cleaning

Lack of grounding
Risk of explosion that may cause severe injuries and even death
- The valve must always be fitted to the motor or via adapter fitted to the motor. The valve must be electrically conductive and equipotential bonded with the motor which must be grounded to the system.
- The valve are not allowed to be fitted to any separate bracket without grounding of the valve.

Painting
Risk of explosion that may cause severe injuries and even death
- The valve must not be painted or otherwise coated with non-conductive sub-stances!
- Any change at the surface protection will lead to loss of explosion protection!

7.2 Installation

7.2.1 Fitting the VFWCB 600 valve on Hägglunds CA and CB

Refer also to the Installation and Maintenance Manual for actual motor.

Pos	Description
1	6 pcs 1/2 UNC x 127 (5“) (included in delivery) Tightening torque: 131 Nm (97 lbf·ft)
2	Valve VFWCB 600
3	2 pcs O-rings ø47,22 x 3,53 NBR 90 (included in delivery)

NOTICE

Contamination of the system!

Risk of damage components.

- Clean all mounting surfaces before assembly!.

- Remove the SAE flanges from motor mounting surface and the plastic plugs from the valve mounting surface.
- Place the O-rings (included in delivery) in their proper position on the valve mounting surface.
- Use clean grease to keep O-rings fixed during assembly.
- Mount the valve against the motor with the ports in the correct position.
- Re-instate paint finish and protect exposed surfaces

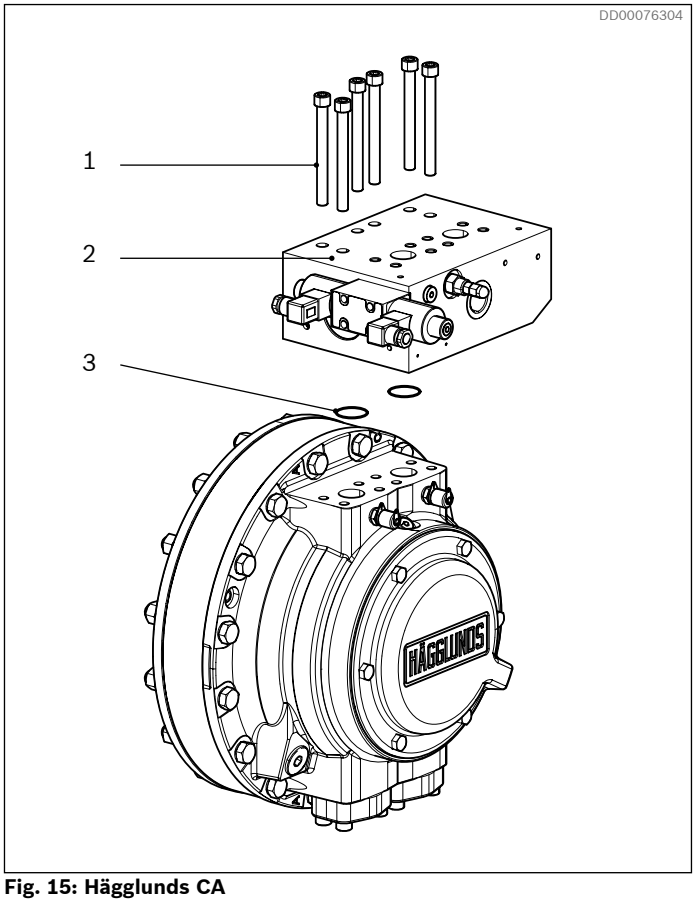

Fig. 15: Hägglunds CA

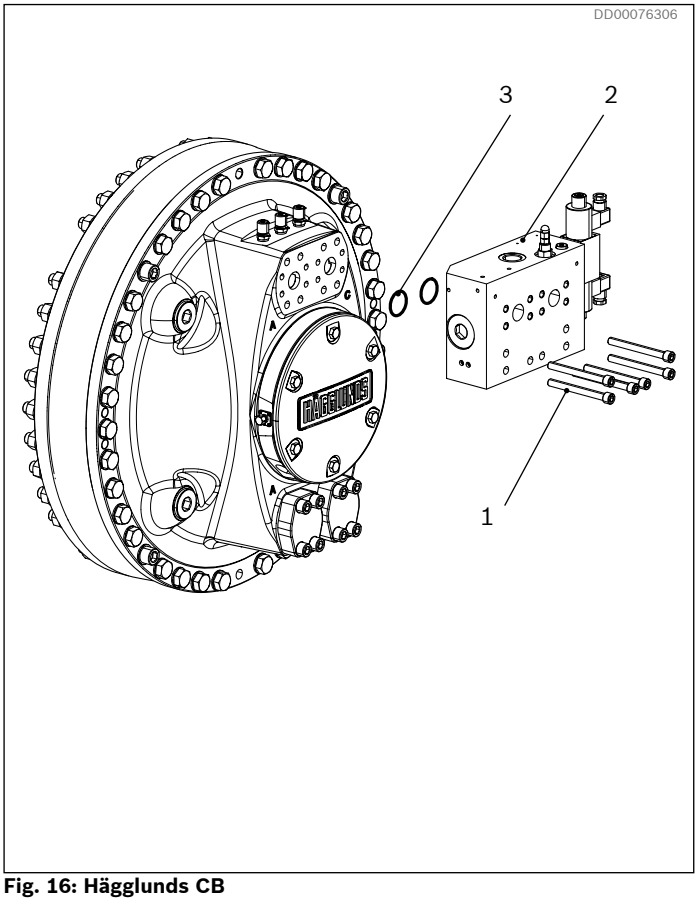

Fig. 16: Hägglunds CB

7.2.2 Fitting the valve on Hägglunds CBM

Refer also to the Installation and Maintenance Manual for actual motor.

NOTICE

Contamination of the system!
Risk of damage components.
▶ Clean all mounting surfaces before assembly!.

- Remove the SAE flanges from motor mounting surface and the plastic plugs from the adapter/valve mounting surfaces.
- Place the O-rings (6) (included in delivery) in their proper position on the adapter (4) mounting surface.
- Use clean grease to keep O-rings fixed during assembly.
- Mount the adapter (4) onto the motor with the ports in their correct position.
- Place the O-rings (3) (included in delivery) in their proper position on the valve (2) mounting surface.
- Use clean grease to keep O-rings fixed during assembly.
- Mount the valve (2) against the adapter (4) with the ports in their correct position.
- Re-instate paint finish and protect exposed surfaces.

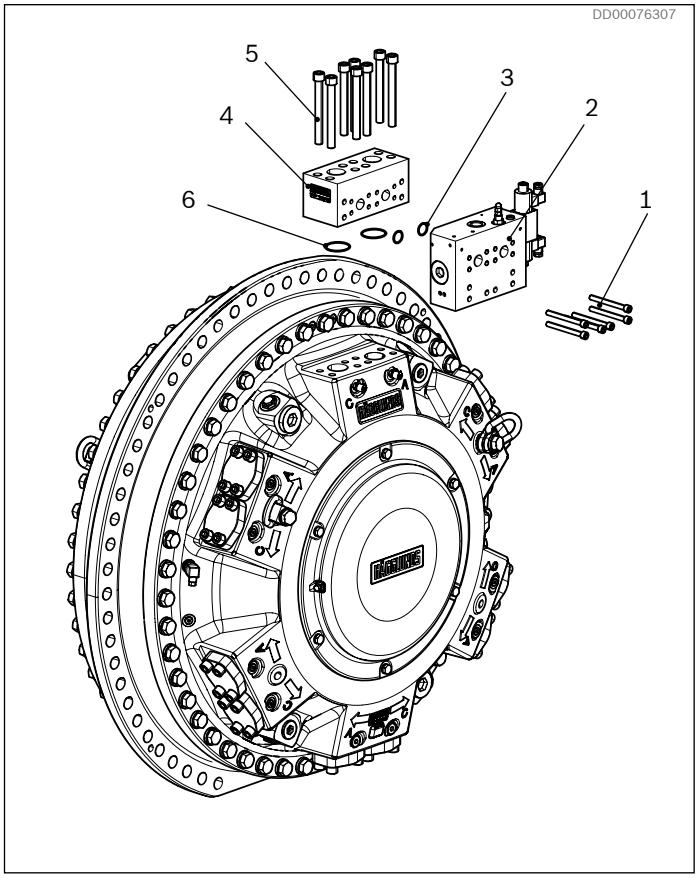

Fig. 17: Hägglunds CBM

Pos	Description
1	6 pcs 1/2 UNC x 127 (5“) (included in delivery) Tightening torque: 131 Nm (97 lbf·ft)
2	Valve VFWCB 600
3	2 pcs O-rings ø47,22 x 3,53 NBR 90 (included in delivery)
4	Adapter VA 1000 15 not included in delivery (*see Data sheet RE 15383 Hägglunds valve adapters*)
5	8 pcs 3/4 UNC x 178 (7") (Included in VA 1000 15) Tightening torque 568 Nm (419 lbf ft)
6	2 pcs O-ring 56,74x3,53 NBR 90 (Included in VA 1000 15)

Note!
Mounting the valve on Hägglunds CBM , adapter R939011952, VA 1000 15 must be ordered separatly!

7.3 Installation drawing

7.3.1 VFWCB 600 E

Refer to dimensional drawing: 078 3920

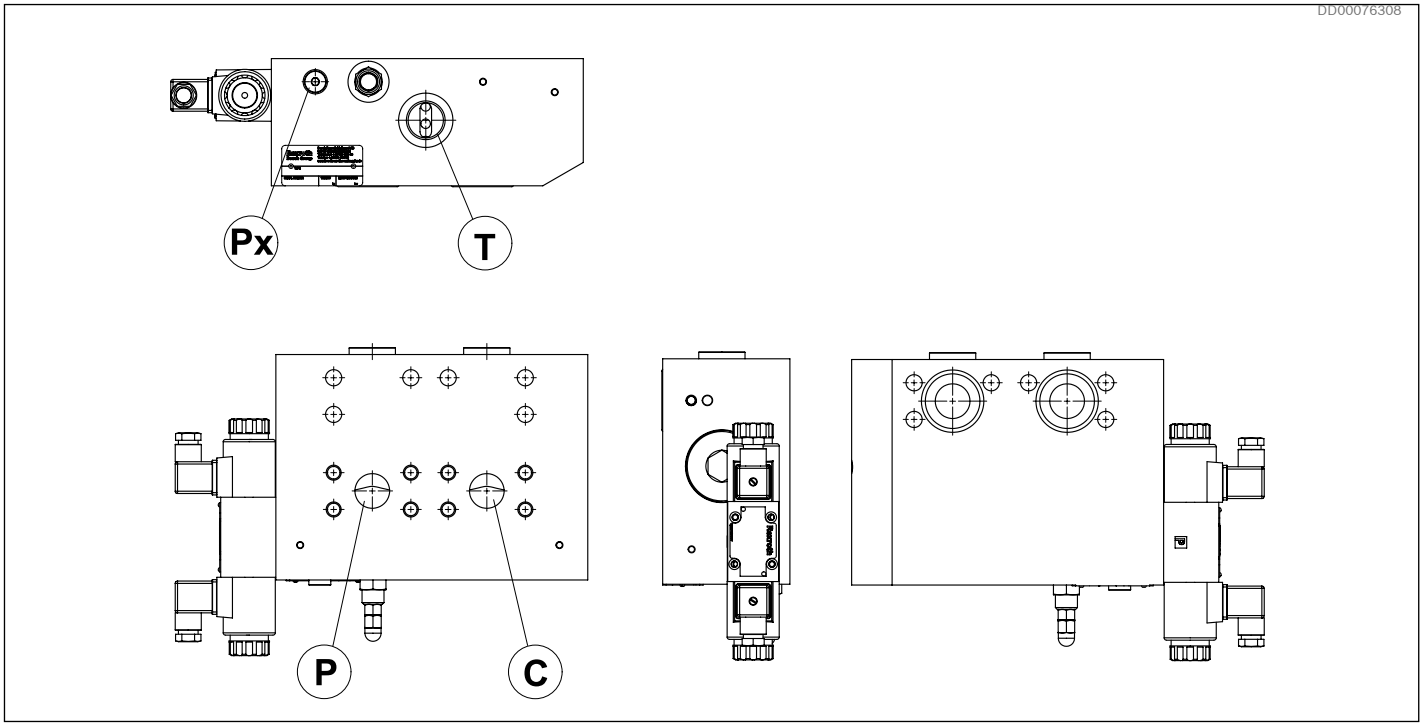

Fig. 18: Installation drawing – VFWCB 600 E, VFWCB 600 E Ex

7.3.2 VFWCB 600 H

Refer to dimensional drawing: 078 3921

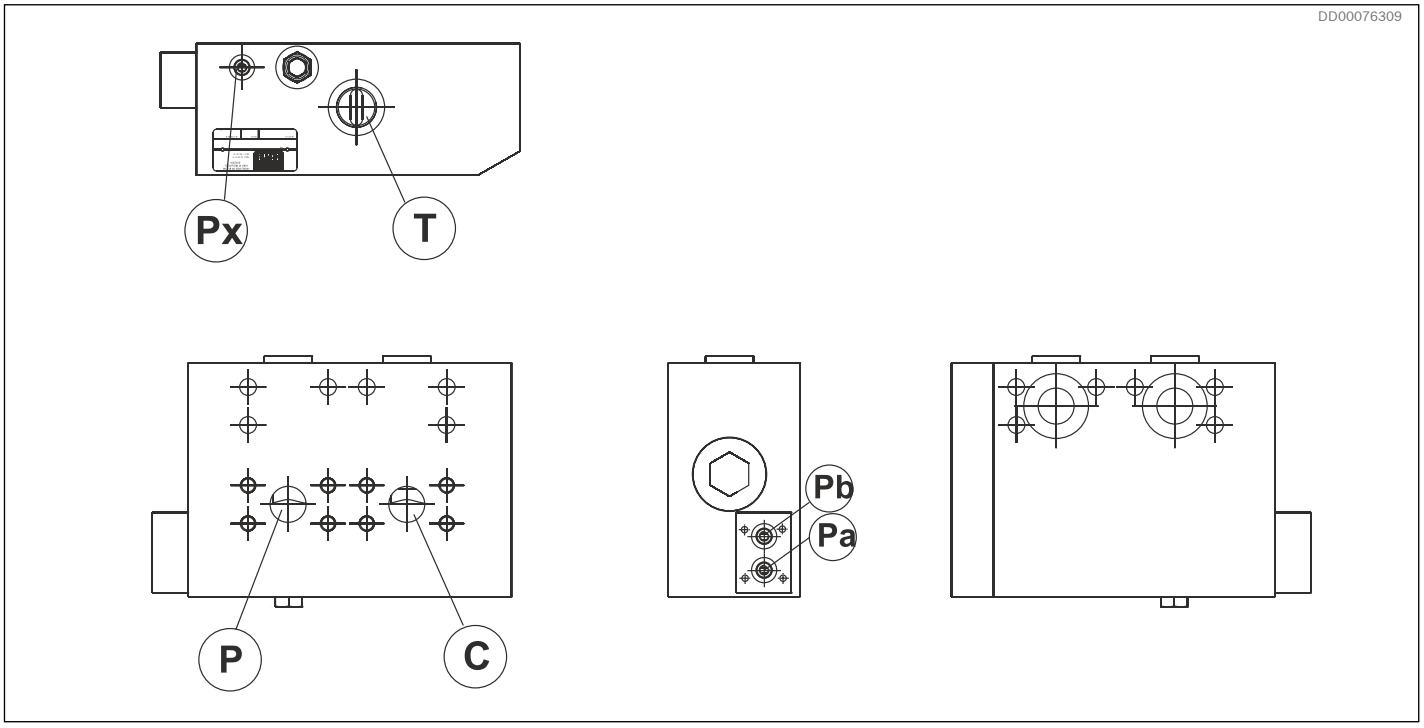

Fig. 19: Installation drawing – VFWCB 600 H, VFWCB 600 H Ex

7.3.3 VFWCB 600 M

Refer to dimensional drawing: 078 3922

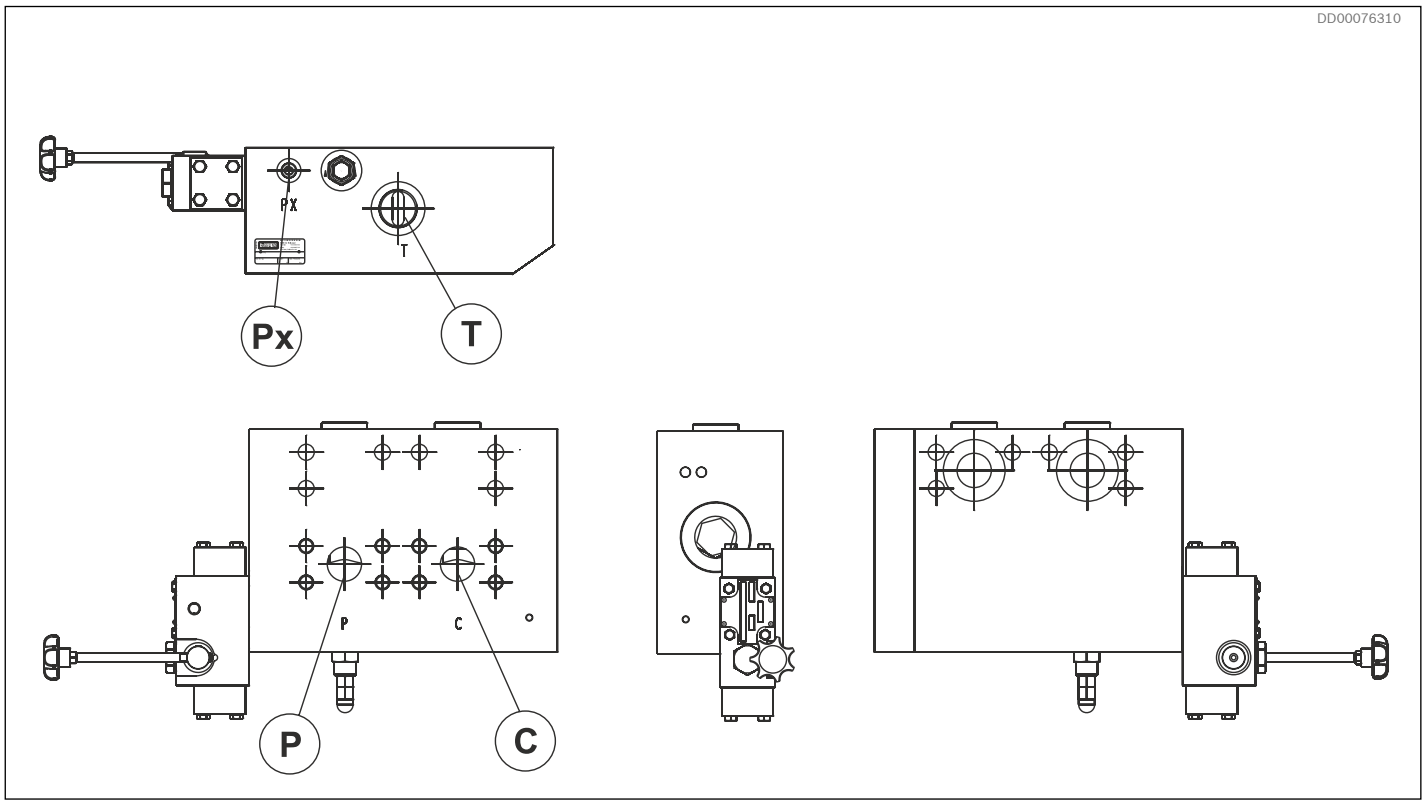

Fig. 20: Installation drawing – VFWCB 600 M

Connection	Description	Port Connection
P, C	Main connection	SAE 1 1/4 *
T	Drain connection	G 1
Px	External pilot	G 1/4
Pa, Pb	External pilot	G 1/4

* J518C, Code 62, 414 Bar (6000 psi)

7.4 Electrical installation

7.4.1 Electric circuit connection, standard.

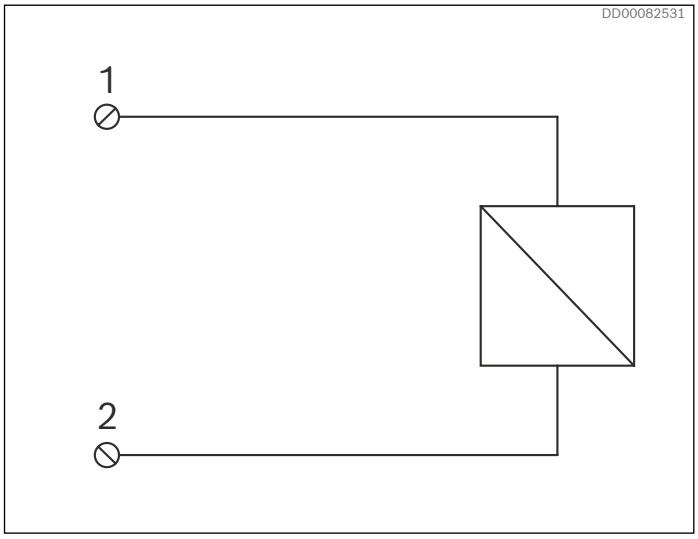

Fig. 21: Circuit diagram standard terminal box

7.4.2 Electrical circuit connection, Ex.

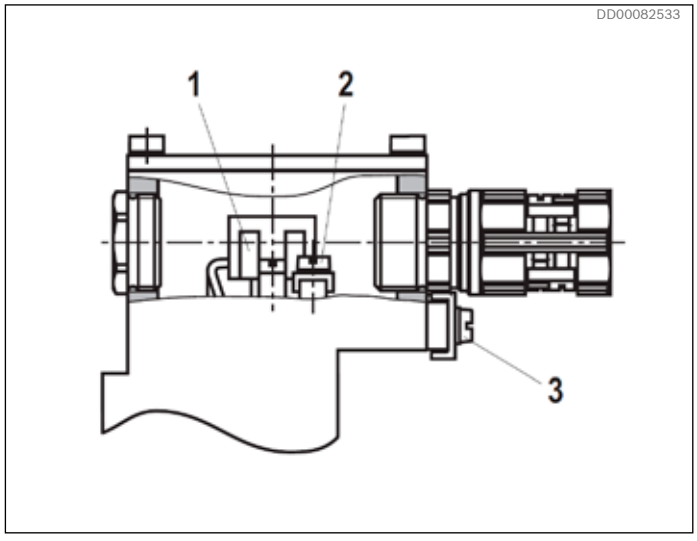

Fig. 22: Electrical connection, Ex terminal box

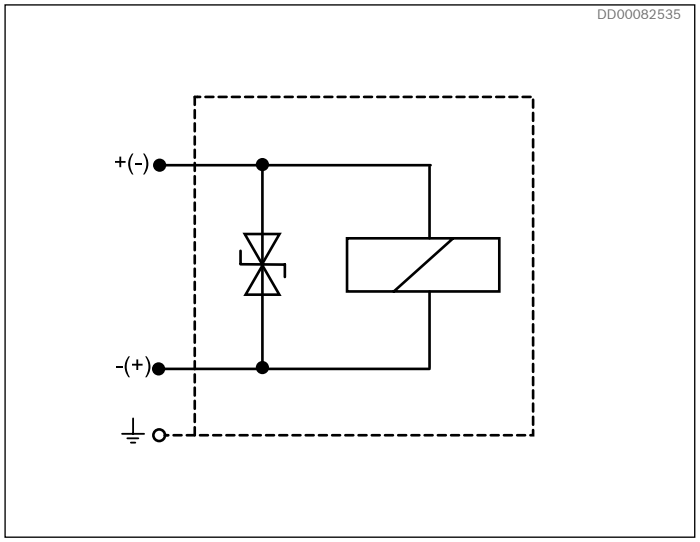

Fig. 23: Circuit diagram Ex terminal box

Table 5: Properties of the connection terminals and mounting elements

Position	Function	Connectable line cross-section
1	Operating voltage connection	Single-wire 0.75 ... 2.5 mm² Finely stranded 0.75 ... 1.5 mm²
2	Connection for protective earthing conductor	Single-wire max. 2.5 mm² Finely stranded max. 1.5 mm²
3	Connection for potential equalization conductor	Single-wire 4 ... 6 mm² Finely stranded min. 4 mm²

Table 6: Cable gland

Type approval	II 2G Ex e IIC Gb
Threaded connection	M20 x 1.5
Protection class according to EN 60529	IP66 (with correctly installed electrical connection)
Line diameter	7 ... 10.5 mm (0.28 ... 0.41 in)
Sealing	Outer sheath sealing

Table 7: Connection line

Line type	Non-armored cables and lines (outer sheath sealing)
Temperature range	–30 ... > +110 °C (-22...>+230 °F)

8 Required and additional documents

	Title	Document no	Document type
🕮	Hydraulic fluid quick reference	RE 15414	Data sheet
🕮	Hägglunds valve adapters	RE 15383	Data sheet
🕮	Directional spool valves, direct operated,with solenoid actuation	RE 23178-XE	Data sheet
🕮	Freewheeling valve VFWCB 600 E	078 3920*)	Dimension drawing
🕮	Freewheeling valve VFWCB 600 H	078 3921*)	Dimension drawing
🕮	Freewheeling valve VFWCB 600 M	078 3922*)	Dimension drawing

Documents at Bosch Rexroth Media Directory

*) Documents only available at LHD extranet. Contact your Bosch Rexroth representative for information.

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