

2-speed valve

Häggglunds VTCA 600

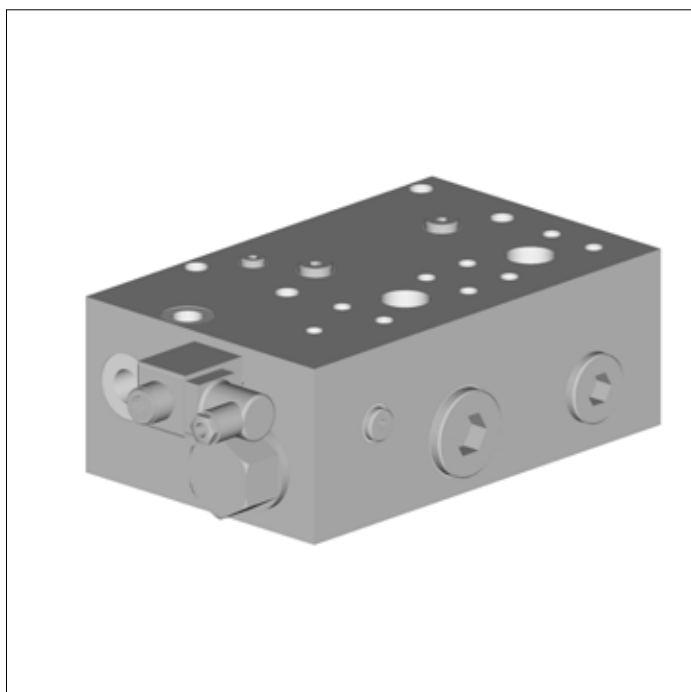
Includes valves for ATEX environment



RE 15389

Edition: 02.2018

Replace: New



- ▶ Valid for: Häggglunds motors CA
- ▶ Maximum flow 600 l/min (158 gpm)
- ▶ For closed and open loop hydraulic system

Features

- ▶ Displacement shift for Häggglunds CA motor
- ▶ Compact and robust design
- ▶ Multifunctional
- ▶ Can be mounted directly on Häggglunds motors
- ▶ Built in brake control function
- ▶ Exchange of oil in motor case
- ▶ Possibility for internal control pressure.

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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 of the hazard, and how serious the injury or property damage could be, there are three levels of 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!

- Charge pressure at the motors connection, must be according to graph (*see 6 Required charge pressure diagram page 14*) under all conditions
- Valve version VTCA 600 X X X X XX 05, mirror inverted, is not allowed to be used in suspended load application

2 Ordering code

In order to identify Häggglunds 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 VTCA 600:

VT	C	A		600	0	H	1	0	0	00
01	02	03		04	05	06	07	08	09	10

01	2-speed valve									VT
02	For motors									C
	CA 50 to CA 210 ⁵⁾									
03	Version									A
04	Maximal flow (l/min)									600
	600									
05	Brake function									0
	Without brake function									
	With brake function ³⁾									B
06	Operation									E
	Electrical operated 24VDC ⁴⁾									
	Hydraulic operated									H
07	Exchange of oil in motor casing									0
	Not prepared									
	Prepared									1
08	Explosive environment									0
	Non explosive environment									
	Explosive environment ²⁾									1
09	Modification ¹⁾									0-9
10	Design									00
	Standard									
	Mirror inverted ^{6) 7)}									05
	Special index ¹⁾									01-99

- 1) To be filled in by Bosch Rexroth DC-HD/ENG
- 2) Only valid for attribute 05 code 0 and attribute 06 code H
- 3) Only in combination with electric operated valve
- 4) Other than 24VDC, must be ordered separately
- 5) Only valid for two speed motors (R/L)
- 6) In combination with Special index motor 06
- 7) **Not allowed to be used in suspended load applications**

3 Functional description

3.1 General

Häggglunds Compact CA 50-210 motors in 2-speed configuration in combination with VTCA 600 valve can shift displacement from full to half displacement while running up to 30 rpm and high pressure maximum 105 bar. Displacement shift from half to full displacement is **not** allowed while the motor is rotating.

Shifting from full to half displacement means that 25% of the pistons are provided with high pressure and 75% of the pistons are provided with low pressure. This resulting in twice the speed and half the output torque compared to full displacement. The valve can be mounted directly onto the motor and can be used in both open and closed loop systems.

When ordering a motor prepared for 2-speed function the main rotation, clockwise (R) or counter clockwise (L), has to be specified. With wrong direction, load on the piston will be increased 3 times, which can give overheating of the pistons.

With the flow inlet connected to P (A-port on motor), the motor shaft rotates in the directions shown by arrows. (see *Fig. 1 and Fig. 2*) R-motor rotates clockwise, and L-motor counter-clockwise, viewed from the motor shaft side. If the motor is working in half displacement, and in reversed "direction of rotation", is the allowed pressure max 210 bar (3000 psi).

For higher speed, two valves can be used, one standard valve and one S-index 05 valve (mirrored inverted). Maximum operating pressure is 350 bar (5076 psi) and maximum flow 600 l/min (158 gpm). When using a 2-speed motor, check the system temperature due to higher pressure loss, flushing may be necessary and 2-speed applications for motors with reduced displacements are not recommended.

The valve is available in five main configurations:

- VTCA 600 0 H: Hydraulic operated displacement shift.
- VTCA 600 0 H S-index 05: Hydraulic operated displacement shift. Two valves.
- VTCA 600 0 E: Electric operated displacement shift, 24 VDC.
- VTCA 600 E S-index 05: Electric operated displacement shift, 24 VDC. Two valves.
- VTCA 600 B E: Electric operated displacement shift with brake control function, 24 VDC.

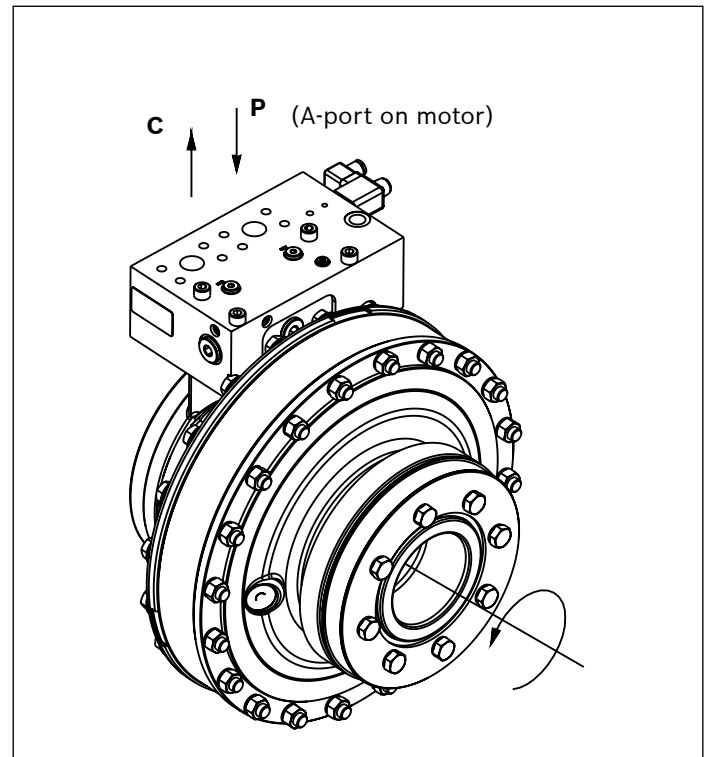


Fig. 1: Motor prepared for valve, direction of rotation, Counter-clockwise = L

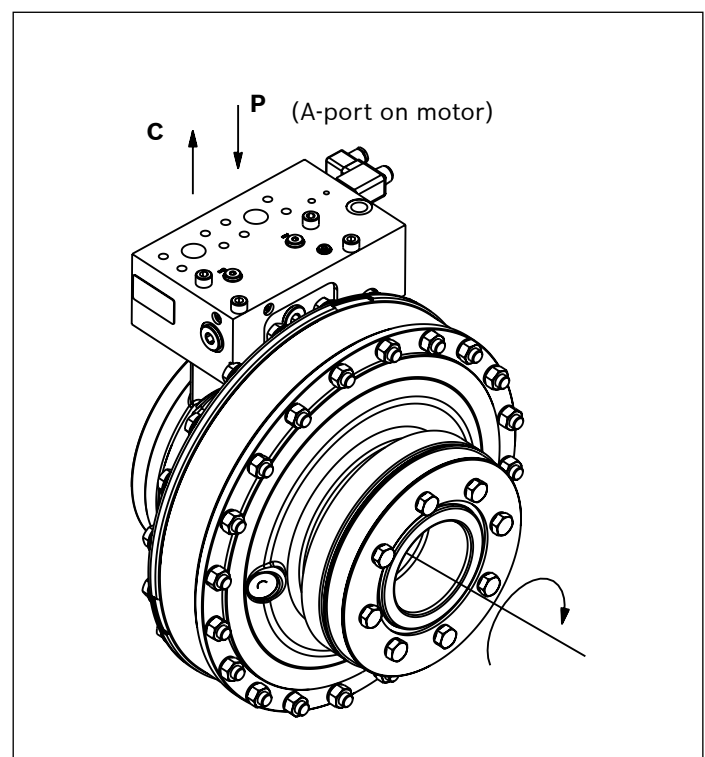


Fig. 2: Motor prepared for valve, direction of rotation, Clockwise = R

3.2 Function

3.2.1 Valve VTCA 600 0 H 0 and VTCA 600 0 H 1

Hydraulic operated valve.

The displacement shift function is controlled by a directional valve (2), see Fig. 6, which is kept in the full displacement position by spring action. The control pressure for the directional valve is obtained from an external source through port "Pc".

3.2.2 Valve VTCA 600 0 E 0 and VTCA 600 0 E 1

Electrical operated valve

The displacement shift function is controlled by a directional valve (2), see Fig. 7, which is kept in the full displacement position by spring action. The control pressure for the directional valve is controlled by an electrical operated directional valve (3) see Fig. 7. The control pressure is obtained from an external source through port "Pc" or internally from "P".

Using internal control pressure from "P"

(Only VTCA 600 0 E)

The VTCA 600 valves are at delivery prepared for control pressure connection at "Pc". In case of electric operated valve (VTCA 600 0 E), the control pressure can be obtained internally from "P" by following instructions below and Fig. 3.

1. Remove plug (B).
2. Remove plug (010).
3. Mount plug (B), tightening torque: 10 Nm.
4. Install a plug at connection "Pc", G 1/2", material ID R913001725

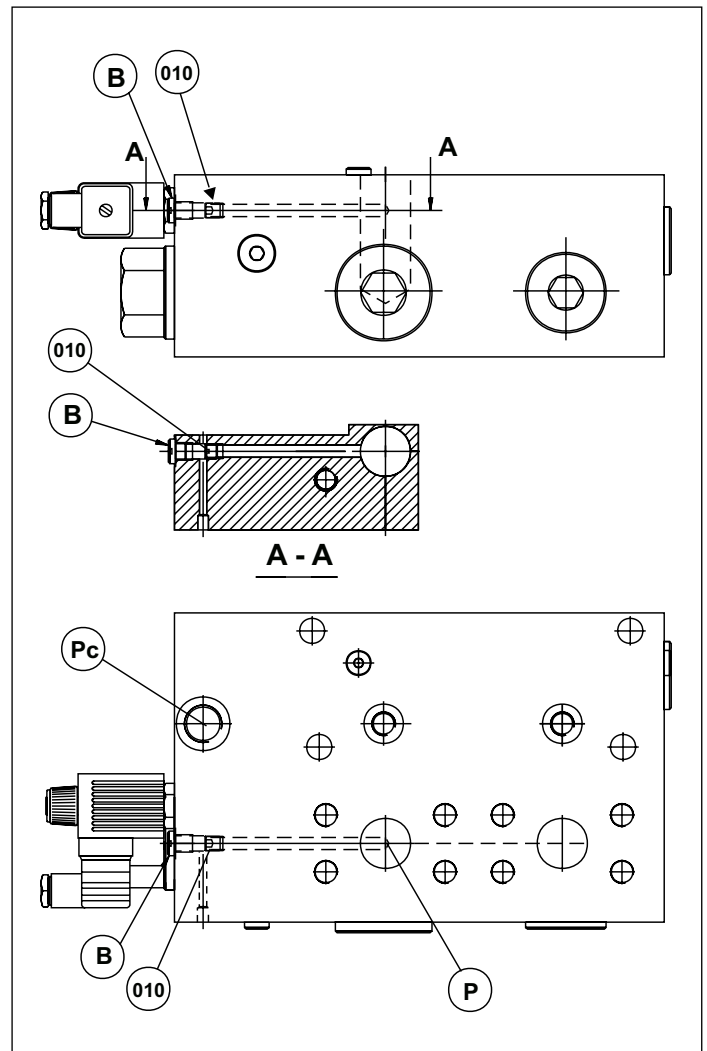


Fig. 3: Using internal control pressure from "P" (Only VTCA 600 0 E)

3.2.4 Valve VTCA 600 B E 0 and VTCA 600 B E 1

Electric operated with brake function.

(See Fig. 8 and Fig. 9)

The displacement shift function is controlled by a directional valve (2) which is kept in the full displacement position by spring action. The control pressure for the directional valve is controlled by an electrical operated directional valve (3), ISO 4401, included in delivery. The control pressure is obtained from an external source through port "Pc".

Brake function

The brake function is electrical operated. The control pressure for the brake is controlled by two electrical operated directional valves (3 and 6), and the brake is connected to connection "BR". The control pressure is obtained from an external source through port "Pc".

Brake off

When the electrical operated directional valves are open, the pressure from "Pc" shifts the directional valve (4), check valve (5) is closed and the pressure are guided to "BR" and the brake release.

Brake on

When the electrical operated directional valve (3) is closed, the directional valve (4) shifts and the check valve (5) opens. Spring pressure in the brake cylinder pushes then oil to tank and the brake applies.

3.2.3 Exchange of oil in motor casing**VTCA 600 0 H 1, VTCA 600 0 E 1 and VTCA 600 B E 1**

are prepared for exchange of oil in motor casing. Nominal oil exchange, with an orifice with a Ø 2 mm hole, is 12 l/min (3.1 US gal/min) at a pressure in "C"-line of 25 bar (365 psi).

NOTICE**High internal pressure in motor case**

Risk of damage motor.

- Make sure that an external draining line is connected to one of the external drain connections D1, D2 or D3 on the motor.

The VTCA 600 0 H 0 and VTCA 600 0 E 0 valves are, at delivery not prepared for exchange of oil in motor case.

Port (8) is plugged, and port (9) is not plugged.

See also hydraulic circuits Fig. 6. and Fig. 7

The valve can be prepared for exchange of oil in motor case by following instructions and Fig. 5.

1. Replace the plug (008), M8, with an orifice, material ID R939055162
2. Install plug (009), R3/8", material ID R913053036.
3. Lock the plugs with Loctite 577 or similar.

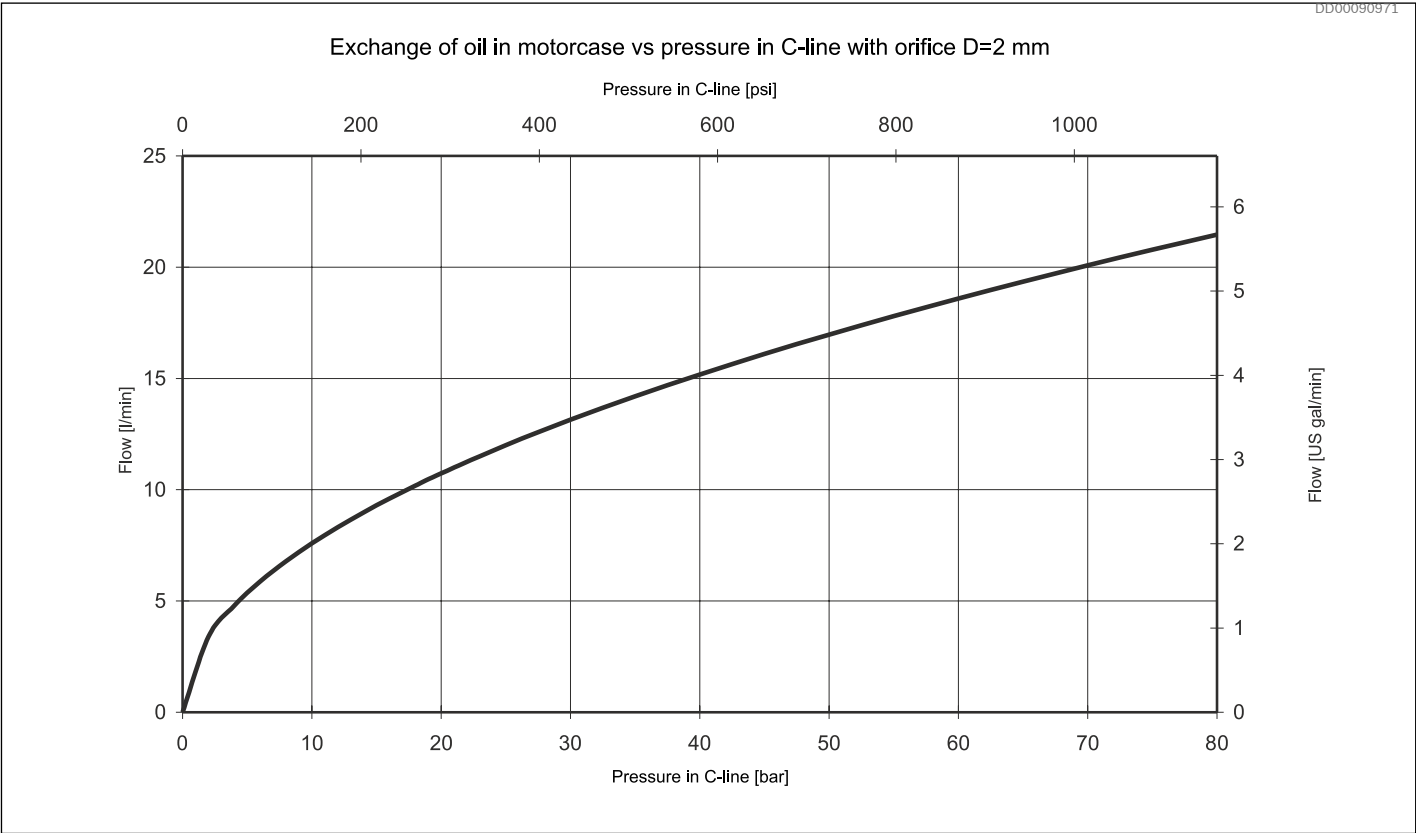


Fig. 4: Exchange of oil in motor case vs pressure in C-line

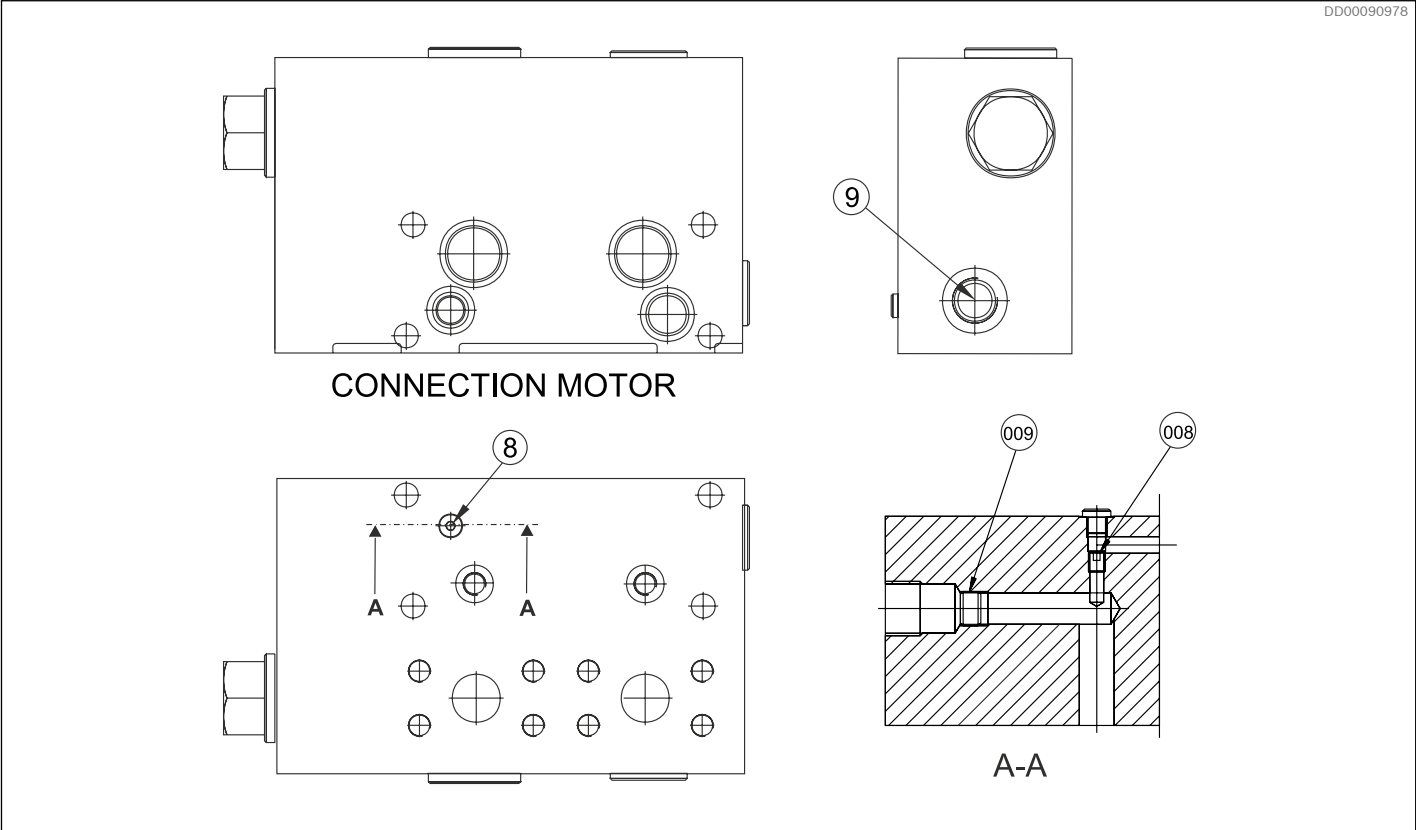
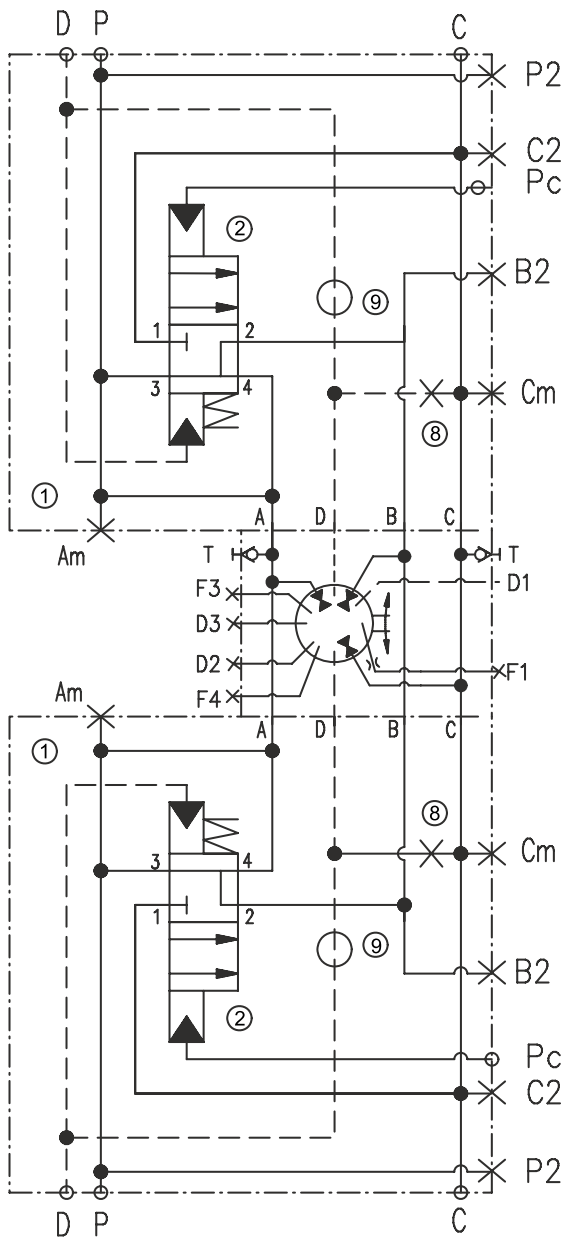


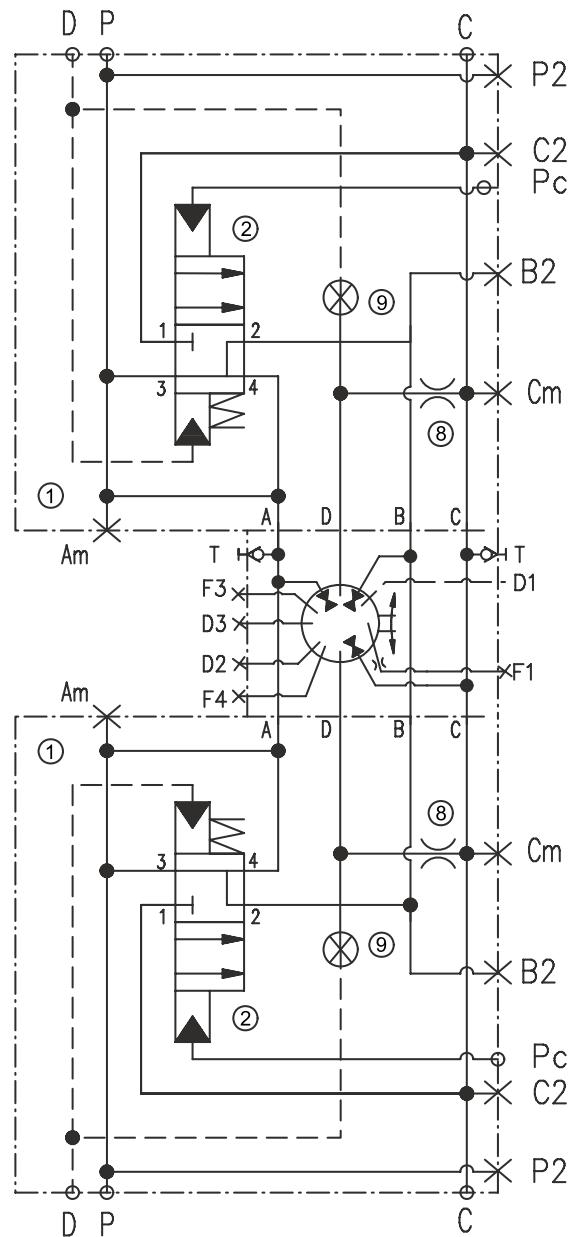
Fig. 5: Exchange of oil in motor case for VTCA 600 0 H 0 and VTCA 600 0 E 0

VTCA 600 0 H 0



VTCA 600 0 H 0 S05

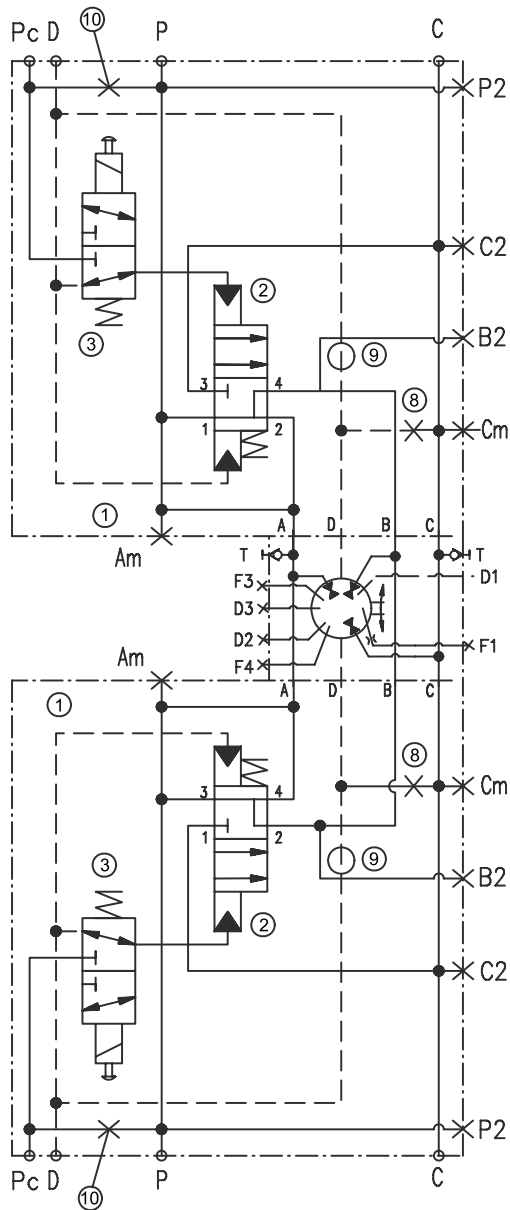
VTCA 600 0 H 1



VTCA 600 0 H 1 S05

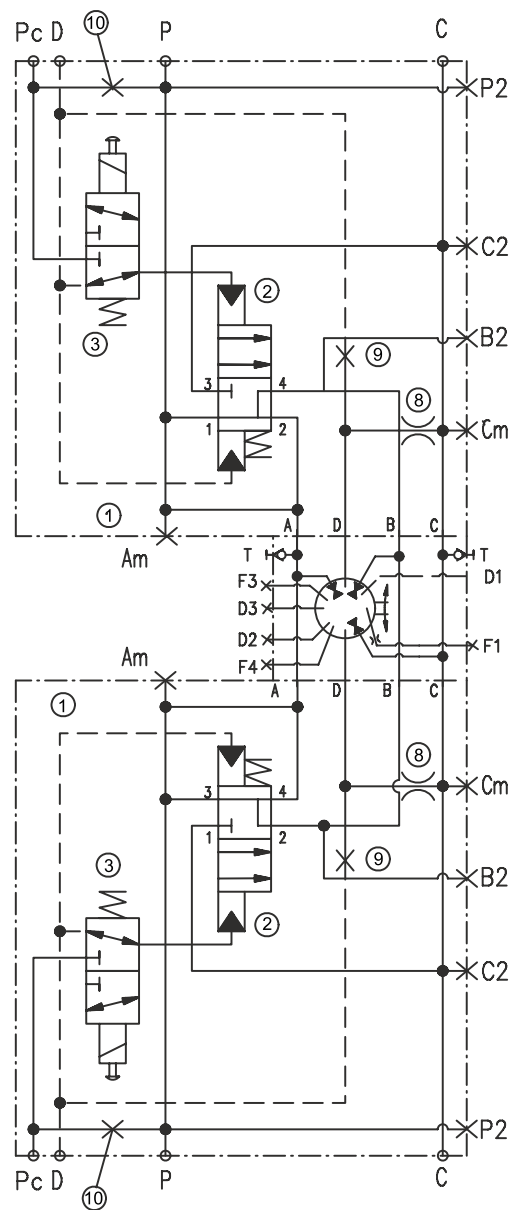
Fig. 6: Hydraulic Circuit for VTCA 600 0 H 0, VTCA 600 0 H 0 S-index 05, VTCA 600 0 H 1 0 and VTCA 600 0 H 1 0 S-index 05

VTCA 600 0 E 0



VTCA 600 0 E 0 S05

VTCA 600 0 E 1



VTCA 600 0 E 1 S05

Fig. 7: Hydraulic Circuit for VTCA 600 0 E 0 ,VTCA 600 0 E 0 S-index 05, VTCA 600 0 E 1 and VTCA 600 0 E 1 S-index 05 .

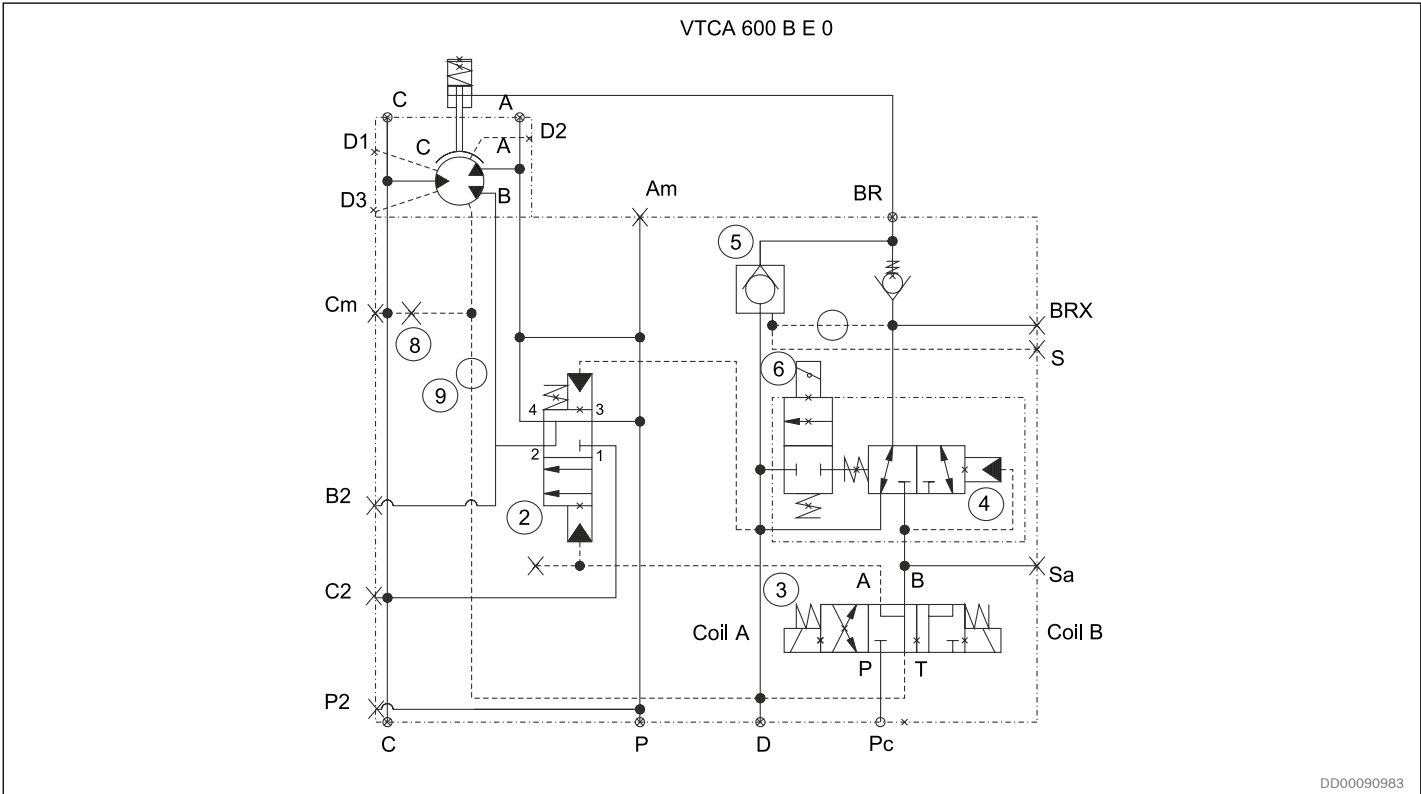


Fig. 8: Hydraulic circuit for VTCA 600 B E 0

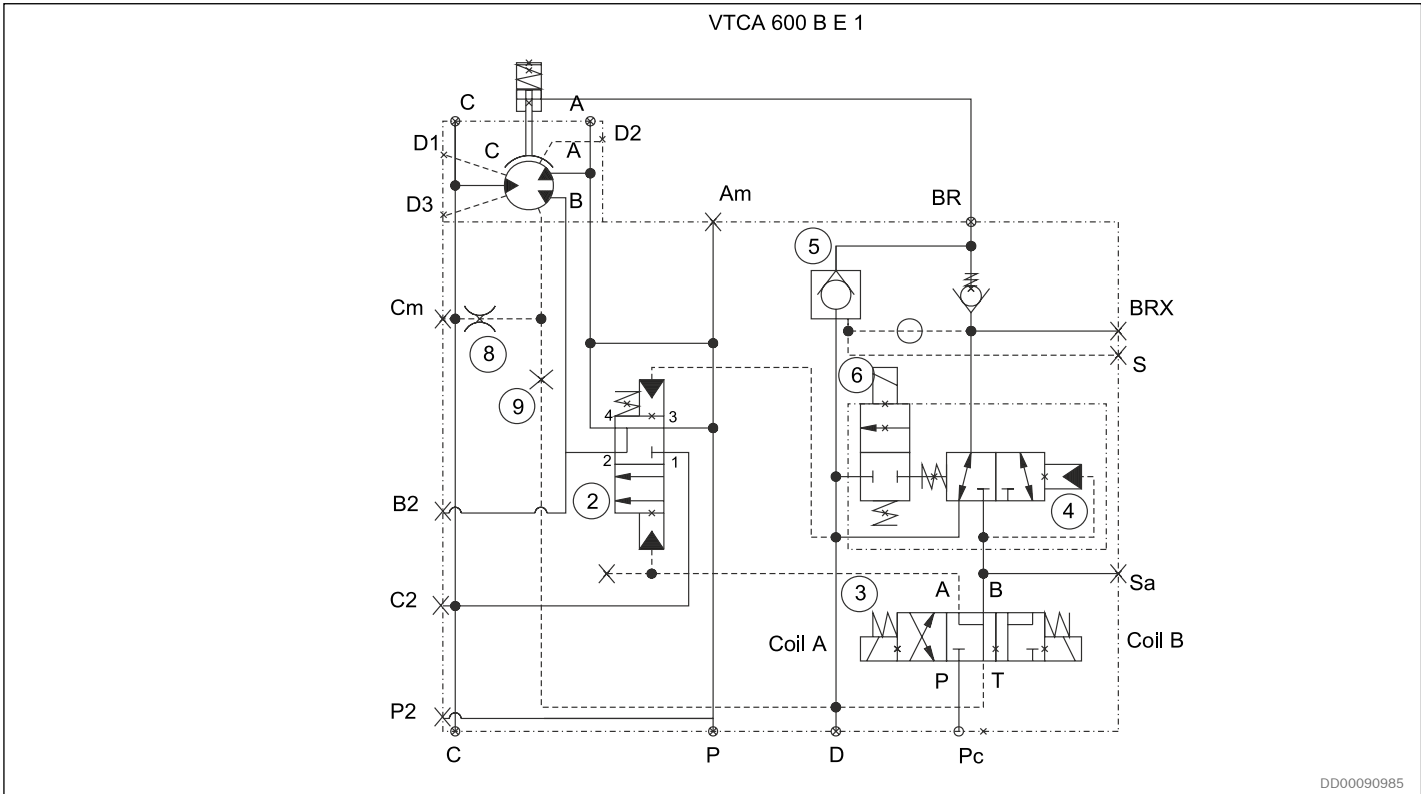


Fig. 9: Hydraulic circuit for VTCA 600 B E 1

4 Technical data

4.1 General data

Table 2: General data VTCA 600

	Metric	US
Mechanical specification		
Maximum operating pressure	350 bar	5 076 psi
Maximum operating pressure reversed direction	210 bar	3 000 psi
Pilot pressure	7 min. to 350 max. bar	101 min. to 5 076 max. psi
Maximum Flow (see 5 Pressure loss diagram page 12)	600 l/min	158 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
Weight		
2-speed valve typical VTCA 600 O H	29 kg	63 lb
2-speed valve typical VTCA 600 O E	29.3 kg	64 lb
2-speed valve typical VTCA 600 B E	36 kg	79 lb
Pilot valve: Connectors EN 175301-803 / Sea water protected		
Supply voltage	24 VDC	
Solenoid power	12 W	
Solenoid current	0.5 A	
Solenoid protection class (EN 175301-803)	IP65	
Surface protection		
Standard painting system	SS-EN ISO 12944 C3, durability range M (Std, colour RAL 2002)	

4.2 Explosion protection information, hydraulic operated VTCA 600

Table 1: Explosion protection information hydraulic VTCA 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 °C (+212 °F)
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 °C (-13.....+122 °F)

5
Pressure loss diagram

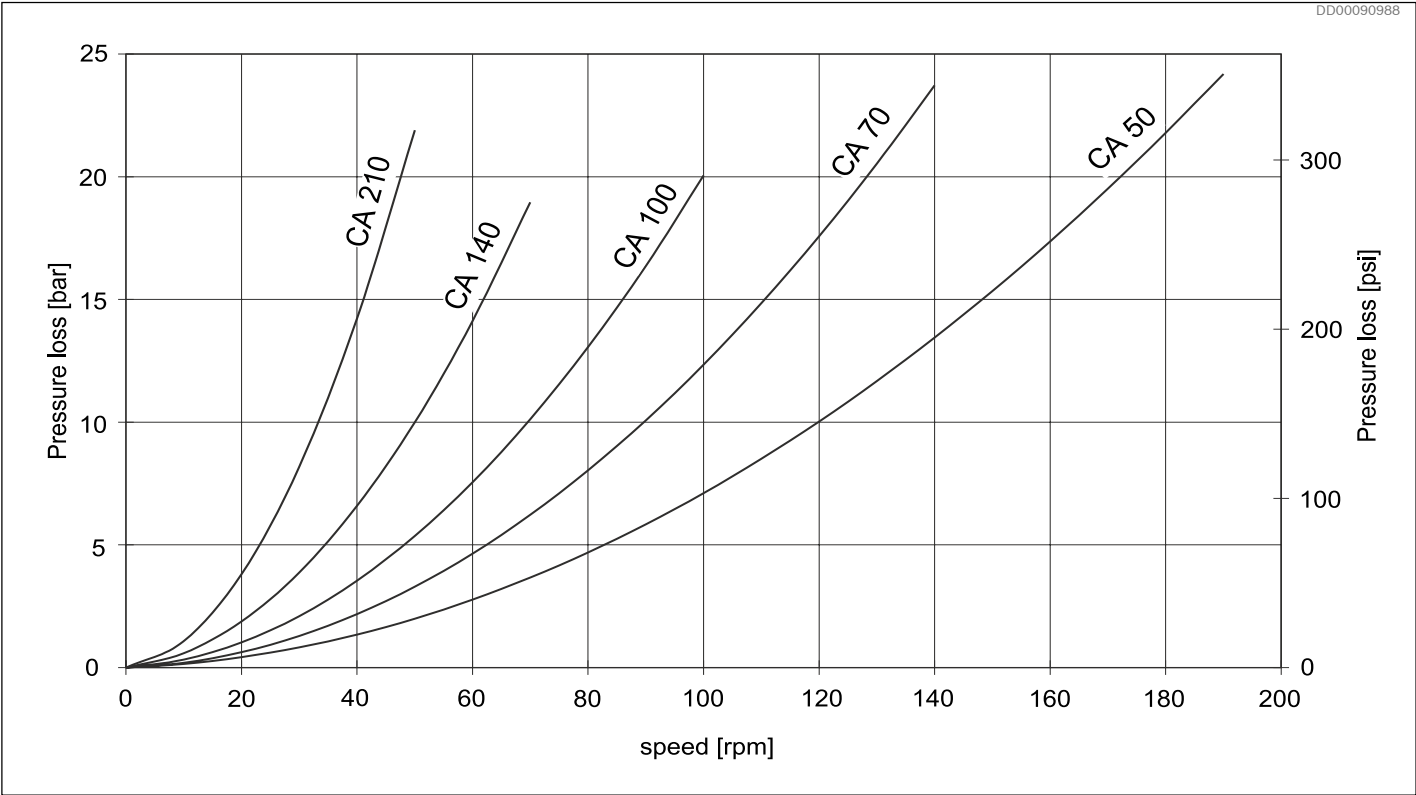


Fig. 10: Pressure loss main circuit P - C at full displacement for standard valve (motor and valve included) Viscosity 40 cSt/187 SSU.

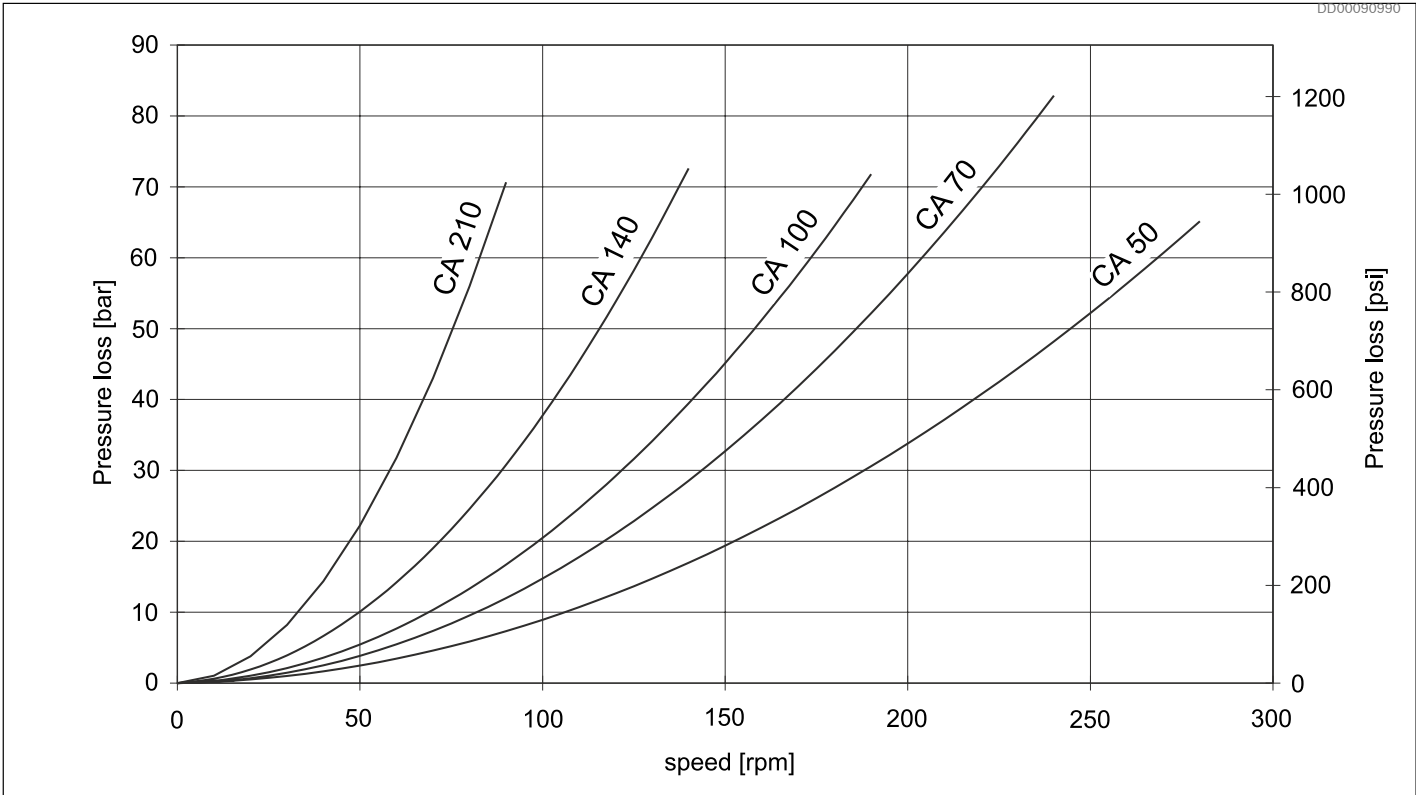


Fig. 11: Pressure loss main circuit P-C at half displacement for standard valve (motor and valve included) Viscosity 40 cSt/187 SSU

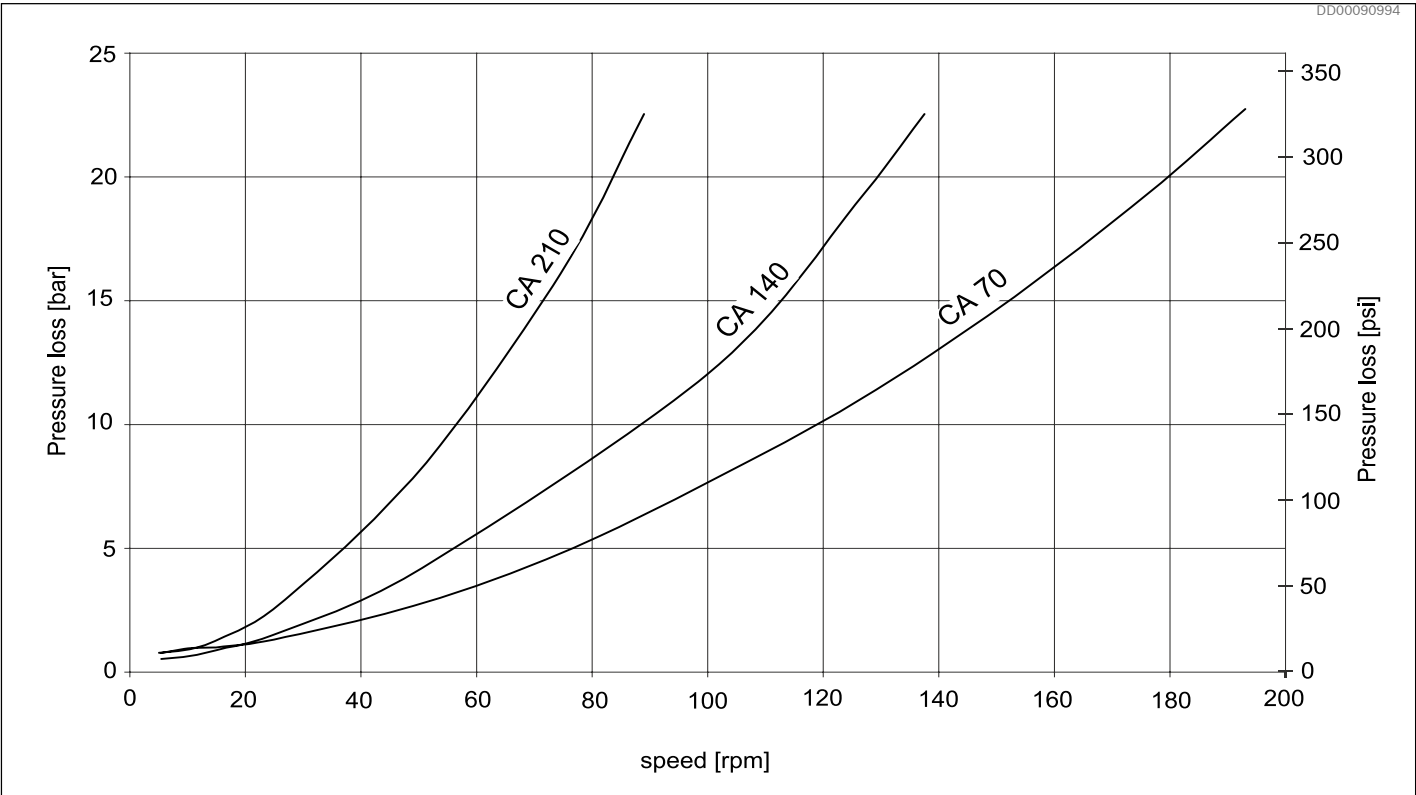


Fig. 12: Pressure loss main circuit P - C at full displacement for standard valve + S-index 05 valve (motor and valve included)
Viscosity 40 cSt/187 SSU.

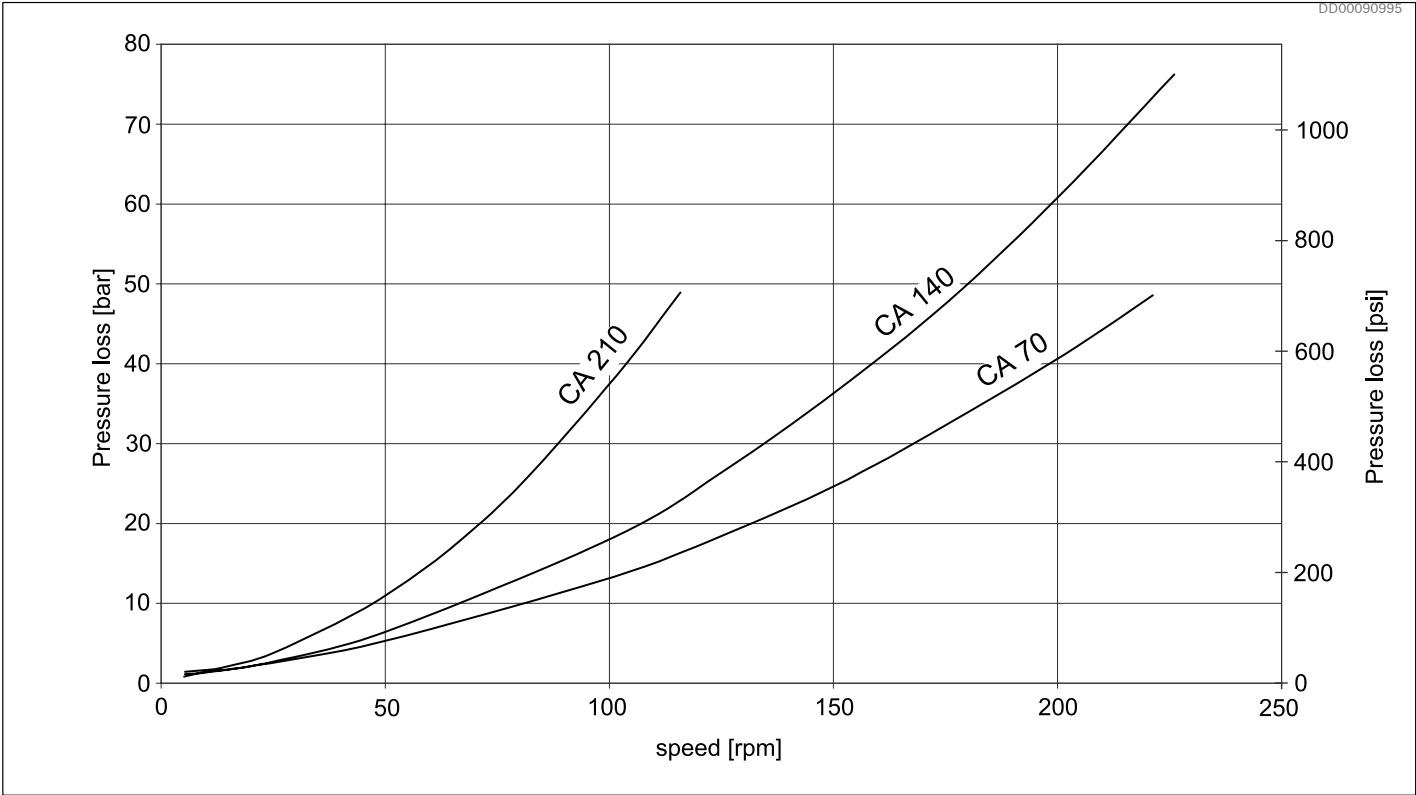


Fig. 13: Pressure loss main circuit P-C at half displacement for standard valve + S-index 05 valve (motor and valve included)
Viscosity 40 cSt/187 SSU

6 Required charge pressure diagram

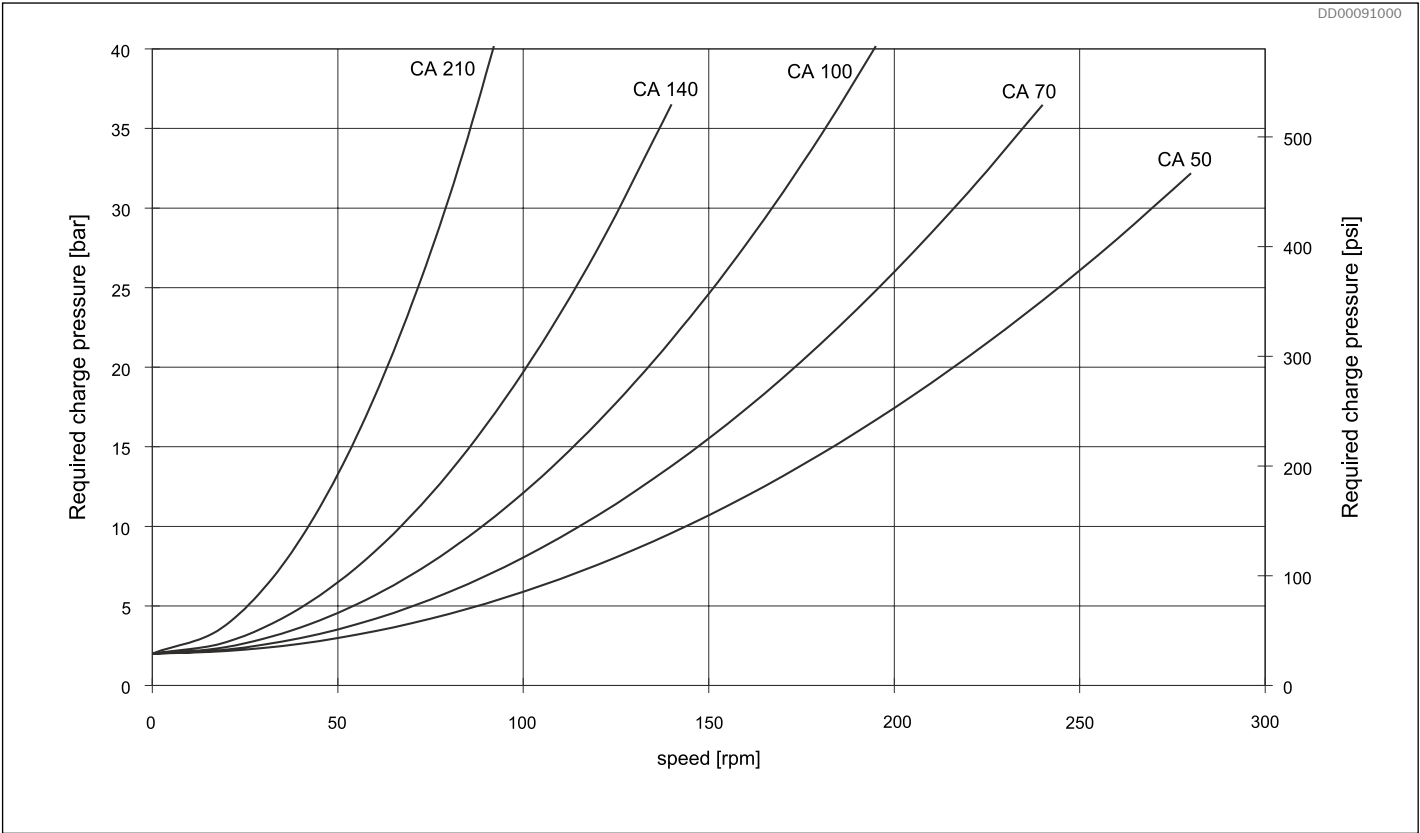


Fig. 14: Required charge pressure when running in half displacement for standard valve (Motor and valve included)

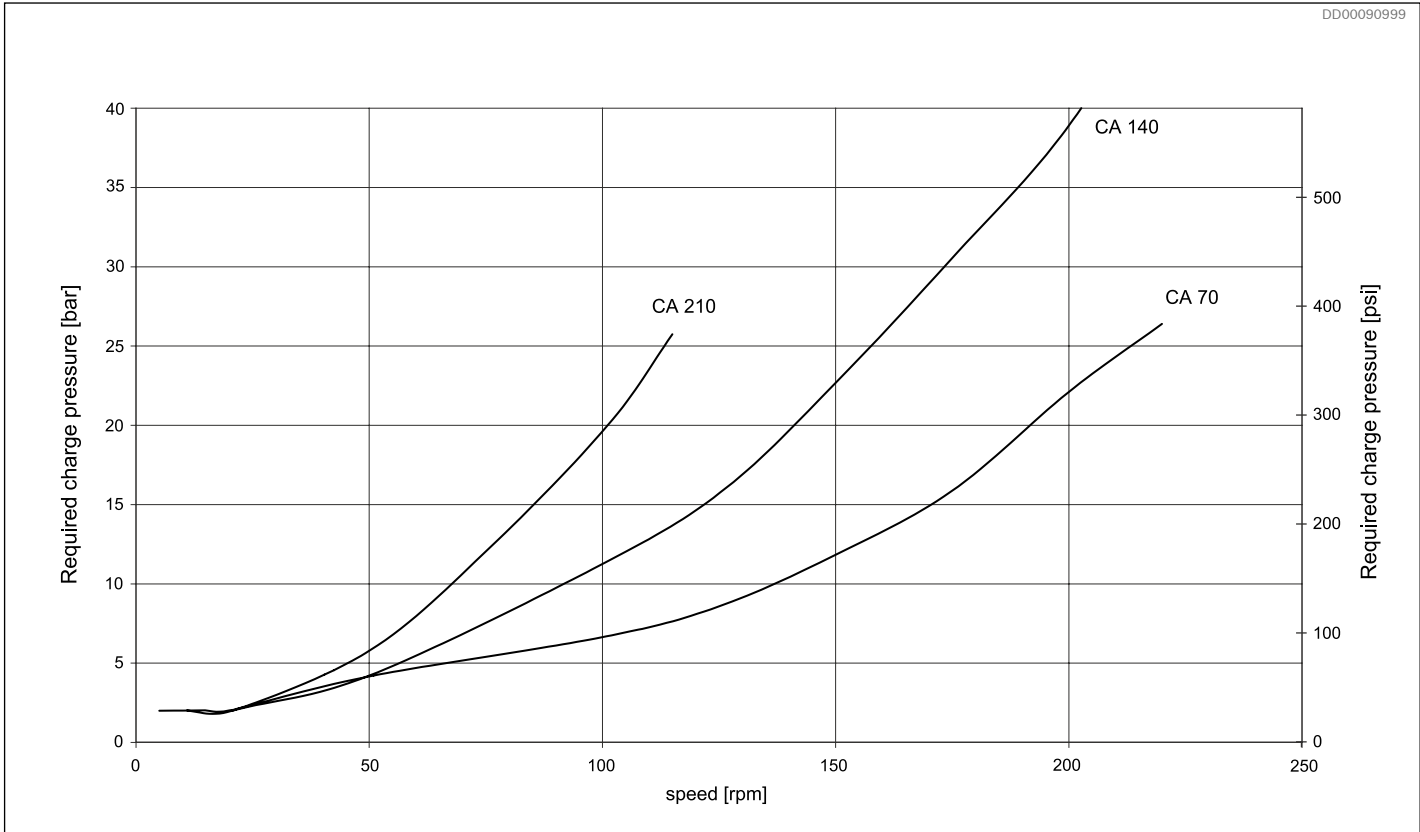


Fig. 15: Required charge pressure when running in half displacement for standard valve + S-index 05 valve (Motor and valves included)

7 Dimensions / Interface

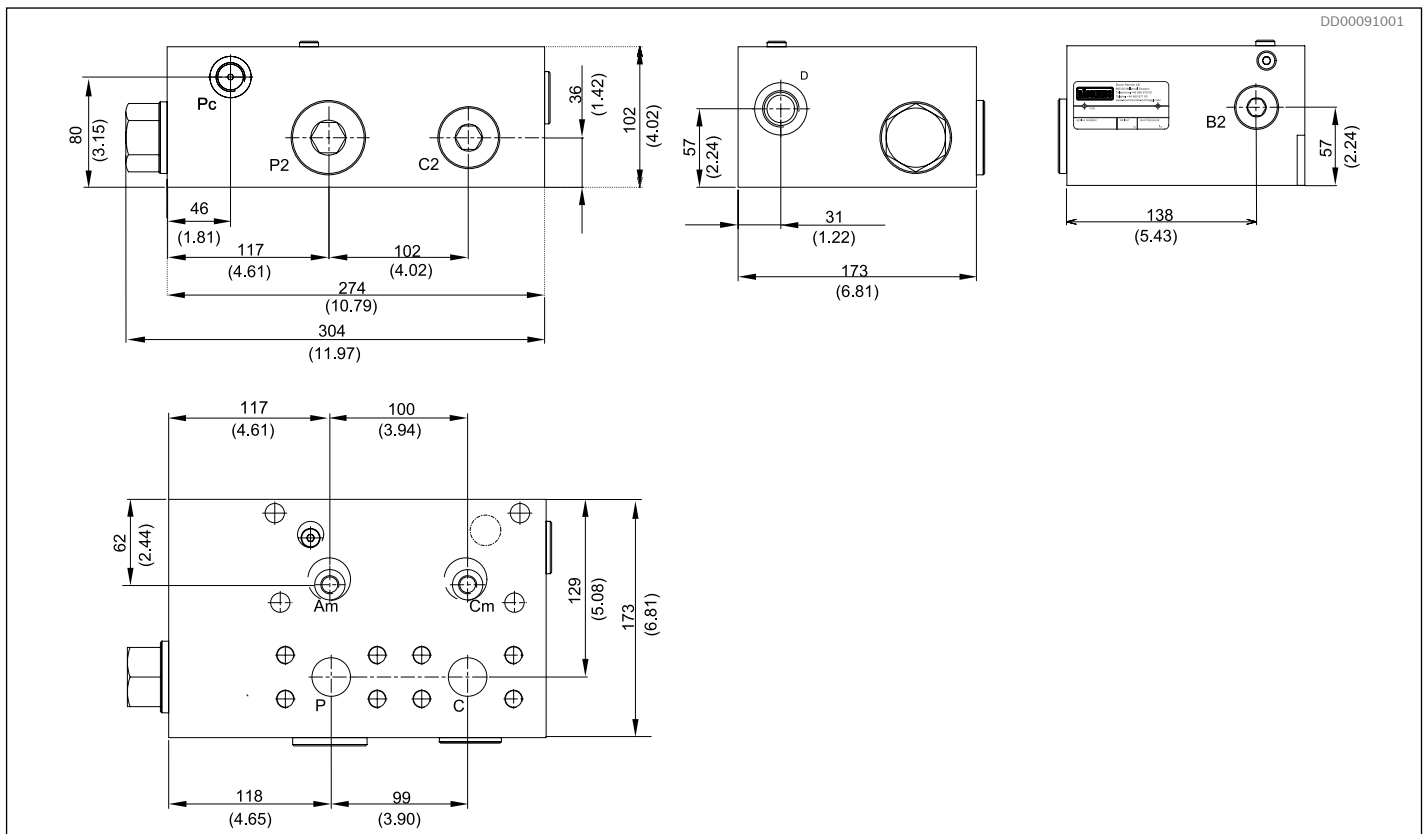


Fig. 16: Dimensions VTCA 600 0 H 0 0 0 00, VTCA 600 0 H 0 1 0 00

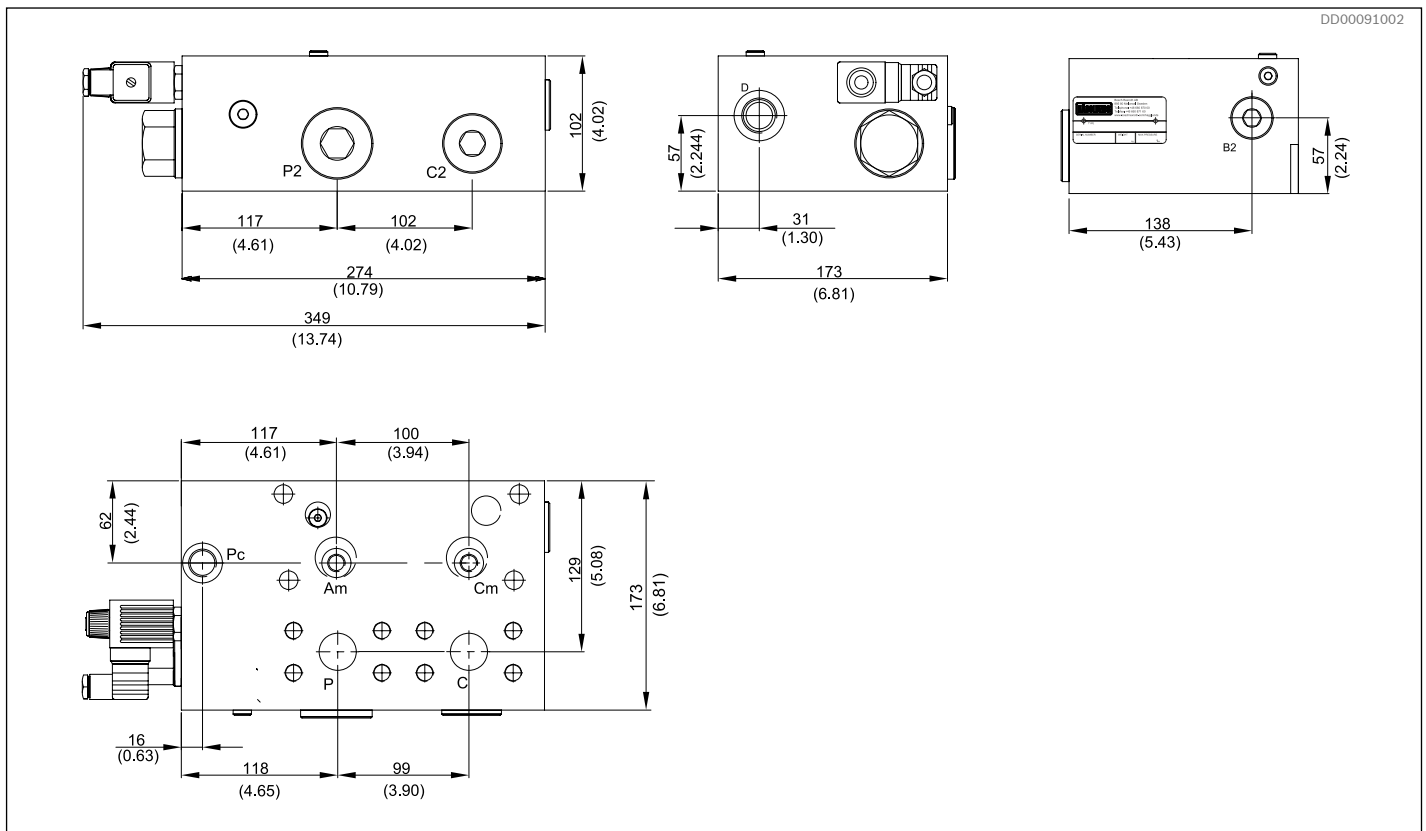
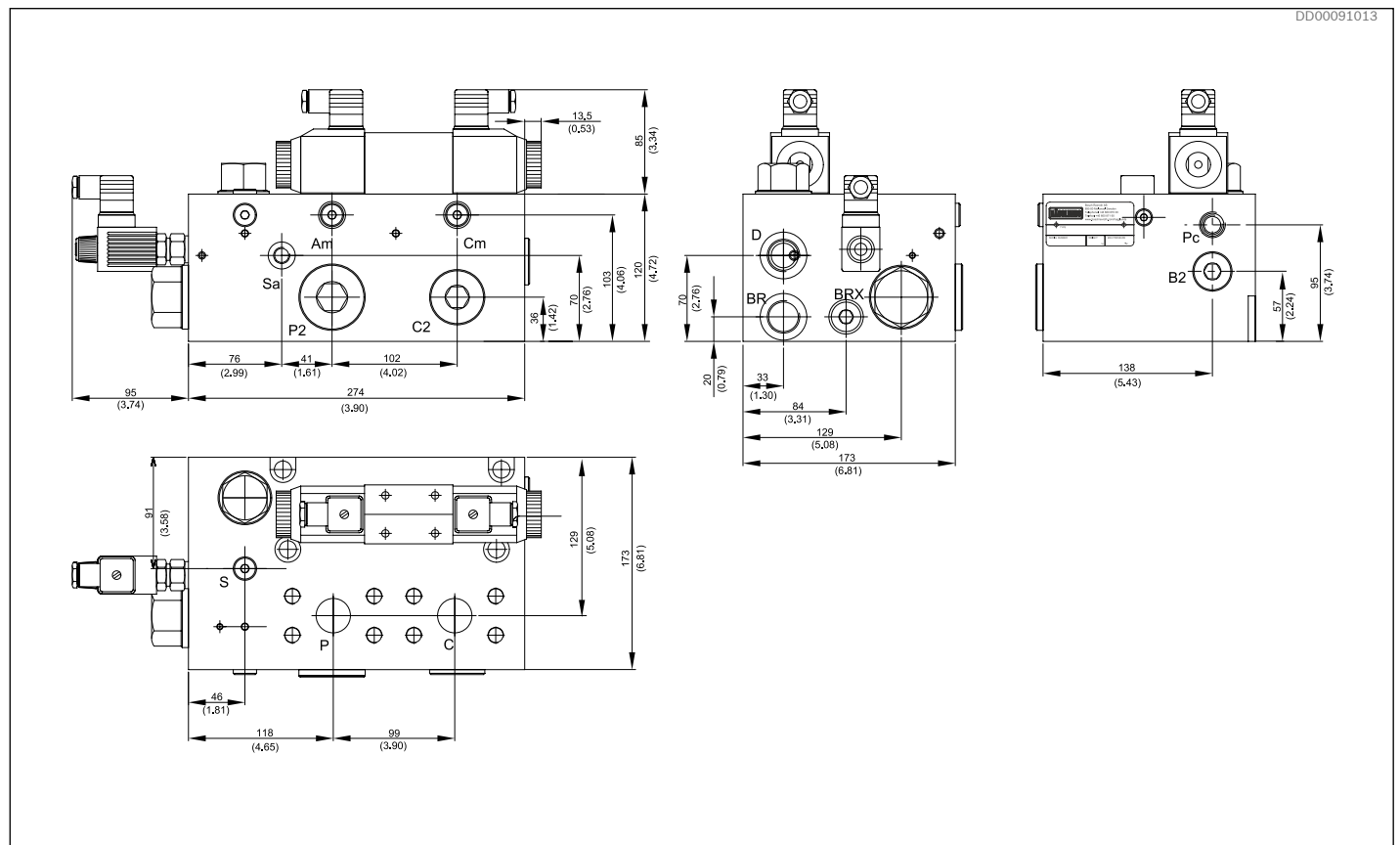
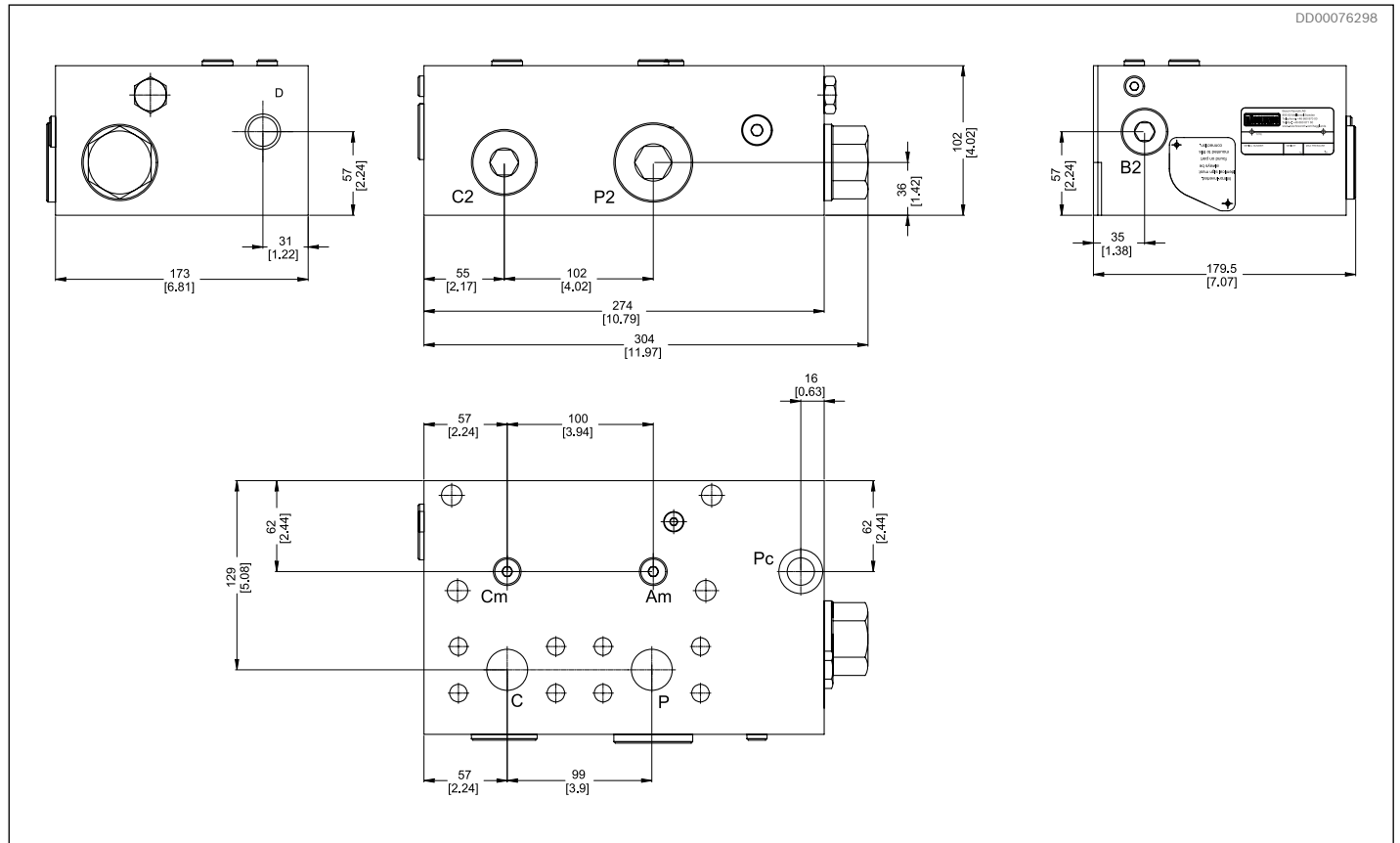


Fig. 17: Dimensions VTCA 600 0 E 0 0 0 00



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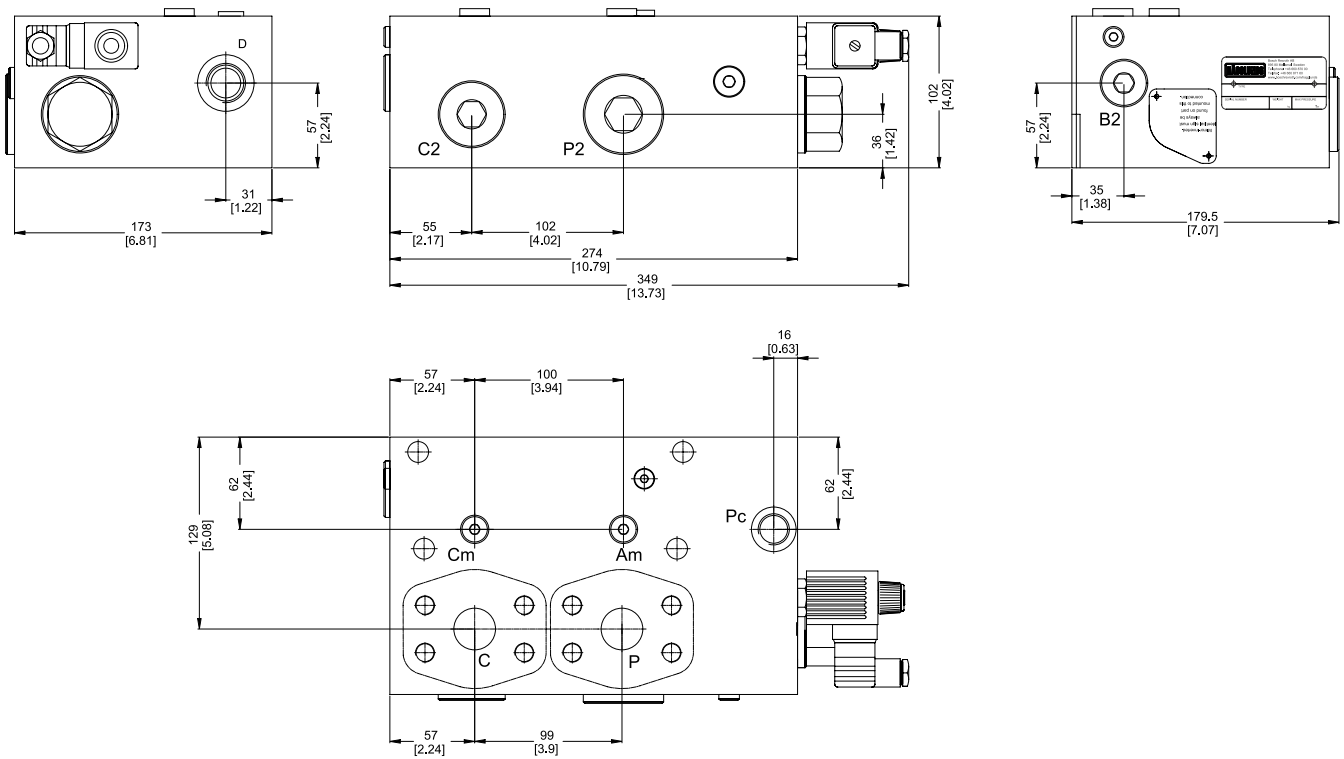


Fig. 20: Dimensions VTCA 600 0 E 0 0 0 05

8 Safety and installation instruction

8.1 Safety instructions

8.1.1 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

8.1.2 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 and 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 electrical 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!

Fig. 21: Dimensions VFWCB 600 H, special index 03

8.2 Installation

8.2.1 Fitting the VTCA 600 valve on Häggglunds CA

Refer also to the [Installation and Maintenance Manual RE 15302-WA](#).

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

Pos	Description
1	4 pcs 1/2 UNC x 127 (5") (included in delivery) Tightening torque: 131 Nm (97 lbf·ft)
2	4 psc Washer 19/13.5 T=2 hardened HB 450-500 (included in delivery)
3	Valve VTCA 600
4	2 pcs O-rings ø34,59x2,62 FPM 70 (included in delivery)
5	1 pcs O-ring 26,64x2,62 FPM 70 (included in delivery)
6	1 pcs O-ring 23,47X2,62 FPM70 (included in delivery)

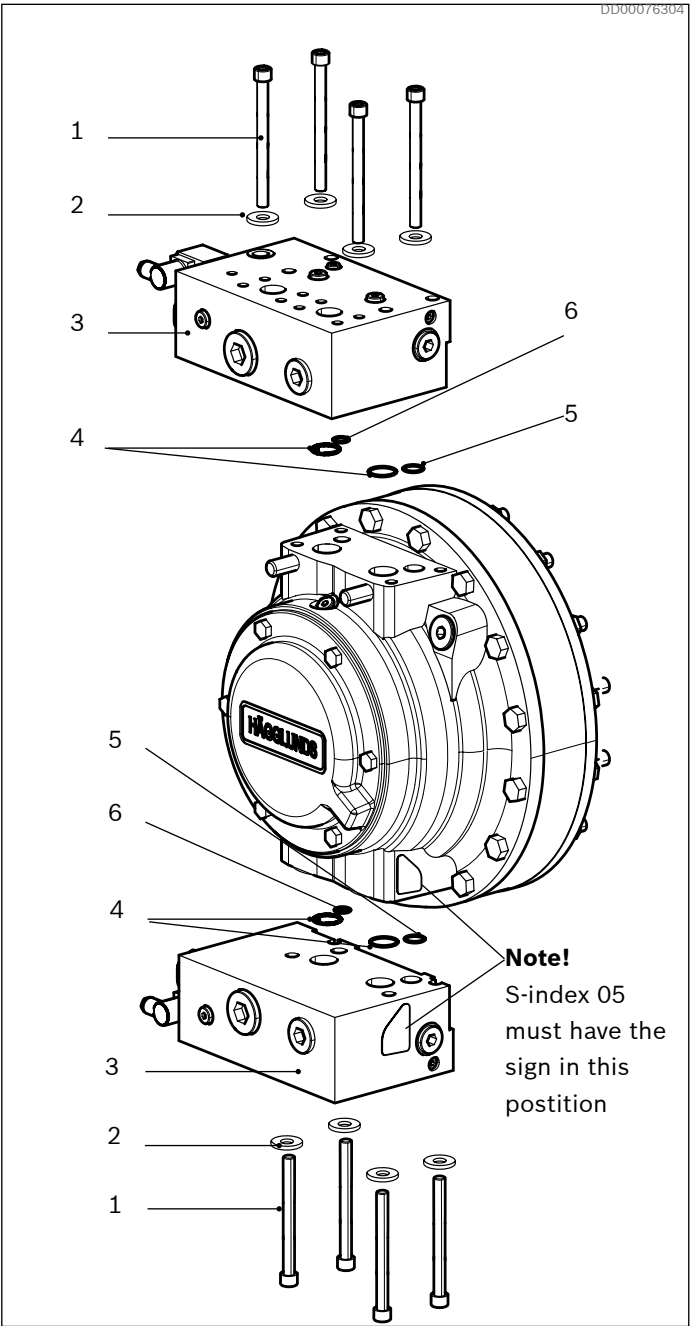


Fig. 22: Häggglunds CA

8.3 Installation drawing

8.3.1 VTCA 600 0 H, VTCA 600 0 H S-index 05

Refer to dimensional drawing: 278 2204, 041 0460

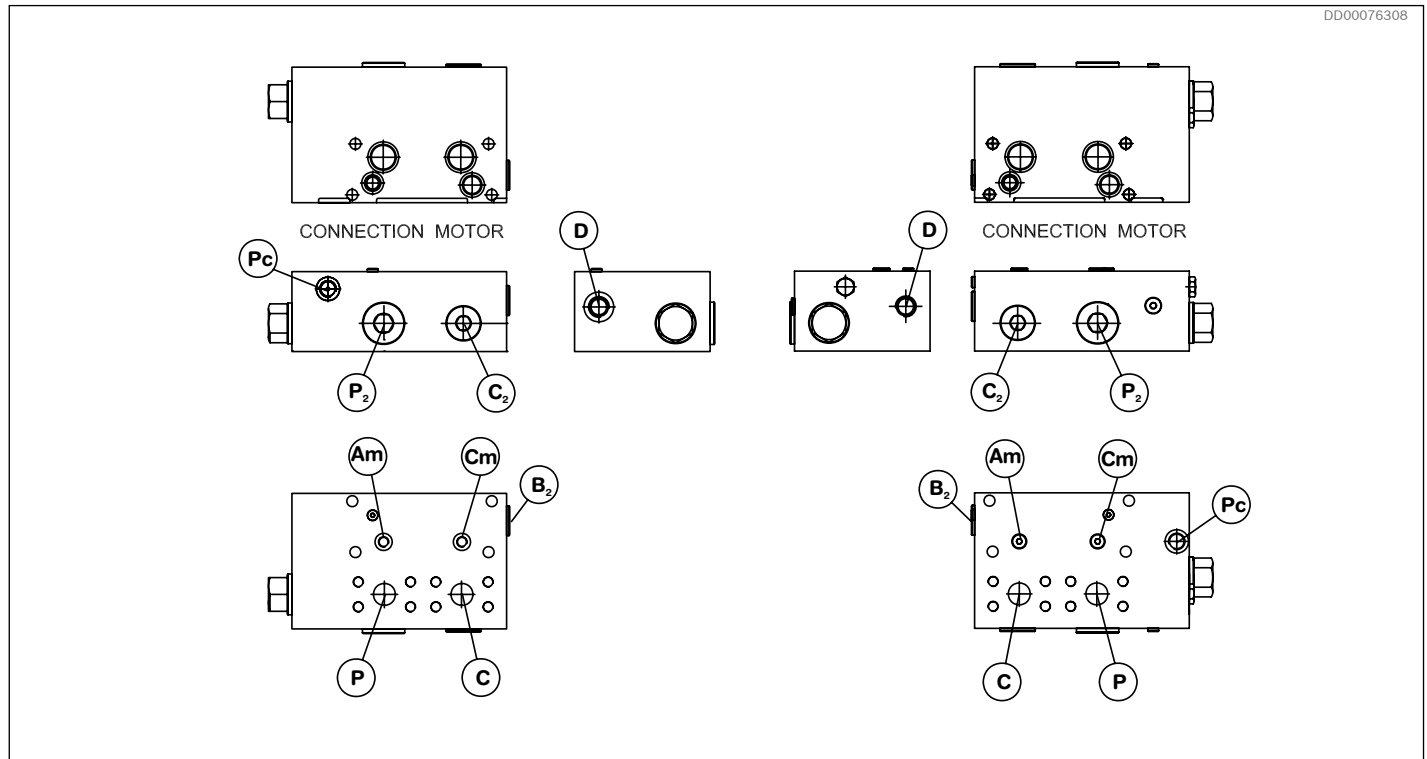


Fig. 23: Installation drawing – VTCA 600 0 H, VTCA 600 0 H S-index 05

8.3.2 VTCA 600 0 E, VTCA 600 0 E S-index 05

Refer to dimensional drawing: 278 2205, 041 0459

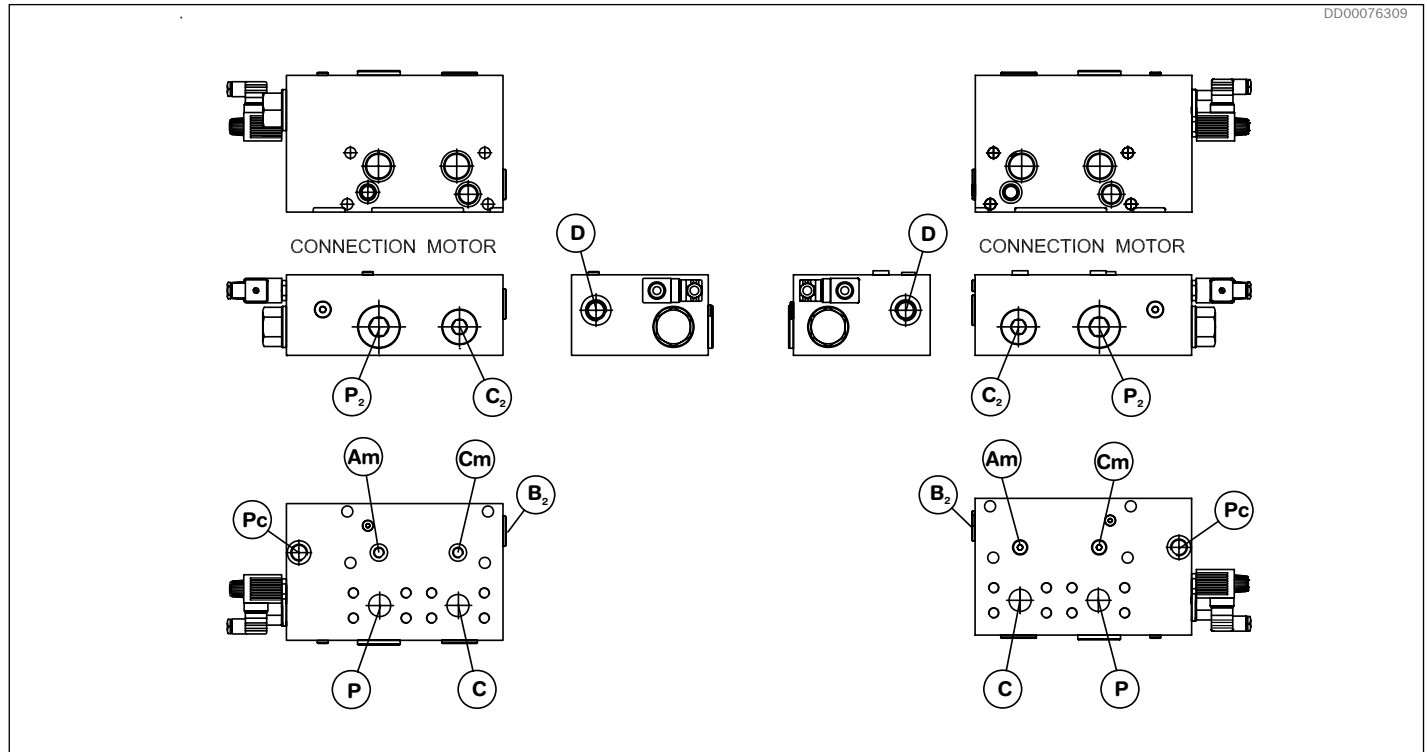


Fig. 24: Installation drawing – VTCA 600 0 E, VTCA 600 0 E S-index 05

8.4 Installation drawing

8.4.1 VTCA 600 B E

Refer to dimensional drawing: 278 2206

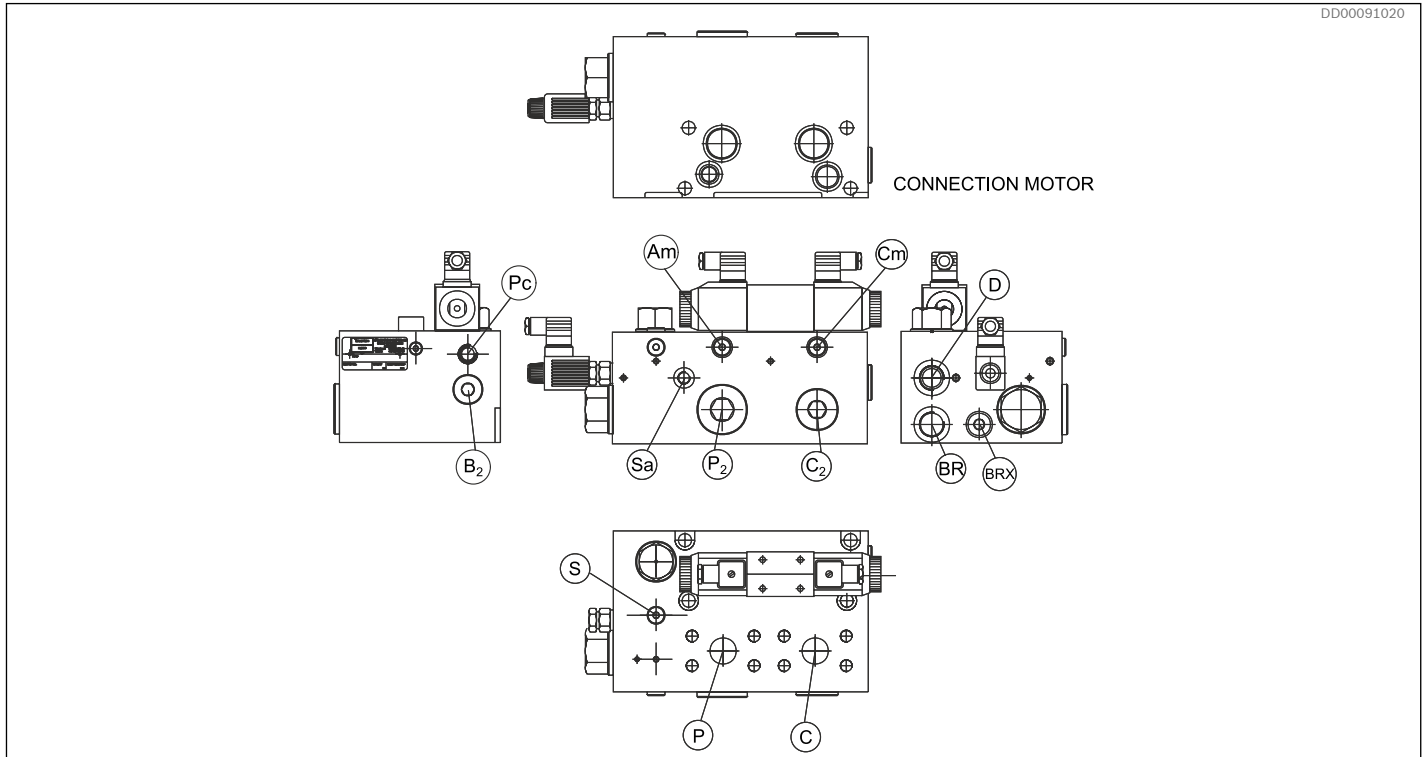


Fig. 25: Installation drawing – VTCA 600 B E

Connection	Description	Port Connection	Remarks
P, C	Main connection	SAE 1 1/4 *	
Pc	Pilot pressure connection	BSP 1/2"	
D	Drain connection	BSP 3/4"	
Am	Pressure point connection	BSP 1/4"	
Cm	Pressure point connection	BSP 1/4"	
BR	Brake line connection	BSP 3/4"	
BRX	Pressure point connection	BSP 3/8"	
Sa	Pressure point connection	BSP 1/4"	
S	Pressure point connection	BSP 1/4"	
P ₂	Connection	BSP 1 1/4"	For two motors
B ₂	Connection	BSP 3/4"	For two motors
C ₂	Connection	BSP 1"	For two motors

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

8.5 Electrical installation

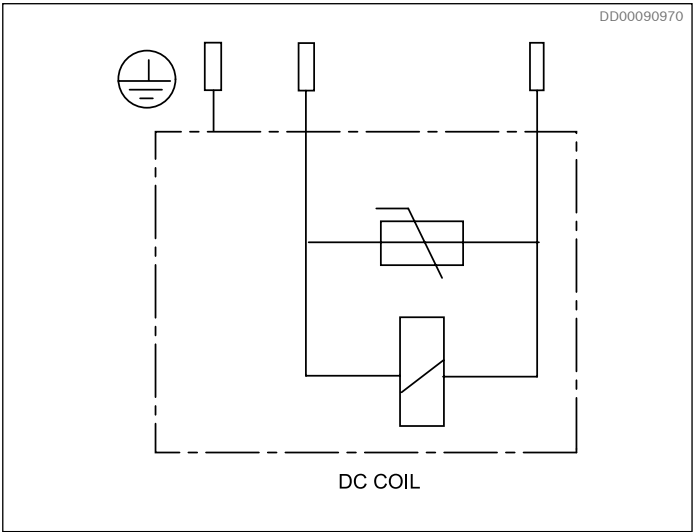








Fig. 26: Circuit diagram standard terminal box

9 Required and additional documents

	Title	Document no	Document type
	Hydraulic fluid quick reference	RE 15414	Data sheet
	Häggglunds valve adapters	RE 15383	Data sheet
	2-speed valve VTCA 600 0 H	278 2204 *)	Dimension drawing
	2-speed valve VTCA 600 0 E	278 2205 *)	Dimension drawing
	2-speed valve VTCA 600 0 B	278 2206 *)	Dimension drawing
	2-speed valve VTCA 600 0 E S-index 05	041 0459 *)	Dimension drawing
	2-speed valve VTCA 600 0 H S-index 05	041 0460 *)	Dimension drawing

Documents at Bosch Rexroth Media Directory

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

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