The Drive & Control Company

Radial piston hydraulic motor Hägglunds CB

RE 15302
Edition: 12.2017
Replace: EN693-18h 2011

- Torque range: up to 370 kNm [up to 272 898 lb-ft]
- Speed:range: up to 125 rpm
- Power range: up to 1000 kW
- Maximum operating pressure: 350 bar [5 076 psi]
- Frame size: 280, 400, 560, 840 and 1120
- Displacement: 15 100 to 70 400 cm3/rev
  [921 to 4 296 in3/rev]
- Specific torque: 240 to 1120 Nm/bar
  [12 204 to 56 952 ft-lbs/1 000 psi]

Features

- High power density
- High torque density
- Energy efficient
- Flexible, many sizes, few mechanical interfaces.
- Insensitive for shock loads
- Very low moment of inertia
- Small footprint (total occupied volume)
- Freewheeling possibility
- Through hole diameter 110 mm

Contents

1 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 Hägglunds CB motor:

CB		0400		0280		S	A	0	N	0	C		00		00
01		03		04		05	06	07	08	09	10		11*		12*

01	**Motor series**	
	Compact	**CB**

03	**Frame size**	
	CB 280	**0280**
	CB 400	**0400**
	CB 560	**0560**
	CB 840	**0840**
	CB 1120	**1120**

04	**Nominal size , specific torque, Nm/bar** *(see section 4.3)*									
	Frame size 280								**0240**	**0280**
									●	●
	Frame size 400	**0240**	**0280**	**0320**	**0360**	**0400**	**0440**	**0480**	**0520**	**0560**
		●	●	●	●	●	●	●	●	●
	Frame size 560						**0440**	**0480**	**0520**	**0560**
							●	●	●	●
	Frame size 840			**0600**	**0640**	**0680**	**0720**	**0760**	**0800**	**0840**
				●	●	●	●	●	●	●
	Frame size 1120			**0880**	**0920**	**0960**	**1000**	**1040**	**1080**	**1120**
				●	●	●	●	●	●	●

05	**Mounting alternatives, shaft**		
		C **Shrink disk coupling**	**S** **Splines**
	Frame size 280	●	●
	Frame size 400	●	●
	Frame size 560	●	●
	Frame size 840	●	●
	Frame size 1120	–	●

06	**Motor prepared for tandem kit**	
	Motor not prepared for TA kit	**A**

07	**Displacement shift**	
	Motor not prepared for displacement shift	**0**

08	**Type of seal** *(see section 5)*		
	NBR (Nitrile)	●	**N**
	FPM (Viton)	●	**V**

09	**Through hole kit** *(see section 7)*		
	No	●	**0**
	Yes	●	**H**

10	**Increased robustness** *(see section 6)*		
	No	●	**0**
	Yes	●	**C**

11	**Modification** *)	
		00-99

12	**Design**	
	Standard	**00**
	Special index *)	**01-99**

● = Available − Not available

*) To be filled in by Bosch Rexroth DC-HD/ENG

2 Functional description

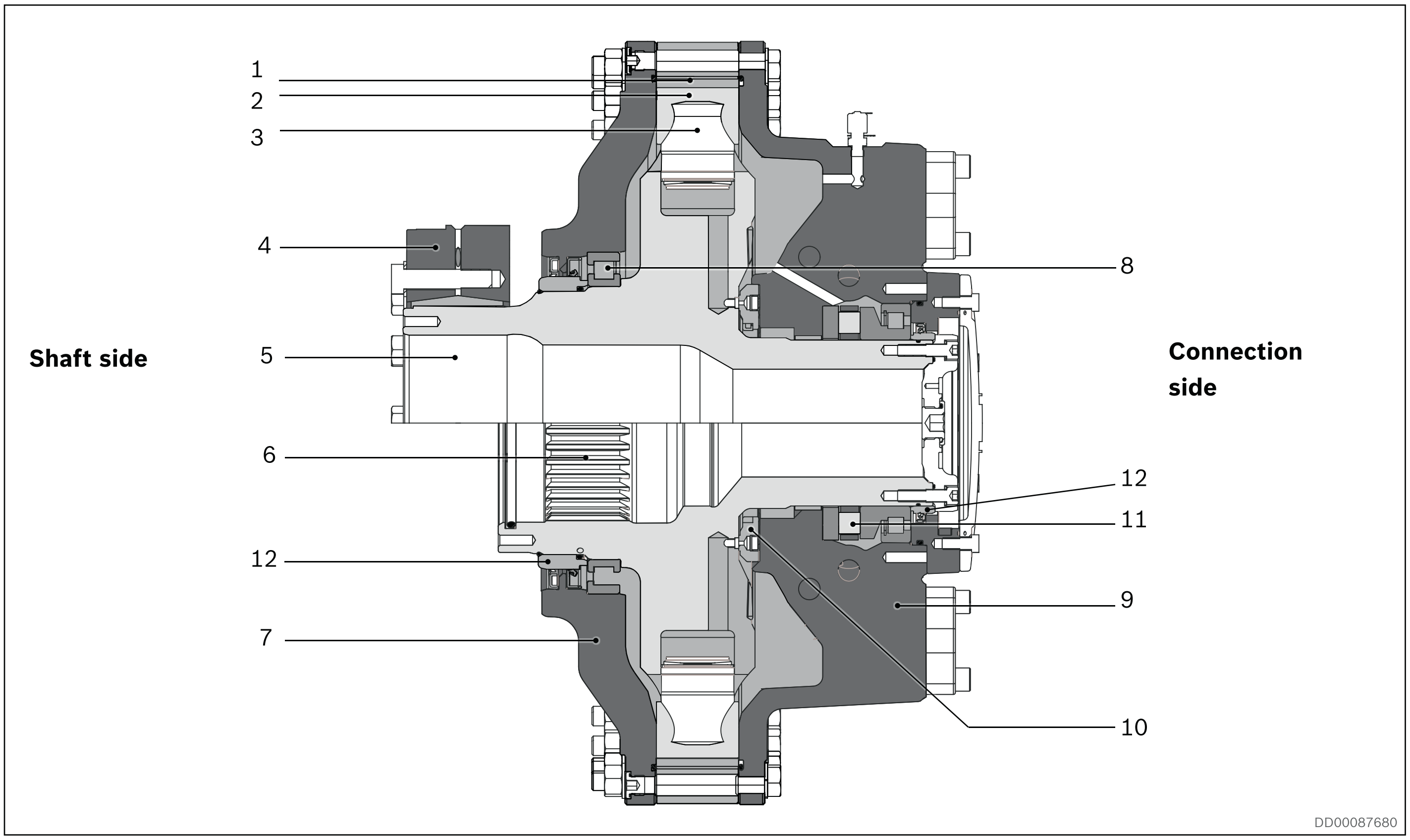

Fig.1: Section view of radial piston hydraulic motor

1. Cam ring	**8.** Cylindrical roller bearing
2. Cam roller	**9.** Connection housing
3. Piston	**10.** Distributor
4. Shrink disk	**11.** Combined axial and radial bearing
5. Cylinder block, hollow shaft	**12.** Wear ring
6. Cylinder block, spline	
7. Housing cover	

Bosch Rexroth‘s hydraulic industrial motor Hägglunds CB is of the radial piston type with a rotating cylinder block/ hollow shaft and a stationary housing. The cylinder block is mounted in fixed roller bearings in the housing. An even number of pistons are radially located in bores inside the cylinder block, and the distributor directs the incoming and outgoing oil to and from the working pistons. Each piston is working against a cam roller.

When the hydraulic pressure is acting on the pistons, the cam rollers are pushed against the slope on the cam ring that is rigidly connected to the housing, thereby producing a torque. The cam rollers transfer the reaction force to the pistons which are guided in the cylinder block. Rotation therefore occurs, and the torque available is proportional to the pressure in the system.
Oil main lines are connected to ports A and C in the connection housing and drain lines to one of the D -ports in the motor housing. (See *3.2 Port connections)*

The motor is connected to the shaft of the driven machine through the hollow shaft or spline of the cylinder block.

Features as an option for Hägglunds CB:
Read for information:
Section 7: Through hole kit

Quality
To assure our quality we maintain a Quality Assurance System, certified to standard ISO 9001.

3 Fluid connections

3.1 Hydraulic symbol

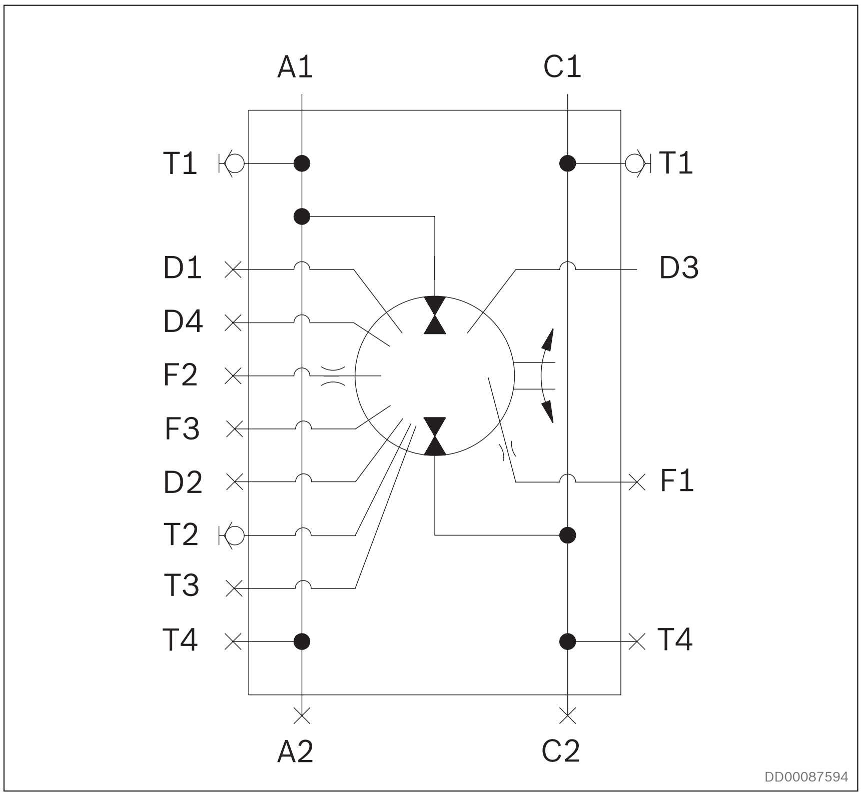

Fig. 2: Hydraulic symbol

Port locations and dimensions, *see Table 1: Port dimensions*

3.2 Port connections

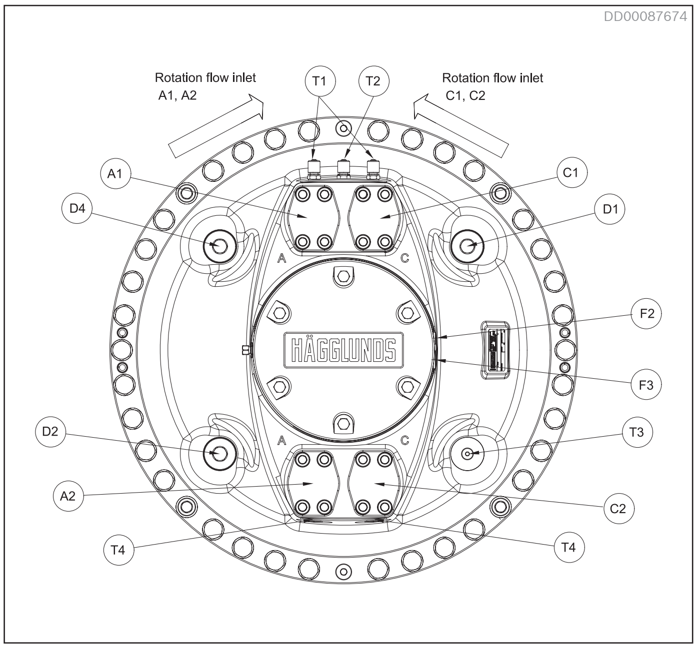

Fig. 3: Connection side of the motor

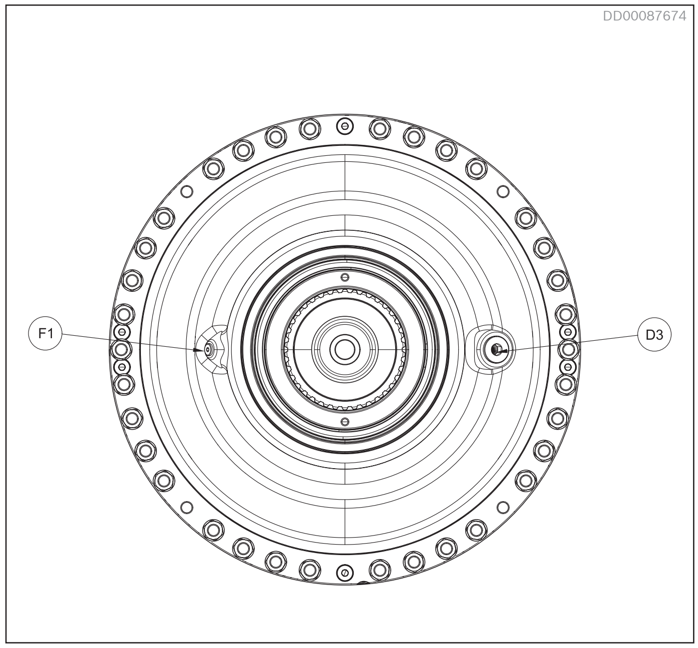

Fig. 4: Shaft side of the motor

Table 1: Port dimensions

Connection	Description	Dimensions	Remarks
A1, A2	Main connection	1 1/4"and 1 1/2" *	If A is used as the inlet, the motor shaft rotates counterclockwise, viewed from the motor shaft side.
C1, C2	Main connection	1 1/4" and 1 1/2" *	If C is used as the inlet, the motor shaft rotates clockwise, viewed from the motor shaft side.
D1	Drain connection	G 1 1/4"	
D2, D4	Alternative drain connection	G 1 1/4"	
D3	Alternative drain connection	G 1"	
T1	Test connection	G 1/4"	Used to measure pressure and/or temperature at the main connections. Minimess M16
T2	Test connection	G 1/4"	Used to measure pressure and/or temperature in drain oil. Minimess M16
T3	Test connection	G 1/4"	Used to measure pressure and/or temperature in drain oil.
T4	Pressure connection	G 1/2"	Connection for double ended torque arm.
F1, F2	Flushing connections	G 1/4"	For flushing of radial lip seal. Normally plugged.
F3	Flushing connection	G 1/2"	For flushing of axial bearing and motor case.

*SAE flange J 518 , code 62, 420 bar (6000 psi).

All connections are normally plugged at delivery.

4 Technical data

4.1 Calculation fundamentals

Table 2: Calculation fundamentals.

	Metric		US	
Output power	$P = \frac{T \cdot n}{9549}$	(kW) on driven shaft	$P = \frac{T \cdot n}{5252}$	(hp) on driven shaft
Output torque (η_m=98%)	$T = T_s \cdot (p - \Delta p_l - p_c) \cdot \eta_m$	(Nm)	$T = \frac{T_s \cdot (p - \Delta p_l - p_c) \cdot \eta_m}{1000}$	(ibf·ft)
Pressure required (η_m=98%)	$p = \frac{T}{T_s \cdot \eta_m} + \Delta p_l + p_c$	(bar)	$p = \frac{T \cdot 1000}{T_s \cdot \eta_m} + \Delta p_l + p_c$	(psi)
Flow rate required	$q = \frac{n \cdot V_i}{1000} + q_l$	(l/min)	$q = \frac{n \cdot V_i}{231} + q_l$	(gpm)
Output speed	$n = \frac{q - q_l}{V_i} \cdot 1000$	(rpm)	$n = \frac{q - q_l}{V_i} \cdot 231$	(rpm)
Inlet power	$P_{in} = \frac{q \cdot (p - p_c)}{600}$	(kW)	$P_{in} = \frac{q \cdot (p - p_c)}{1714}$	(hp)

Quantity	Symbol		Metric	US
Power	P	=	kW	hp
Output torque	T	=	Nm	lbf·ft
Specific torque	T_s	=	Nm/bar	lbf·ft/1000 psi
Rotational speed	n	=	rpm	rpm
Required pressure	p	=	bar	psi
Pressure loss	Δp_l	=	bar	psi
Charge pressure	p_c	=	bar	psi
Flow rate required	q	=	l/min	gpm
Total volumetric loss	q_l	=	l/min	gpm
Displacement	V_i	=	cm^3/rev	in^3/rev
Mechanical efficiency	η_m	=	0,98 [1]	

[1] Not valid as starting efficiency

4.2 General data

Table 3: General data (metric)

			Frame size				
			CB 280	**CB 400**	**CB 560**	**CB 840**	**CB 1120**
Type of mounting			See section *9: Mounting alternatives*				
Port connections			See section *3.2: Port connections*				
External loads			See section *4.14: Permissible external loads*				
Hydraulic fluids			See section *4.5: Hydraulic fluids*				
Pressure	Maximum operating pressure	bar	350	350 3)	350	350	350
	Maximum peak pressure 1)	bar	420	420	420	420	420
	Charge pressure	bar	See section *4.4: Recommended charge pressure*				
	Maximum case pressure	bar	3	3	3	3	3
	Maximum case peak pressure 2)	bar	8	8	8	8	8
Temperature limits of case drain oil Seal type: NBR (Nitrile)							
	Minimum	°C	-35	-35	-35	-35	-35
	Maximum	°C	+70	+70	+70	+70	+70
Seal type: FPM (Viton)							
	Minimum	°C	-20	-20	-20	-20	-20
	Maximum	°C	+100	+100	+100	+100	+100
Oil volume in motor case		l	15	21	19	25	32
Moment of inertia for rotary group							
	Motor with splines	$kg \cdot m^2$	7.2	15.0	18.1	31.1	42.1
	Motor with shaft coupling	$kg \cdot m^2$	9.1	18.3	22.7	35.7	72.7 4)
Weight							
	Motor with splines	kg	705	1060	1115	1445	1770
	Motor with shaft coupling	kg	800	1160	1290	1620	2340 4)

1) Peak pressure 420 bar maximum, allowed to occur up to 10 000 times.
2) Momentary pressure spikes t< 0.1 s of up to 8 bar are permitted.
3) Pressure limitations in some nominal motor sizes see *Table 5*
4) Motor including coupling adapter

Table 4: General data (US)

			Frame size				
			CB 280	**CB 400**	**CB 560**	**CB 840**	**CB 1120**
Type of mounting			See section 9*: Mounting alternatives*				
Port connections			See section *3.2: Port connections*				
External loads			See section *4.14: Permissible external loads*				
Hydraulic fluids			See section *4.5: Hydraulic fluids*				
Pressure	Maximum operating pressure	psi	5076	5076 3)	5076	5076	5076
	Maximum peak pressure **1)**	psi	6091	6091	6091	6091	6091
	Charge pressure	psi	See section *4.4: Recommended charge pressure*				
	Maximum case pressure	psi	44	44	44	44	44
	Maximum case peak pressure **2)**	psi	116	116	116	116	116
Temperature limits of case drain oil Seal type: NBR (Nitrile)							
	Minimum	°F	-31	-31	-31	-31	-31
	Maximum	°F	+158	+158	+158	+158	+158
Seal type: FPM (Viton)							
	Minimum	°F	-4	-4	-4	-4	-4
	Maximum	°F	+212	+212	+212	+212	+212
Oil volume in motor case		US gal	4.0	5.6	5.0	6.6	8.5
Moment of inertia for rotary group							
	Motor with splines	lb·ft²	170.859	355.955	429,520	738.014	999.048
	Motor with shaft coupling	lb·ft²	215.946	434.266	538.679	847.174	1725.197 4)
Weight							
	Motor with splines	lb	1555	2335	2450	3185	3900
	Motor with shaft coupling	lb	1760	2555	2840	3570	10692 4)

1) Peak pressure 6091 psi maximum, allowed to occur up to 10 000 times.
2) Momentary pressure spikes t< 0.1 s of up to 116 psi are permitted
3) Pressure limitations in some nominal motor sizes see *Table 6*
4) Motor including coupling adapter

4.3 Motor data

Table 5: Specific data, metric

Frame size	Nominal size	Specific torque	Displacement	Maximum torque [1]	Maximum speed	Maximum operating pressure [2]	Maximum operating power [3]
		Nm/bar	cm3/rev	kNm	rpm	*p* bar	kW
CB 280	240	240	15100	79	68	350	530
	280	280	17600	92	58	350	530
CB 400	240	240	15100	79	125 [5]	350	970
	280	280	17600	92	105	350	950
	320	320	20100	110	94	350	970
	360	360	22600	120	82	350	960
	400	400	25100	130	75	350	970
	440	440	27600	131	65	320 [4]	820
	480	480	30200	129	62	290 [4]	660
	520	520	32700	130	57	270 [4]	670
	560	560	35200	129	53	250 [4]	630
CB 560	440	440	27600	140	65	350	930
	480	480	30200	160	62	350	970
	520	520	32700	170	57	350	960
	560	560	35200	180	53	350	970
CB 840	600	600	37700	200	45	350	880
	640	640	40200	210	41	350	850
	680	680	42700	220	40	350	890
	720	720	45200	240	37	350	870
	760	760	47800	250	34	350	840
	800	800	50300	260	34	350	890
	840	840	52800	280	32	350	870
CB 1120	880	880	55300	290	34	350	970
	920	920	57800	300	33	350	980
	960	960	60300	315	32	350	990
	1000	1000	62800	330	31	350	1000
	1040	1040	65300	340	29	350	980
	1080	1080	67900	355	28	350	980
	1120	1120	70400	370	27	350	980

[1] Calculated as: Metric= Ts • (350-15) • 0,98
[2] The motors are designed according to DNV-rules. Test pressure 420 bar. Peak pressure 420 bar maximum , allowed up to 10 000 times.
[3] Flushing of motor case is required. See section *4.10: Flushing*
[4] **Note!** Max pressure <350 bar
[5] Viton seals are recommended for speeds above 110 rpm

Table 6: Specific data, US

Frame size	Nominal size	Specific torque	Displacement	Maximum torque [1]	Maximum speed	Maximum operating pressure [2]	Maximum operating power [3]
		lbf·ft/1000 psi	in3/rev	lbf·ft	rpm	*p* psi	hp
CB 280	240	12200	920	5700	68	5000	710
	280	14200	1070	67000	58	5000	710
CB 400	240	12200	920	57000	125 [5]	5000	1300
	280	14200	1070	67000	105	5000	1300
	320	16300	1230	76000	94	5000	1300
	360	18300	1380	86000	82	5000	1300
	400	20300	1530	95000	75	5000	1300
	440	22400	1690	97000	65	4600 [4]	1100
	480	24400	1840	95000	62	4200 [4]	890
	520	26400	1990	96000	57	3900 [4]	900
	560	28500	2150	95000	53	3600 [4]	840
CB 560	440	22400	1690	100000	65	5000	1300
	480	24400	1840	110000	62	5000	1300
	520	26400	1990	140000	67	5000	1300
	560	28500	2150	130000	53	5000	1300
CB 840	600	30500	2300	140000	45	5000	1200
	640	32500	2450	150000	41	5000	1100
	680	34600	2610	160000	40	5000	1200
	720	36600	2760	170000	37	5000	1200
	760	38700	2910	180000	34	5000	1100
	800	40700	3070	190000	34	5000	1200
	840	42700	3220	200000	32	5000	1200
CB 1120	880	44700	3370	210000	34	5000	1300
	920	46700	3520	220000	33	5000	1300
	960	48800	3680	230000	32	5000	1300
	1000	50800	3830	240000	31	5000	1300
	1040	52800	3980	250000	29	5000	1300
	1080	54900	4140	260000	28	5000	1300
	1120	56900	4290	270000	27	5000	1300

1) Calculated as: US= Ts • (5076-215) • 0,98
2) The motors are designed according to DNV-rules. Test pressure 6000 psi. Peak pressure 6000 psi maximum , allowed up to 10 000 times.
3) Flushing of motor case is required. See section *4.10: Flushing*
4) **Note!** Max pressure <350 bar
5) Viton seals are recommended for speeds above 110 rpm

4.4 Recommended charge pressure

The hydraulic system must be such that the motor will recieve sufficient charge pressure at the charge pressure port. This applies to all types of installations.

4.4.1 The motor working in driving mode only

The pressure at the charge pressure port, should, during operation of the motor, be at least one bar above the case pressure independent of numbers of ports that are connected. Two cases to be considered:

Case 1: No shock loads.
Required charge pressure = case pressure + 1 bar (14.5 psi) during operation, but shall not be below 2 bar (29.0 psi)

Case 2: With shock loads.
Required charge pressure at the **outlet** port corresponds to 30% of value given in diagram. See *Fig. 5.and Fig. 6*

4.4.2 The motor working in braking mode

Required charge pressure at the **inlet** port is according to diagram. See *Fig. 5 and Fig. 6.*

Notice!
The diagrams is valid for 1 bar (14,5 psi) case pressure. With increasing case pressure the charge pressure must be increased accordingly.

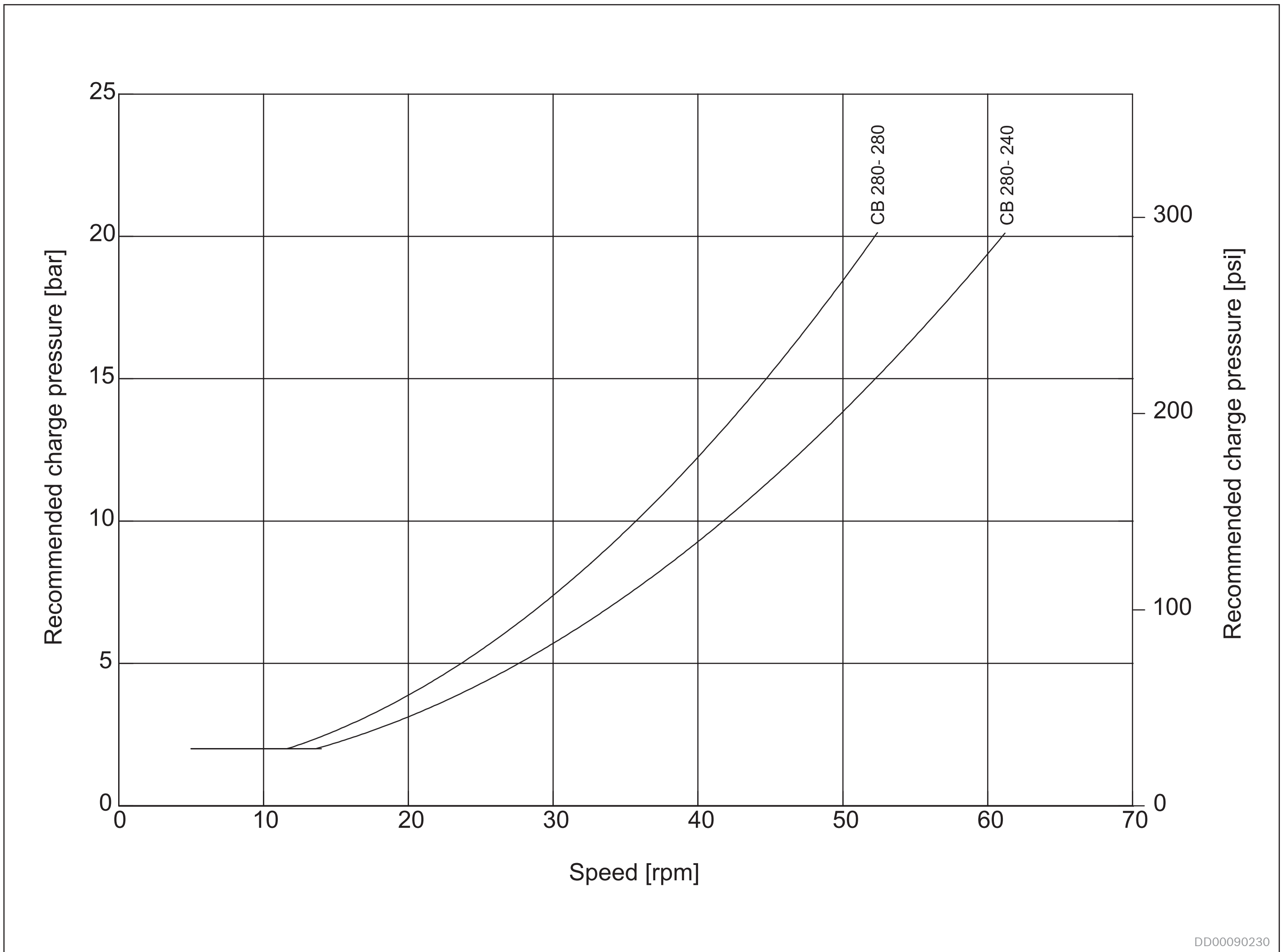

Fig. 5: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 280, 2-port connection. Valid for oil viscosity 40 cSt.

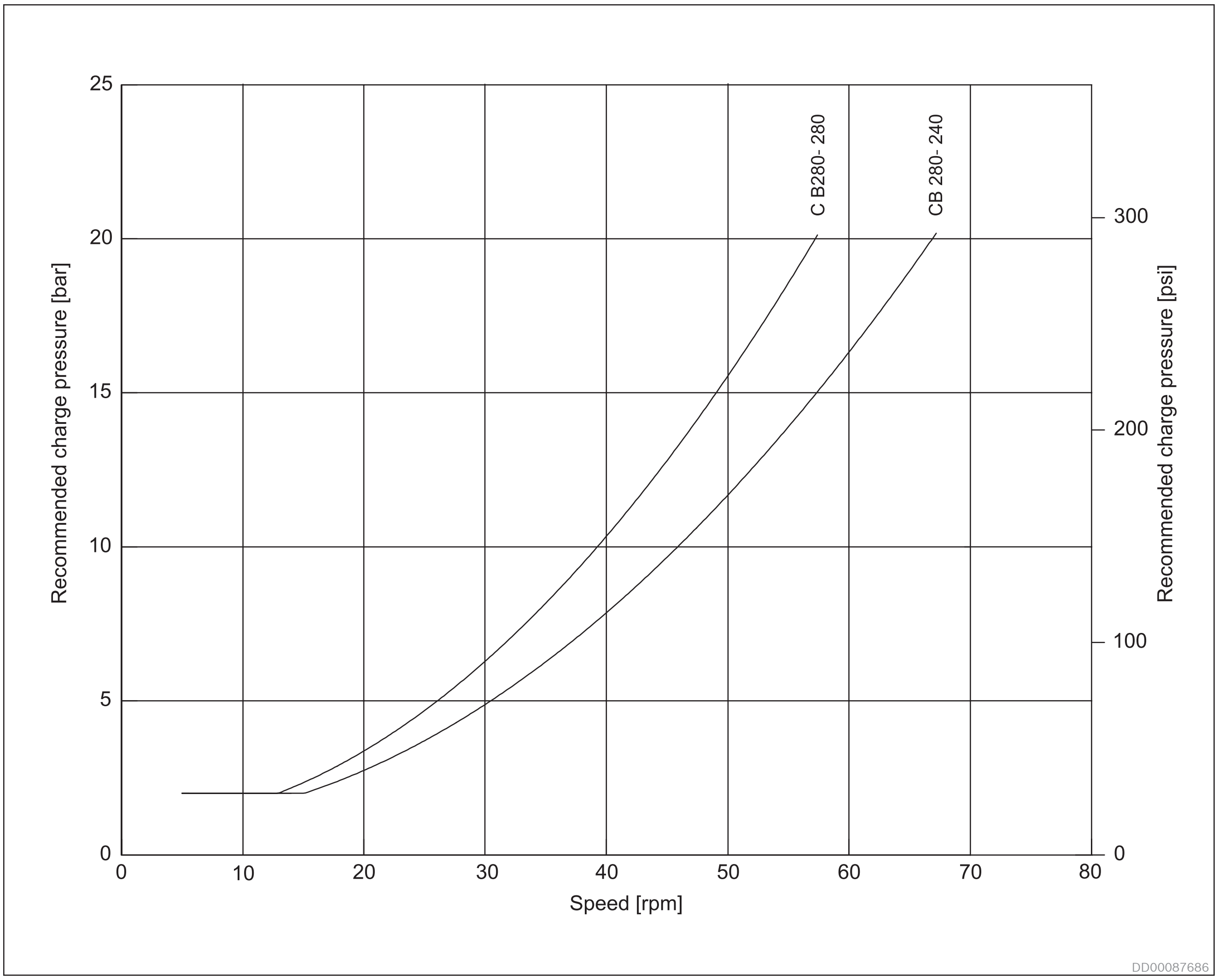

Fig. 6: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 280, 4-port connection. Valid for oil viscosity 40 cSt.

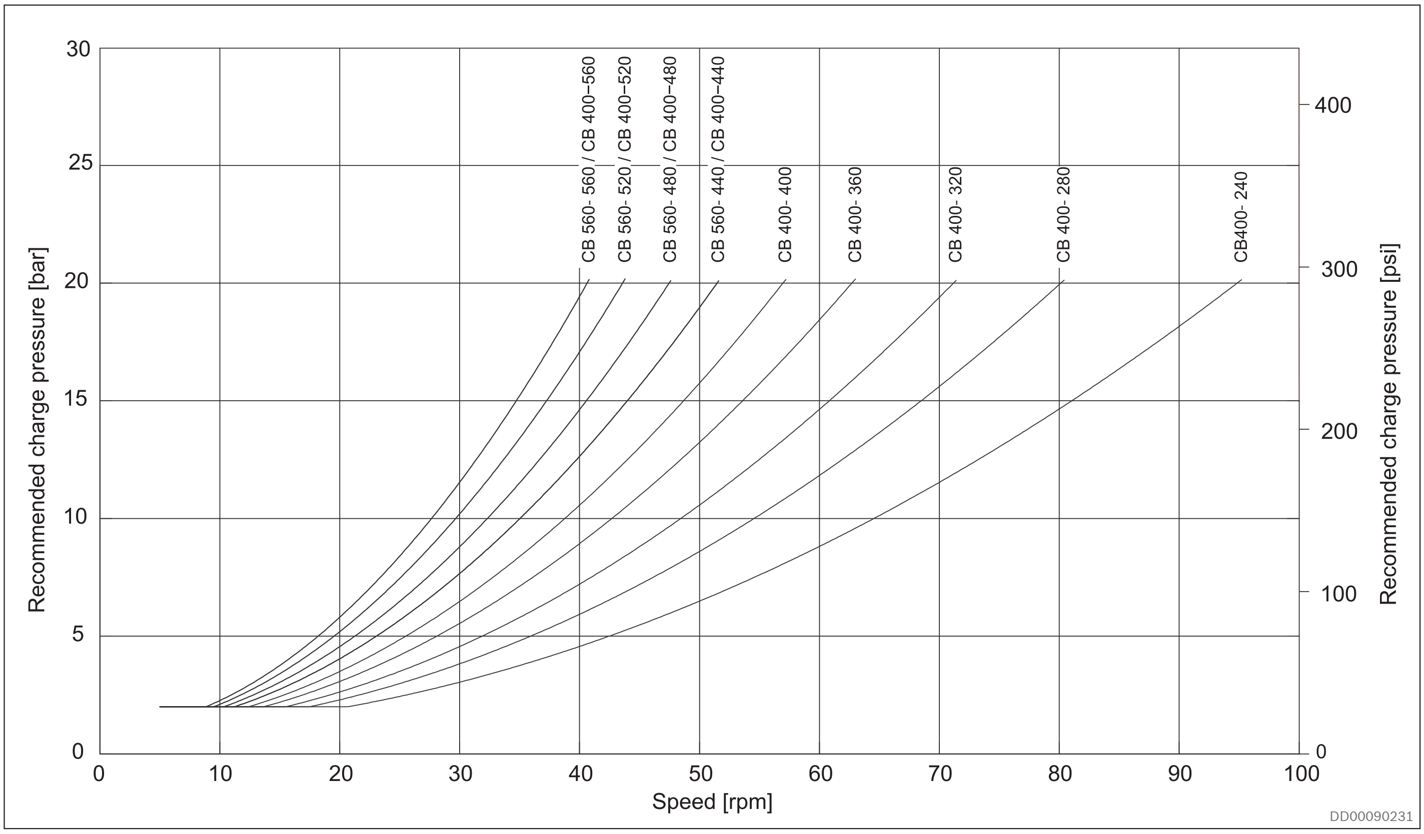

Fig. 7: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 400 to CB 560, 2-port connection. Valid for oil viscosity 40 cSt.

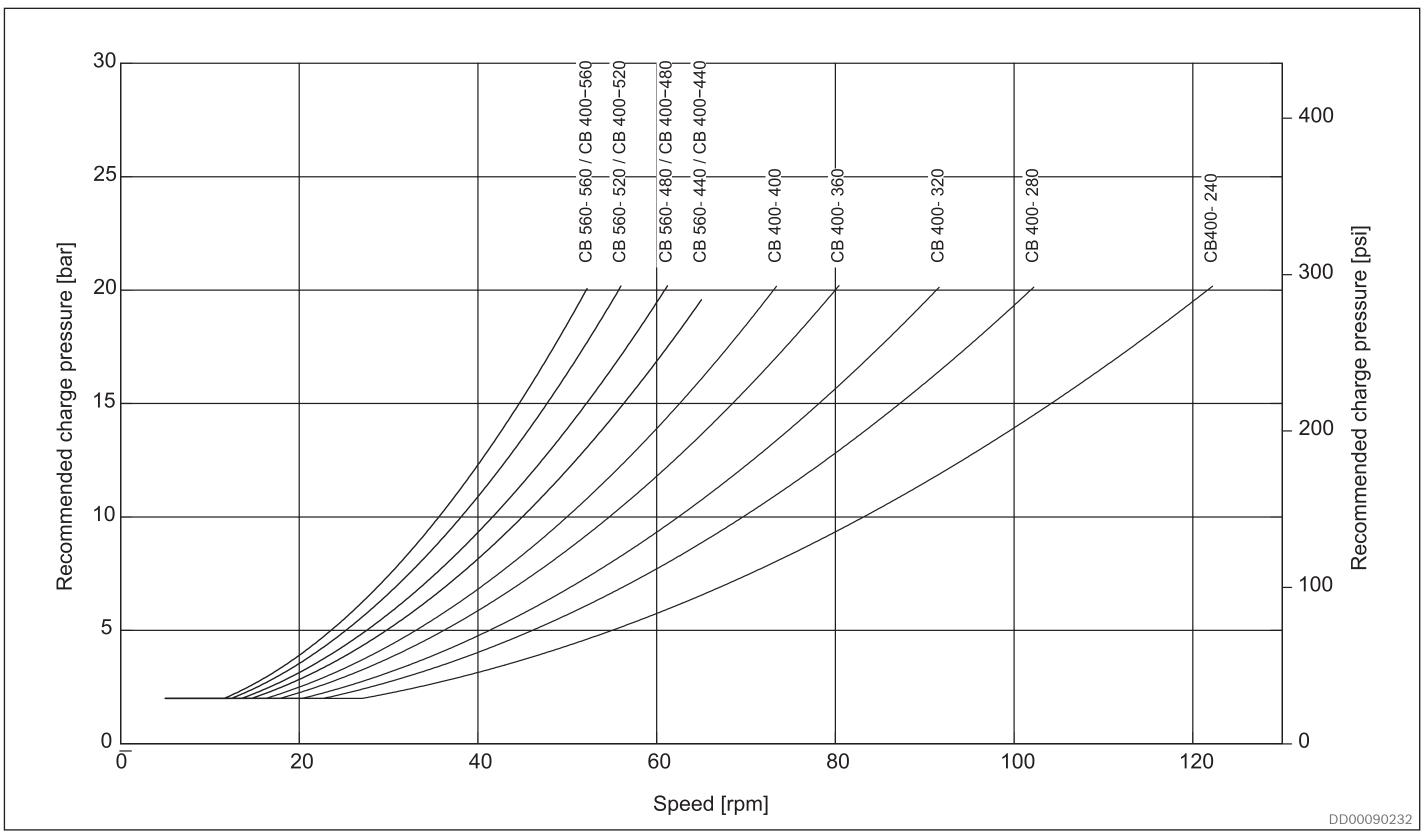

Fig. 8: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 400 to CB 560, 4-port connection. Valid for oil viscosity 40 cSt.

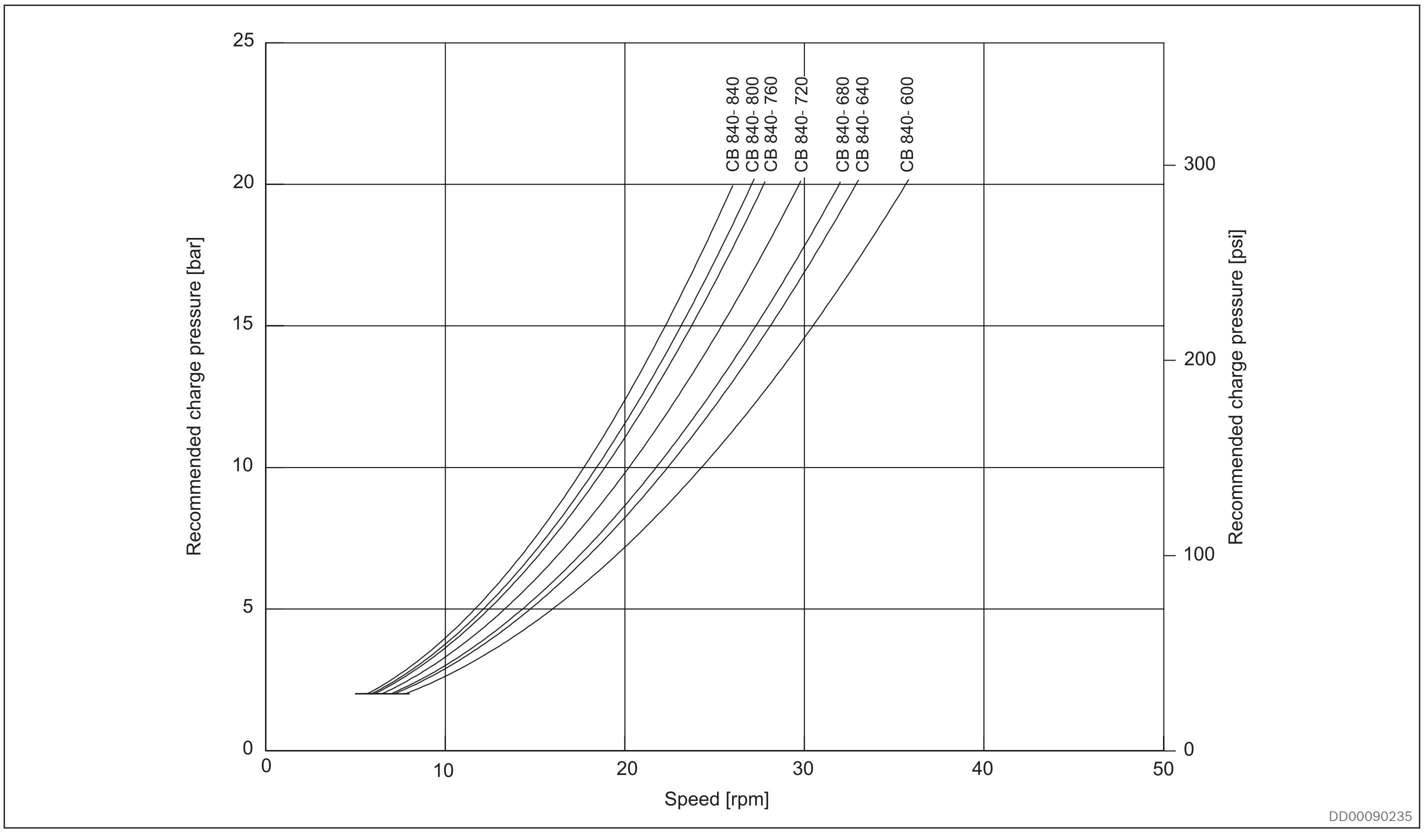

Fig. 9: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 840, 2-port connection. Valid for oil viscosity 40 cSt.

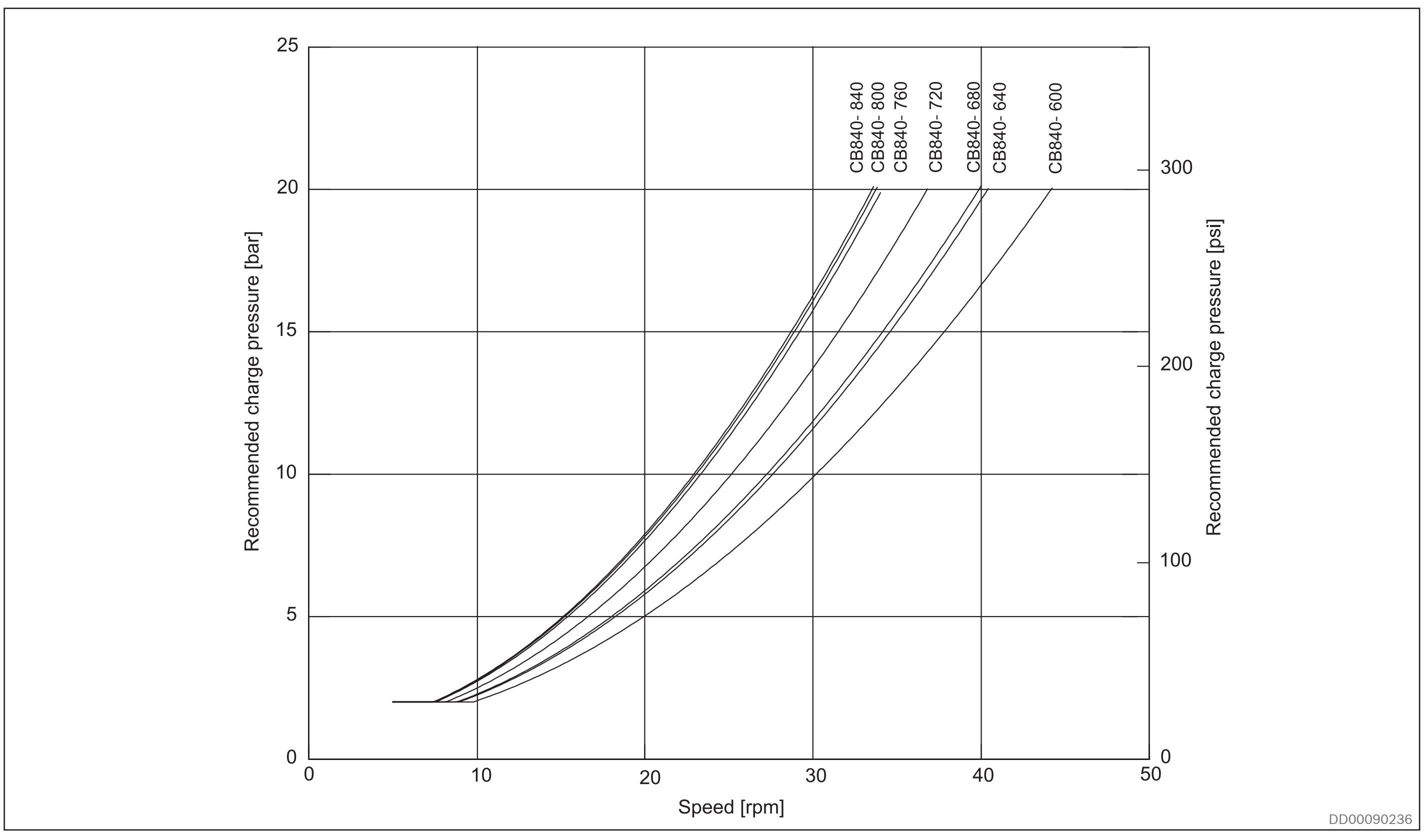

Fig. 10: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 840, 4-port connection. Valid for oil viscosity 40 cSt.

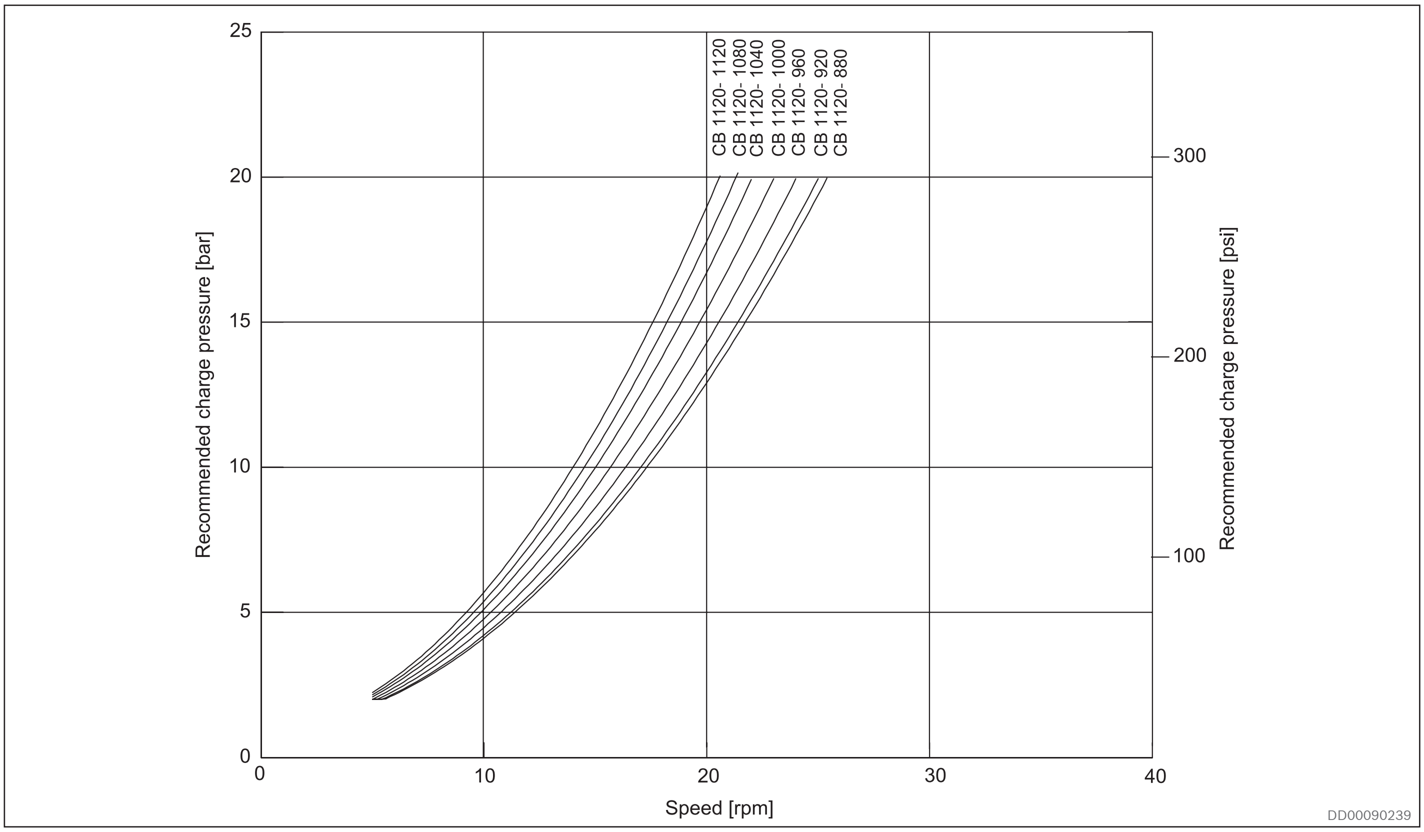

Fig. 11: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 1120, 2-port connection. Valid for oil viscosity 40 cSt.

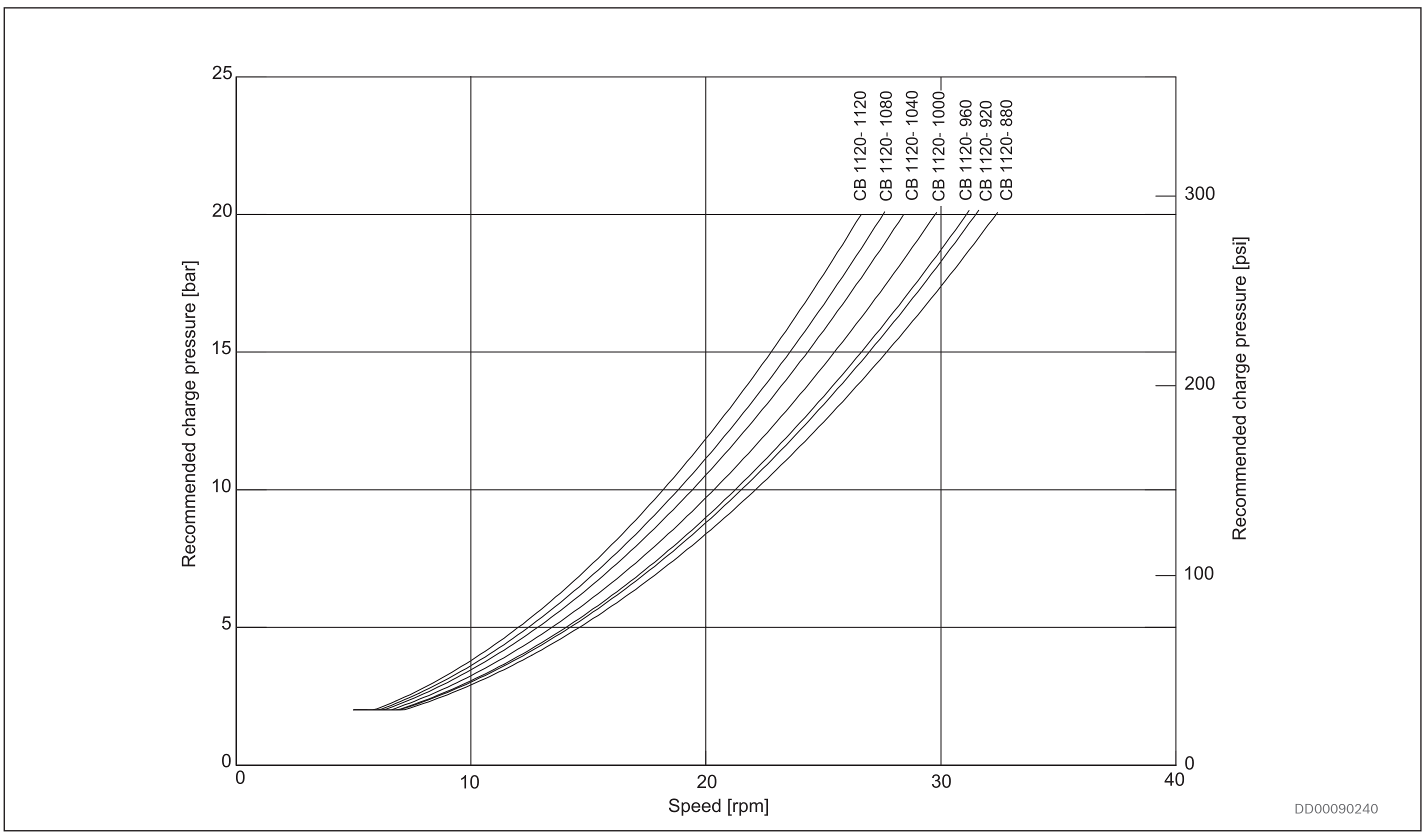

Fig. 12: Recommended charge pressure for motor workning in braking mode, Hägglunds CB 1120, 4-port connection. Valid for oil viscosity 40 cSt.

4.5 Hydraulic fluids

The hydraulic motor Hägglunds CB is primarily designed for operation with hydraulic fluids according to ISO 11158 HM. Before the start of project planning, see data sheet RE 15414, Hydraulic fluid quick reference, for detailed information on hydraulic fluids and specific additional demands.

Table 7: Applicable fluids

ISO 11158	ISO 15380	ISO 12922
Mineral oil based and mineral oil related hydraulic fluids	Environmentally acceptable hydraulic fluids	Fire resistant hydraulic fluids

Within these standards, not all fluid classes are allowed, some are recommended, and there are also additional demands (see data sheet RE 15414).

Filtration of the hydraulic fluid

A contamination level better than 18/16/13 according to ISO 4406 is required.

The less contamined the fluid, the longer the service life of the hydraulic motor.

Details regarding the selection of hydraulic fluid

The hydraulic fluid should be selected such that the operating viscosity in the temperature range, as measured in the motor housing, is within optimum operation range, see *Fig. 13*. General recommendation is to have a system temperature of 50°C, see dotted line in *Fig. 13*. An ISO VG 68 fluid will render just above 40 cSt at this point.

- Optimum viscosity range is 40 to 150 cSt.
- Running above 150 cSt or below 40 cSt results in reduced efficiency.
- Running above 400 cSt results in substantial efficiency loss.
- Starting at above 10000 cSt imparts unnecessary strain on parts.
- Running below 30 cSt may impact service life.
- Running below 20 cSt may render instant seizure.

The operating temperature is also limited by the seal type, see *Table 3: General data (metric) or Table 4: General data (US).*

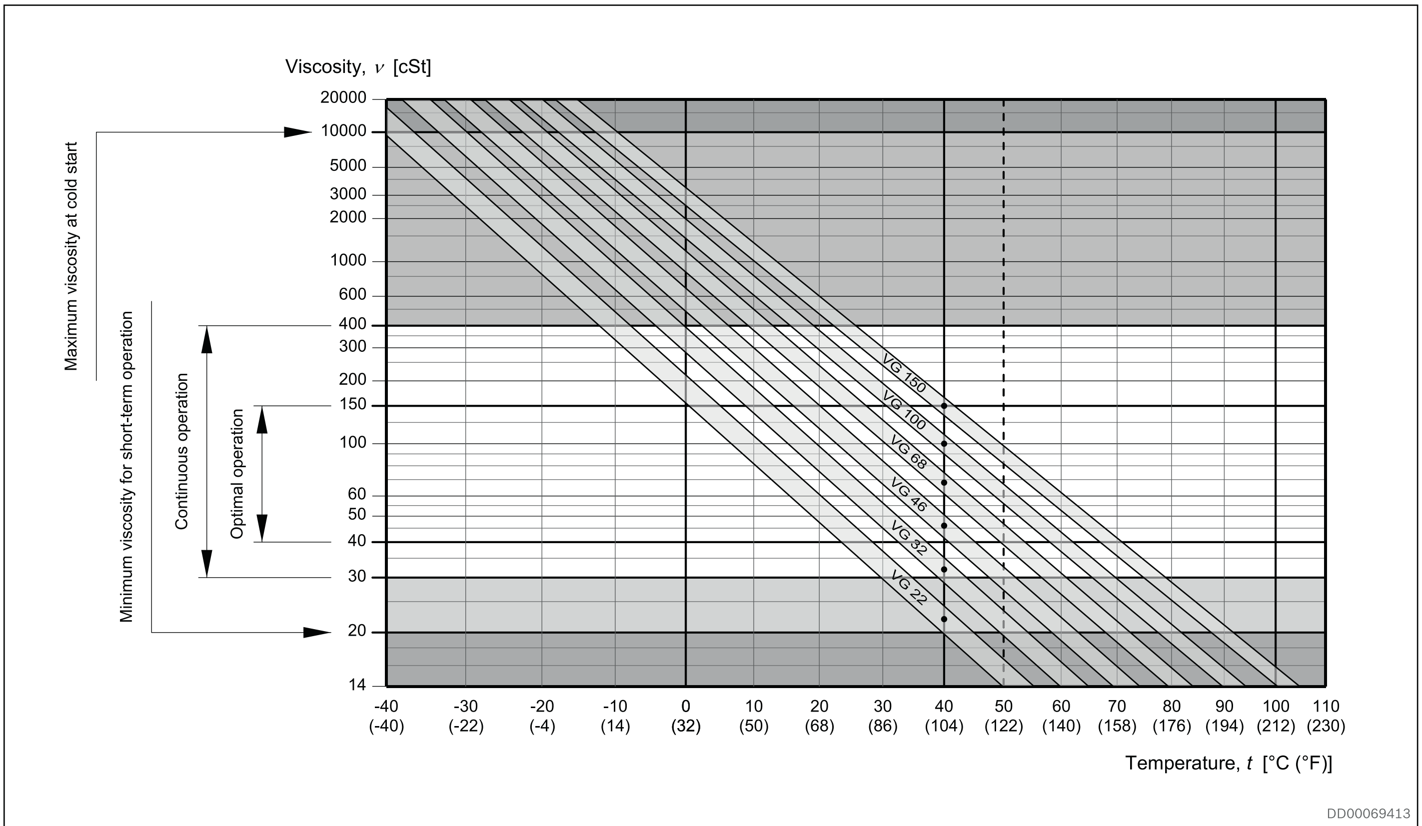

Fig. 13: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100

4.6 Overall efficiency

The diagrams are valid for oil viscosity 40 cSt and charge pressure 15 bar (218 psi) at the motor main ports A or C.

Each diagram has the following label definitions:

1. Output power.
2. Constant pressure curves.
3. Overall efficiency.
4. Flushing of motor case is required.

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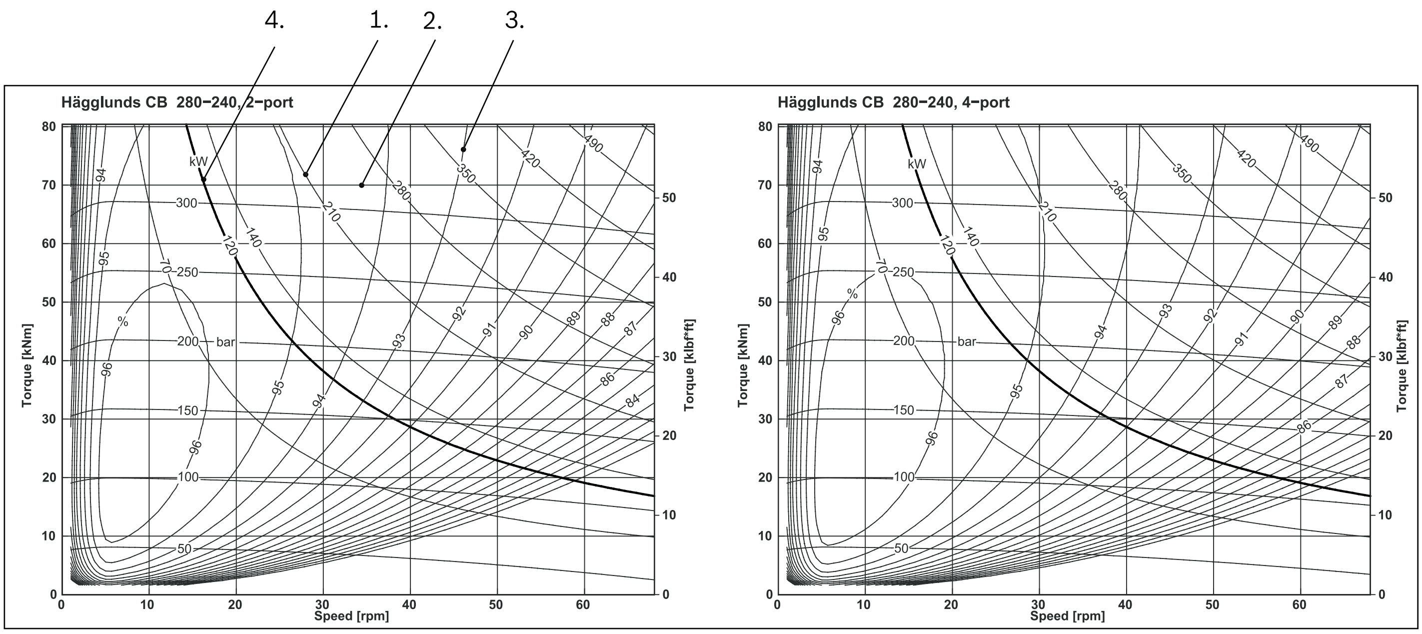


Fig. 14: CB 280 240

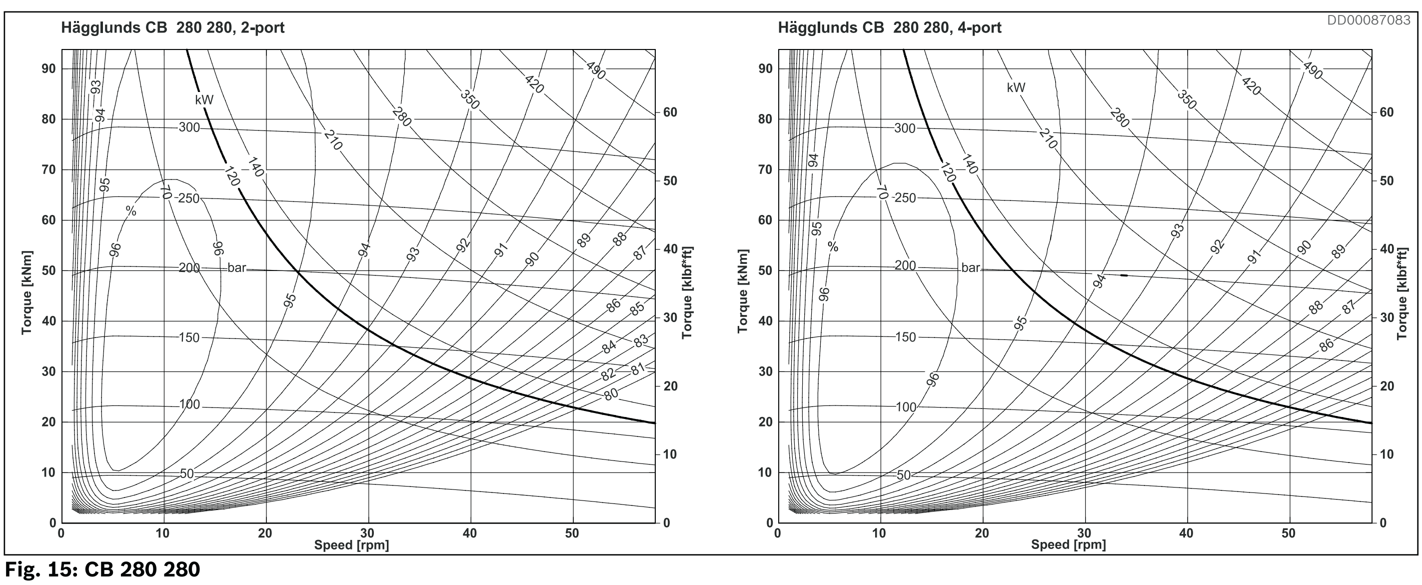


Fig. 15: CB 280 280

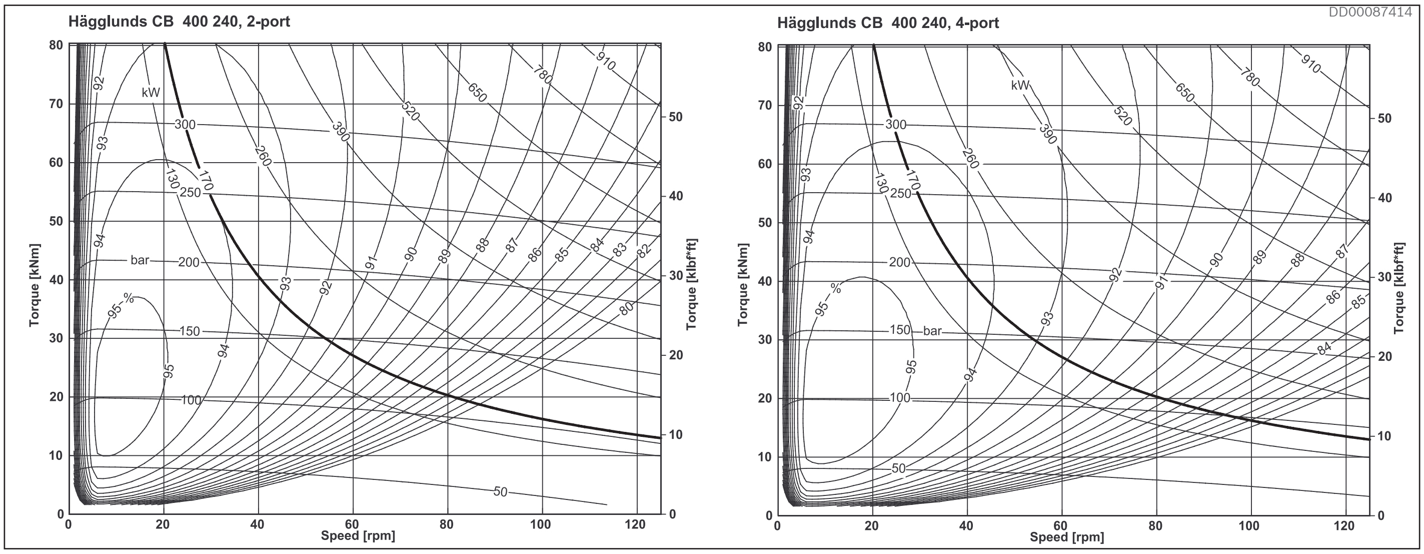


Fig. 16: CB 400 240

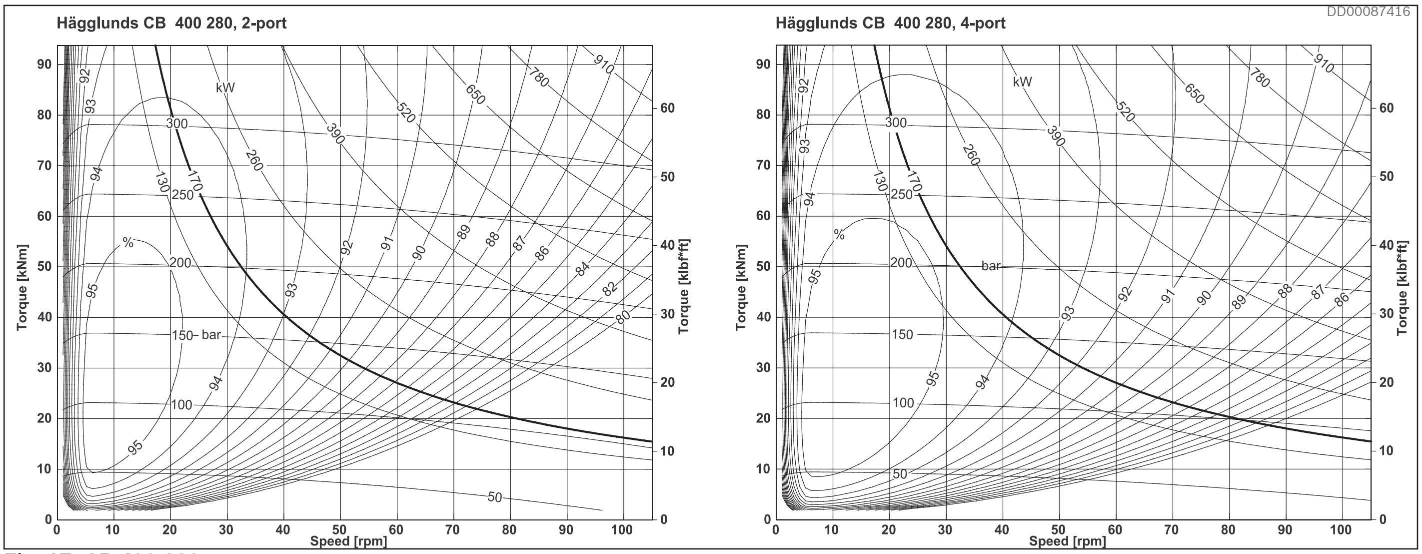


Fig. 17: CB 400 280

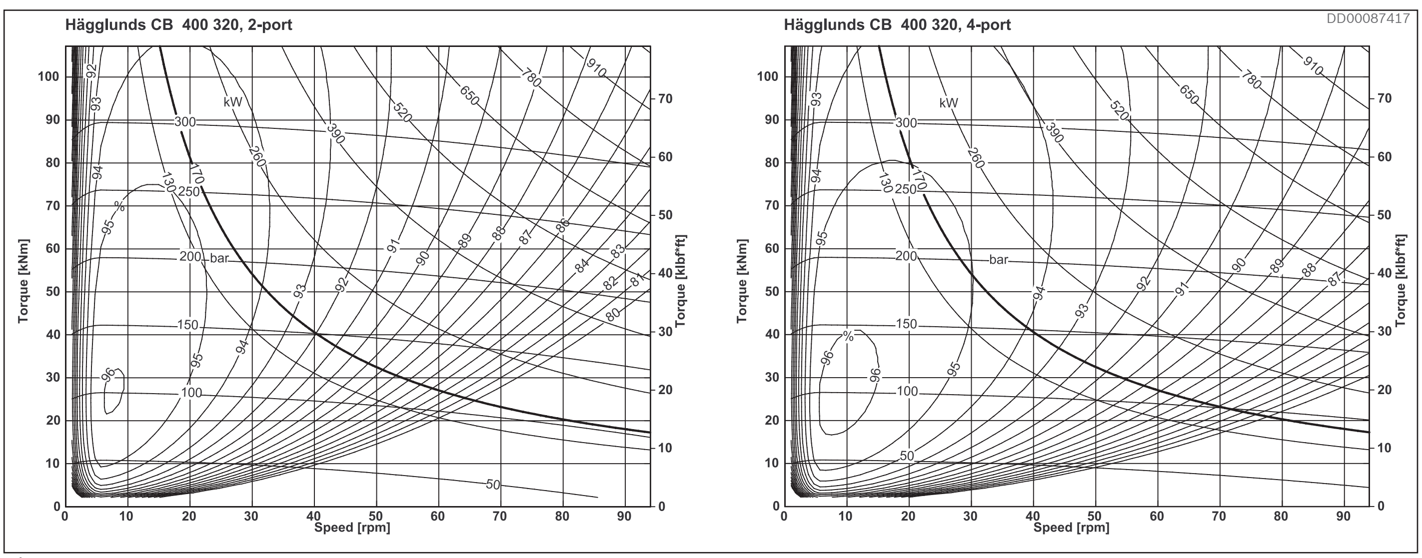


Fig. 18: CB 400 320

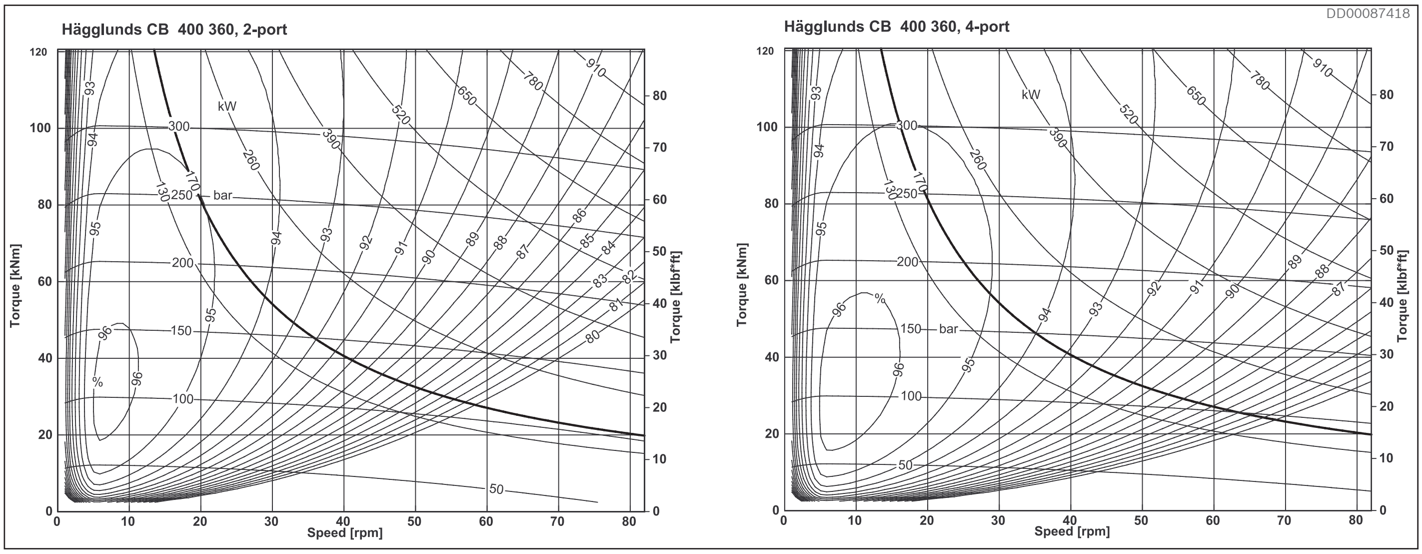


Fig. 19: CB 400 360

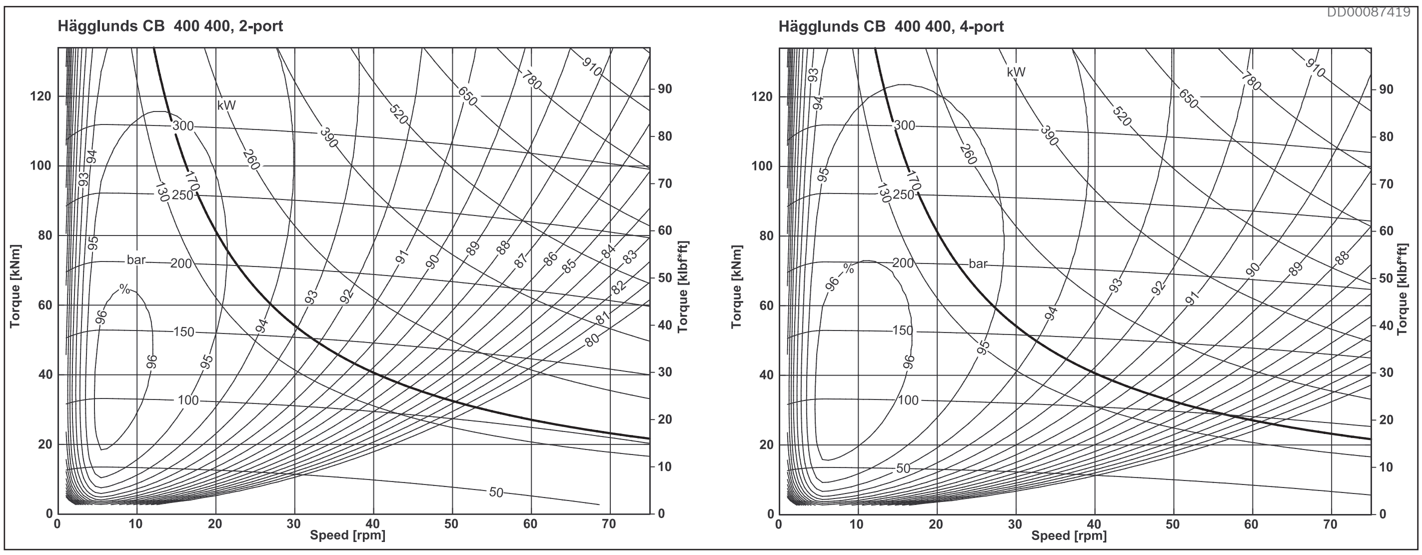


Fig. 20: CB 400 400

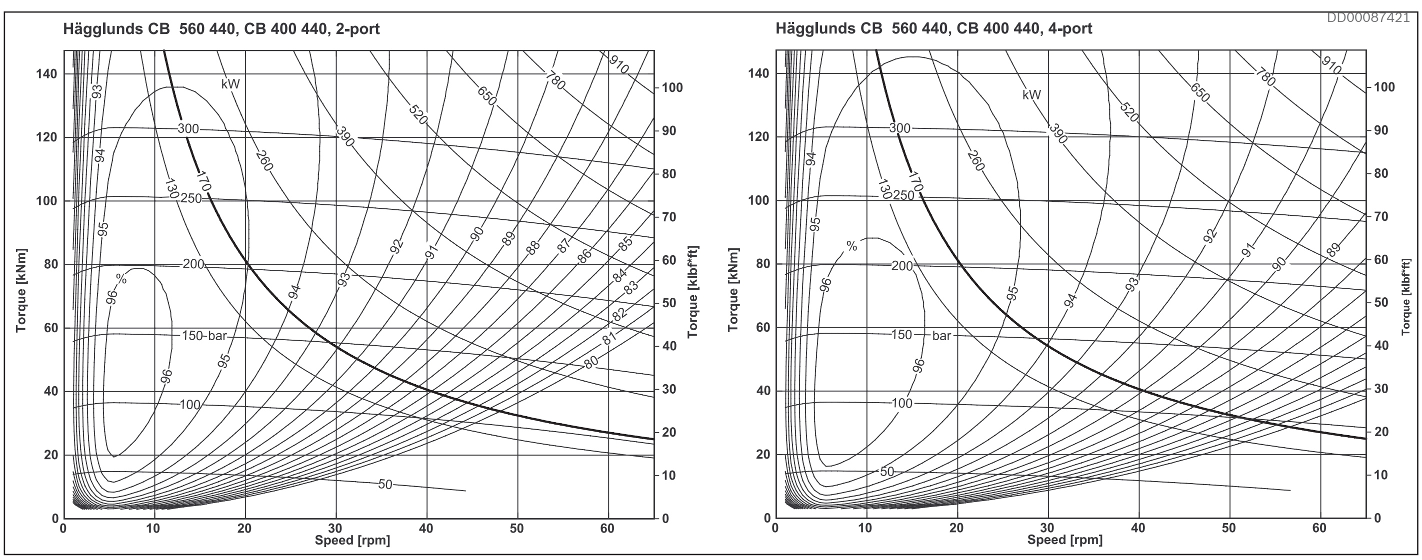


Fig. 21: CB 560 440. CB 400 440

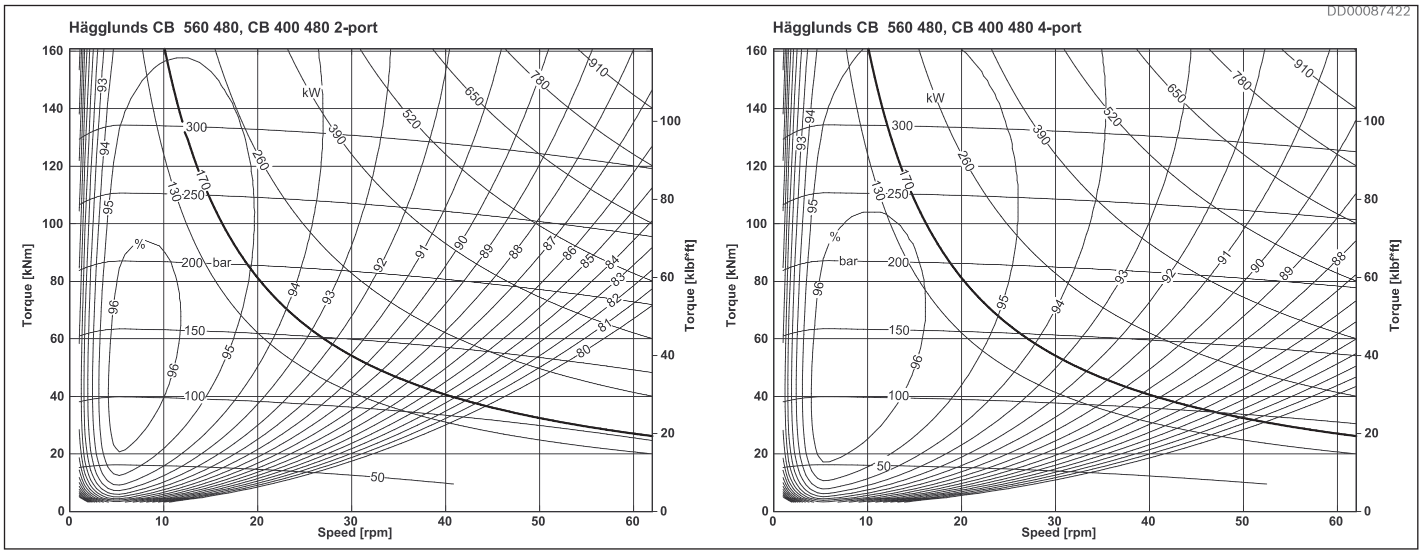


Fig. 22: CB 560 480, CB 400 480

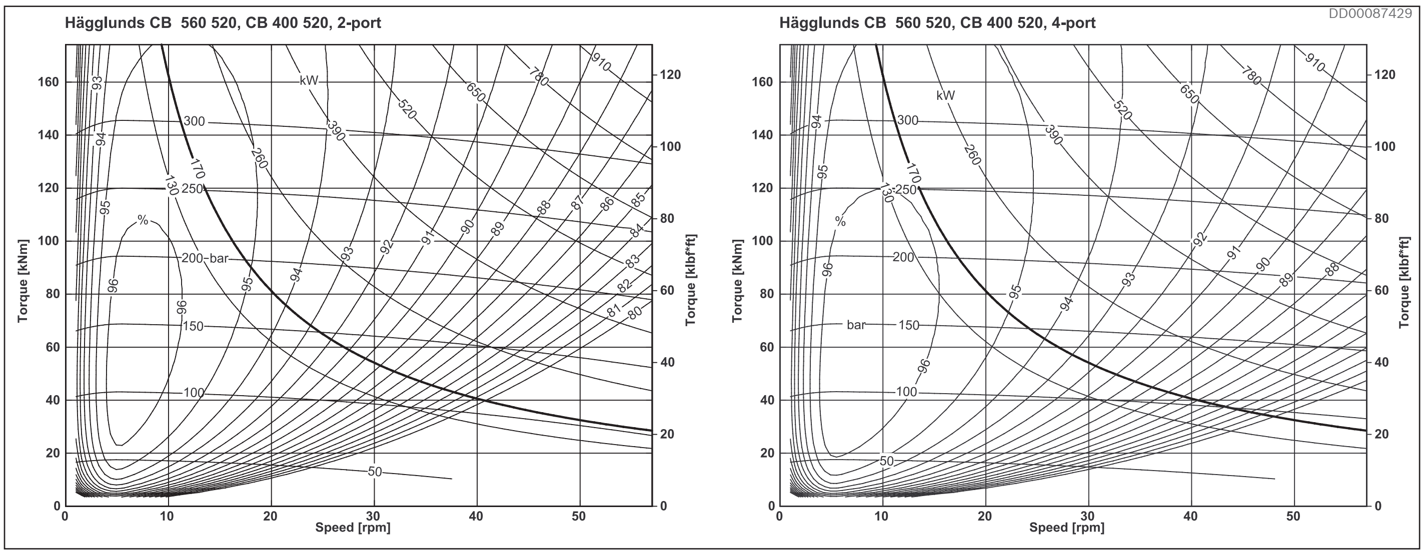


Fig. 23: CB 560 520, CB 400 520

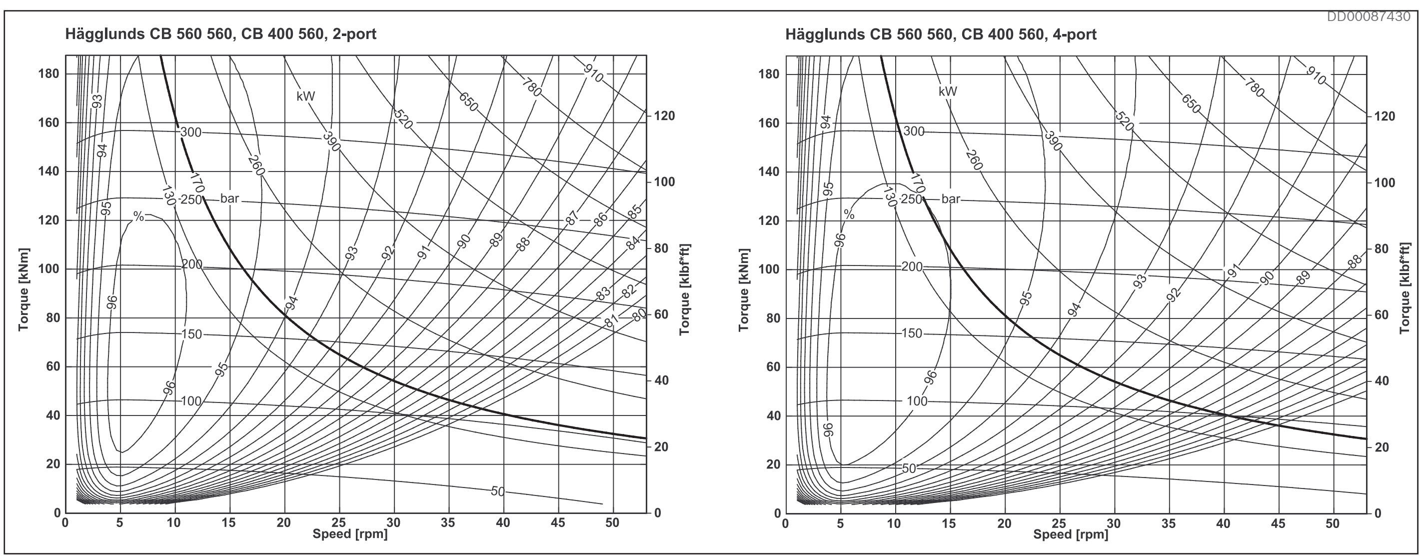


Fig. 24: CB 560 560, CB 400 560

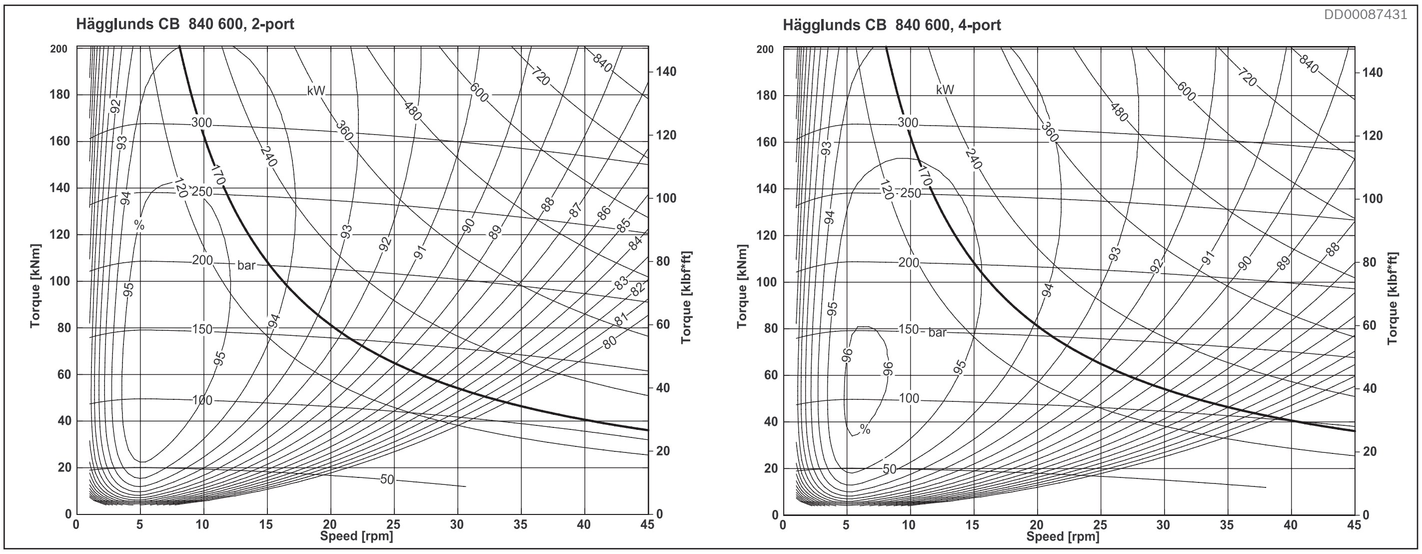


Fig. 25: CB 840 600

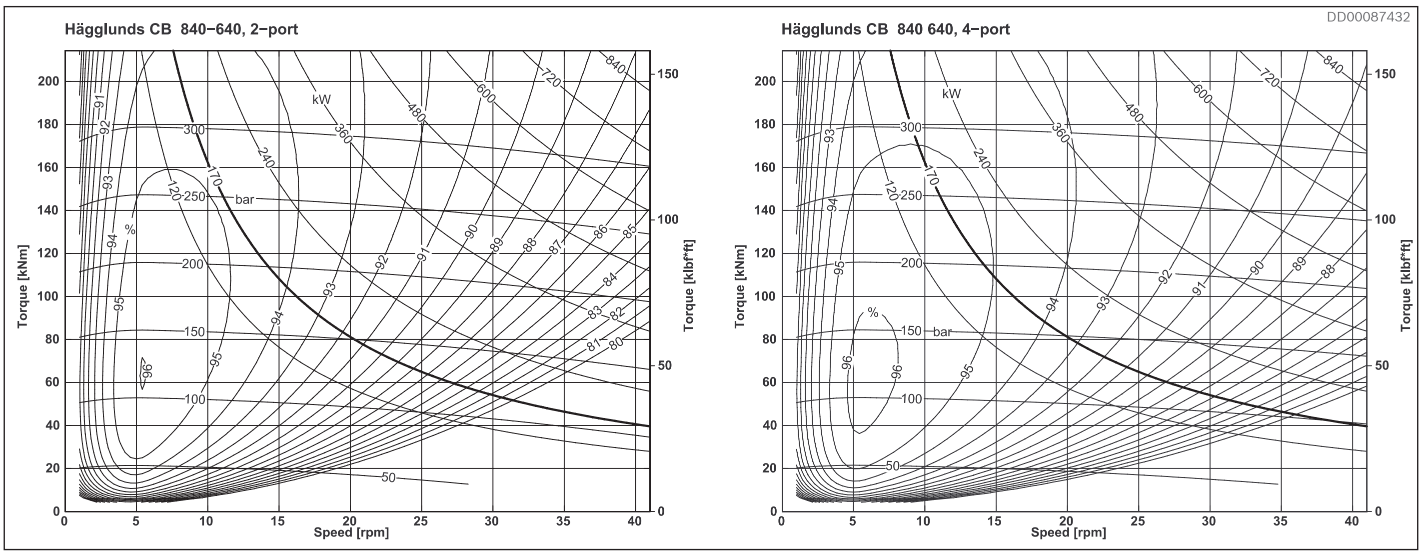


Fig. 26: CB 840 640

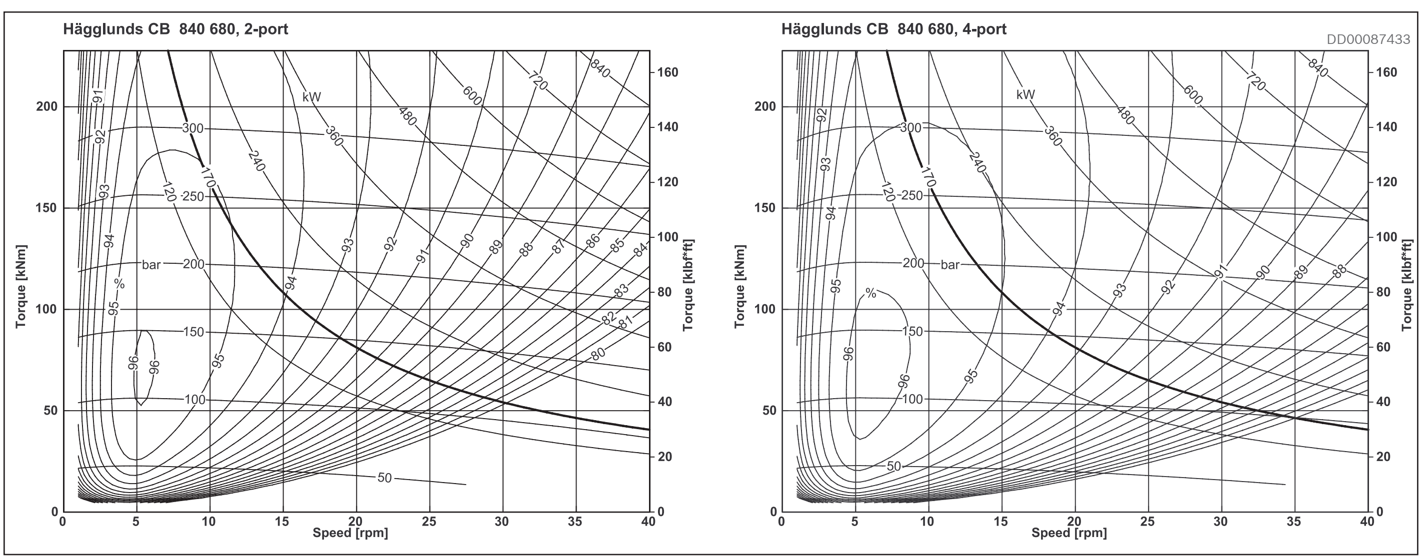


Fig. 27: CB 840 680

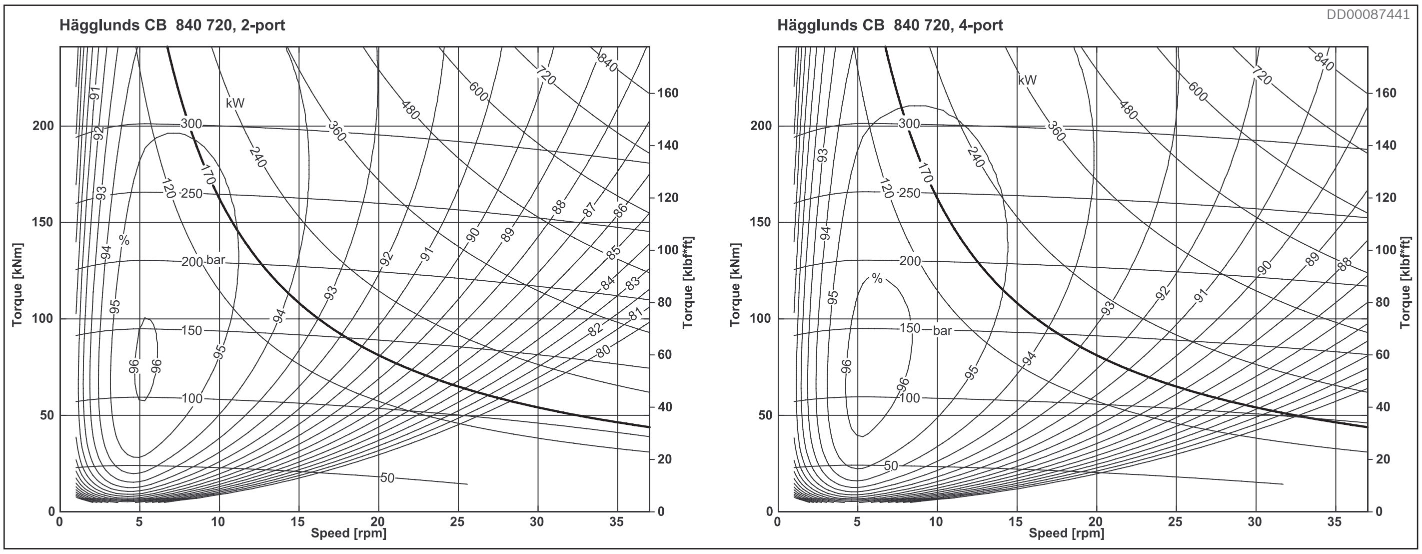


Fig. 28: CB 840 720

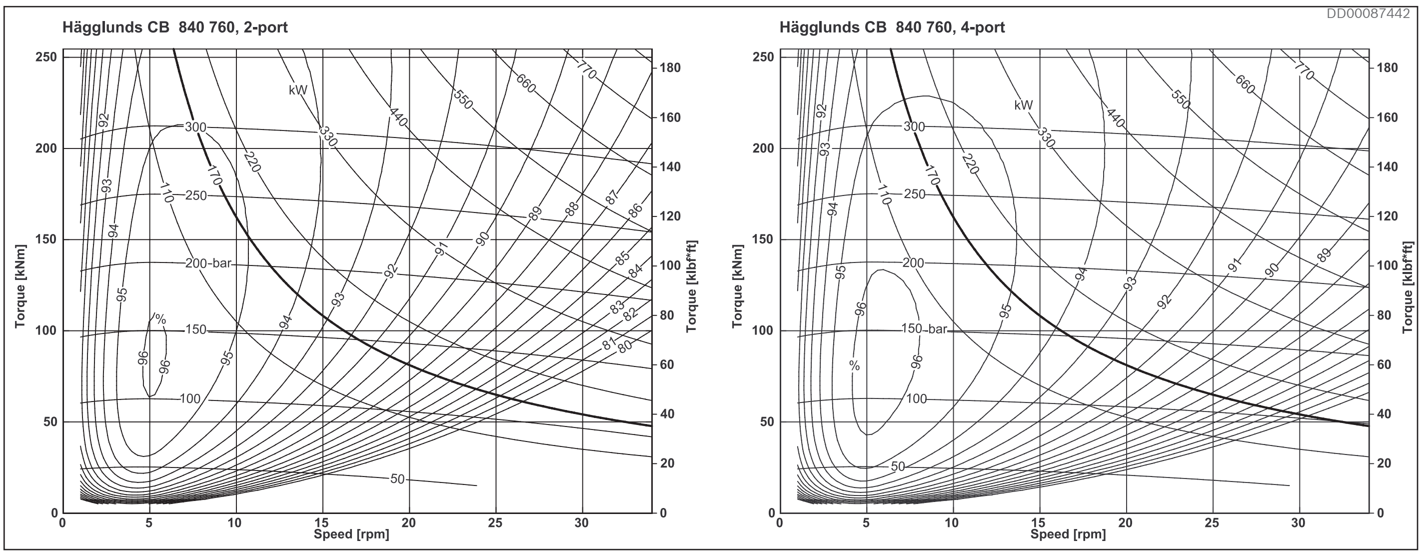


Fig. 29: CB 840 760

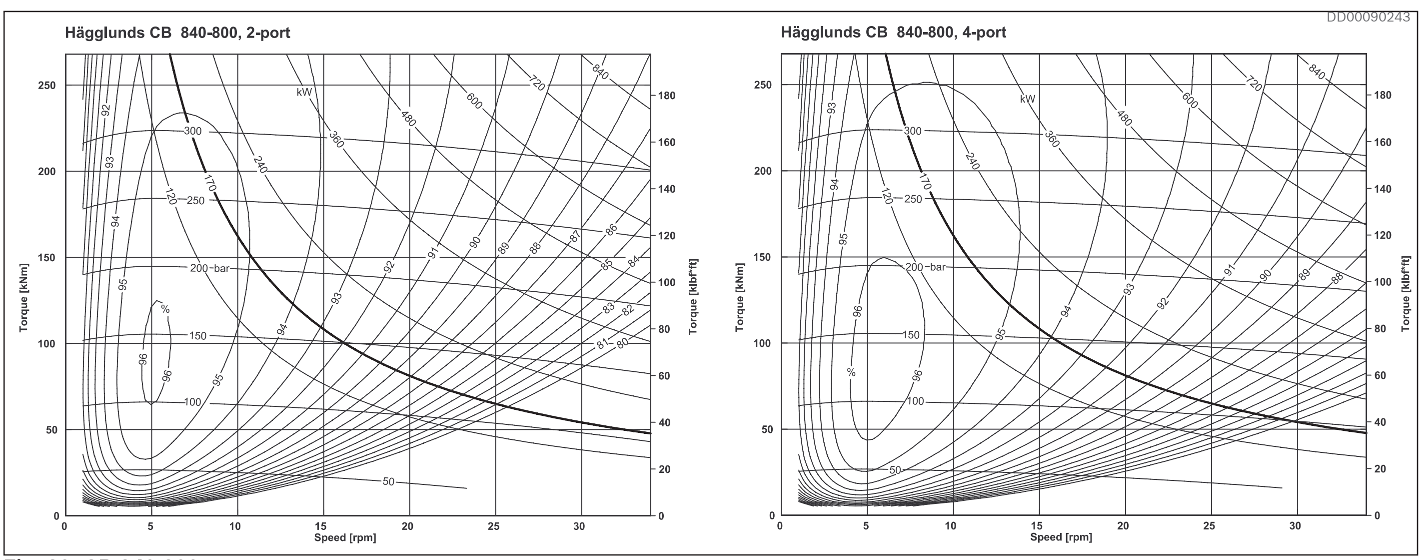


Fig. 30: CB 840 800

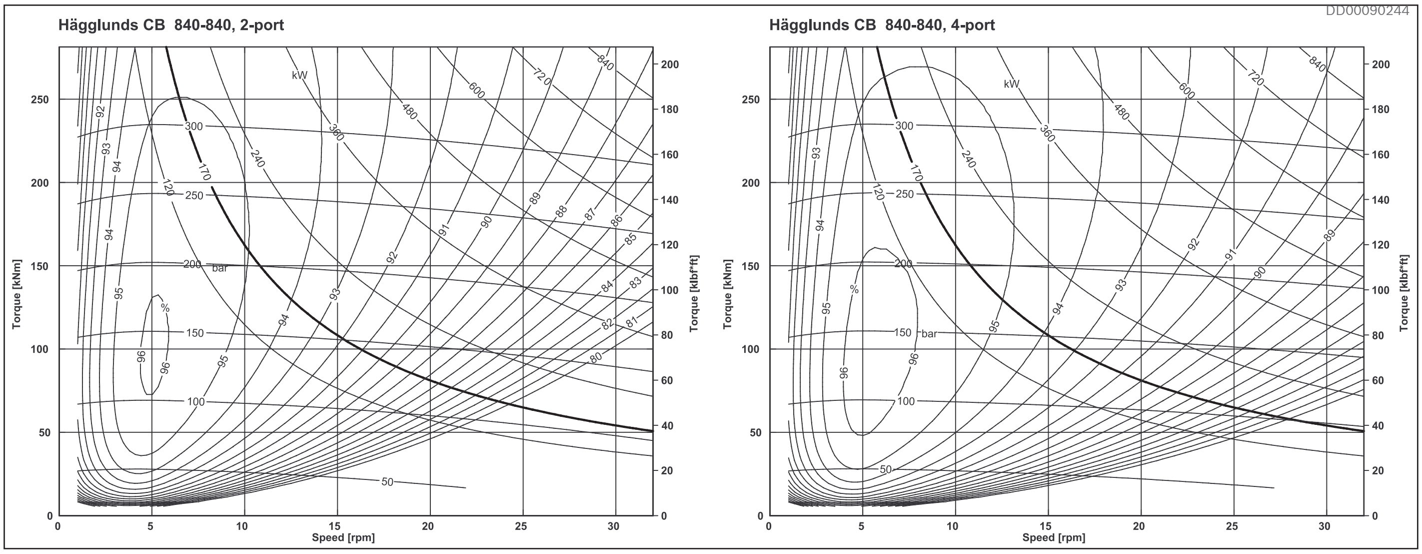


Fig. 31: CB 840 840

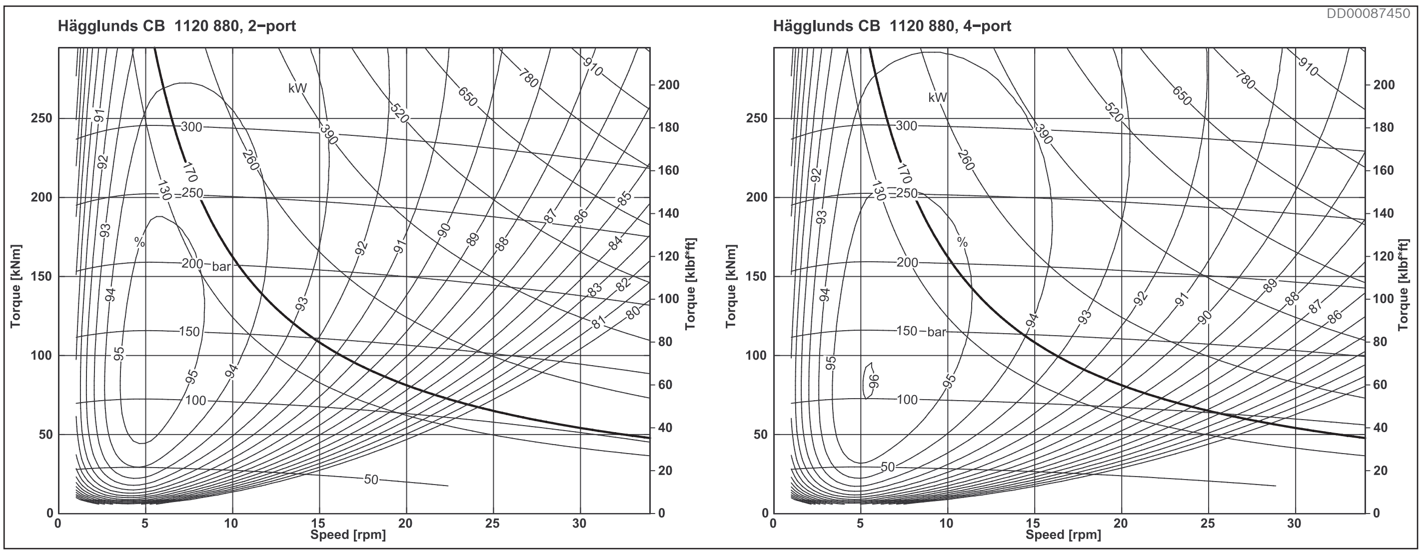


Fig. 32: CB 1120 880

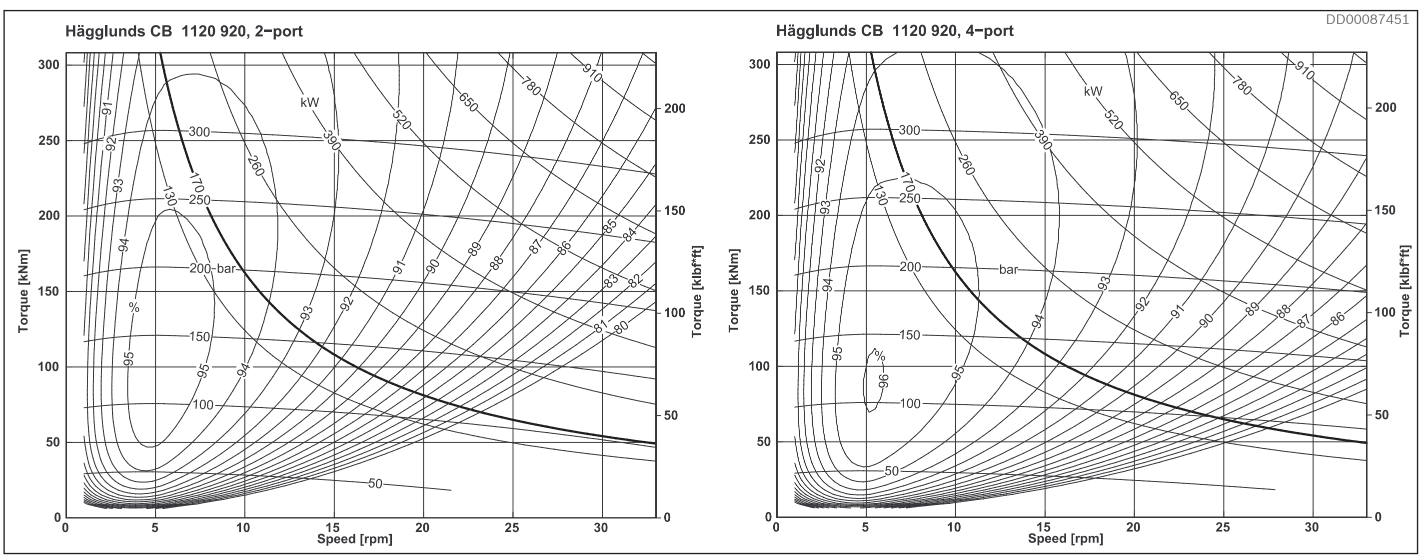


Fig. 33: CB 1120 920

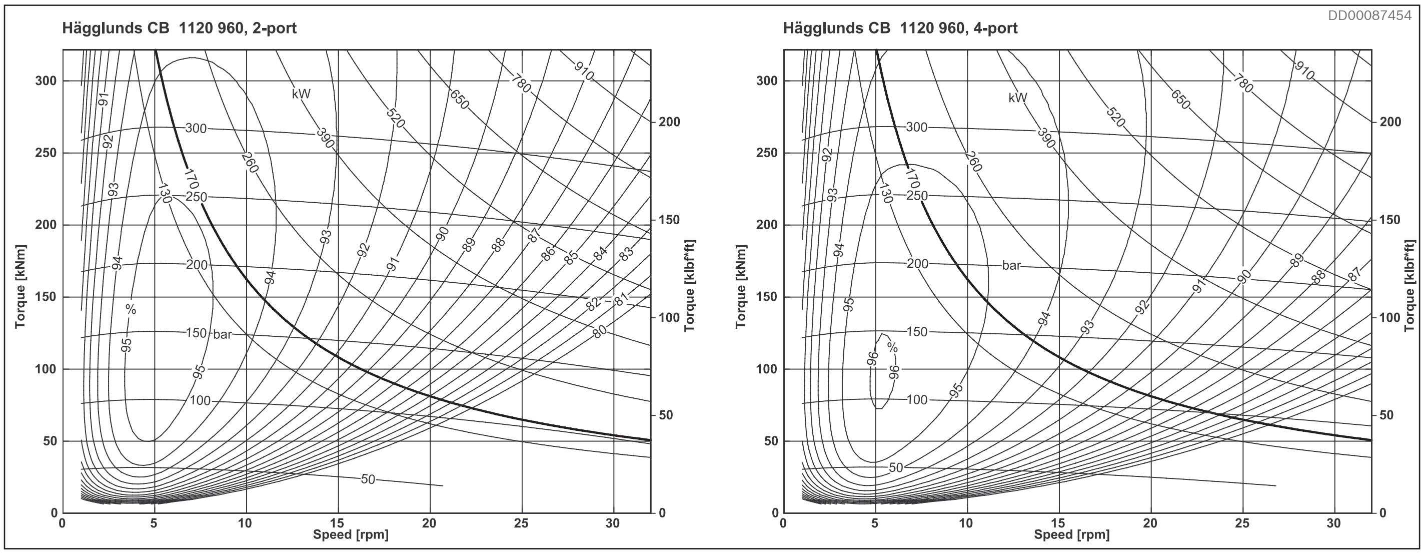


Fig. 34: CB 1120 960

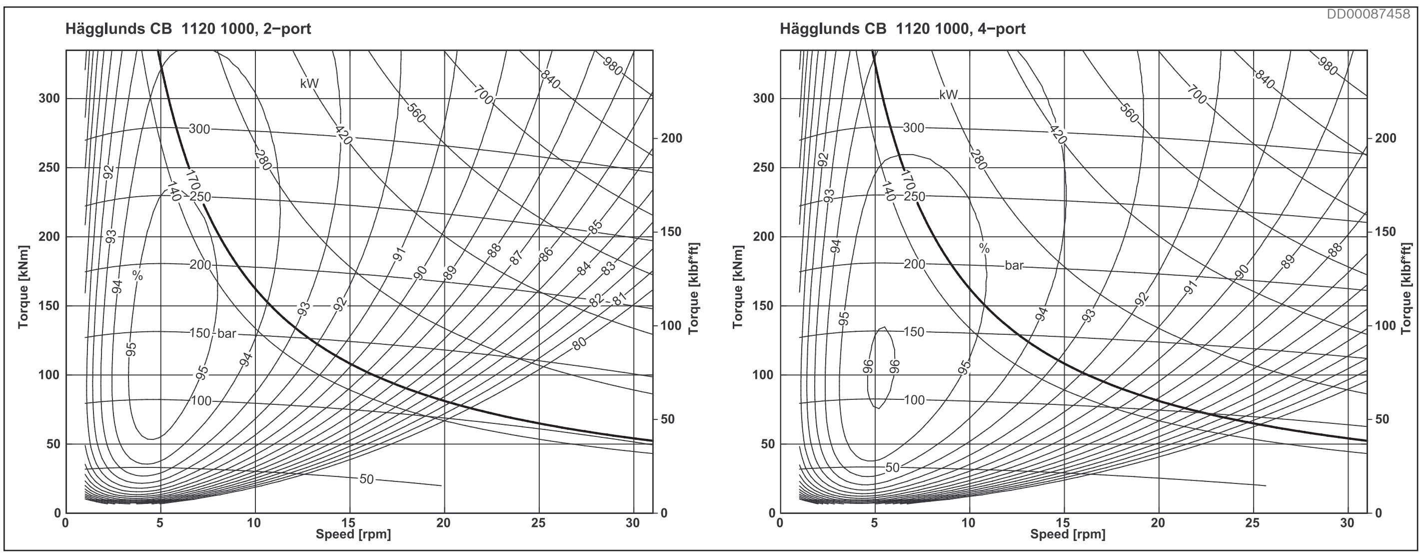


Fig. 35: CB 1120 1000

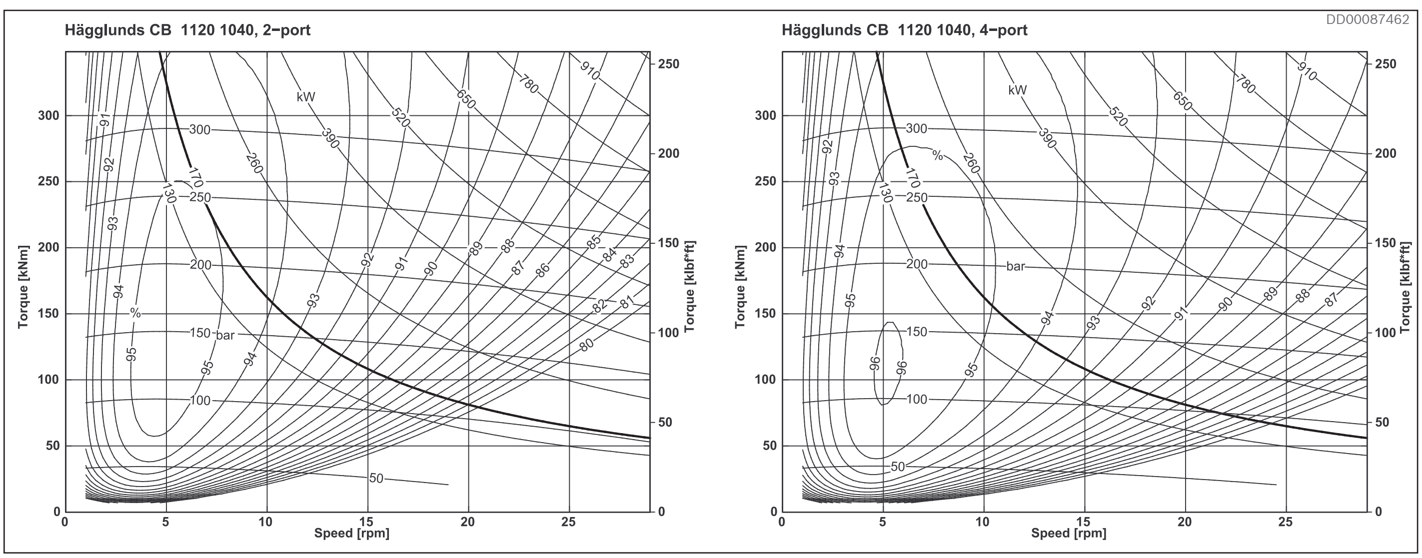


Fig. 36: CB 1120 1040

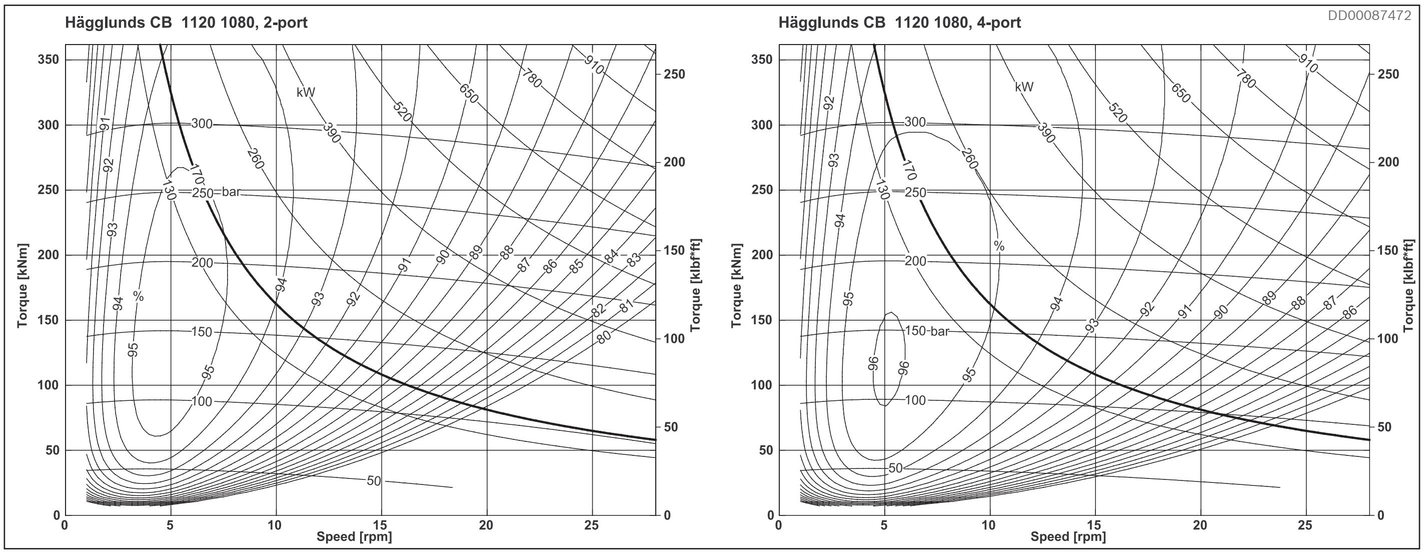


Fig. 37: CB 1120 1080

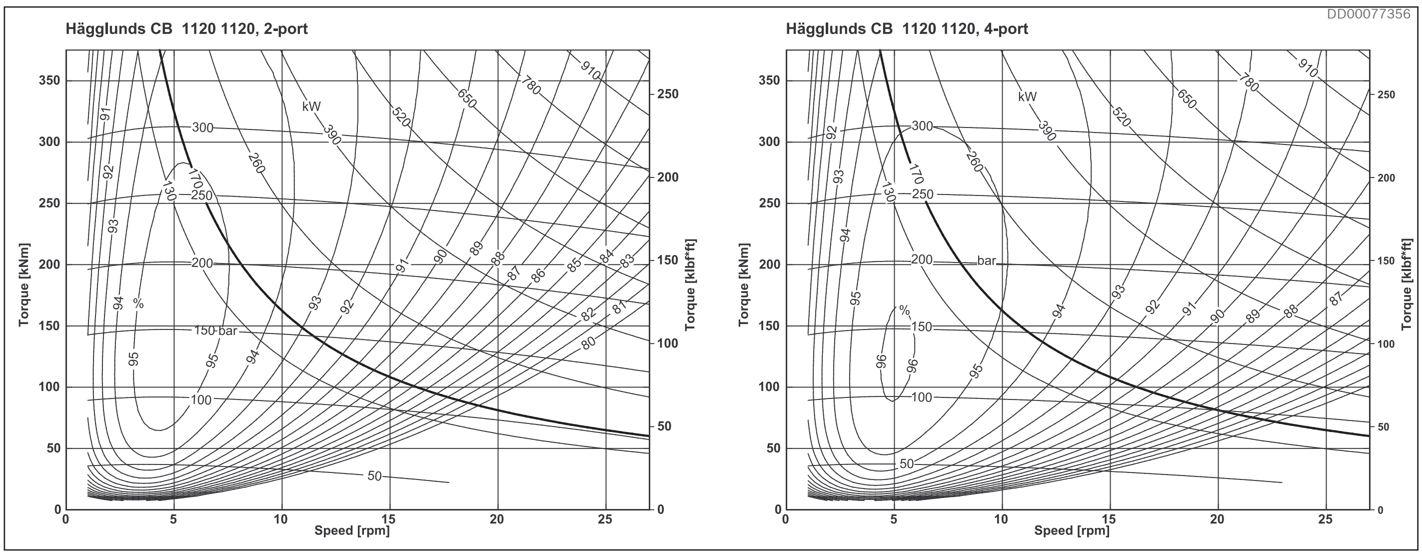


Fig. 38: CB 1120 1120

4.7 Pressure loss diagrams

Pressure loss, oil viscosity 40 cSt

$$\text{Actual pressure difference} = \frac{\text{output torque}}{\text{specific torque} \cdot \text{mechanichal effiency}} + \text{pressure loss} \qquad \Delta p = \frac{T}{Ts \cdot \eta_m} + \Delta p_l$$

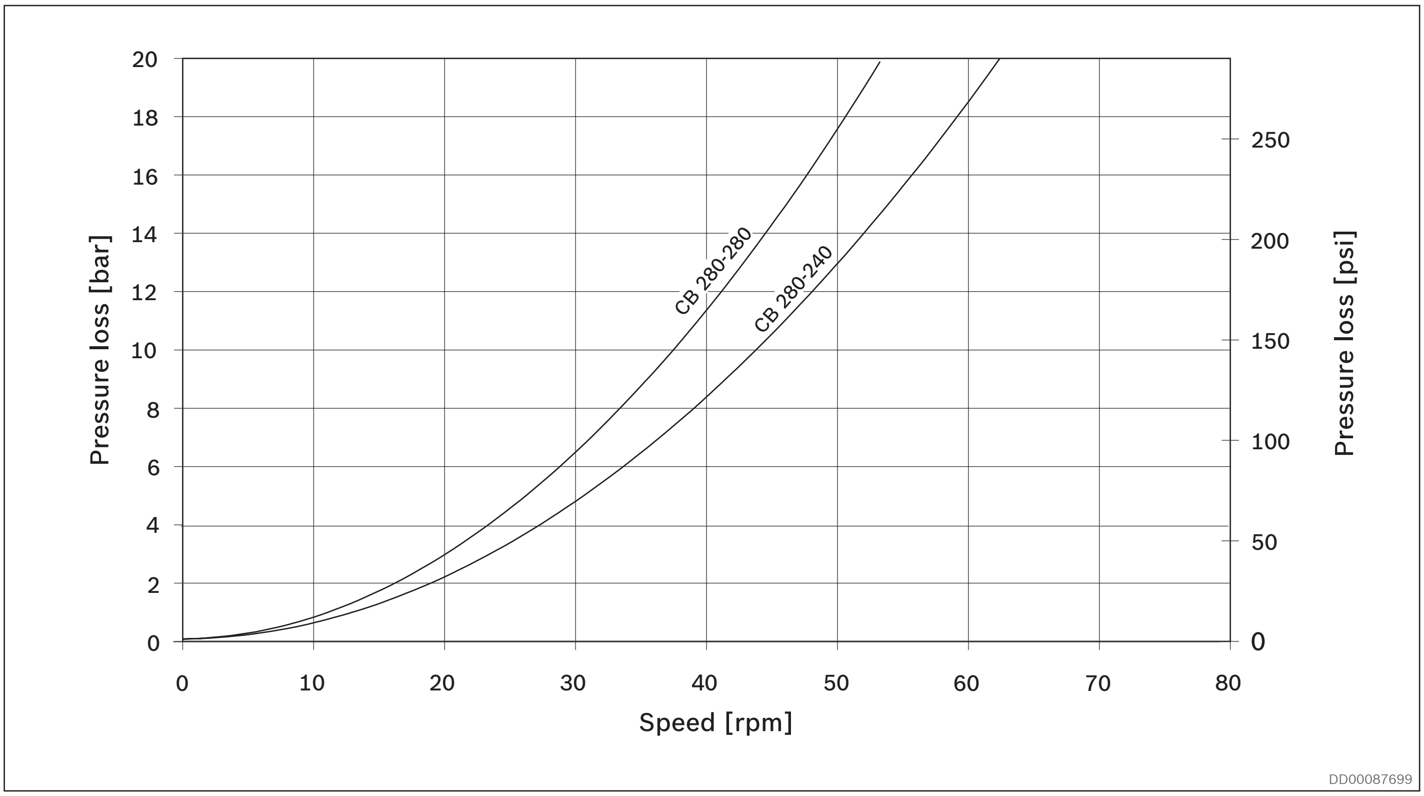


Fig. 39: CB 280 pressure loss 2 ports

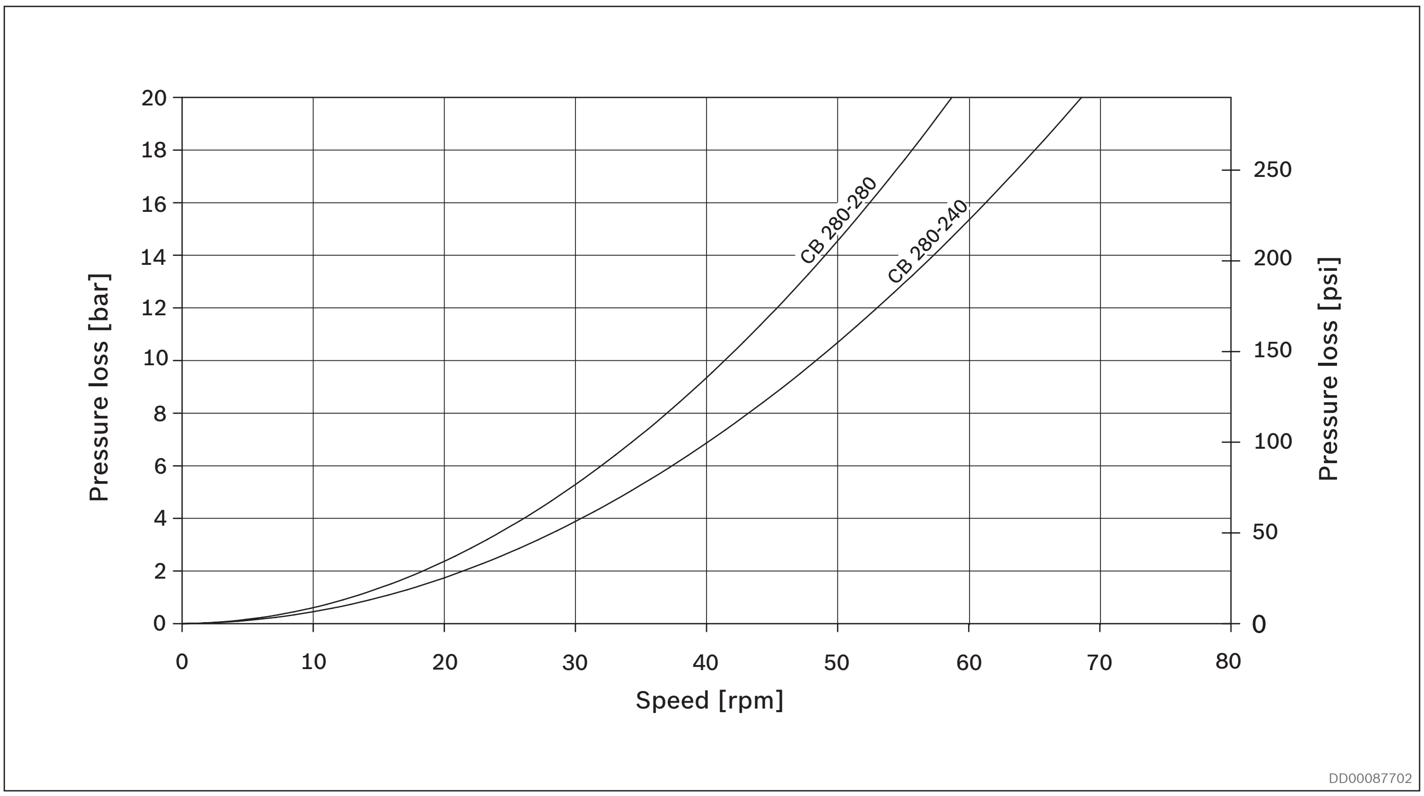


Fig. 40: CB 280 pressure loss 4 ports

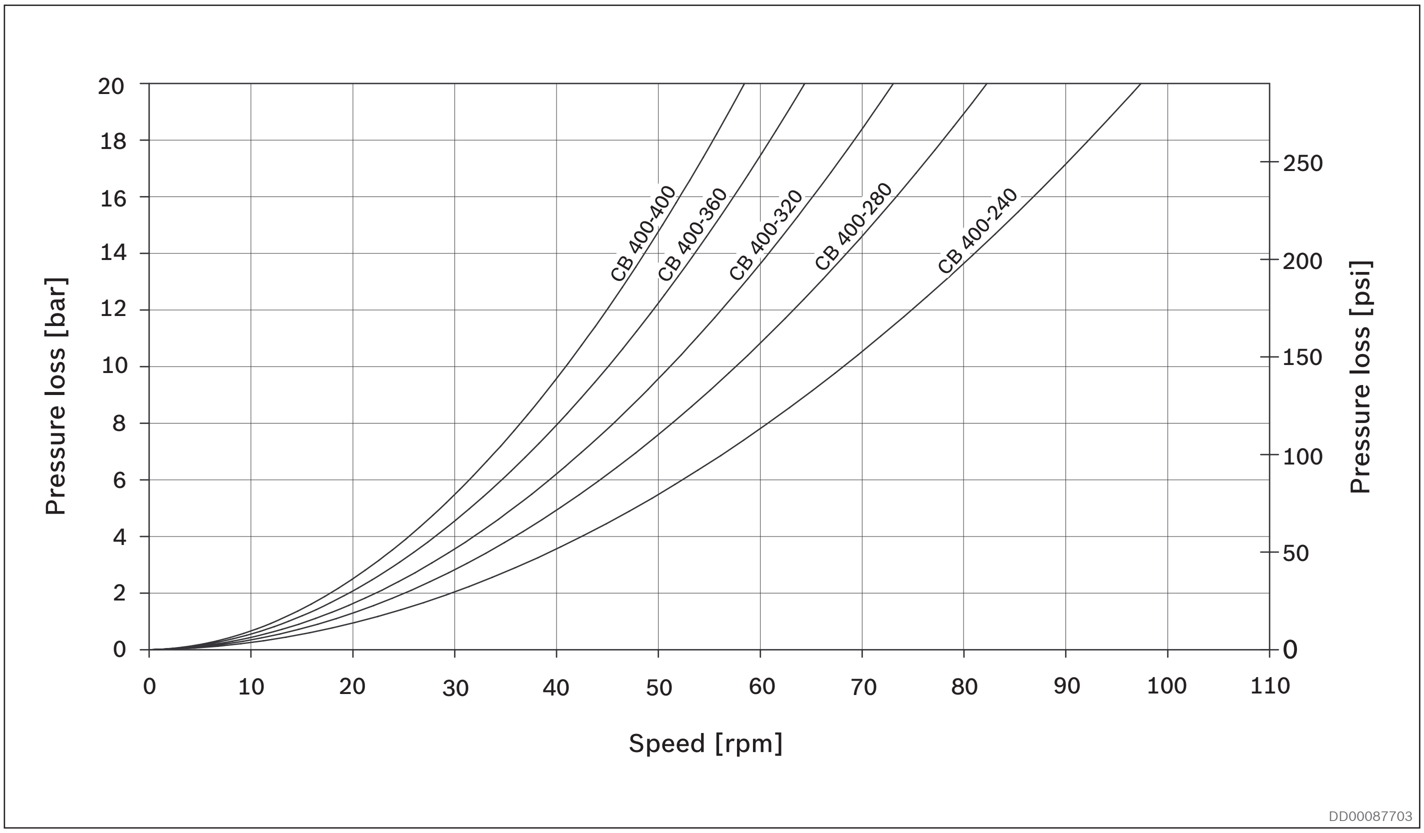


Fig. 41: CB 400-240 to CB 400-400 pressure loss 2 ports

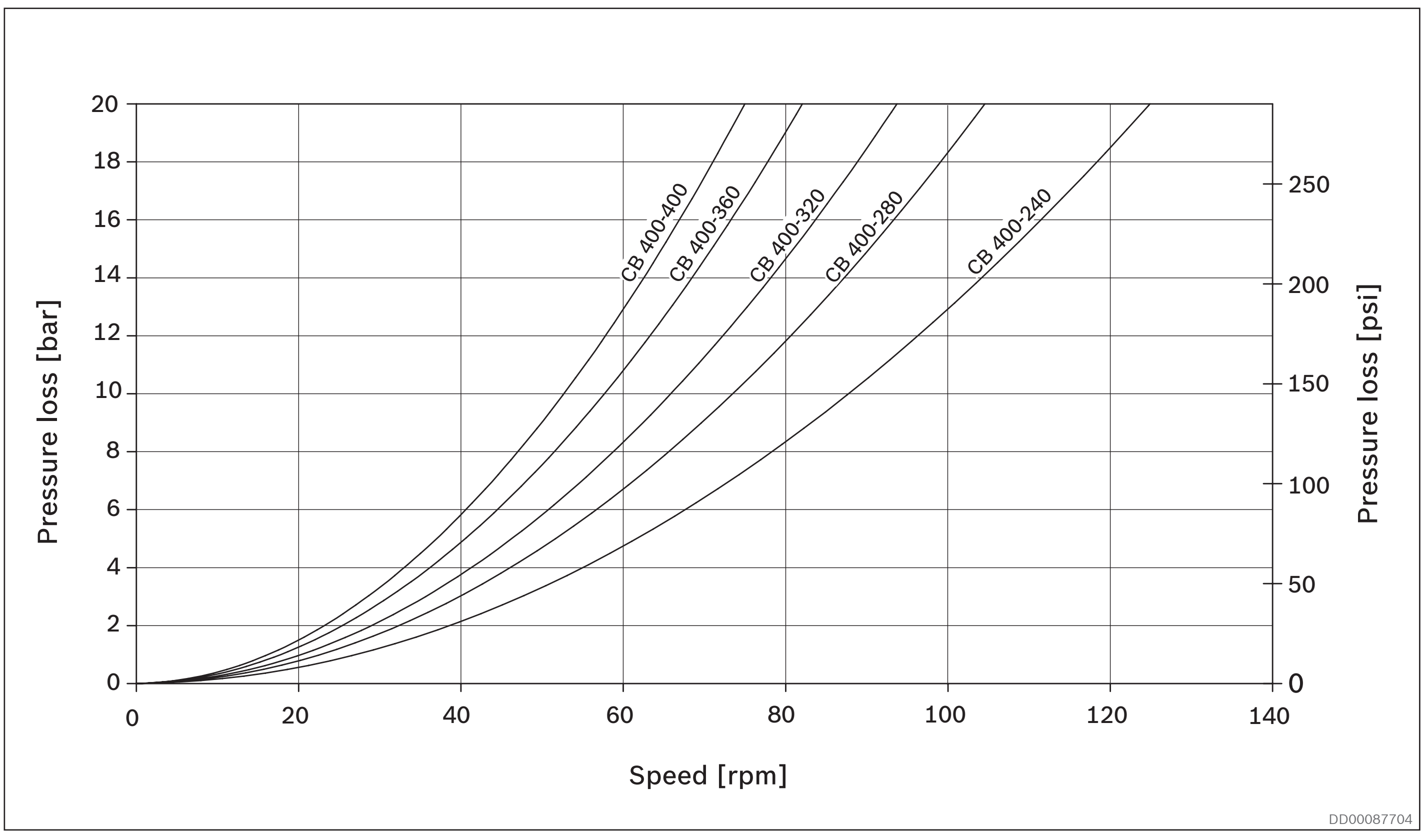


Fig. 42: CB 400240 to CB 400-400 pressure loss 4 ports

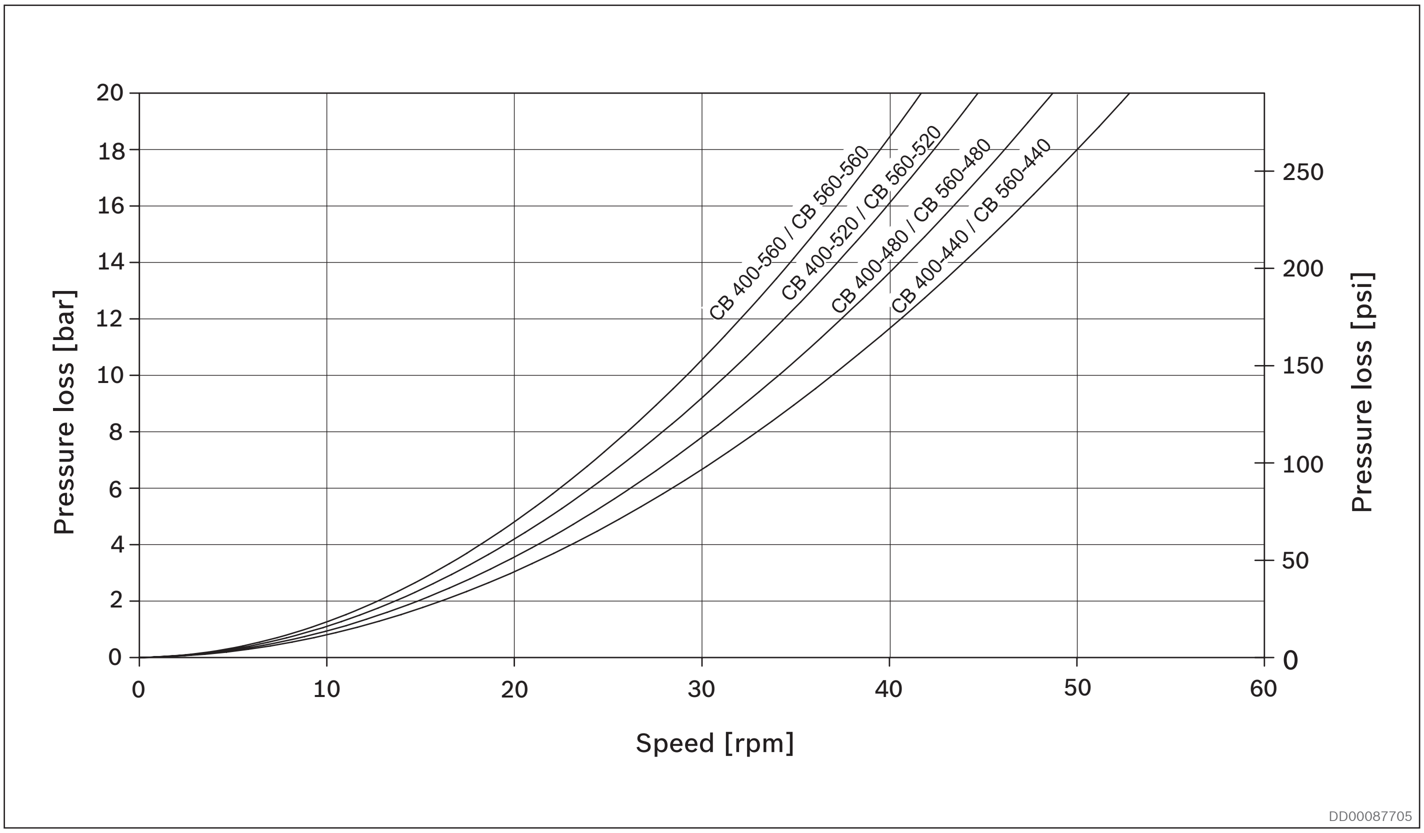


Fig. 43: CB 400-440 to CB 400-560, CB 560 pressure loss 2 ports

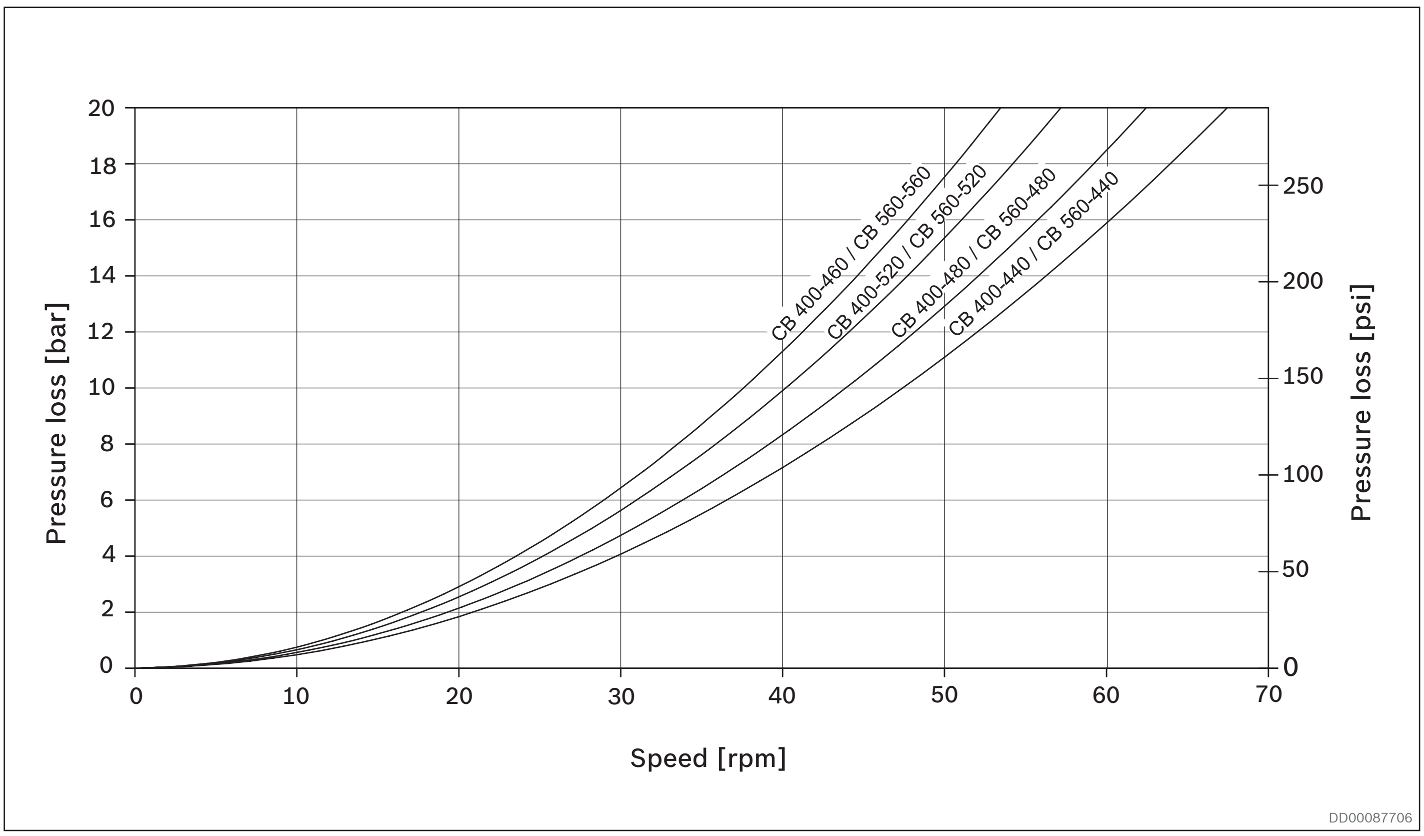


Fig. 44: CB 400-440 to CB 400-560, CB 560 pressure loss 4 ports

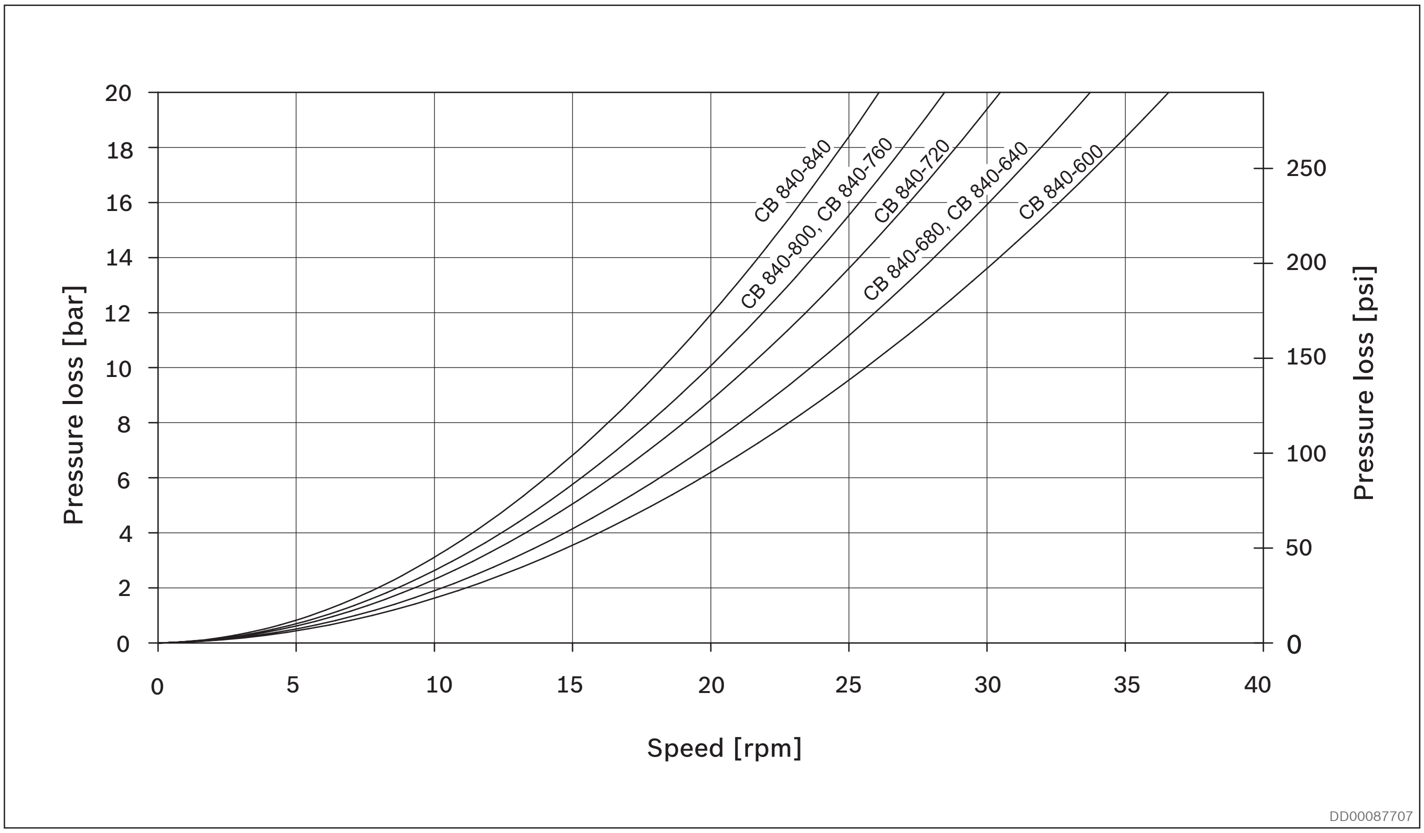


Fig. 45: CB 840 pressure loss 2 ports

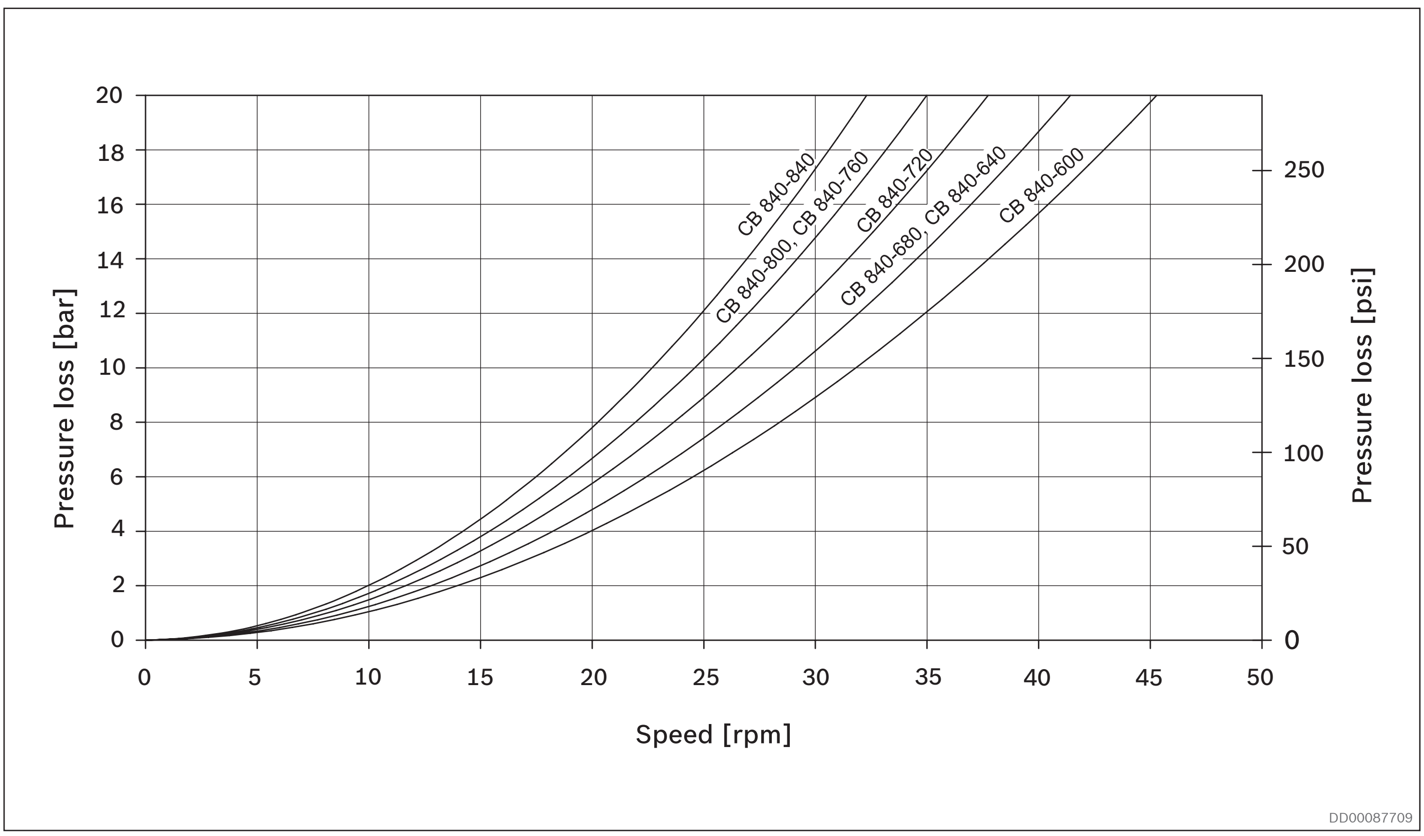


Fig. 46: CB 840 pressure loss 4 ports

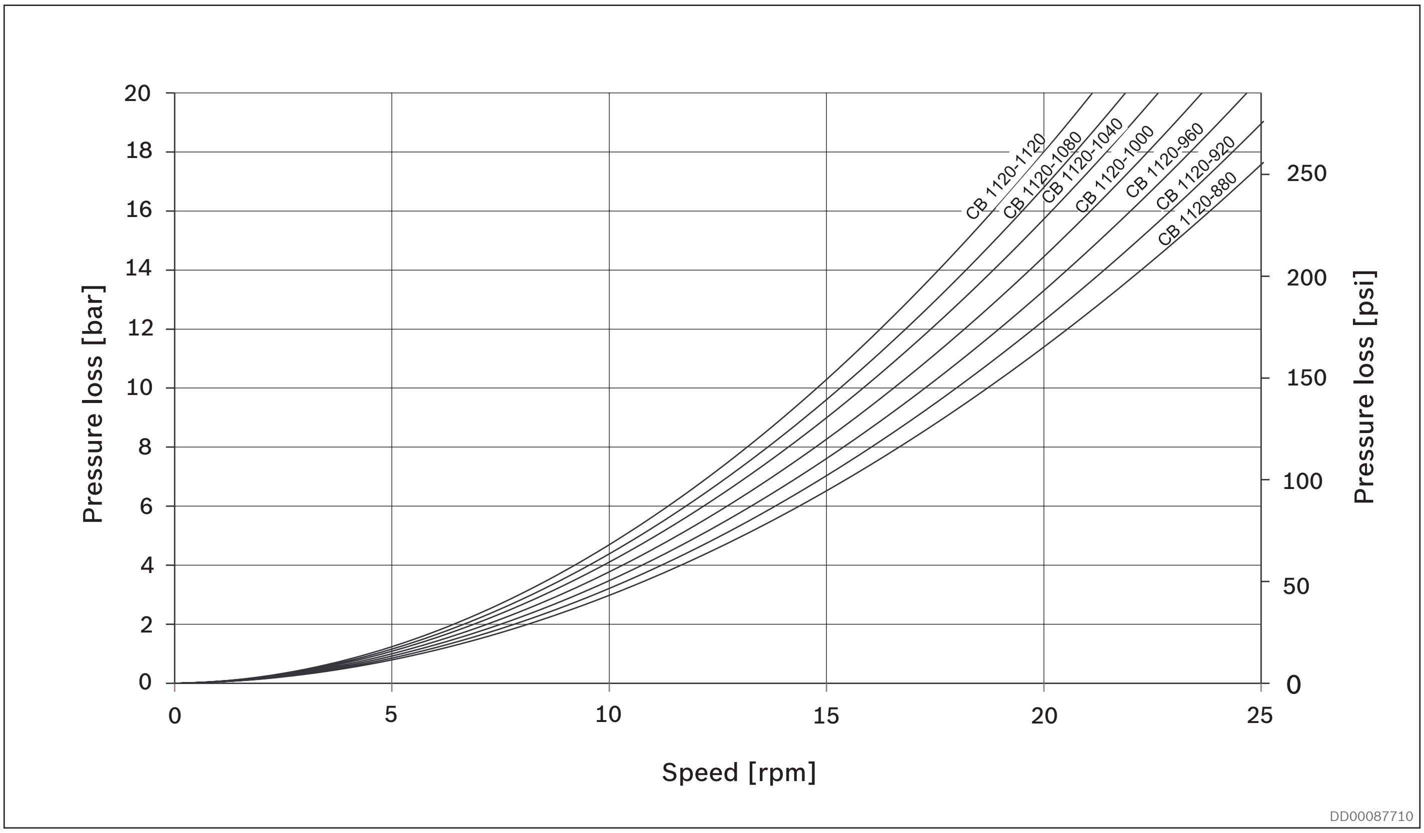


Fig. 47: CB 1120 pressure loss 2 ports

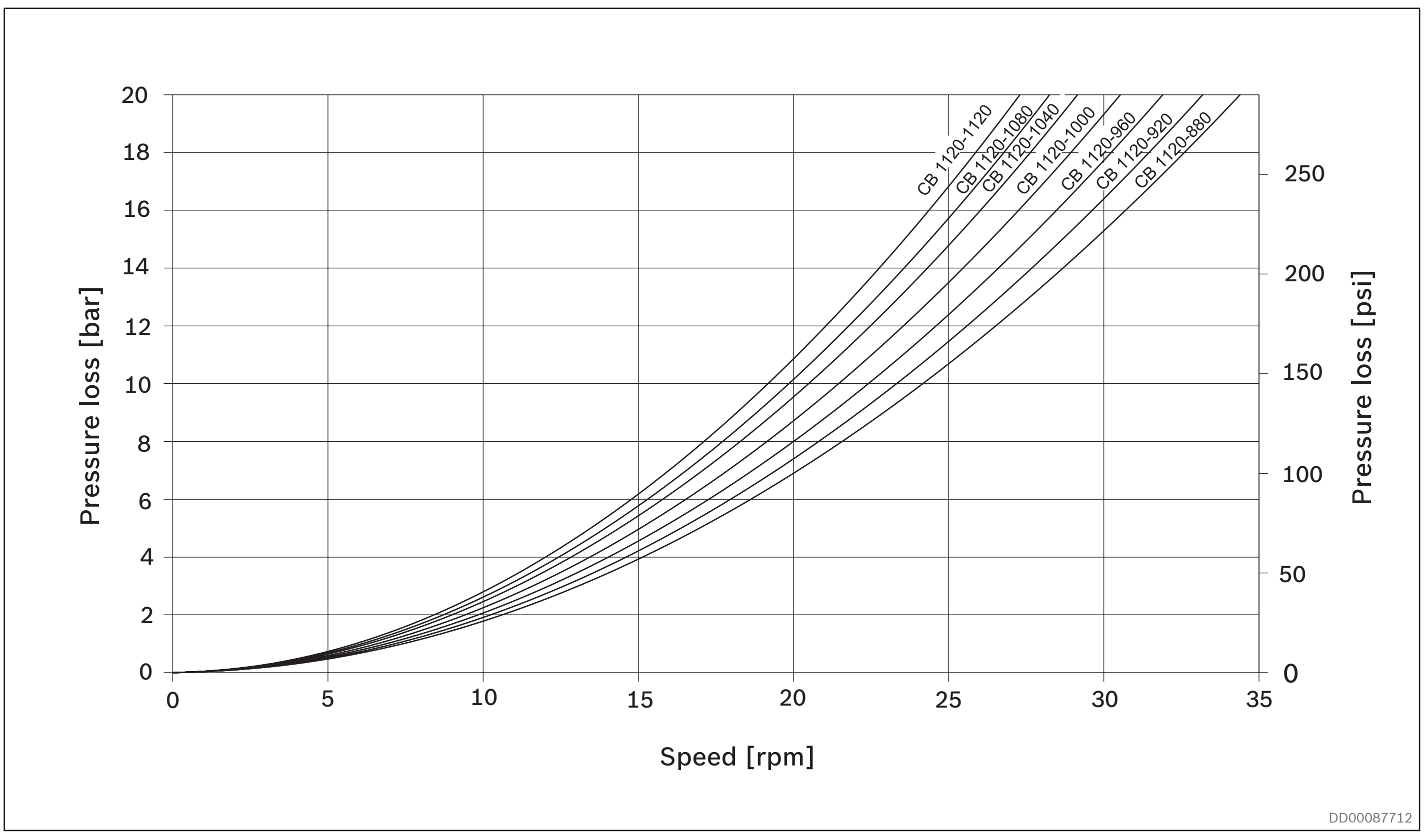


Fig. 48: CB 1120 pressure loss 4 ports

4.8 Quick selection diagram

Rated life for Hägglunds CB is calculated according to DIN ISO 281 Apendix 1.

The diagram below represents the torque and speed, corresponding to a modified rating life L10mh = 40 000 h. Oil viscosity in motor case 40 cSt. Contamination level not exceeding ISO 4406 18/16/13 (NAS 1638, class 7).
The diagram is based on a charge pressure of 15 bar (218 psi).

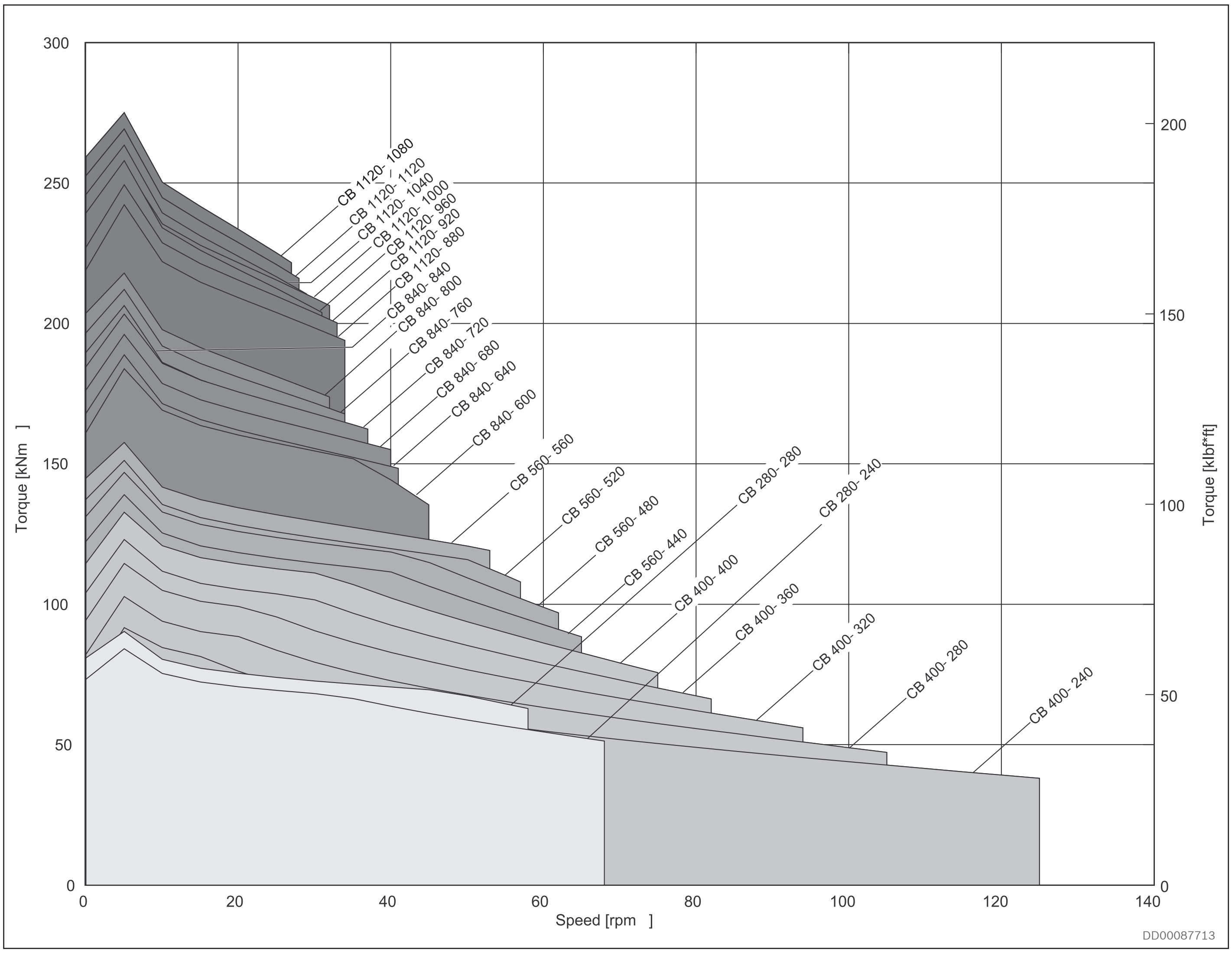


Fig. 49: Quick selection diagram

Notice!
Higher case oil viscosity increases the motor rating life considerably.
Reduced temperature in the motor case, increase rating life for the motor.

4.9 Draining, venting and flushing of the motor

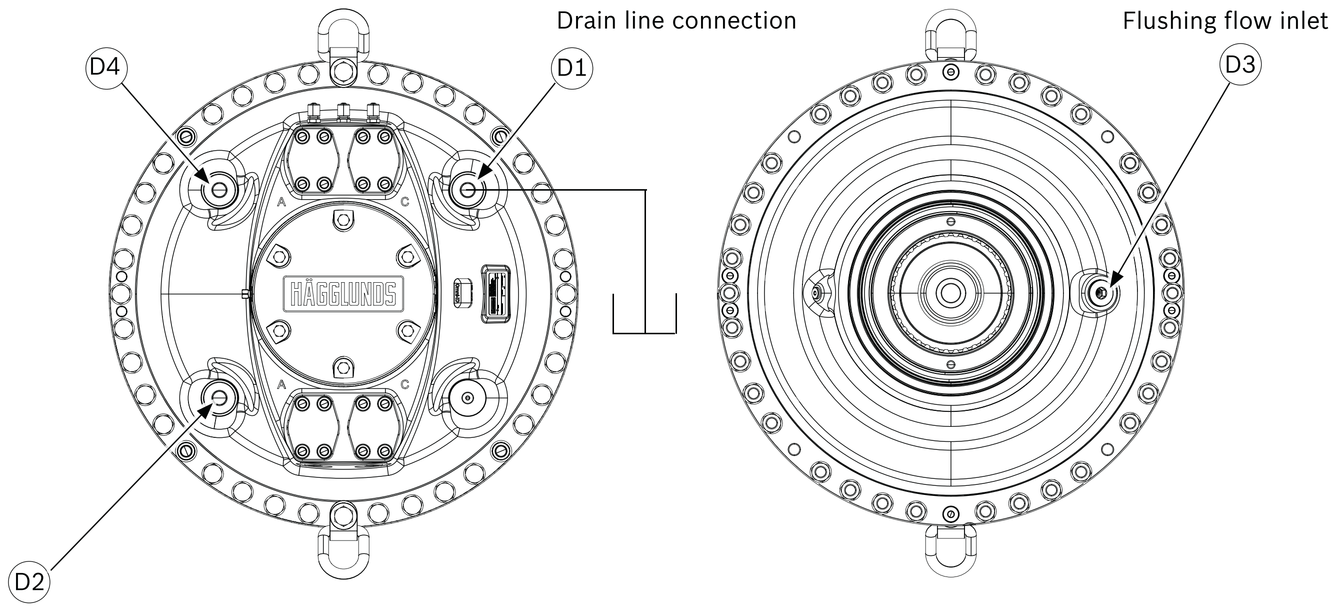


Fig. 50: Horizontal mounting

4.9.1 Horizontal mounting

When the motor is installed with the shaft in the horizontal plane, the highest of the four drain outlets D1, D2, D3 or D4 must always be used (see *Fig. 50*).
Drain line must be connected to the tank with a minimum of restrictions, to ensure that the maximum case pressure is not exceeded.

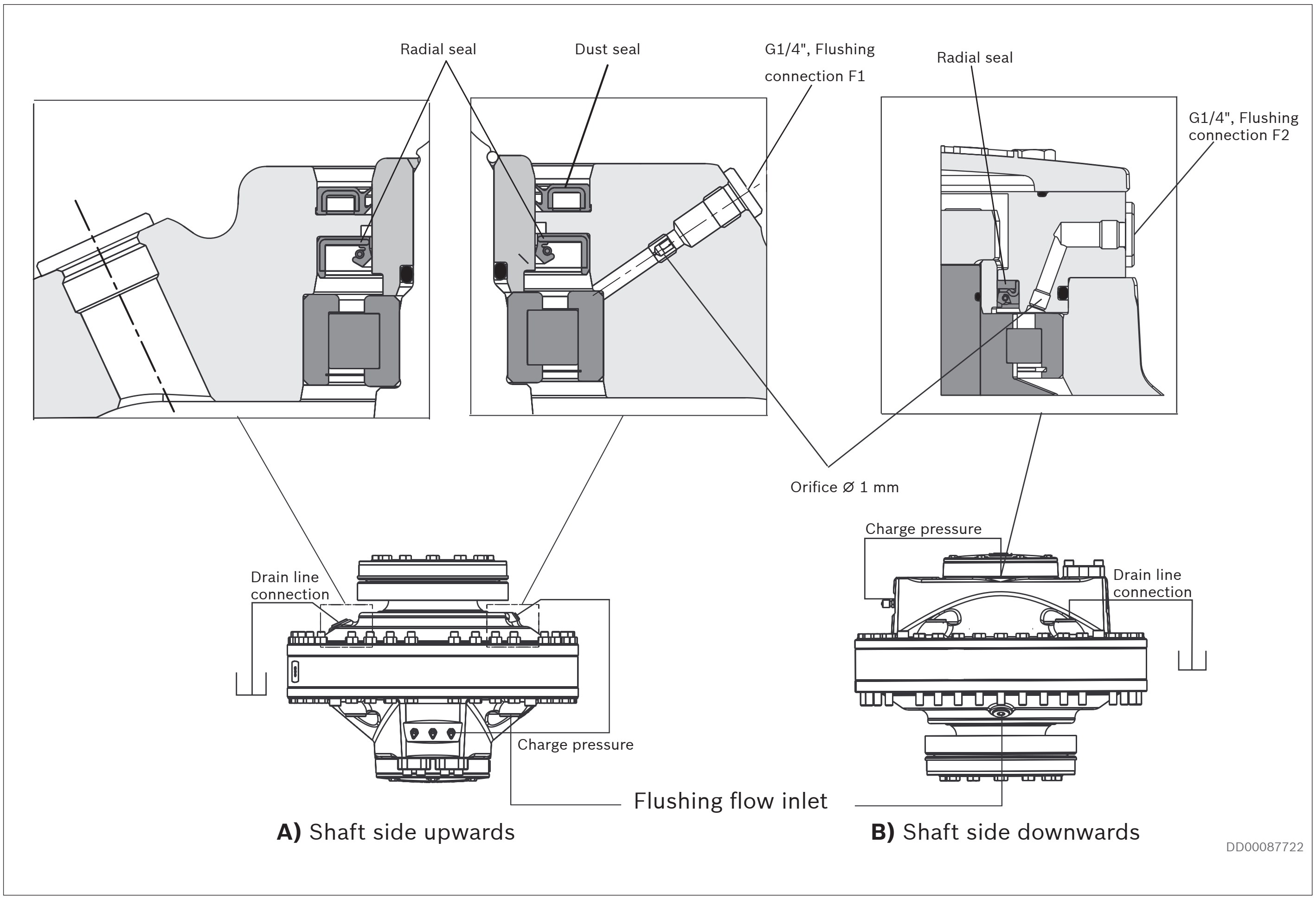


Fig. 51: Vertical mounting

4.9.2 Vertical mounting

When the motor is mounted vertically, the highest of four drain ports D1 to D4 must be used.
Flushing (lubrication) of radial seal from charge pressure is necessary.

A) Motor shaft pointing upwards

The drain line must be connected to the drain port D3 in the housing cover (See *Fig. 51*, *alt.: A) Shaft side upwards*).
The flushing connection F1 on the housing cover should be connected to the charge pressure. With bidirectional drives, use the connection with lowest average pressure. (Connecting to high pressure will increase the motor drain flow).

B) Motor shaft pointing downwards

The drain line must be connected to one of the drain ports D1 to D4 in the connection block. (See *Fig. 51* alt.: *B) Shaft side downwards*).
The flushing connection F2 shall be connected to charge pressure. With bidirectional drives, use the connection with lowest average pressure. (Connecting to high pressure will increase the motor drain flow).

4.10 Flushing

Flushing of motor case

The CB motors have very high overall efficiency, and they are frequently used in applications with high power.
To avoid high temperature in the case, the losses generated in the motors must be cooled away. High temperature gives lower viscosity and this gives reduction in basic rating life and max allowed power for the motor.
Flushing flow inlets, see *Fig. 50* and *Fig. 51*.
For continuous duty the motors must be flushed when the shaft power exceed the following max power:

Table 8: Maximum motor power without flushing

Frame size	Flushing limit power, E_{FL}	
	kW	hp
CB 280	120	160
CB 400/560/840/1120	170	227

When the motor have to be flushed, the required flushing flow can be calculated according to following:
E_1 = Power loss due to mechanical losses = c • motor power
E_2 = Power loss due to volumetric losses

Table 9: Heat transmitted to air at ambient temperature +20°C (68°F) and motor case temperature +50°C (122°F)

Frame size	Heat transmitted to air	
	kW	hp
CB 280	0.6	0.8
CB 400/560/840/1120	0.9	1.2

Required flushing to keep motor case maximum 10°C (18°F) warmer than flushing oil:
q flushing = 3.4 · (E_1 + E_2 - Heat transmitted to air) l/min.
q flushing $_{US}$ = 0.67 · (E_{1US} + E_{2US} - Heat transmitted to air) gpm.
Viscosity in the motor case must be controlled according to diagram, *Fig. 13*.

Exemple:

Hägglunds CB 400-400 working at 250 bar and n = 20 rpm.

$$E_1 = \frac{c \cdot p_{high} \cdot n \cdot V_i}{600 \cdot 1000} \text{ (kW)}$$

$$E_2 = \frac{q_1 \cdot p_{high}}{600} \text{ (kW)}$$

$$E_{1US} \quad \frac{c \cdot p_{high} \cdot n \cdot V_i}{1714 \cdot 231} \text{ (hp)}$$

$$E_{2US} \quad \frac{q_1 \cdot p_{high}}{1714} \text{ (hp)}$$

p_{high} = motor high pressure	[bar] [psi]
n = motor speed	[rpm]
V_i = motor displacement	[cm³/rev] [in³/rev]
q_l = motor leakage	[l/min] [gpm] (see *Fig. 52)*
c = 0,01	

$$\text{Total power} = \frac{p_{high} \cdot n \cdot V_i}{600 \cdot 1000} = \frac{250 \cdot 20 \cdot 25100}{600 \cdot 1000} = 209.2 \text{ kW}$$. The motor case must be flushed

E_1 = 0.01 · 209.2 = 2.1 kW (2.8 hp)

$$E_2 = \frac{7 \cdot 250}{600} = 2.9 \text{ kW (3.9 hp)}$$

q flushing = 3.4 · (E_1 + E_2 - Heat transmitted to air) = 3.4 · (2.1 + 2.9 - 0.9) = 14 l/min
q flushing $_{US}$ = 0.67 · (E_{1US} + E_{2US} - Heat transmitted to air) = 0.67 · (2.8 + 3.9 - 1.2) = 3.7 gpm

4.11 External leakage

External leakage is from the distributor to the motor case and from the piston assembly to the motor case.
Valid for 40 cSt and at 1/3 of max speed.

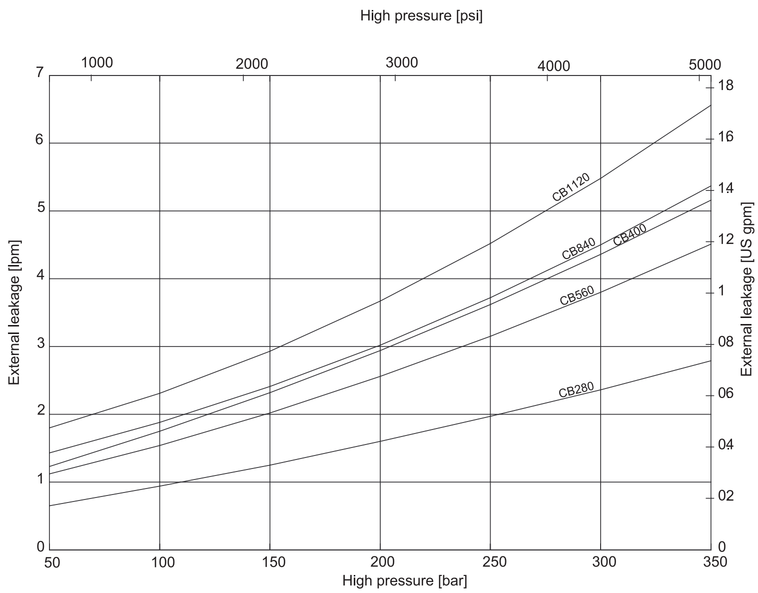


Fig. 52: External leakage

4.12 Viscosity factor K

The diagram shows the avarage values.
Actual flow rate = speed · displacement + external leakage

$$q = \frac{n \cdot V_i}{1000} + q_i \cdot K \quad [l/min]$$

Variation in external leakage at different oil viscosities. When calculating external leakage using other viscosities than 40 cSt, multiply the value given in the external leakage diagram by the factor K.

$$q_{US} = \frac{n \cdot V_i}{231} + q_i \cdot K \quad [gpm]$$

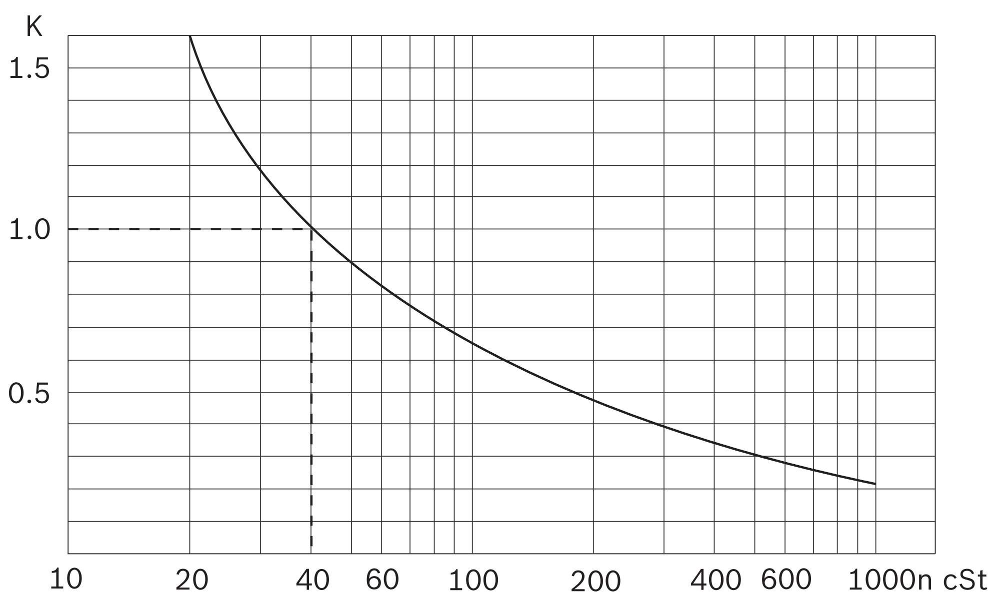


Fig. 53: Viscosity factor K

4.13 Freewheeling

4.13.1 The function of freewheeling

Hägglunds CB motors can be operated in freewheeling mode.
Principally this is performed by disengaging the pistons, allowing the rotating group to rotate as a flywheel on its main bearings. The piston units are not engaged and thus there is no oil flow to cause a flow loss, Hägglunds motors of standard design are suitable for this performance due to the following facts:

1. Pistons are not actuated by any return springs.
2. The motor case can withstand sufficient case pressure to force the pistons toward the bottom of each cylinder bore and keep them in this position.

The basic function of the freewheeling is to have the drain ports D1 - D4 lightly pressurized (see *Fig. 56*) while main ports A and C are without restriction drained directly to the fluid reservoir. See *Fig. 55*. The case pressure introduced in the normal drain connection will then act on the outer surface of each piston assembly pressing them towards the motor centre.

The rotating part of the motor (cylinder block with piston and cam roller) can now rotate on its main bearings without any pumping of oil, as the piston with cam rollers have lost any contact with the cam ring. See *Fig. 54*.

During freewheeling periods, the following functions must be performed:

1. Main connections A & C of the motor drained to reservoir.
2. Fail-safe type brake released, if used.
3. An adequate pressure introduced into the drain ports of the motor. *See Fig. 56 (*required case pressure).

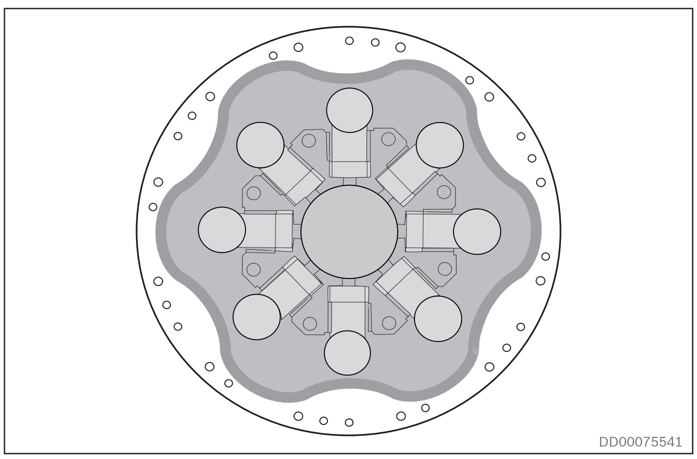


Fig. 54: Freewheeling

4.13.2 Circuit design

The following schematic explains a system (closed/open) with freewheeling (activated mode illustrated) as a permanent feature for the application.

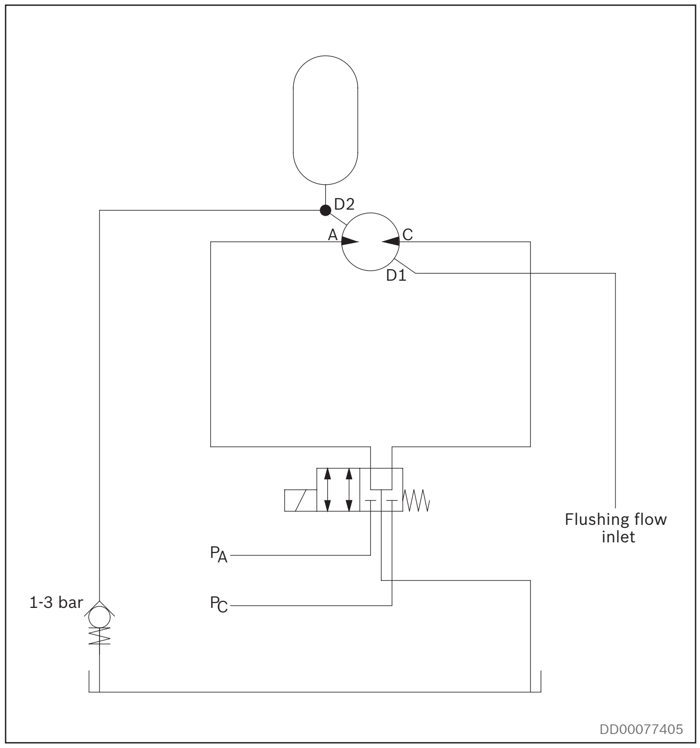


Fig. 55: Schematic principle freewheeling.

Freewheeling valve function, see *section 10.6.6 page 71.*

Notice!
It is not allowed for the pistons to extend back to the camring, until the motor has reached a complete standstill.

4.13.3 Oil volume for freewheeling

Freewheeling conditions are obtained by pressurizing the case via the drain connections and drain the main ports to tank. To retract all pistons completely, a certain oil volume is required depending upon motor type. This oil volume can be calculated from the following:

$$V_F = \frac{V_i}{2 \; N_L}$$

V_F = Needed Freewheeling volume [cm³] or(in³)
V_i = Total displacement of the motor [cm³] or(in³)
N_L = 10 (No of lobes for one camring)

To use Hägglunds CB motor in freewheeling mode must following be maintained:

- The motor must be pressurized all the time when the motor is in freewheeling mode, see *Fig. 56*.
- The motor must be flushed all the time when the motor is in frewheeling mode, see *Fig. 56*.

An accumulator can be added into the circuit to shorten the time to retract all the pistons completely, see *Fig. 56*.

An accumulator can be added into the circuit to reduce the pressure spikes in the motor case when the pistons are extracted, see *Fig. 55*.

4.13.4 Power loss freewheeling

Even if the freewheeling operation takes place with lowest possible friction in the main bearings and with no flow losses in the main ports of the motor, a powerloss must take place in the motor case due to viscous friction between moving and fixed parts. This powerloss is expressed in diagram, *Fig. 56*.

Case flushing is required to prevent overheating, see diagram *Fig. 56*

Required case pressure 1-3 bar (15-44 psi).

Case oil temperatur to be below 50°C (122°F).

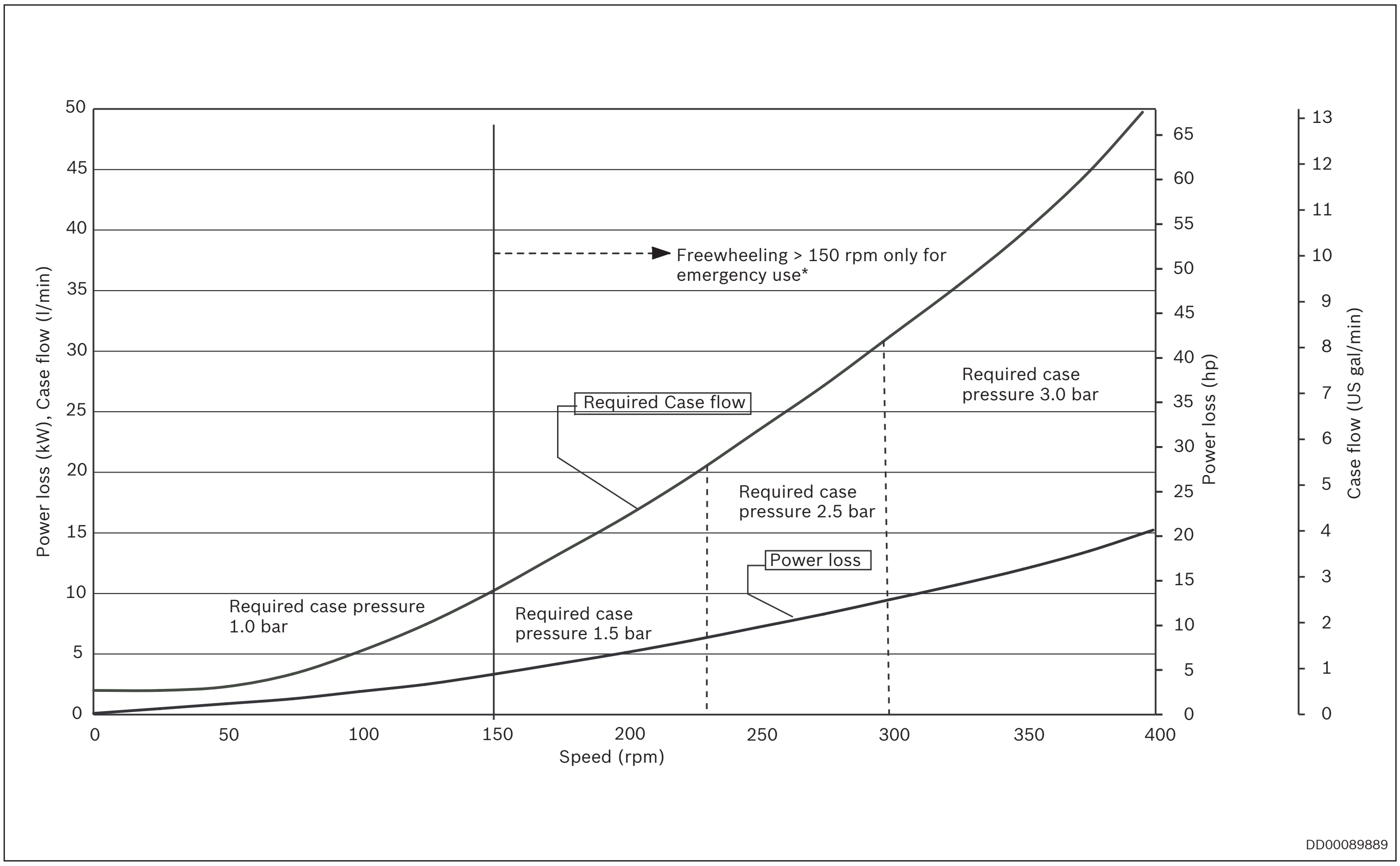


Fig. 56: Power loss freewheeling, oil viscosity 40 cSt (187 SSU)

*) Viton seals are recomended for speeds above 110 rpm.

Notice!

Freewheeling will require exchange of oil in the housing to prevent overheating.

In order to accomplish proper freewheeling, a case pressure according to *Fig. 56* has to be maintained. On the other hand, a higher casing pressure than 2 bar (29 psi) should be avoided in order to achieve good life of the main radial shaft seal.

4.14 Permissible external loads

4.14.1 External load with torque arm mounting

Shaft mounted motor with torque arm.

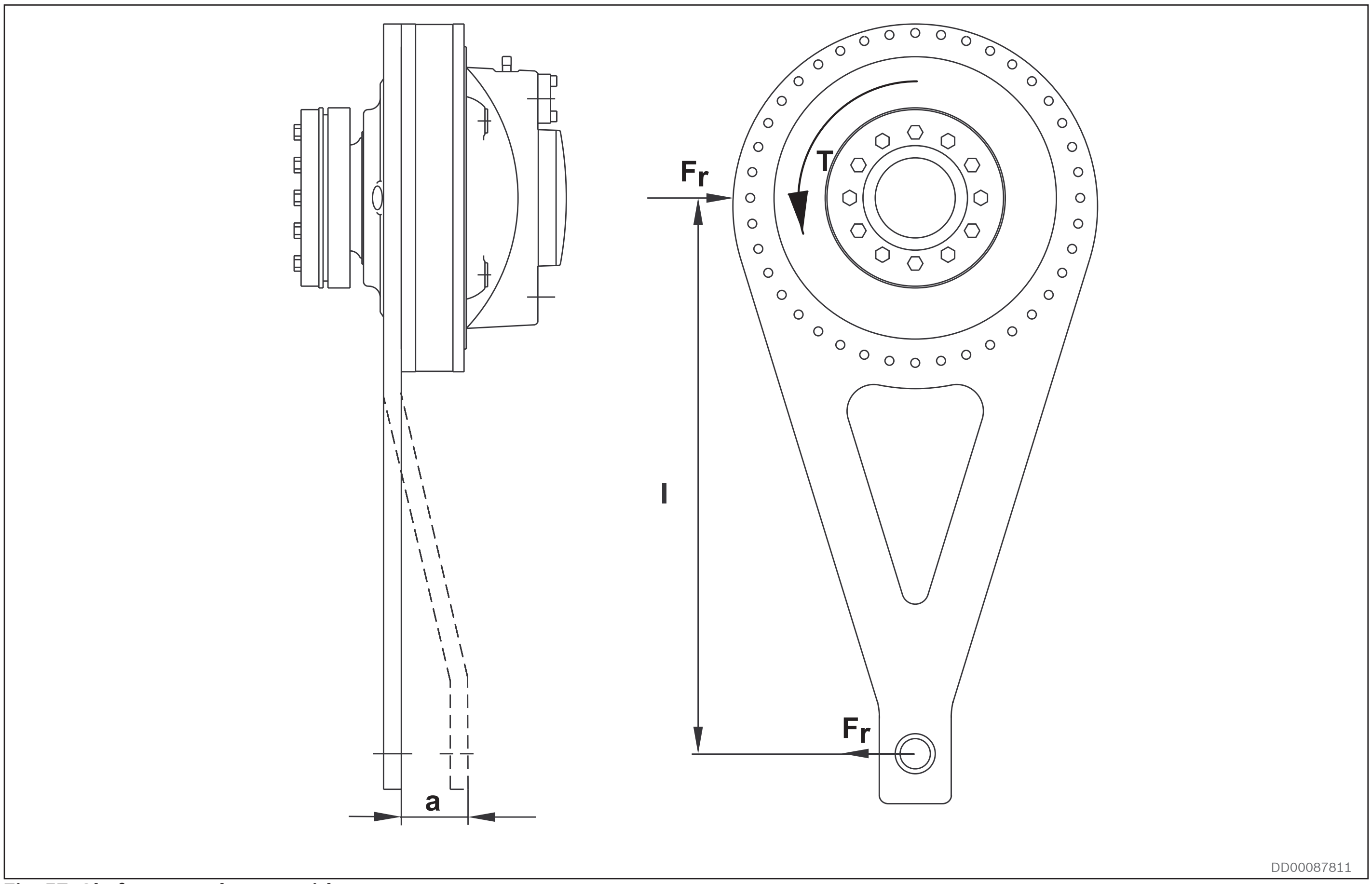


Fig. 57: Shaft mounted motor with torque arm.

If non standard torque arms TC A are used, forces must be checked for main bearings and coupling.

$F_r = \frac{T}{l}$	F_r = Total radial force on fixed motor mounting
	T = Output torque for motor
	l = Lever length
	a = The axial distance for action point of radial force

4.14.2 Permissible external dynamic loads

Permissible external dynamic loads Hägglunds CB 280

Torque arm mounted motor. (Figure and diagram are not scaled to each other).
Viscosity 40 cSt/187 SSU, speed 20 rpm.

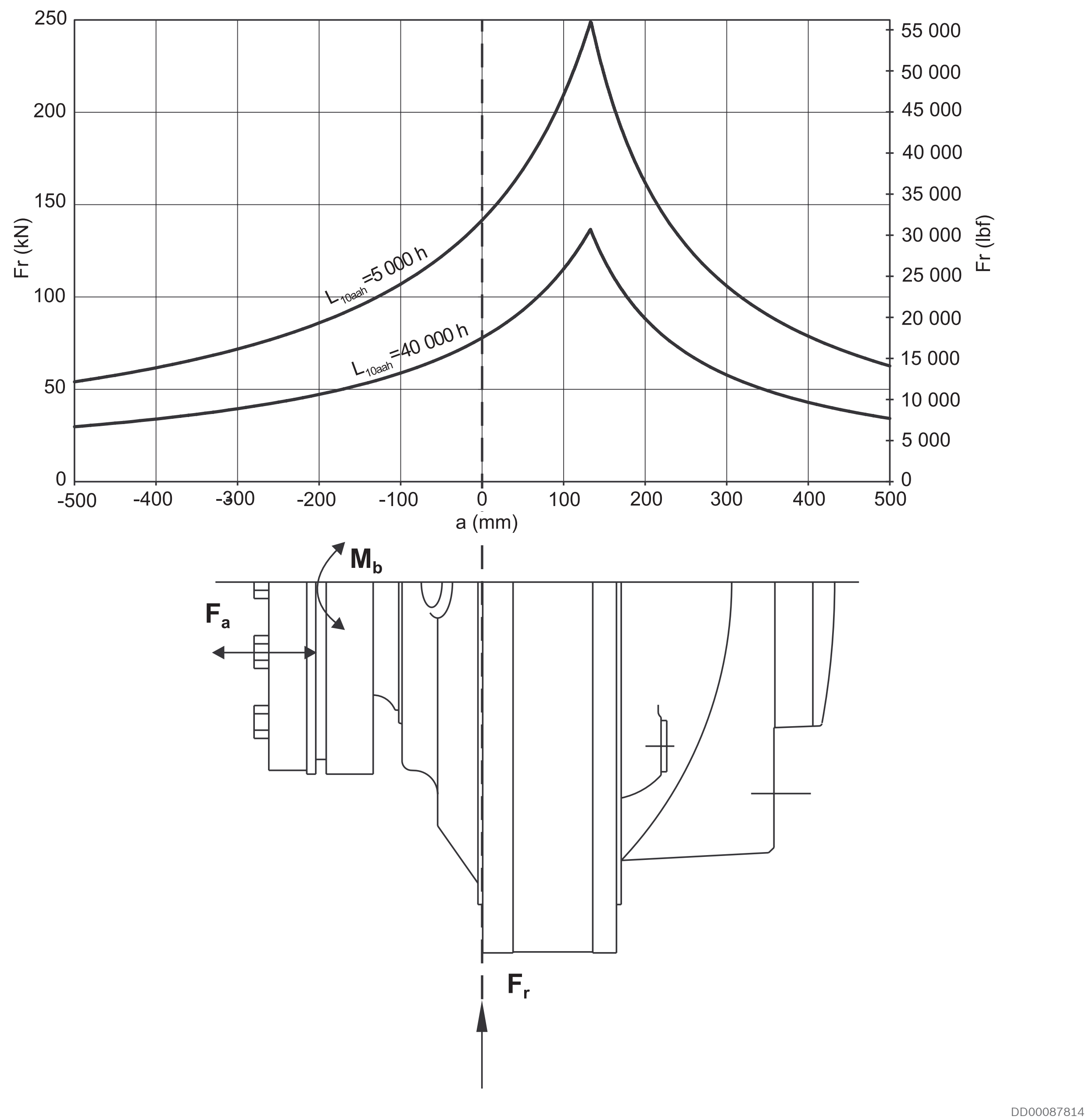


Fig. 58: Permissable external dynamic loads Hägglunds CB 280

Notice!
When flange mounted motor, please contact Bosch Rexroths representative.

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 750 lbf).

Remark: For continuous axial load applications, please contact your Bosch Rexroth representative.

Bending: Permissible bending moment M_b for motor with shrink disk coupling is 30 000 Nm (22 110 lbf·ft).

Permissible external dynamic loads Hägglunds CB 400

Torque arm mounted motor. (Figure and diagram are not scaled to each other).
Viscosity 40 cSt/187 SSU, speed 25 rpm.

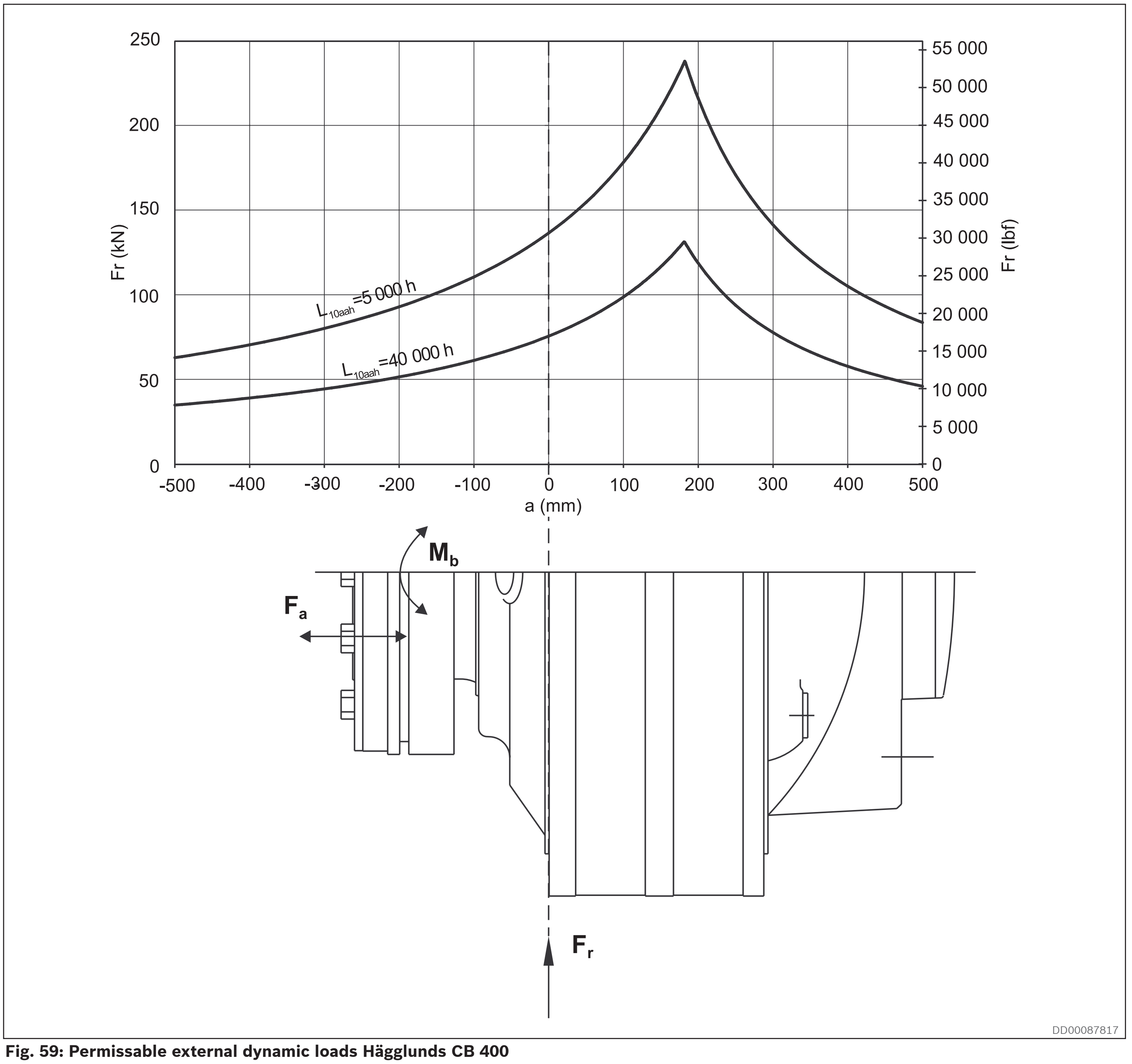


Fig. 59: Permissable external dynamic loads Hägglunds CB 400

Notice!
When flange mounted motor, please contact Bosch Rexroths representative.

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 750 lbf).

Remark: For continuous axial load applications, please contact your Bosch Rexroth representative.

Bending: Permissible bending moment M_b for motor with shrink disk coupling is 30 000 Nm (22 110 lbf·ft).

Permissible external dynamic loads CB 560

Torque arm mounted motor.(Figure and diagram are not scaled to each other).
Viscosity 40 cSt/187 SSU, speed 20 rpm.

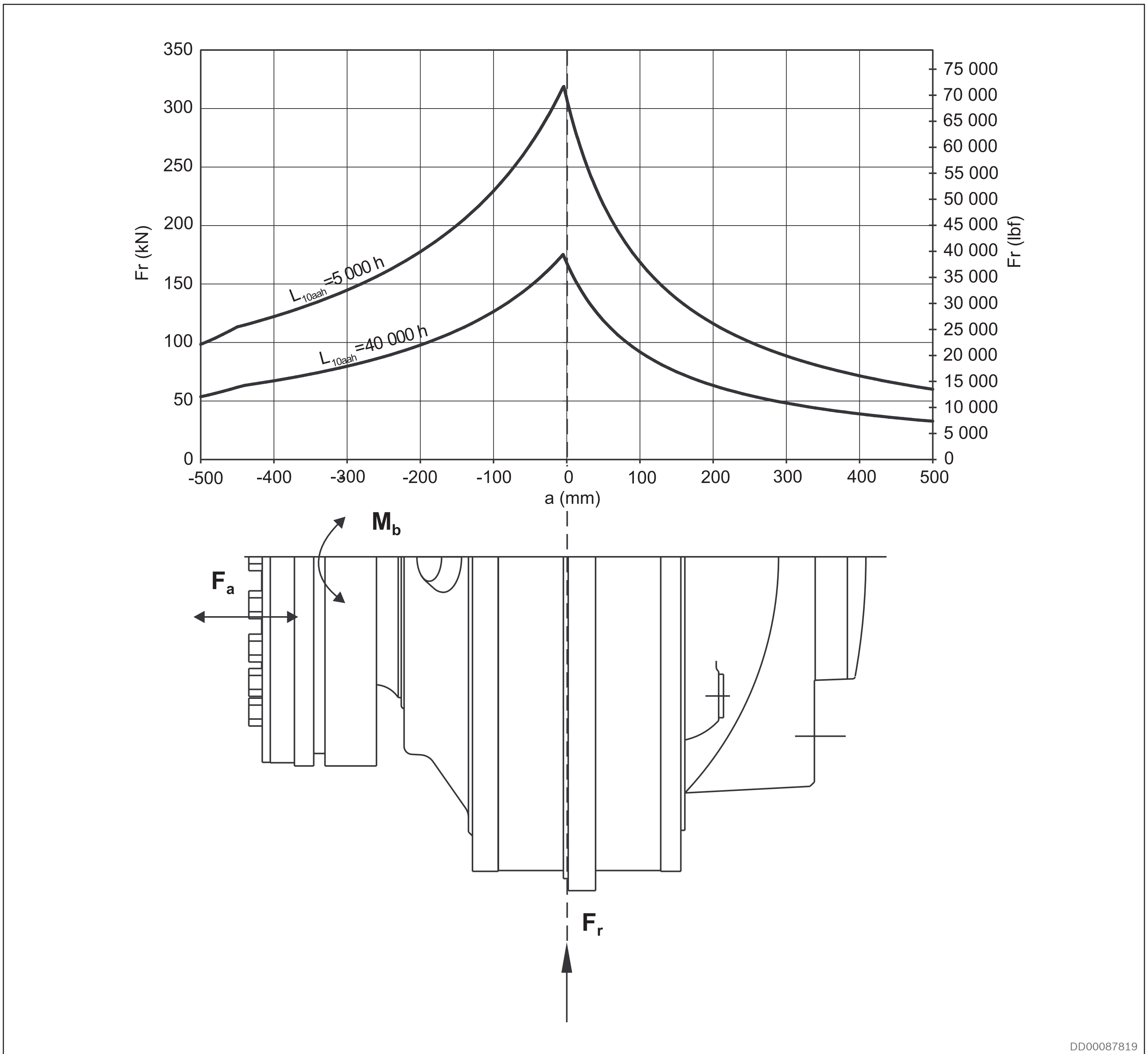


Fig. 60: Permissable external dynamic loads Hägglunds CB 560

Notice!
When flange mounted motor, please contact Bosch Rexroths representative.

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 750 lbf).

Remark: For continuous axial load applications, please contact your Bosch Rexroth representative.

Bending: Permissible bending moment M_b for motor with shrink disk coupling is 30 000 Nm (22 110 lbf·ft).

Permissible external dynamic loads CB 840

Torque arm mounted motor. (Figure and diagram are not scaled to each other).
Viscosity 40 cSt/187 SSU, speed 10 rpm.

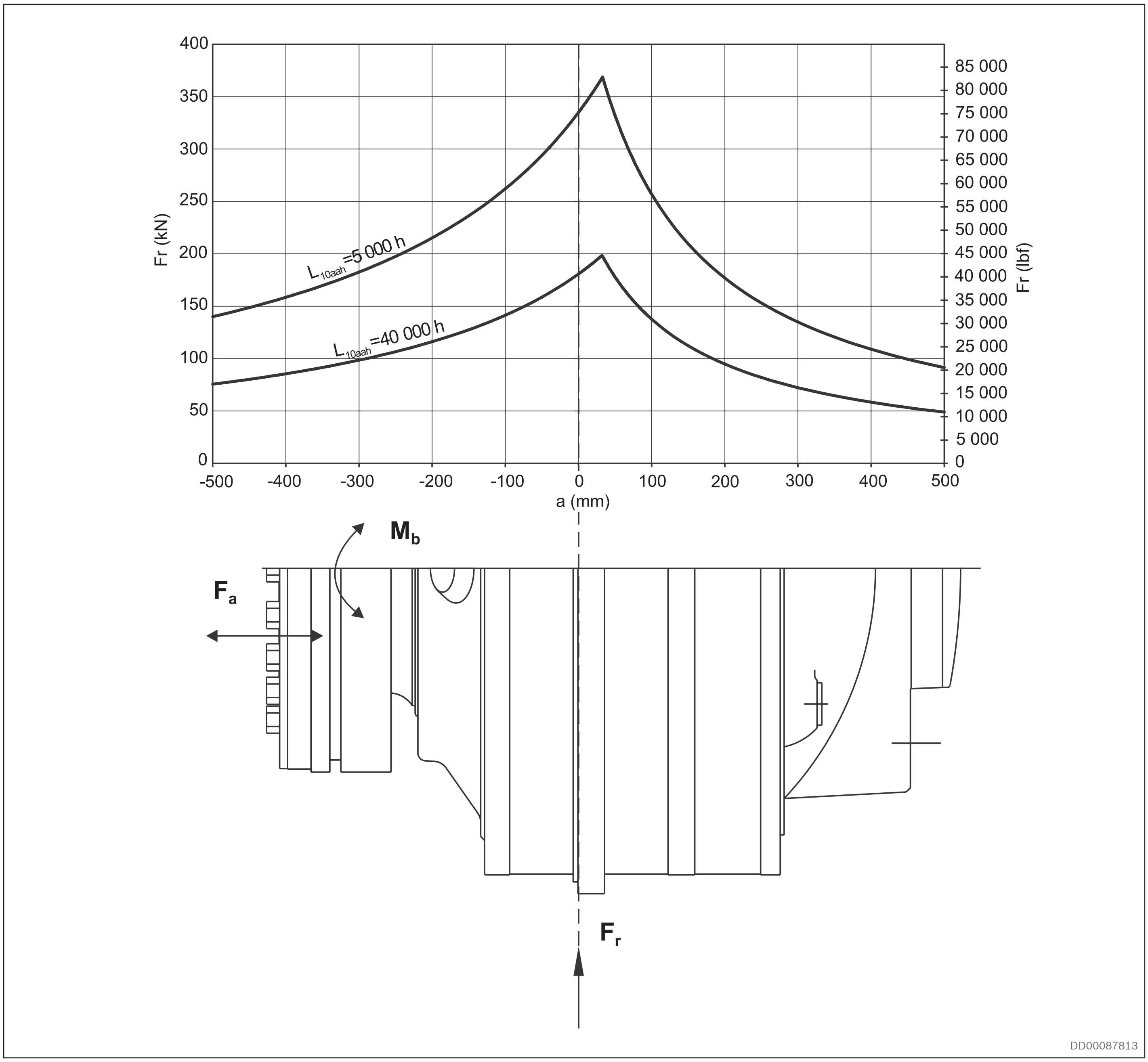


Fig. 61: Permissable external dynamic loads Hägglunds CB 840

Notice!
When flange mounted motor, please contact Bosch Rexroths representative.

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 750 lbf).

Remark: For continuous axial load applications, please contact your Bosch Rexroth representative.

Bending: Permissible bending moment M_b for motor with shrink disk coupling is 30 000 Nm (22 110 lbf·ft).

Permissible external dynamic loads CB 1120

Torque arm mounted motor.(Figure and diagram are not scaled to each other).
Viscosity 40 cSt/187 SSU, speed 10 rpm.

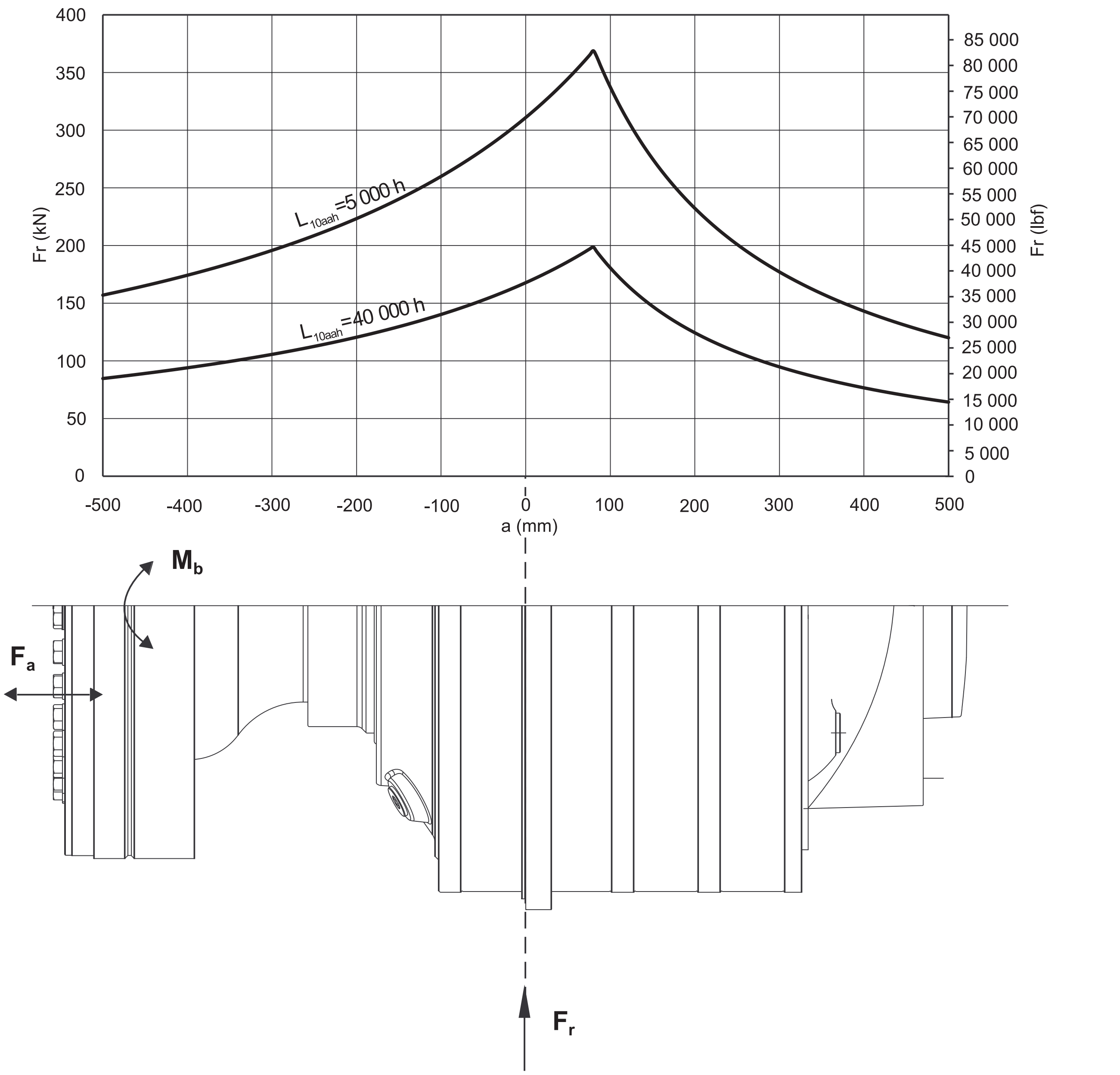


Fig. 62: Permissable external dynamic loads Hägglunds CB 1120

Notice!
When flange mounted motor, please contact Bosch Rexroths representative.

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 750 lbf).

Remark: For continuous axial load applications, please contact your Bosch Rexroth representative.

Bending: Permissible bending moment M_b for motor with shrink disk coupling is 30 000 Nm (22 110 lbf·ft).

4.14.3 Permissible external static load

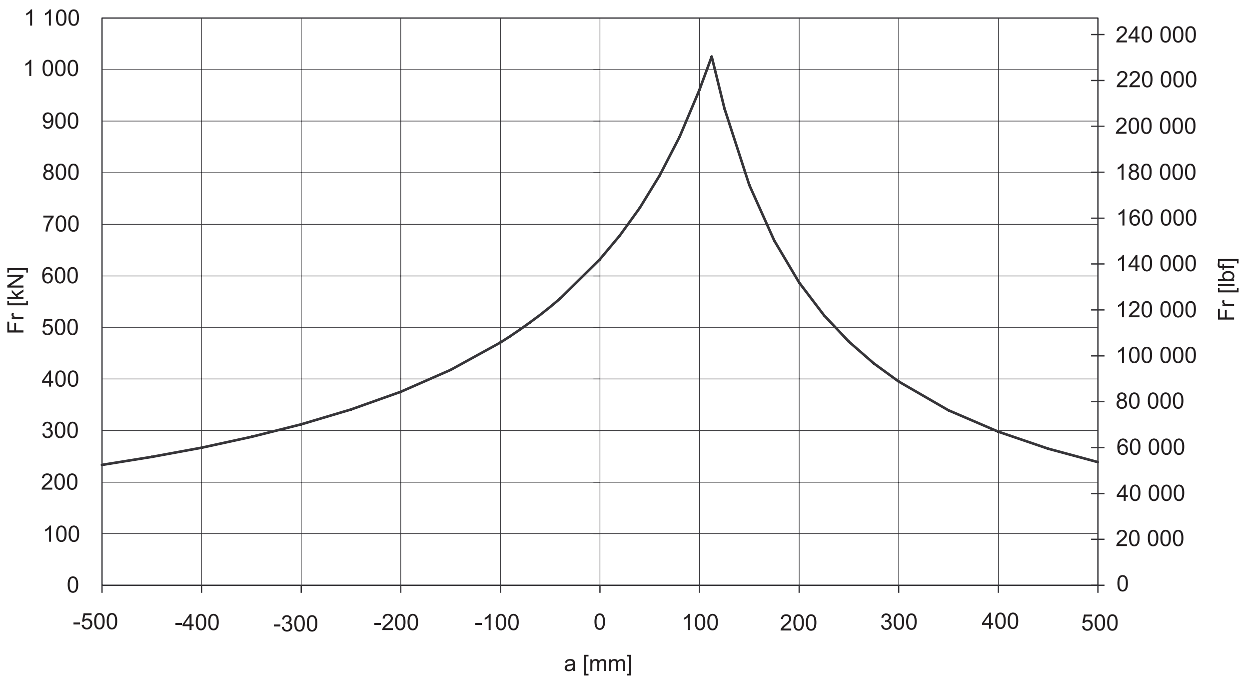


Fig. 63: Permissible external static load Hägglunds CB 280

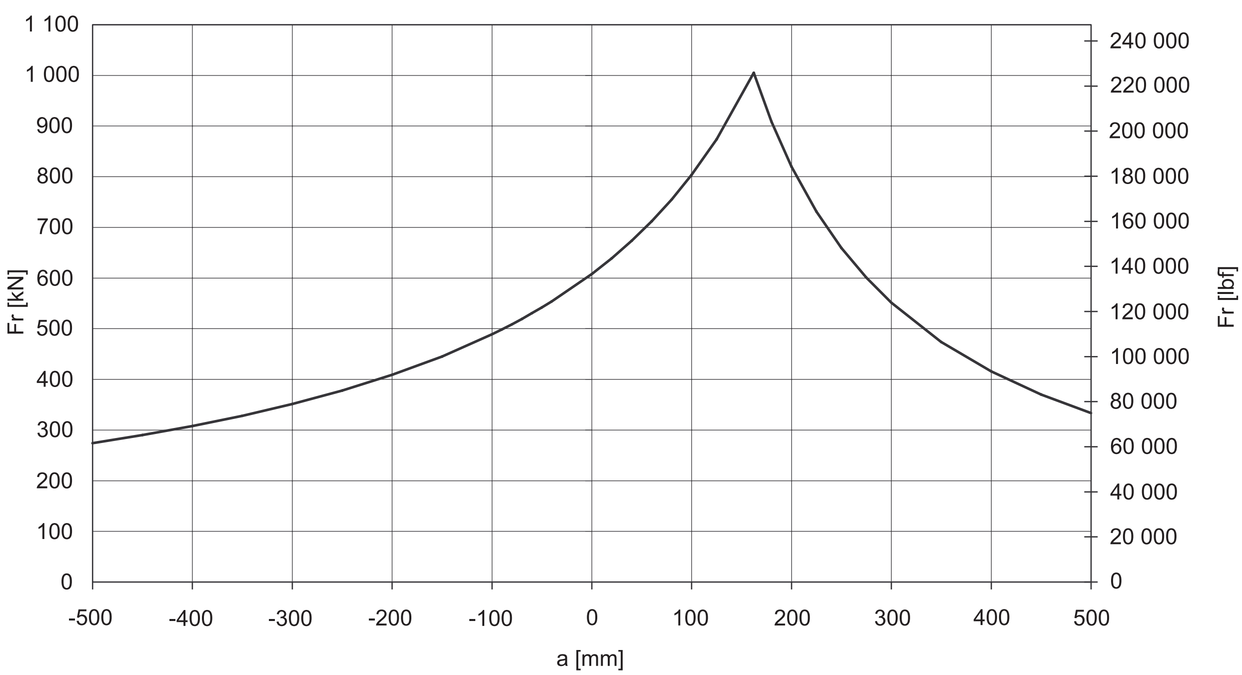


Fig. 64: Permissible external static load Hägglunds CB 400

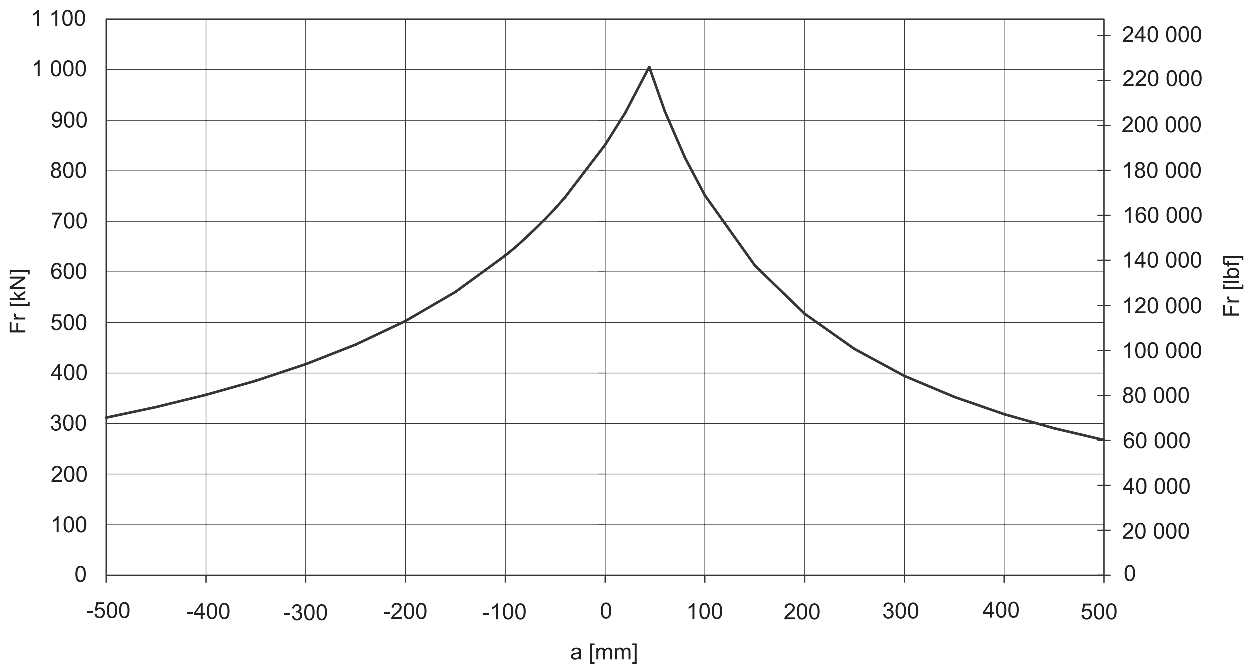


Fig. 65: Permissible external static load Hägglunds CB 560

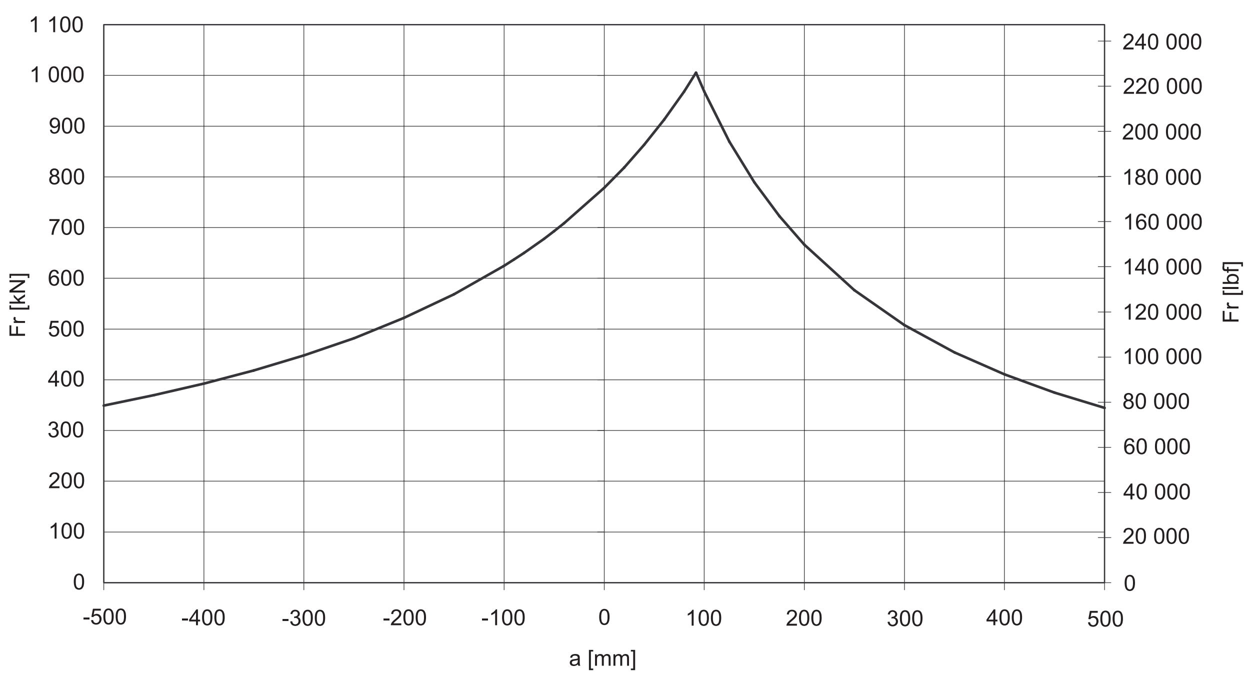


Fig. 66: Permissible external static load Hägglunds CB 840

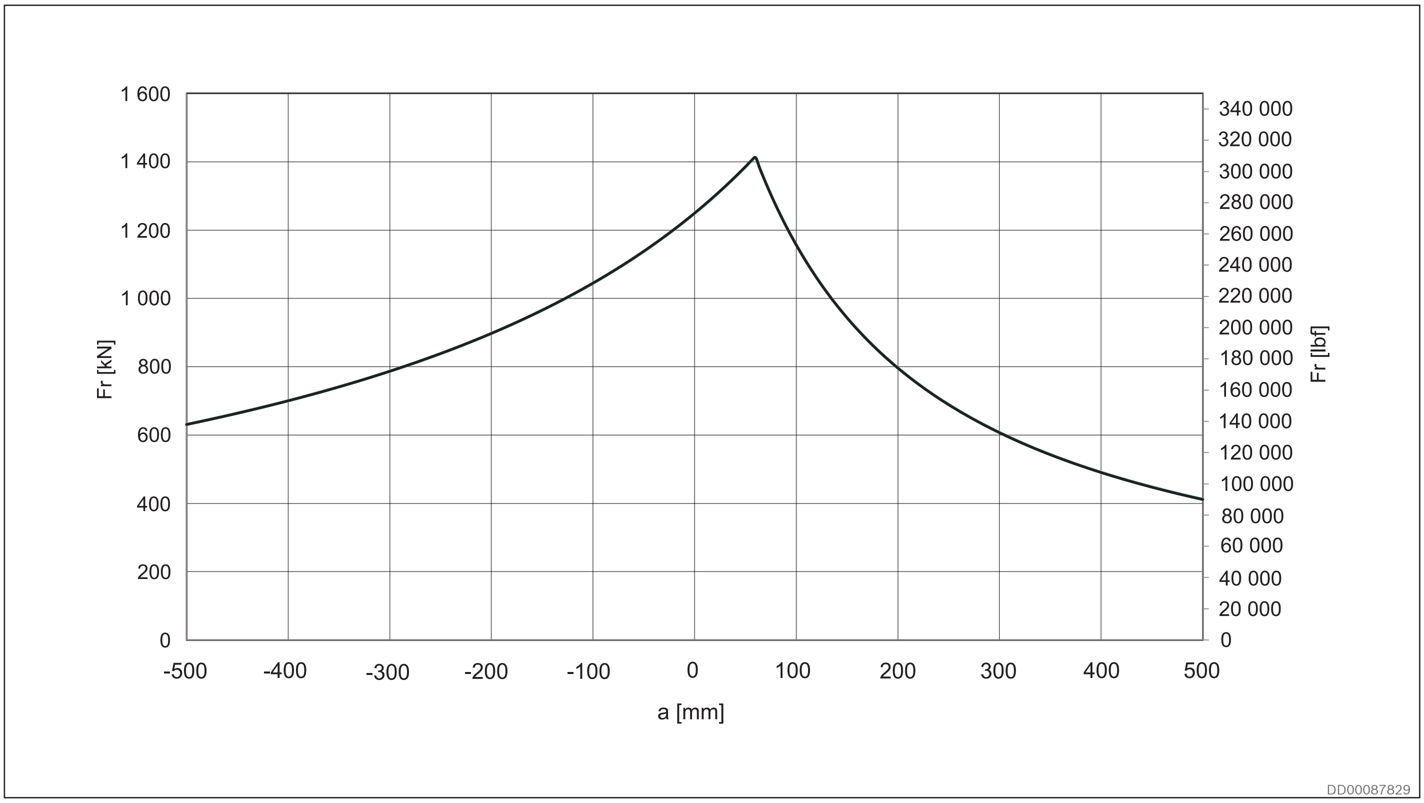


Fig. 67: Permissible external static load Hägglunds CB 1120

4.15 Low speed performance

For Hägglunds CB 280 to CB 1120

Fig. 68 and *Fig. 69* shows speed deviation factor "i" as function of n_{av}.
A is max. deviation from average speed in r/min.
n_{av} is average speed in r/min.

$A = n_{av} \cdot i$ (rpm)
$n_{max} = n_{av} + A$ (rpm)
$n_{min} = n_{av} - A$ (rpm)

The figures refers to 40 cSt viscosity, and moment of inertia 36 kgm² (850 lb·ft²).

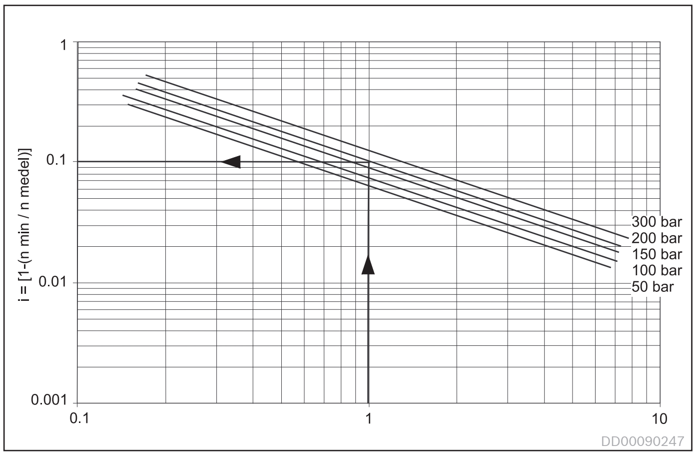


Fig. 68: Speed deviation CB 280

Exemple:Presume: n_{av} = 1 rpm and p_{max} = 200 bar
n_{av} = 1 gives i = 0,1 (*see Fig. 68*) and A = 1 · 0,1 = 0,1 rpm.
Obtained amplitude value shall be reduced to two decimals.
n_{max} = 1,0 + 0,1 = 1,1
n_{min} = 1,0 - 0,1 = 0,9

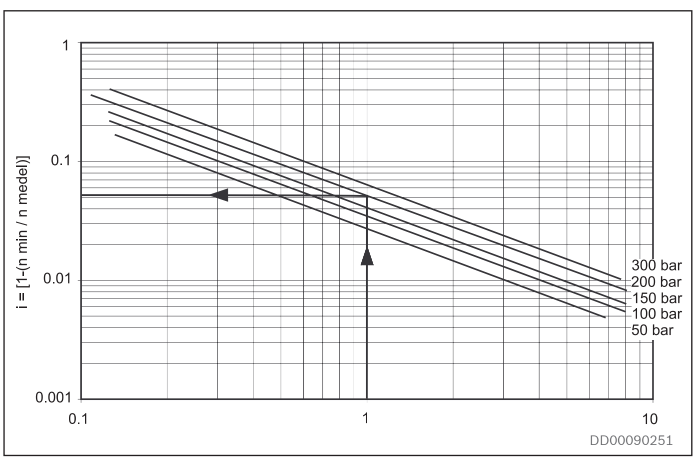


Fig. 69: Speed deviation CB 400, CB 560, CB 840, CB 1120

Exemple:Presume: n_{av} = 1 rpm and p_{max} = 200 bar
n_{av} = 1 gives i = 0,05 (*see Fig. 69*) and A = 1 · 0,05 = 0,05 rpm.
Obtained amplitude value shall be reduced to two decimals.
n_{max} = 1,0 + 0,05 = 1,05
n_{min} = 1,0 - 0,1 = 0,95

Speed variation data was acquired according to ISO 4392-3 where torque on the shaft and flow into the motor is held constant.

In order to obtain smooth operation at low speed it is important to understand that the mechanisms behind speed variation are governed by leakage and friction variation in the motor together with characteristics of the load and the hydraulic system.

When the theoretical flow needed to rotate the motor is in the same order of magnitude or less than the leakage flow there is a risk for speed variation. Friction losses in the motor will increase at low speed due to reduced oil film thickness. Any variation in these friction losses may result in speed variation.

- Speed variation resulting from both friction and leakage will be lower with high case oil viscosity. Recomendation is to have a case oil viscosity between 100-150 cSt.

  The load characteristics on the shaft will also affect speed variation, for example moment of inertia, friction effects and natural frequency.

- Smooth operation at low speed is enhanced by a constant flow source, like a flow control valve or a small pump that is not operating in its lower displacement range.

  Compressibility of hydraulic oil volume between flow source and motor and deformation of hoses may also result in speed variation, especially if the natural frequency of the hydraulic system and the load is close to each other.

- Therefore, smooth operation is enhanced by a stiff hydraulic system connecting the flow source and the motor, i.e. using short pipings with small dimension.

4.16 Painting system

Corrosion protection

The painting system of Hägglunds motors and accessories are avalible in two different corrosivity categories regarding corrosion protection in accordance with SS-EN ISO 12944:

- C3 - Corrosivity category Medium - which is recommended for normal urban and industrial atmosphere.
- C5M - Corrosivity category Very High - which is recommended for marine environment with high salt load or other aggressive atmosphere.

Colour

Standard colour for Hägglunds motors and accessories is orange (RAL 2002)

5 Type of seal

Option N:

NBR (Nitrile) Preferred alternative at low ambient temperatures and moderate case oil temperatures.
See section *4.2: General data*

Option V:

FPM (Viton) Preferred alternative at higher case oil temperatures and freewheeling at higher speed (> 110 rpm) or operating with fire resistant fluids. See section *4.2: General data*, *4.13.4: Power loss freewheeling* and *4.5: Hydraulic fluids*

6 Increased robustness

Option 0:

CB has un-coated piston assemblies and DLC-coated piston rings as standard.

Option C:

DLC-coated piston assemblies shall always be used in the following cases:
- If operating speed ≤3rpm
- If operating parameters (eg. viscosity) are unclear

DLC-coated piston assemblies is recommended to be used in the following cases:
- When replacing an existing MB-motor with a CB-motor
- If there is a risk for cavitation in combination with chock loads

7 Through hole kit

This device makes it possible to flush through the driven shaft or to draw electric cables through the motor. The through hole kit is prepared for rotation speed sensor.

Dimension drawing

See chapter*12: Related documents*

Ordering code

See ordering code for Hägglunds CB section *1: Ordering code*.

Table 10: Dimensions Hägglunds CB with through hole kit

	L1			
	Splines		Shrink disk	
Motor	mm	in	mm	in
CB 280	490	19.29	599	23.58
CB 400	608	23.94	726	28.58
CB 560	658	25.91	752	29.61
CB 840	776	30.55	870	34.25
CB 1120	894	35.20	988	38.90

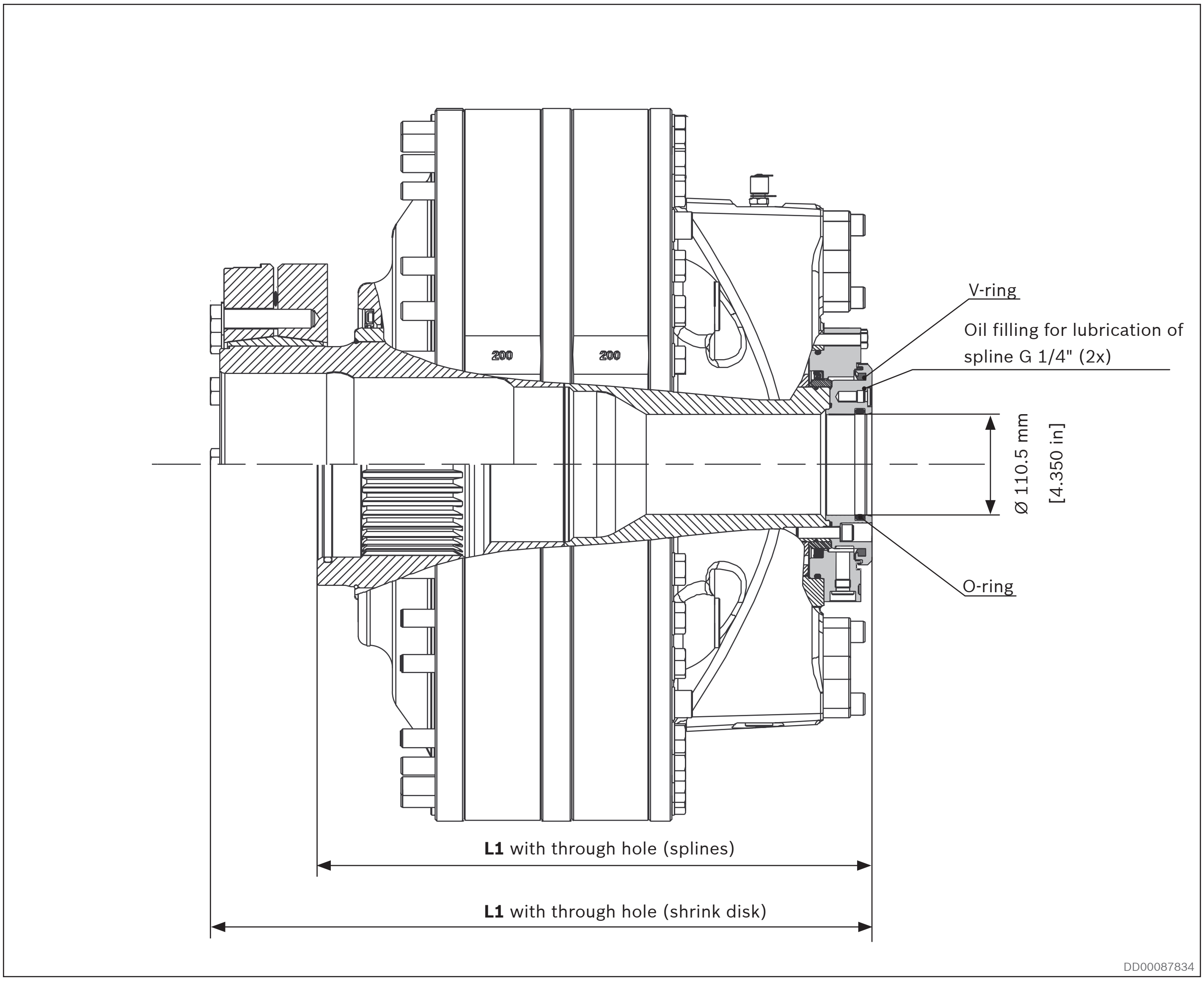


Fig. 70: Example: Hägglunds CB 400 with through hole kit.

8 Dimensions / Interface

8.1 Dimensions

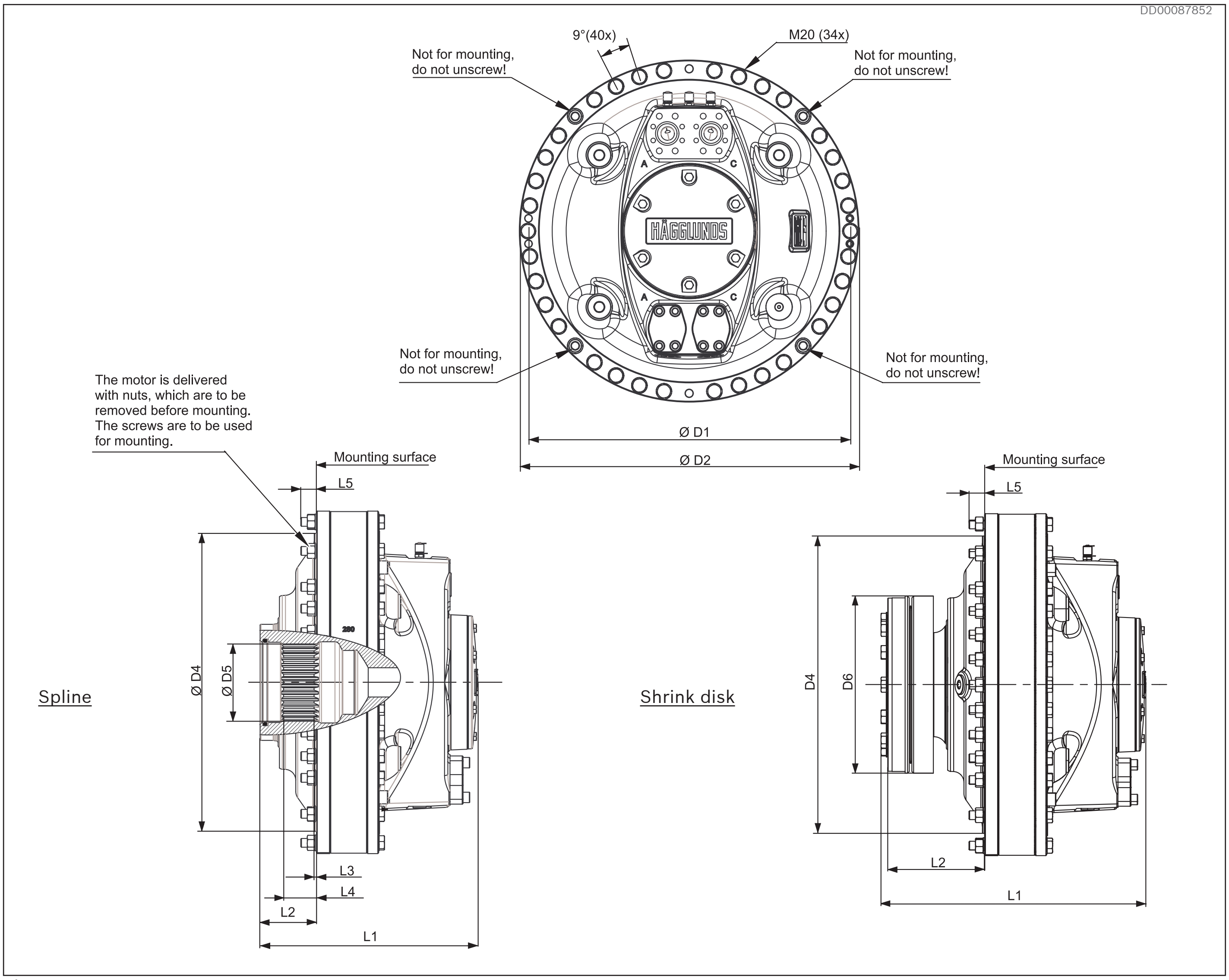


Fig. 71: CB 280

Table 11: Dimensions CB 280

			Dimensions			
			Splines		Shrink disk	
			mm	in	mm	in
D1	Pitch diameter		742	29.21	742	29.21
D2	Outer diameter		782	30.79	782	30.79
D4	Guide diameter		680	26.77	680	26.77
D5	Spline size	DIN 5480	N200 x 5 x 30 x 38 x 9H		-	-
D6	Shrink disk diameter		-	-	405	15.94
L1	Total length	***Without through hole***	494	19.45	603	23.74
L2	Length to hollow shaft		130	16.38	227	8.94
L3	Length to spline end		6	0.24	-	-
L4	Length to spline		76	2.99	-	-
L5	Protruding length of screws		36	1.42	36	1.42

For dimensional drawings CB 280, see chapter *12: Related documents*

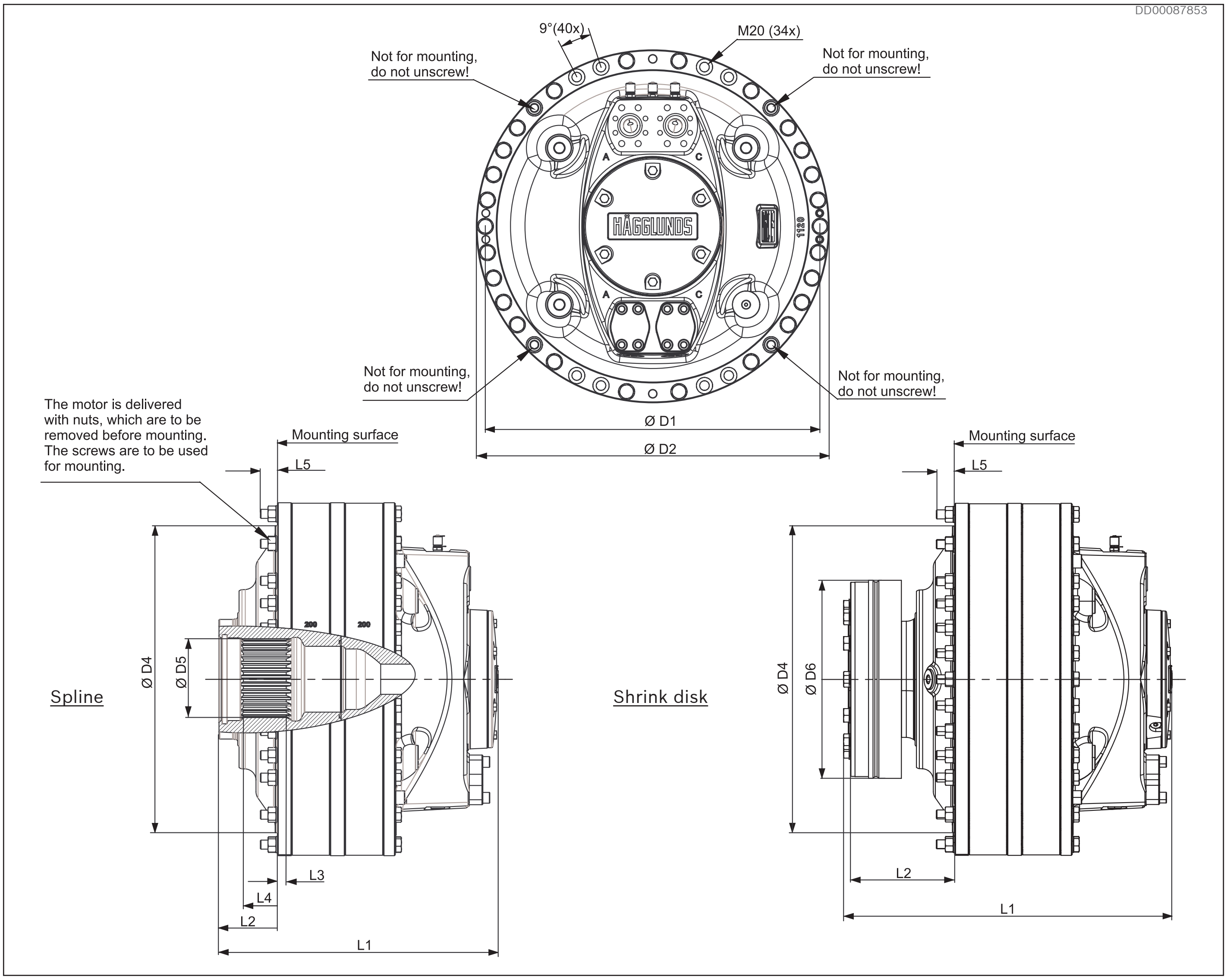


Fig. 72: CB 400

Table 12: Dimensions CB 400

			Dimensions			
			Splines		Shrink disk	
			mm	in	mm	in
D1	Pitch diameter		742	29.21	742	29.21
D2	Outer diameter		782	30.79	782	30.79
D4	Diameter of guide edge		680	26.77	680	26.77
D5	Spline size	DIN 5480	N200 x 5 x 30 x 38 x 9H		-	-
D6	Shrink disk diameter		-	-	440	17.32
L1	Total length	***Without through hole***	612	24.09	729	28.70
L2	Length to hollow shaft		189	7.44	237	9.33
L3	Length to spline end		40	1.57	-	-
L4	Length to spline		135	5.31	-	-
L5	Produting length of screws		38	1.50	38	1.50

For dimensional drawings CB 400, see chapter *12: Related documents*

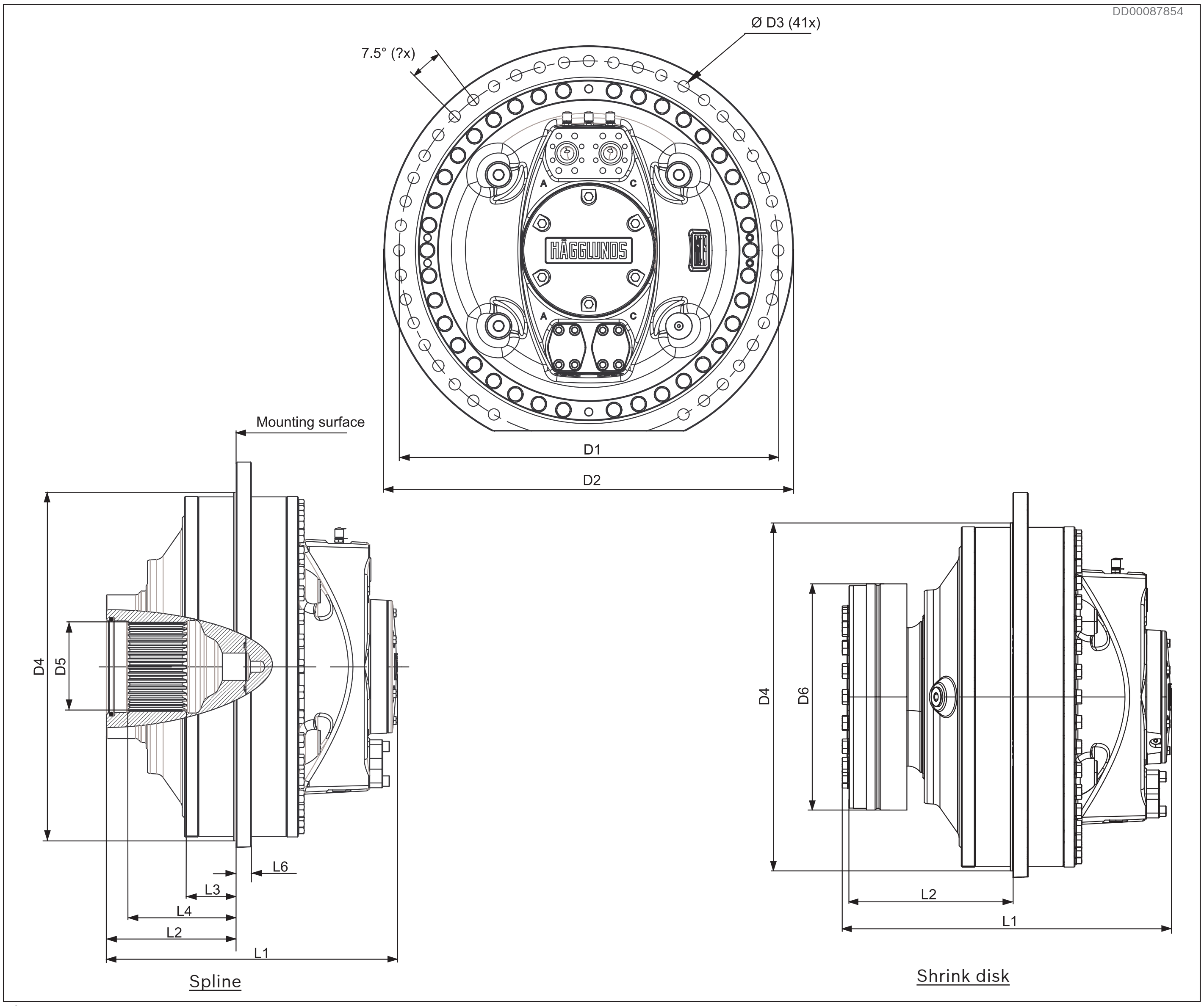


Fig. 73: CB 560

Table 13: Dimensions CB 560

			Dimensions			
			Splines		Shrink disk	
			mm	in	mm	in
D1	Pitch diameter		870	34.25	870	34.25
D2	Outer diameter		940	37.01	940	37.01
D3	Screw hole		26	1.02	26	1.02
D4	Guide diameter		800	31.50	800	31.50
D5	Spline size	DIN 5480	N260 x 5 x 30 x 50 x 9H		-	-
D6	Shrink disk diameter		-	-	520	20.47
L1	Total length	***Without through hole***	662	26.06	576	22.68
L2	Length to hollow shaft		298	11.73	381	15,00
L3	Length to spline end		124	4.88	-	-
L4	Length to spline		244	9.61	-	-
L6	Thickness of mounting ring		35	1.38	35	1.38

For dimensional drawings CB 560, see chapter *12: Related documents*

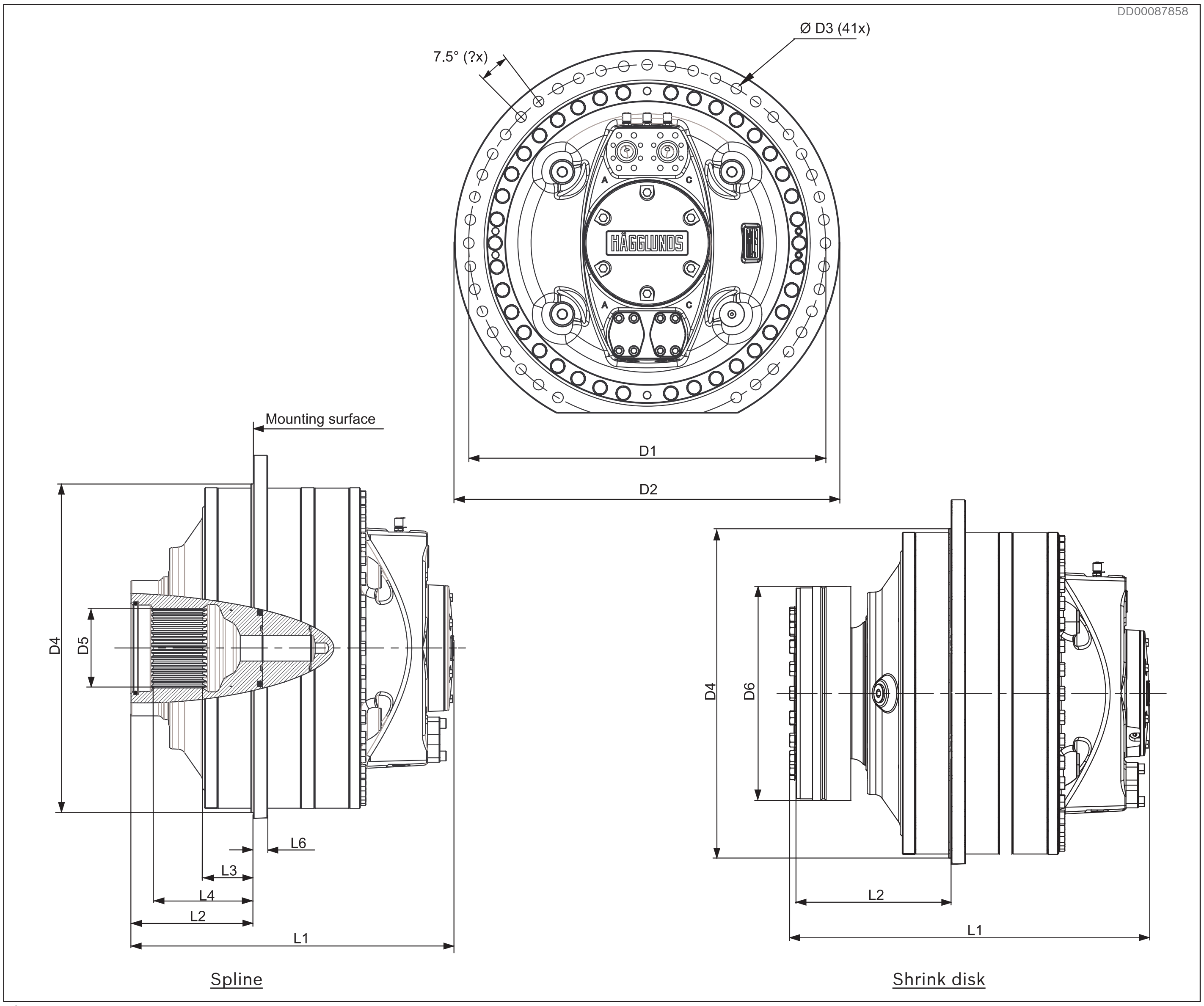


Fig. 74: CB 840

Table 14: Dimensions CB 840

			Dimensions			
			Splines		Shrink disk	
			mm	in	mm	in
D1	Pitch diameter		870	34.25	870	34.25
D2	Outer diameter		940	37.01	940	37.01
D3	Screw hole		26	1.02	26	1.02
D4	Guide diameter		800	31.50	800	31.50
D5	Spline size	DIN 5480	N260 x 5 x 30 x 50 x 9H		-	-
D6	Shrink disk diameter		-	-	520	20.47
L1	Total length	***Without through hole***	780	30,71	874	34.41
L2	Length to hollow shaft		298	11.73	381	15,00
L3	Length to spline end		124	4.88	-	-
L4	Length to spline		244	9.61	-	-
L6	Thickness of mounting ring		35	1.38	35	1.38

For dimensional drawings CB 840, see chapter *12: Related documents*

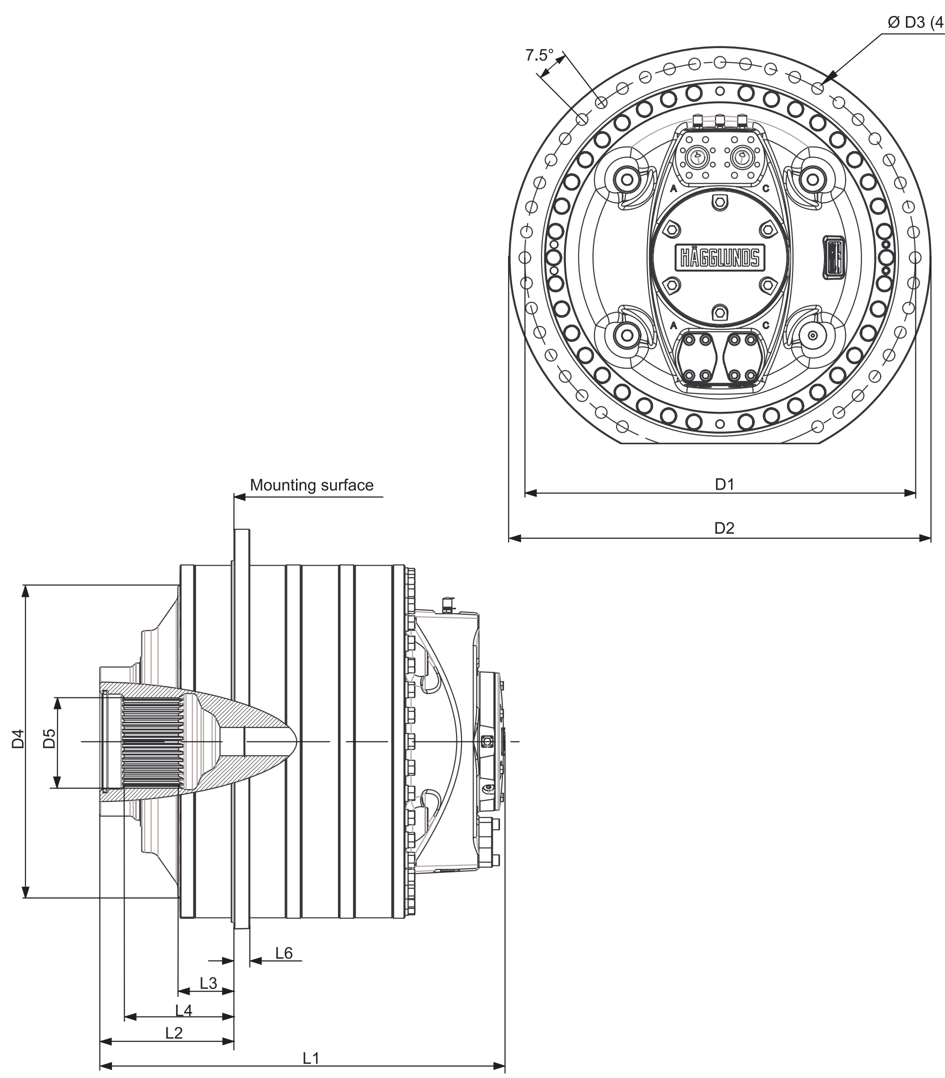


Fig. 75: CB 1120

Table 15: Dimensions CB 1120

			Dimensions Splines	
			mm	**in**
D1	Pitch diameter		870	34.25
D2	Outer diameter		940	37.01
D3	Screw hole		26	1.02
D4	Guide diameter		800	31.50
D5	Spline size	DIN 5480	N260 x 5 x 30 x 50 x 9H	
L1	Total length	***Without through hole***	897	35.31
L2	Length to hollow shaft		297	11.69
L3	Length to spline end		123	4.84
L4	Length to spline		243	9.57
L6	Thickness of mounting ring		35	1.38

For dimensional drawings CB 1120, see chapter *12: Related documents*

9 Mounting alternatives

9.1 General information

With splines for flange or torque arm mounting.
The splines shall be lubricated, and filled with hydraulic oil at assembly, or filled with transmission oil from the connected gearbox. To avoid wear in the splines, the installation must be within the specified tolerances in *Fig. 76*
For requirements of spline shaft, see chapter *12: Related documents*

9.1.1 Flange mounting with splines

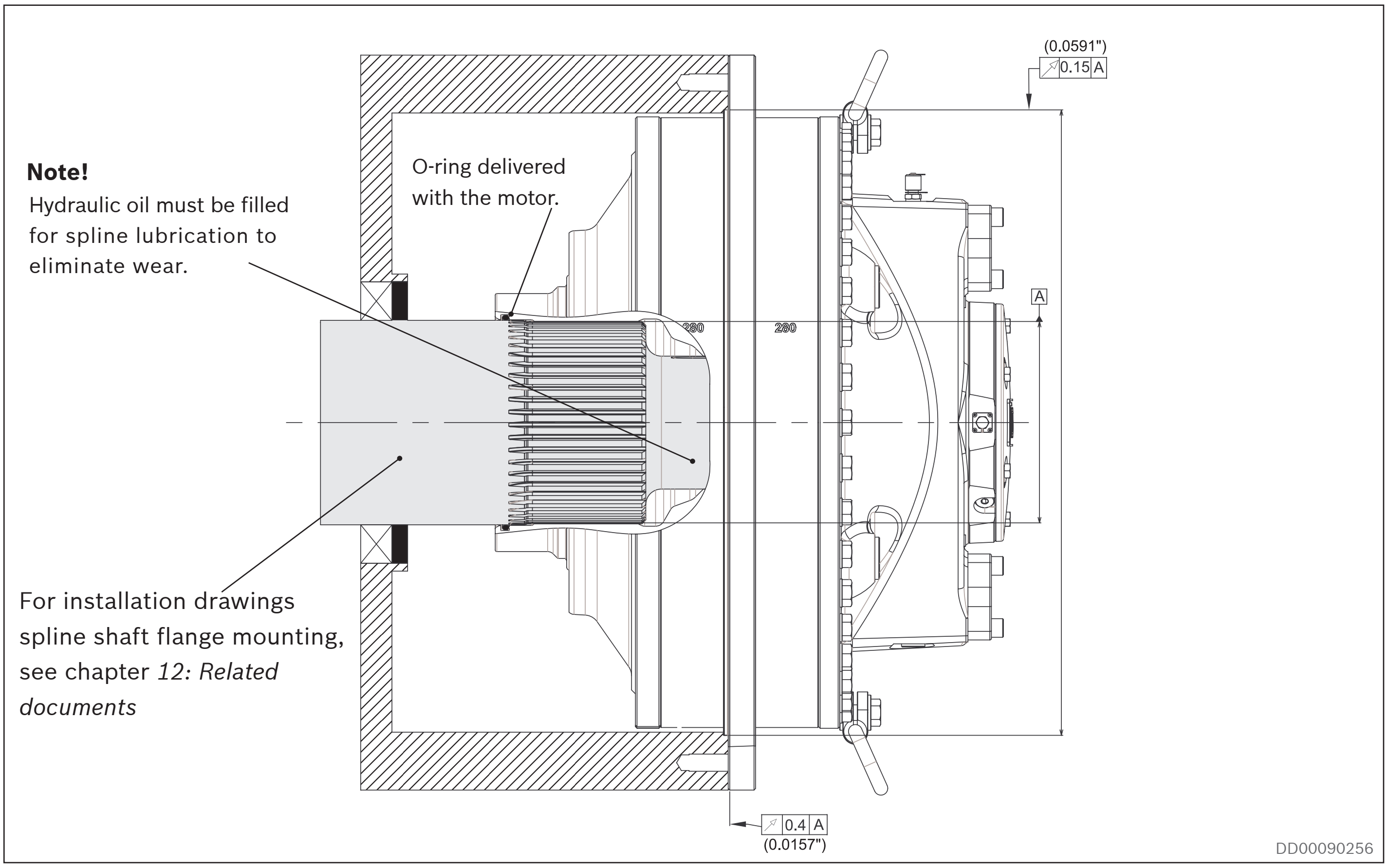


Fig. 76: Flange mounting for CB 280 to CB 1120.

Features

- Possibility to use the motor as a one side shaft support bearing.
- Oil lubrication of splines give no wear.
- Easy mounting of motor to driven shaft.

Note!
Flange mounting gives high risk for overloading of motor main bearings. Always check that the shaft and motor bearings are statically determined.

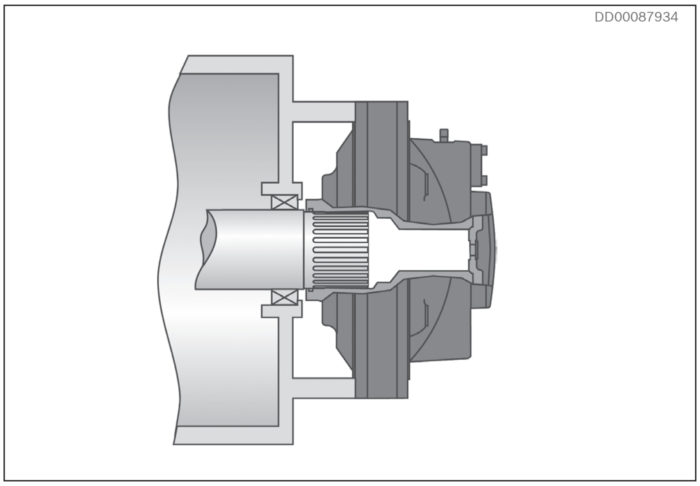


Fig. 77: Flange mounted motor with splines and low radial load from driven shaft.

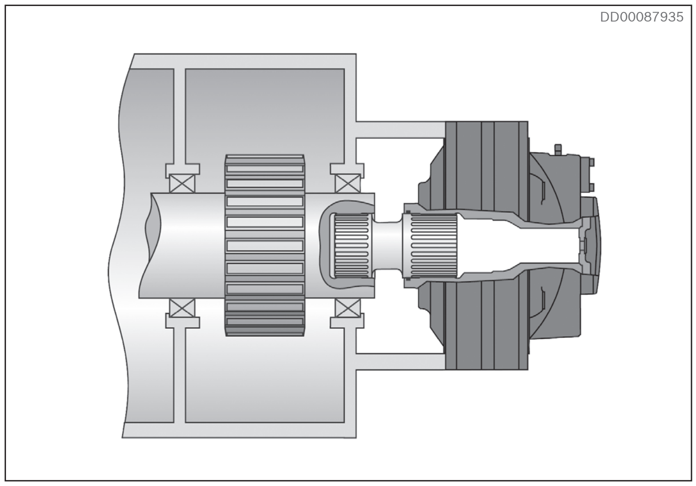


Fig. 78: Flange mounted motor with splines to avoid high radial load from driven shaft.

Table 16: Recommended material in the spline shaft

Drive	Steel with yield strenght
Unidirectional drive	Rel_{min} = 450 N/mm² (65 000 lb/ft²)
Bidirectional drive	Rel_{min} = 700 N/mm² (101800 lb/ft²)

Table 17: Spline designation shaft

	Spline				
Frame size	**CB 280**	**CB 400**	**CB 560**	**CB 860**	**CB 1120**
Designation: Standard DIN 5480	W200x5x30x38x9H		W260x5x30x50x9H		

9.1.2 Torque arm mounting with splines

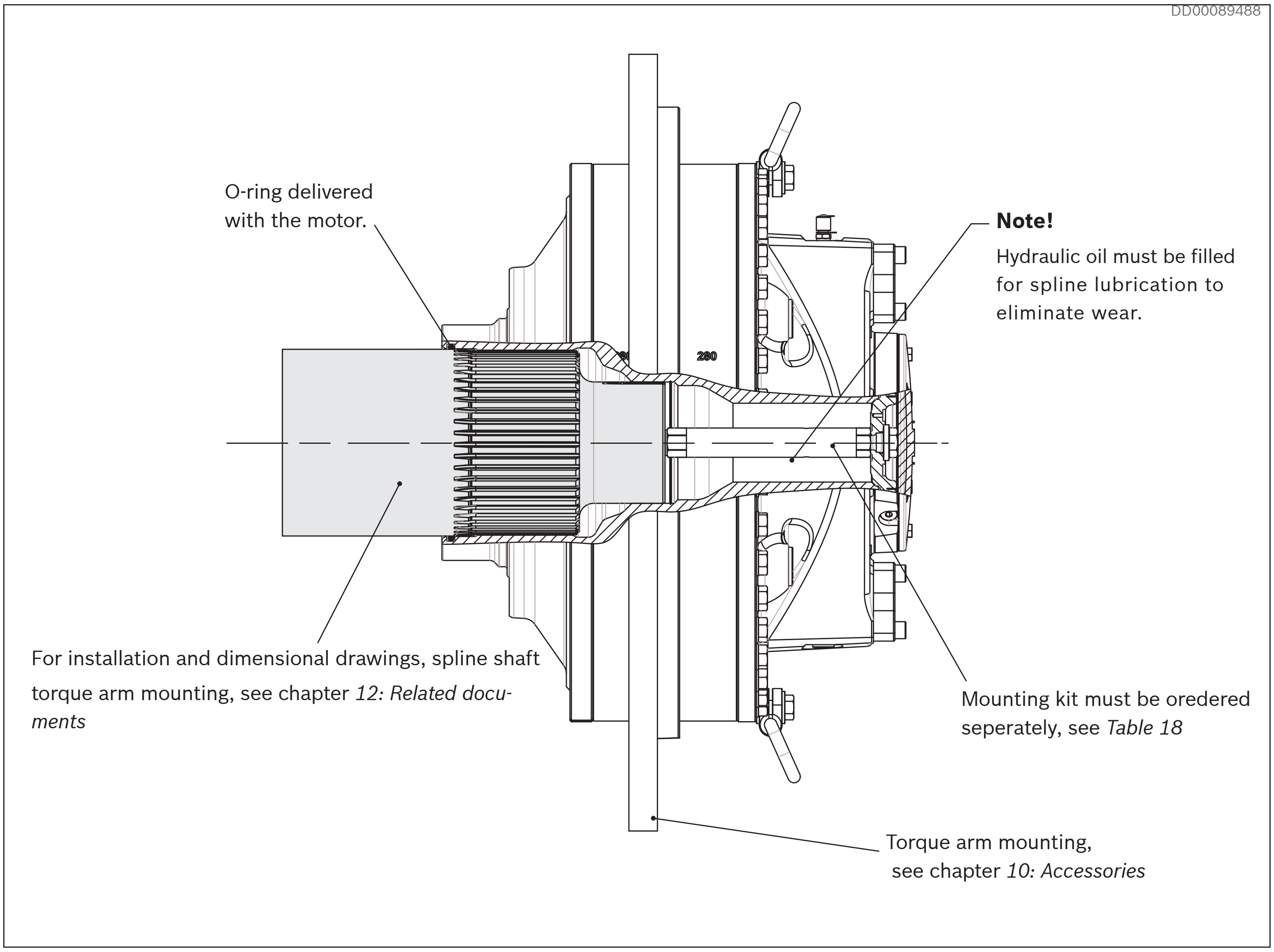


Fig. 79: Torque arm mounting motor with splines

Recommended material in the shaft, see *Table 16*.
Spline designation shaft, see *Table 17*.

Table 18: Material ID mounting kit for CB 280 to CB 840

Motor type	**Material ID Mounting kit** (Must be ordered separatly)
CB 280	R939002612
CB 400	R939002613
CB 560	R939002614
CB 840	R939002615

9.1.3 Submerged mounting with splines

Valid for Hägglunds CB 280 to CB 1120.

For submerged applications spline motor with special index S11 shall be used,

The dimensional drawing for design of flange, and item number for O-rings, see chapter *12 Related documents*.

Data

Max depth in water is 70 meter.

To order

- O-rings, see Dimension drawing submerged applications chapter *12 Related documents*.
- Special index motor S-11, prepared for submerged applications.
- Painting system C5M-Corrosivity category Very High is recommended.

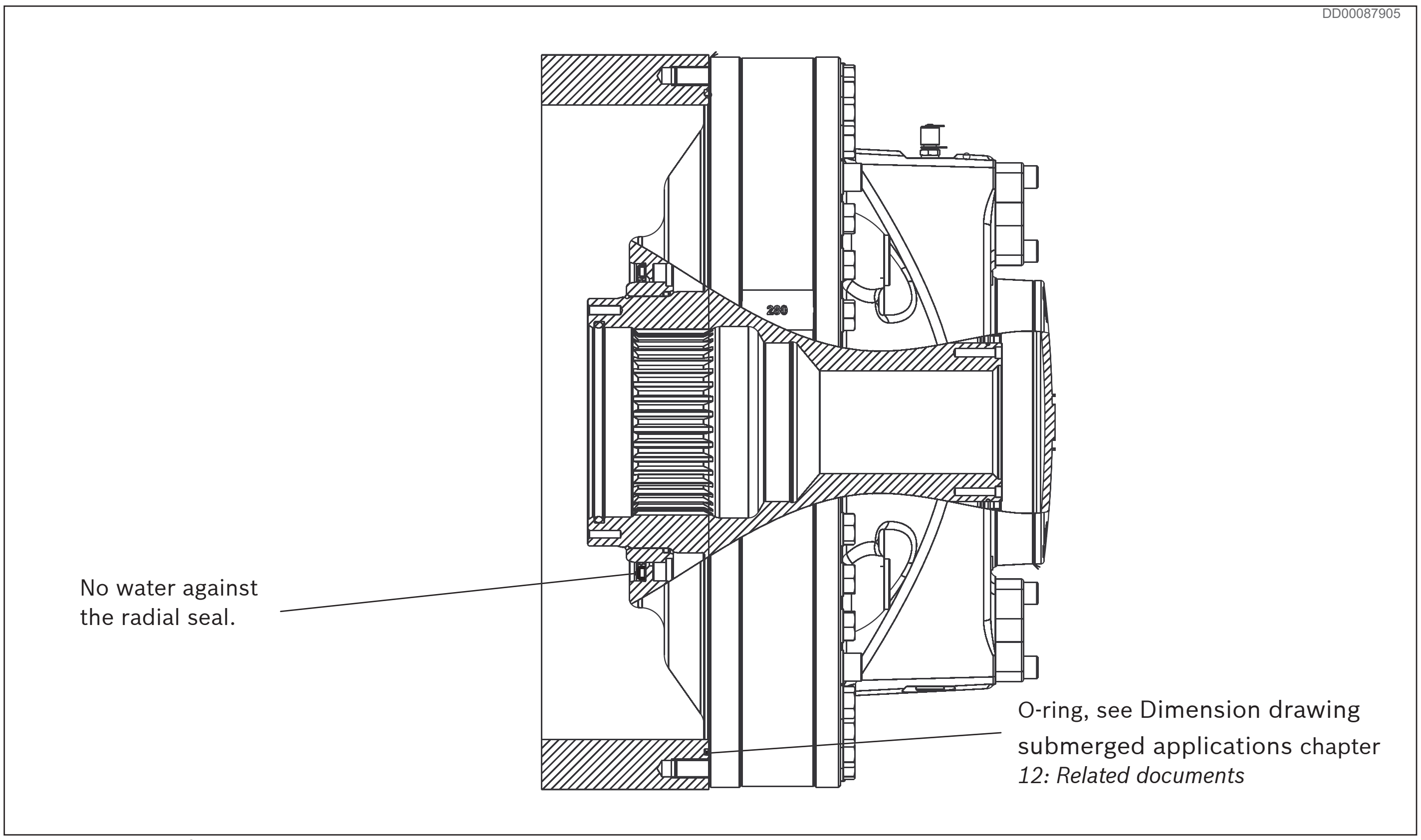


Fig. 80: CB motor for submerged application

9.1.4 Torque arm mounting on plain shaft

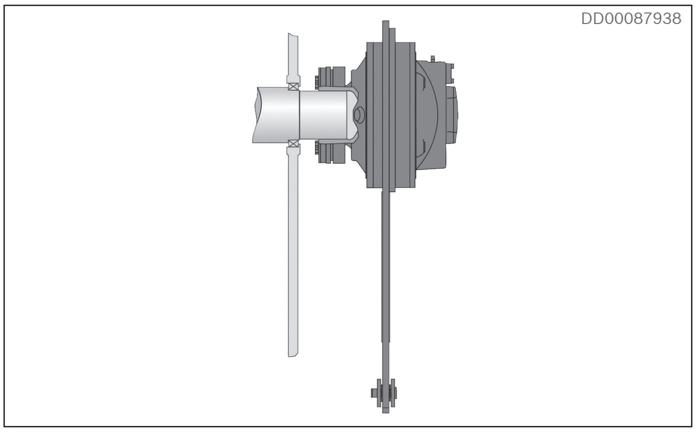


Fig. 81: Torque arm mounted motor with shrink disk.

Dimensions and material for shaft end, plain shaft

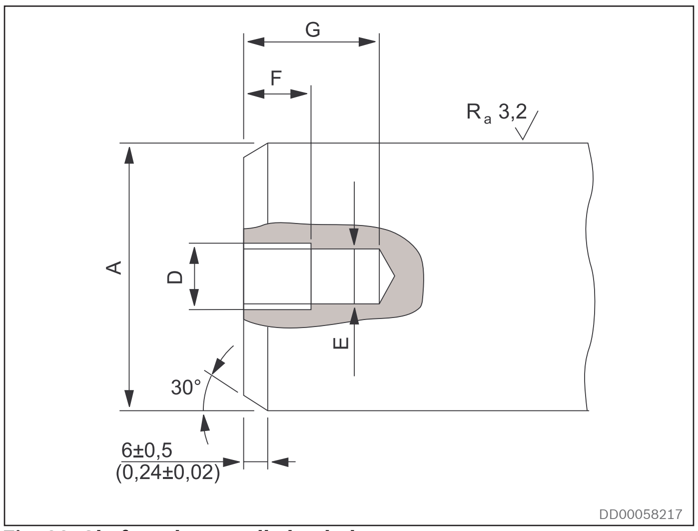


Fig. 82: Shaft end, normally loaded

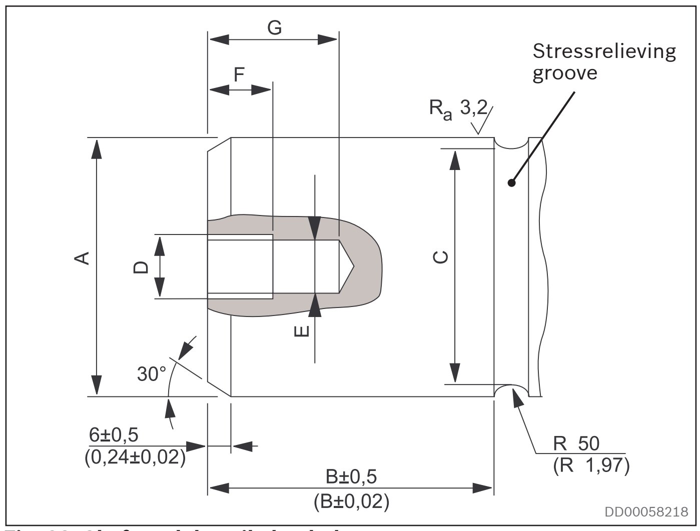


Fig. 83: Shaft end, heavily loaded

Design of driven shaft end on normally loaded shaft
In drives with only one direction of rotation and/or load where the stresses in the shaft are moderate, the shaft can be plain.

Design of driven shaft end on heavily loaded shaft.
Where the driven shaft is heavily loaded and is subject to high stresses, for example for changes in the direction of rotation and/or load, it is recommended that the driven shaft should have a stress relieving groove.

Table 19: Shaft recommendations

Dim		CB 280		CB 400		CB 560/840/1120	
A	**mm**	ø180	-0,014 -0,054	ø200	-0,015 -0,061	ø260	-0,017 -0,069
	in	ø7,0866	-0,00055 -0,00215	ø18,1102	-0,00059 -0,00240	ø10,2362	-0,00067 -0,00272
B	mm	106		117		153	
	in	4,17		4,61		6,02	
C	mm	174		194		254	
	in	6,85		7,64		10,00	

Note! The dimensions are valid at +20 °C (68 °F)

Table 20: Threads for assembly tool (plain shaft)

Measures	Dimensions, threads for assembly tool			
D	M20		UNC 5/8"	
E	>17 mm	0,67 in	>13,5 mm	0,53 in
F	25 mm	0,98 in	22 mm	0,87 in
G	50 mm	1,97 in	30 mm	1,18 in

Table 21: Recommended material in the shaft

Drive	Steel with yield strenght
Unidirectional drive	Rel_{min} = 300 N/mm²
Bidirectional drives	Rel_{min} = 450 N/mm²

10 Accessories

10.1 Torque arms

Mounting alternatives

Dimensions, techical data, order code and material ID for torque arms, see separate data sheet: **RE 15355**

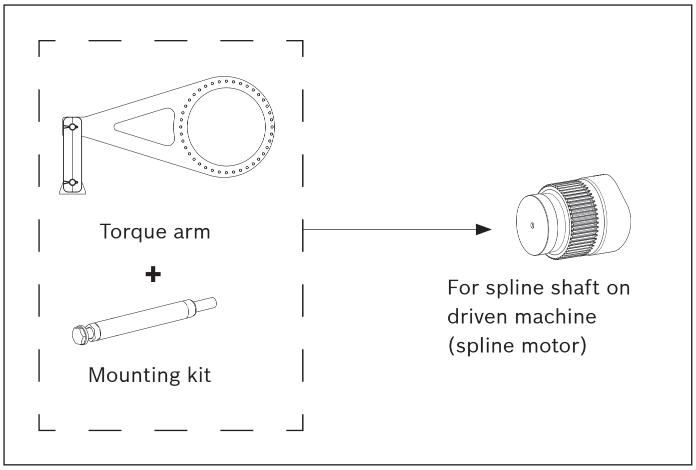


Fig. 84: Single ended torque arm mounting for spline shaft

Features

- Easy mounting i.e. no alignment problems.
- Quick mounting of motor to driven shaft
- Robust torque-transmitting.
- Controlled external forces on driven shaft.
- Space saving. i.e. close mounting to the driven machine.

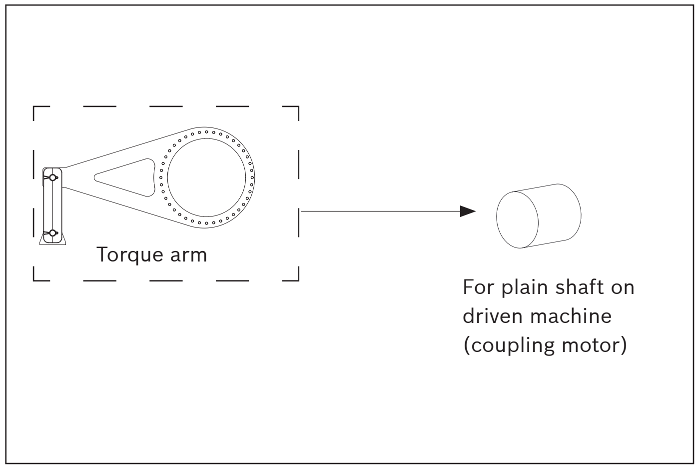


Fig. 85: Single ended torque arm mounting for plain shaft

Features

- Easy mounting i.e. no alignment problems.
- Simplified machining of customer shaft.
- Controlled external forces on driven shaft.

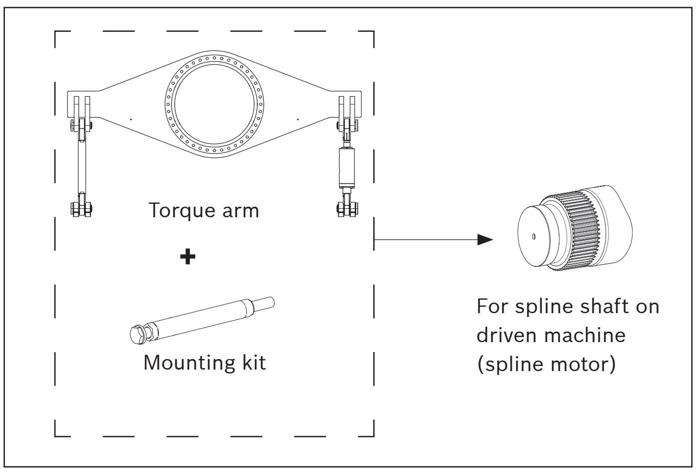


Fig. 86: Double ended torque arm mounting for spline shaft

Features

- Easy mounting i.e. no alignment problems.
- Quick mounting of motor to driven shaft
- Robust Torque-transmitting.
- Reduction of external forces on driven shaft.

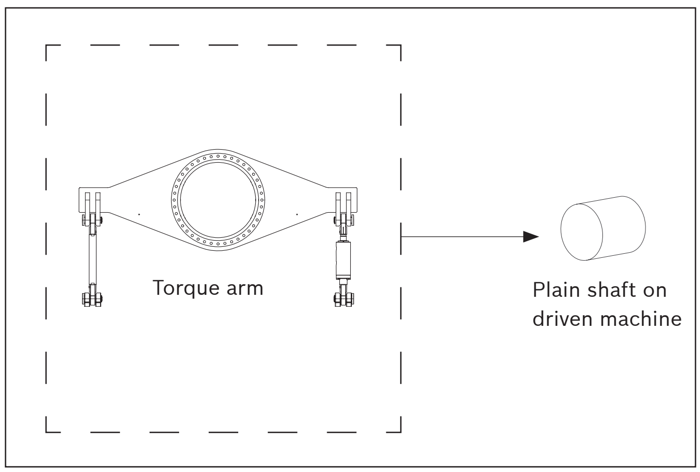


Fig. 87: Double ended torque arm mounting with plain shaft

Features

- Easy mounting i.e. no alignment problems..
- Simplified machining of customer shaft.
- Reduction of external forces on driven shaft.

10.2 Flushing set and Early warning kit

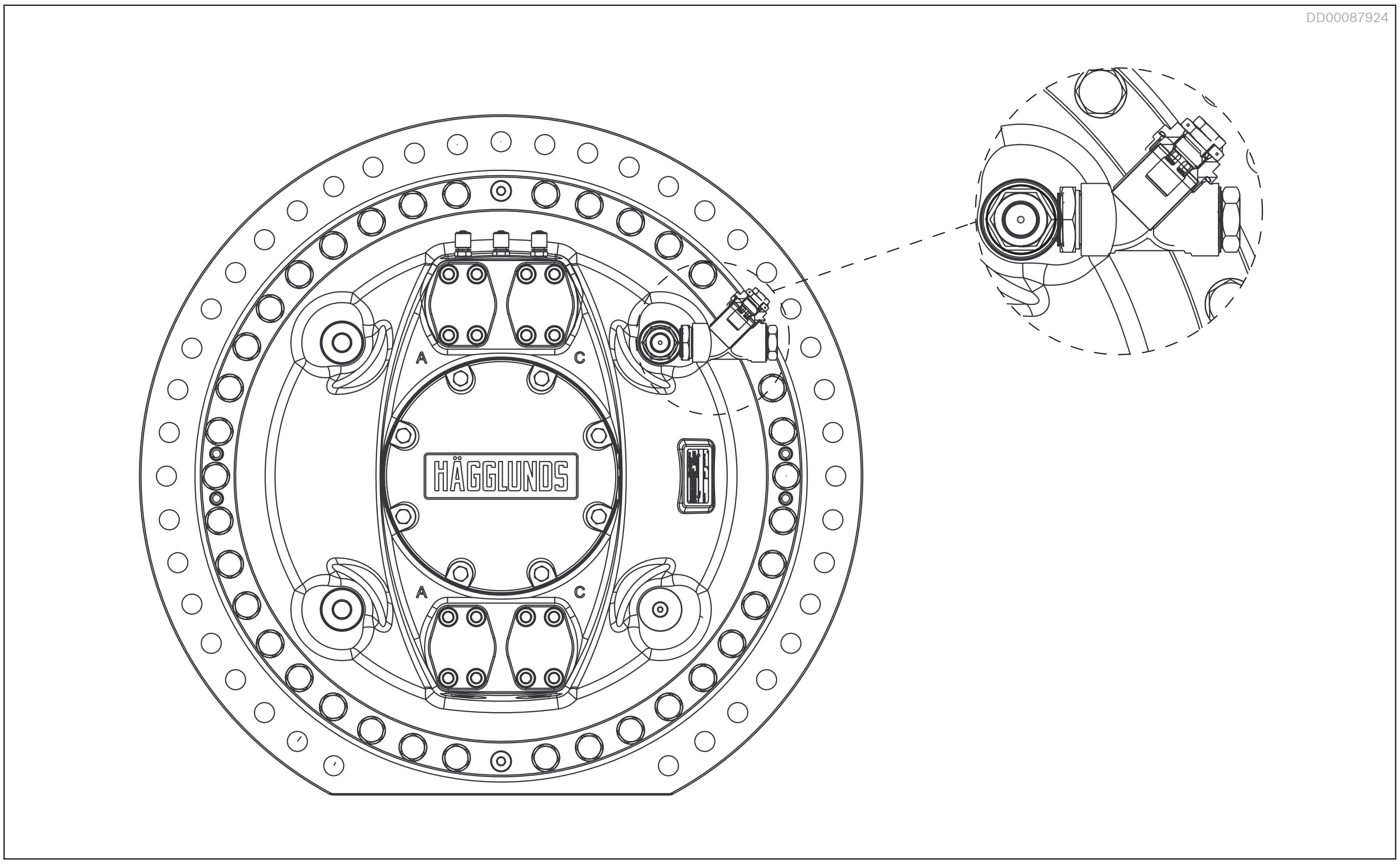


Fig. 88: Magnetic plug mounted on CB

For technical data, see document nr: **RE 15359**
For inspection and maintenance routines, see *Installation and maintenance manual*: **RE 15302-WA**.

Features

- Easy inspection of motor condition
- Early detection of potential failures

Description

The flushing set is basically a magnetic plug installed in the drain line. By regularly inspecting the magnetic plug a malfunction of the hydraulic motor can be detected and corrected and a total breakdown can be avoided. It can be used for HägglundsCB 280 to CB 1120.

10.3 Coupling adapter for CB 1120

The coupling adapter includes shrink disk and adapter shaft. Mounting kit must be ordered separately.
The coupling adapter is designed for a plain driven shaft.

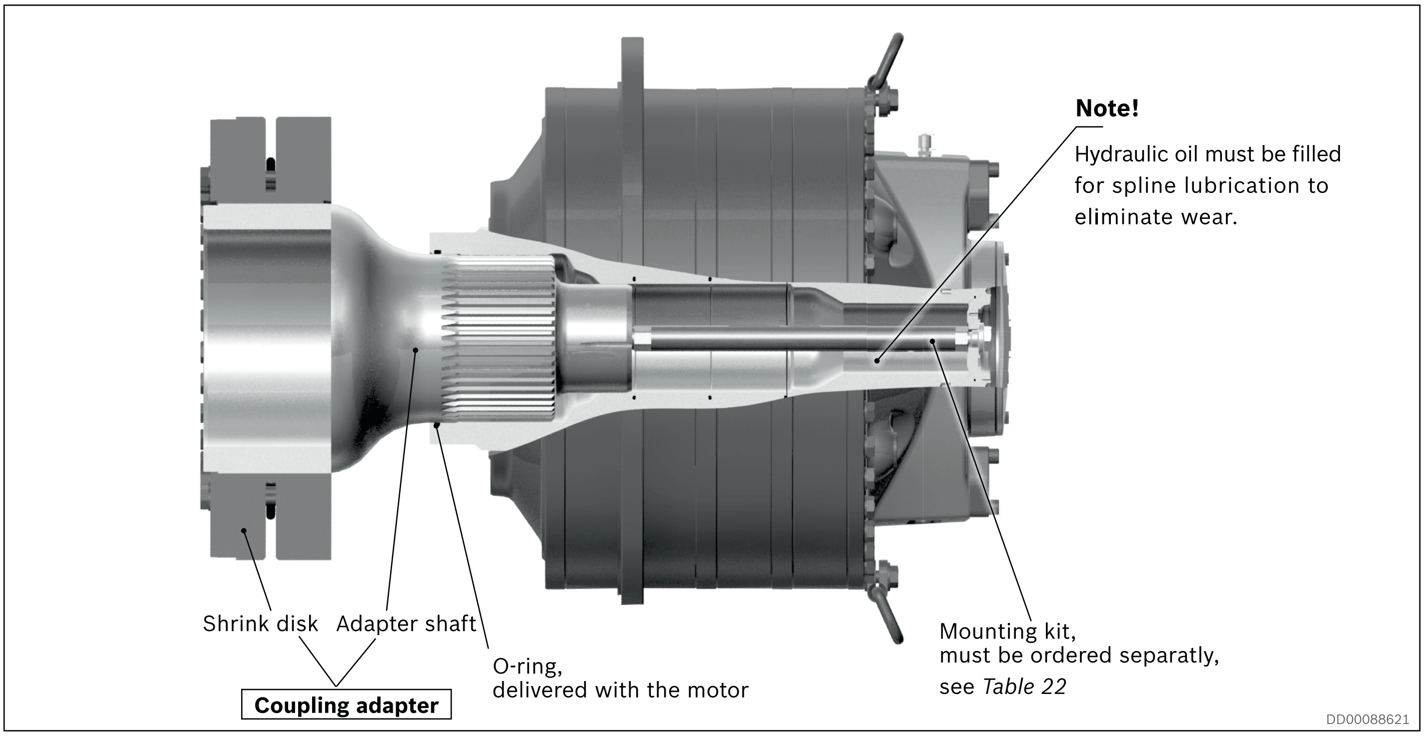


Fig. 89: CB 1120 motor with coupling adapter

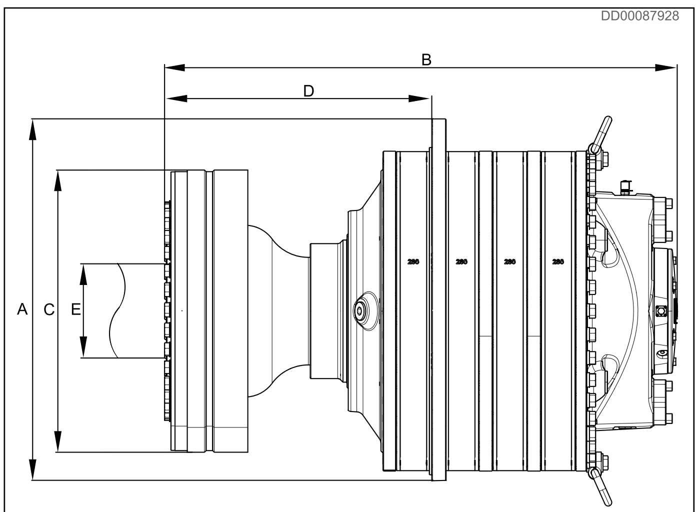


Fig. 90: CB 1120 motor with coupling adapter

Table 22: Material ID coupling adapter and mounting kit

	Coupling adapter	**Mounting kit** (Must be ordered separatly)
Material ID Unidirectional and bidirectional drive	R939000328	R939055284

Table 23: Dimensions CB 1120 motor with coupling adapter

A		**B**		**C**		**D**		**E**	
mm	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**	**mm**	**in**
940	57.48	1 251	47.68	690	28.35	650	30.43	340	14.17

For dimensional drawings CB 1120 with coupling adapter, see chapter *12: Related documents*

10.4 Temperature sensor

Function

The temperature sensor is mounted in port T3, see *Fig. 92* and messure fluid temperature in the motor case. The sensor element is a Pt100 resistance sensor, which change resistance in relation to the fluid temperature in the motor case.

Technical data, Pt 100/4-20 mA sensor

Material ID: R939005085 Temperature sensor

Table 24: Technical data, Pt 100/4-20 mA sensor

Sensor length l	60 mm (2.36“)
Process connection	G 1/4“ 100
Degree of protection	IP65
Ambient temperature	- 40...+85 ºC (-40...185 ºF)
Type of sensor element	Pt 100
Output	4-20 mA / 0..100 ºC (32...212 ºF)
Connector	DIN 43650 screw terminals
Cable connection	Pg9 cable Ø6-8 mm
Electrical connection	2-wire connection
Connection	Pin 1 - Ub Pin 2 – 4-20 mA output
Supply voltage Ub	7.5 - 30 VDC
Reverse polarity protection	Yes
Max, load	750 Ω at 24 V ((Ub - 7.5 V)/0.022)

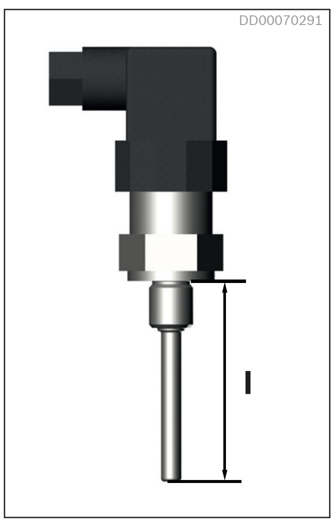


Fig. 91: Temperature sensor

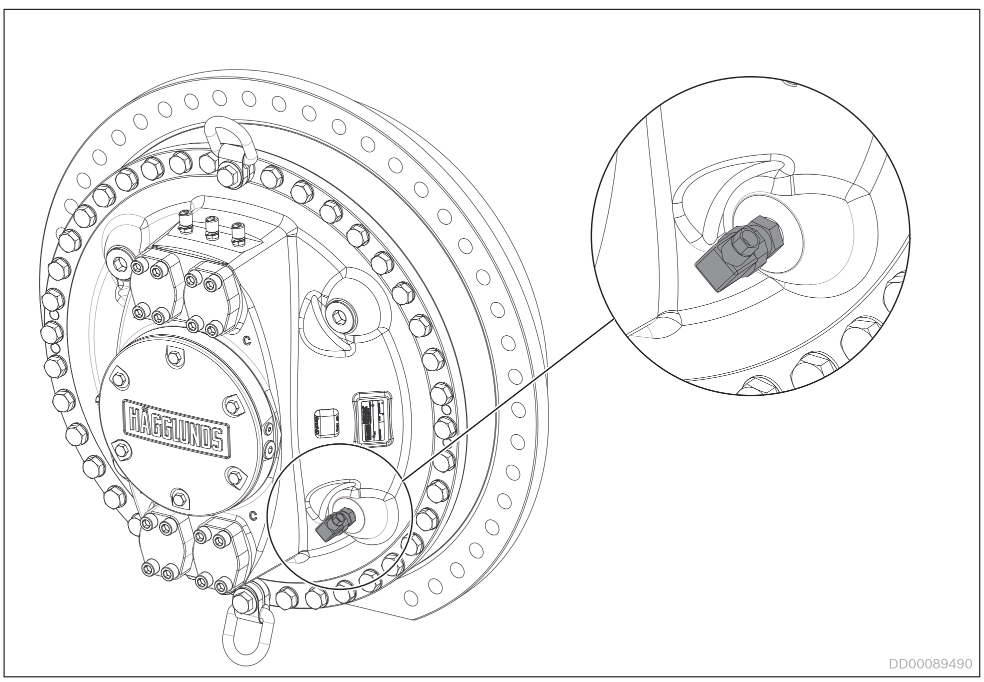


Fig. 92: Temperature sensor

10.5 Speed sensor

10.5.1 Hägglunds CB with SPDC

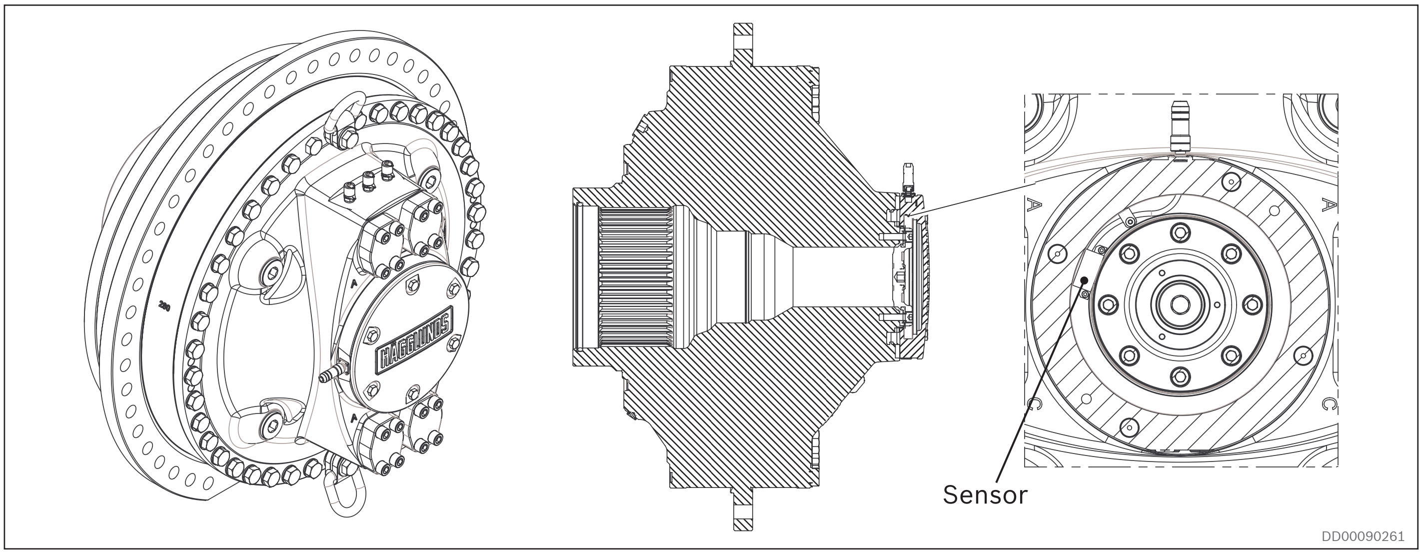


Fig. 93: No through hole

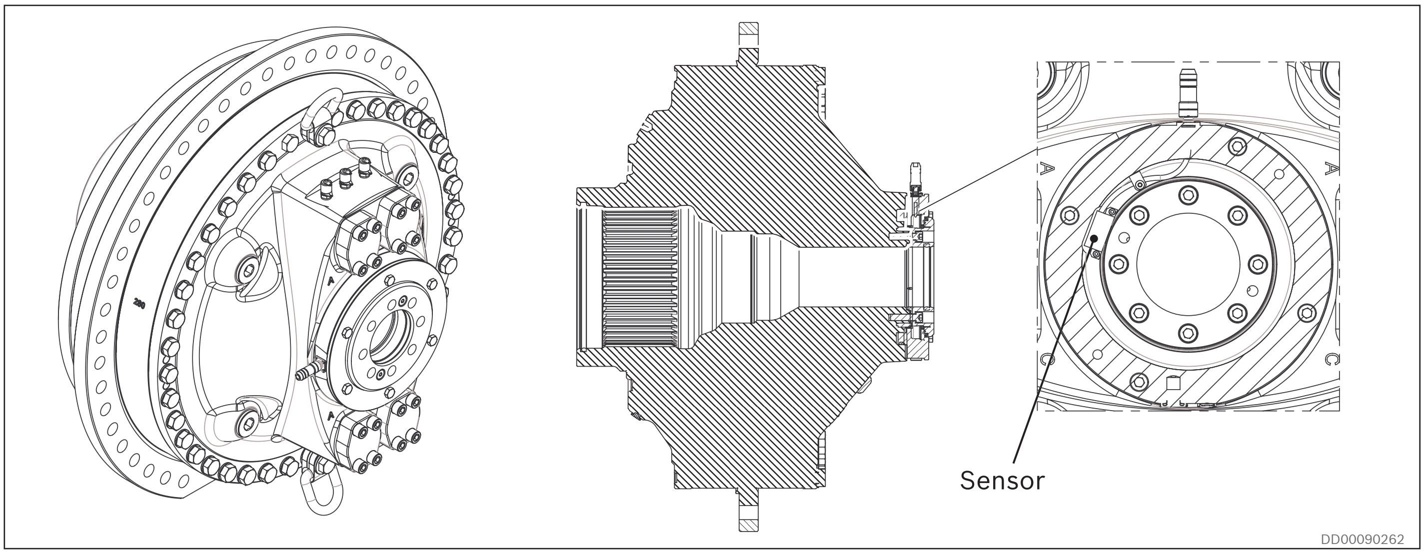


Fig. 94: With through hole

For technical data, see document nr: **RE 15350**

Features

- Possibility with through hole
- Slim design fully integrated in motors.
- Non-contact, wear free sensing system
- Possibility to read directions of rotation from sensor
- 1856 pulses per revolution for good speed control possibility
- Protection class IP67

Description

Speed sensing unit, Hägglunds SPDC, is a digital incremental encoder using magnetic sensing technology.

The sensor generates two square wave signals with 90° phase shift for detection of speed and direction of rotation.

10.5.2 Explosion proof speed sensor SPDB 2

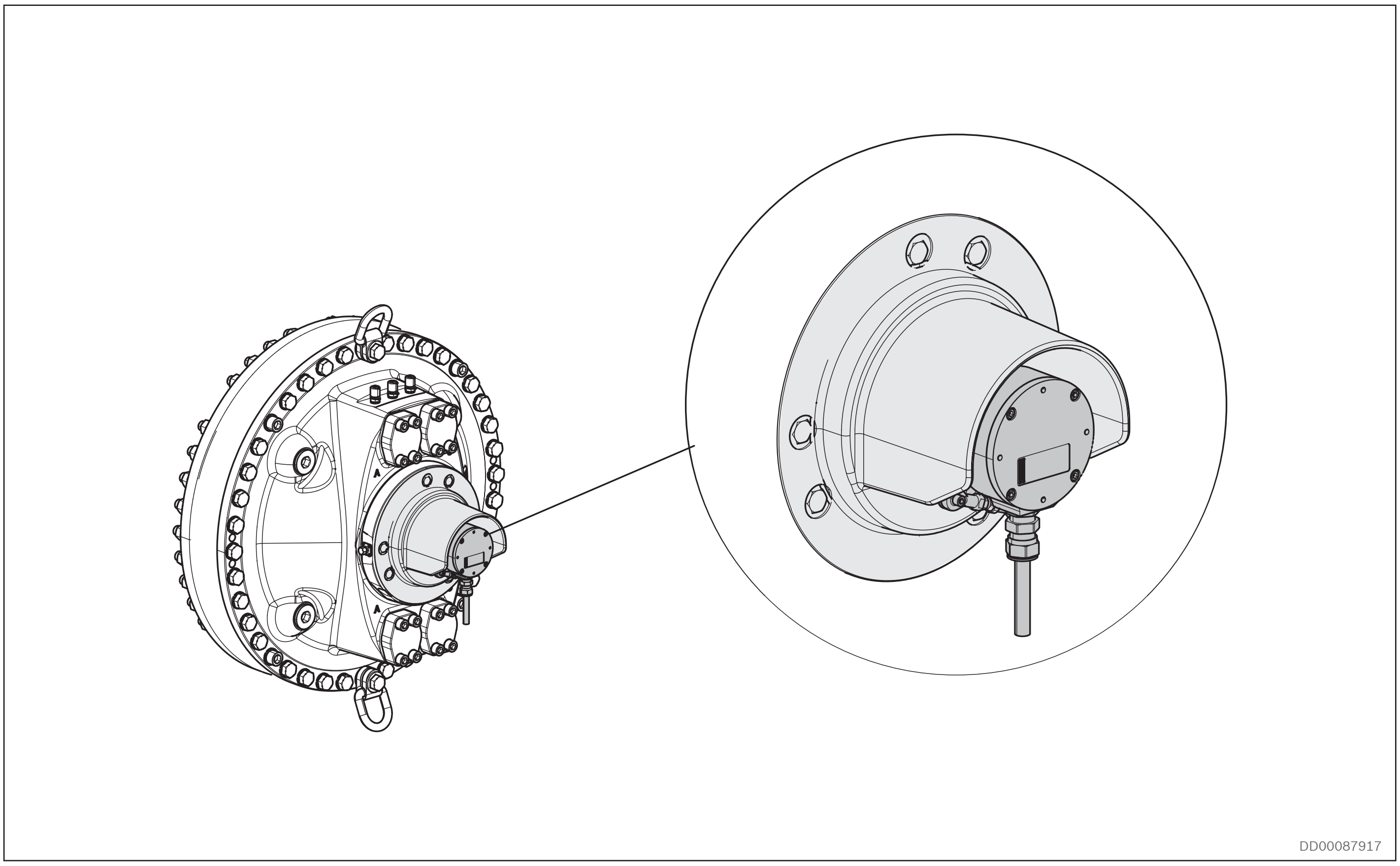


Fig. 95: SPDB 2

For technical data, see document nr: **RE 15352**

Features

- ATEX/IECEx approved
- 1000 and 3600 pulses per revolution for good speed control possibility.
- Possibility to read directions of rotation from sensor
- Sensor is equipped with zero pulse
- Protection class IP65
- Optional cable set with juction box to simplify connection

Description

Digital incremental hollow shaft sensor with torque arm mounting.

Recommendations:

1000 pulses for speed 6 rpm and above.
3600 pulses for speed below 6 rpm.

10.5.3 Inductive speed sensor SPDE with through hole unit.

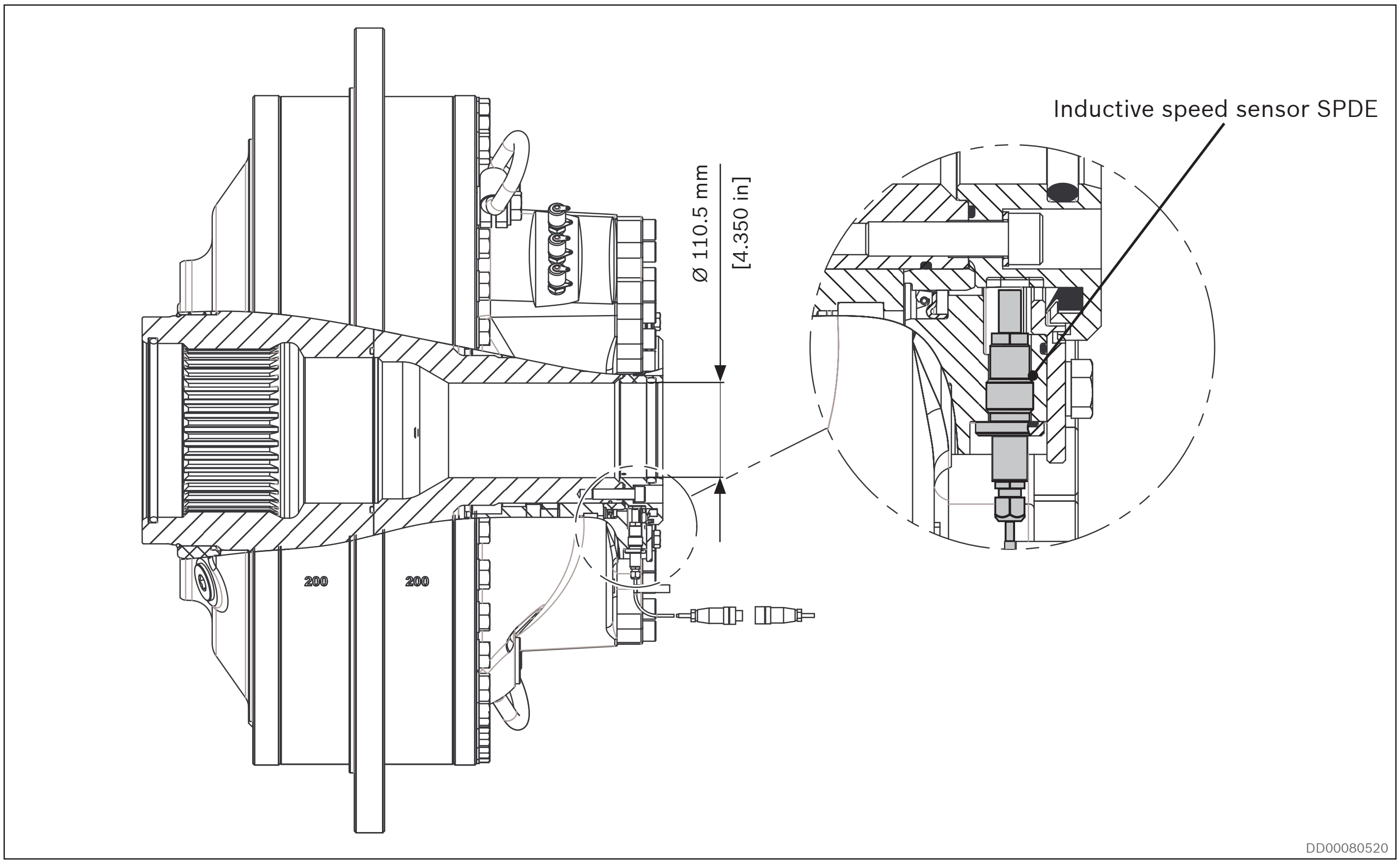


Fig. 96: Inductive speed sensor SPDE with trough hole unit

For technical data, see document nr: **RE 15351**

Features

- Non-contact, wear free system
- Robust design
- ATEX/IECEx -version available
- Through hole version available
- 40 pulses per revolution

The sensor is mainly intended for speed indication. Direction of rotation cannot be indicated.

Mounting is done by replacing a plug on the motor with the sensor and tighten to 35 Nm.

Description

Two types of sensors are available.

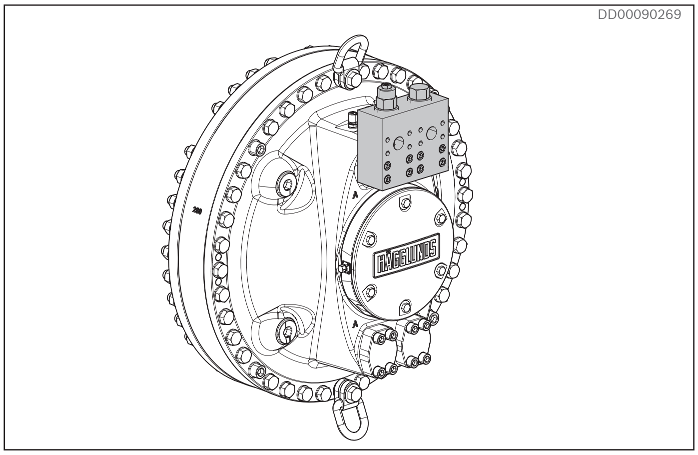
- The standard type has a PNP output for direct driving of load or digital input.
- The ATEX/IECEx type (explosion proof) needs an isolation amplifier outside explosive area.

To order:

	Material ID
Standard type	R939002764
ATEX/IECEx type	R393054489

10.6 Valves

10.6.2 Counter balance valve, VCBCA 480.



For technical data, see document nr: **RE 15378**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Counter balance function with low pilot pressure
- Pilot pressure independent of load pressure

The VCBCA 480 valve is designed for Hägglunds motors and provides counter balance function on one or both motor lines depending on the configuration. The maximum operating pressure is 350 bar (5076 psi) and maximum flow 480 l/min (127 gpm).

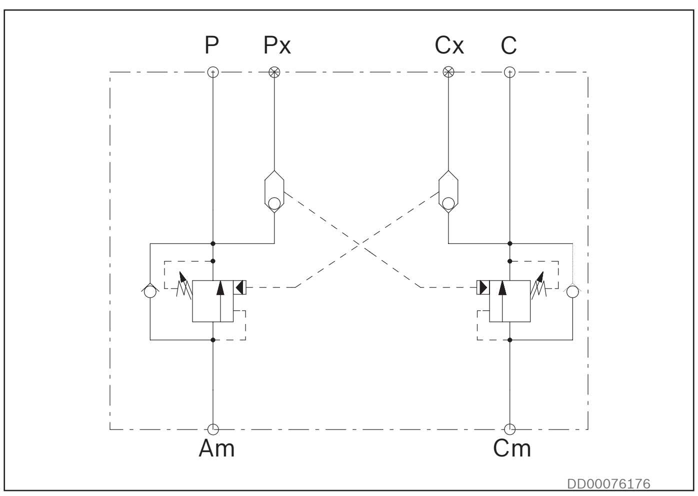
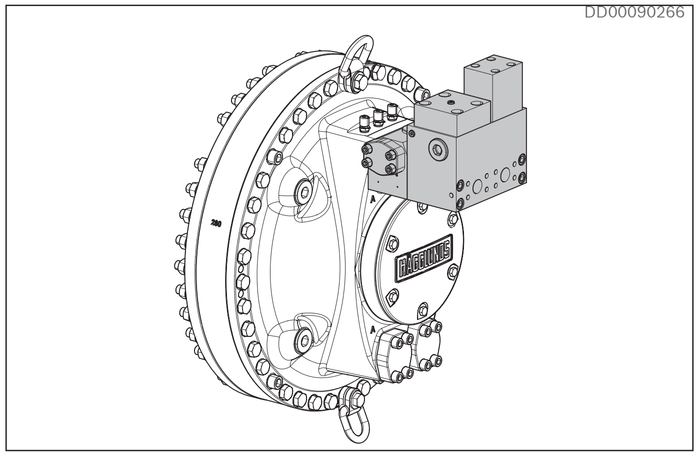


Fig. 97: Hydraulic circuit VCBCA 480 00 00 A

10.6.1 Counter balance valve, VCBCA 1000.



For technical data, see document nr: **RE 15379**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Counter balance function with low pilot pressure
- Pilot pressure independent of load pressure

The VCBCA 1000 valve is designed for Hägglunds motors and provides counter balance functions on the motor high pressure line and straight through connection on the motor charge pressure line. The maximum operating pressure is 350 bar (5076 psi) and maximum flow 1000 l/min (264 gpm).

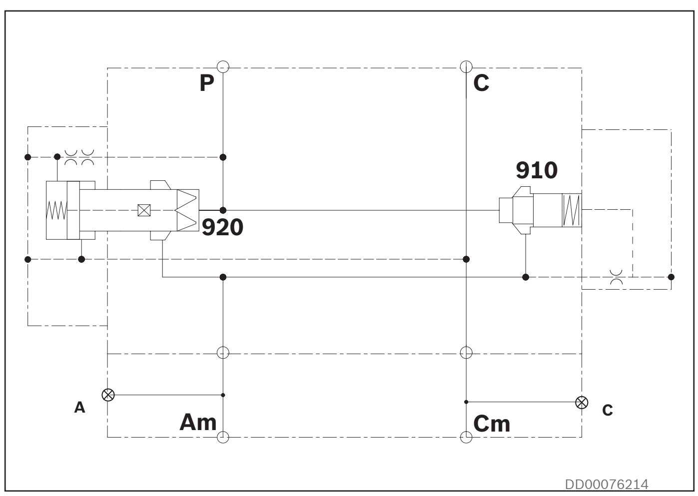
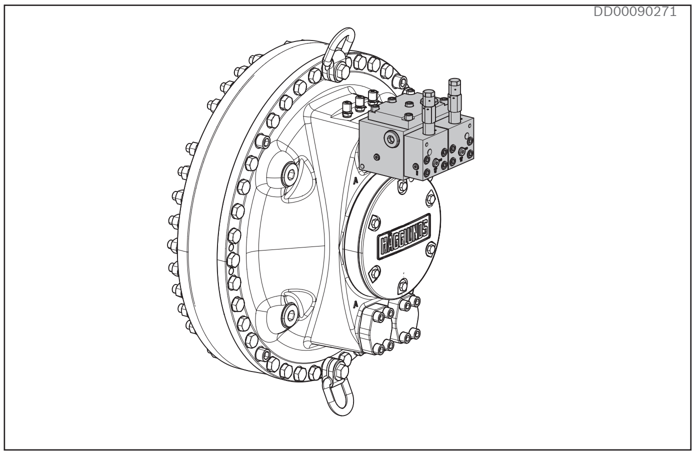


Fig. 98: Hydraulic circuit VCBCA 1000 00

10.6.3 Cross-over valves, COCB 700 and COCB 1000



For technical data, see document nr: **RE 15376**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Oil exchange system for closed loop (COCB 1000-3)
- Protect the motor from high pressure peaks
- Provides cavitation protection

The valve COCB is designed for Hägglunds motors and provides cross-line relief at pressure shocks and cavitation protection. The relief valves has a standard setting of 350 bar (5076 psi) but can be delivered with preset level 280 bar (4061 psi), 300 bar (4351 psi) and 330 bar (4786 psi). Pressure setting is made without charge pressure.
The charge pressure relief valve has a standard setting of 15 bar (218 psi) but is adjustable down to 3 bar (44 psi).

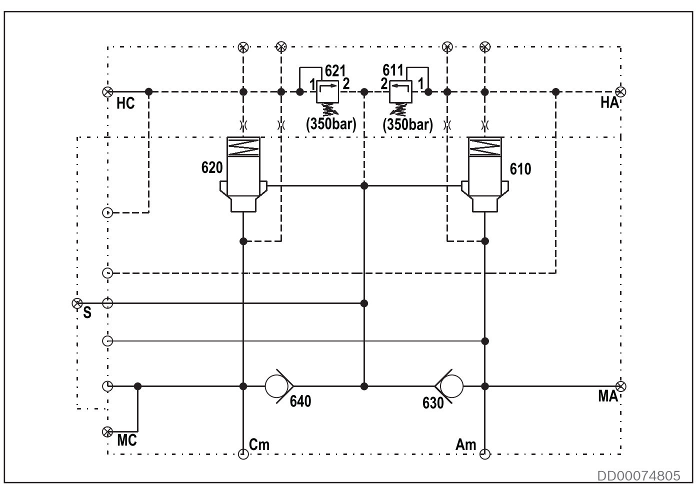
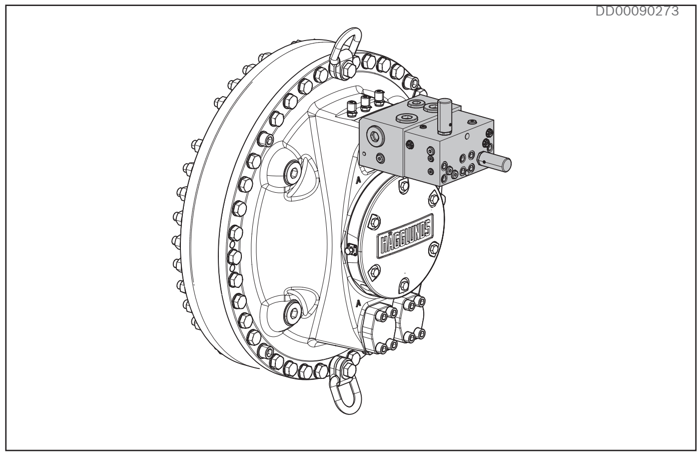


Fig. 99: Hydraulic circuit COCB 1000 1

10.6.4 Constant tension valve, CTCA 1000



For technical data, see document nr: **RE 15377**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Possible for remote control of constant tension pressure
- Multi-functional
- Constant tension function via high performance cartridge
- Dynamic braking with hot oil exchange
- Free circulation function with minimal pressure drop
- Provided with an anti-cavitation check valve

The CTCA valve is designed for Hägglunds Compact motors and provides many functions in one valve unit. In addition to the constant tension function it provides possibilities for dynamic breaking as well as free-circulation function.
The maximum operating pressure is 350 bar (5076 psi). The valve can be delivered with preset level 280 bar (4061 psi), 300 bar (4351 psi), 330 bar (4786 psi) and 350 bar (5076 psi)

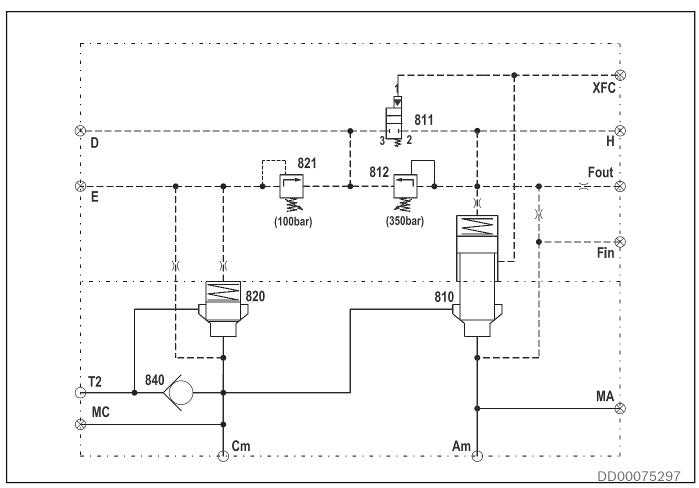
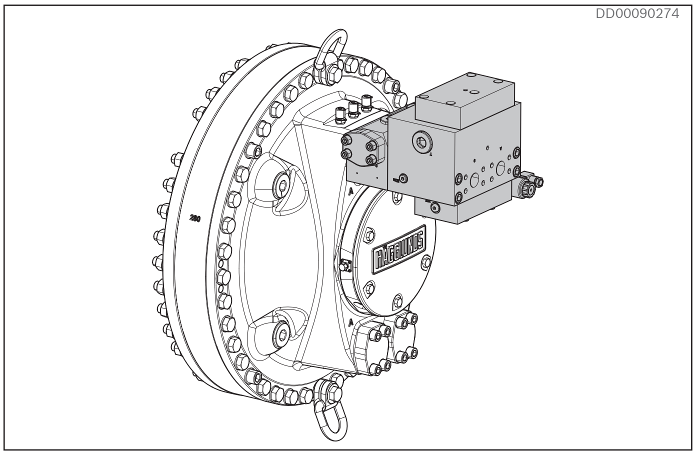


Fig. 100: Hydraulic circuit CTCA 1000

10.6.5 Free circulation valve with freewheeling, VFCCA 1000



For technical data, see document nr: **RE 15381**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Free circulation function with minimal pressure drop
- Free circulation shift allowed up to 40 rpm
- Freewheeling function
- Shifting from drive operation into freewheeling allowed up to 10 rpm
- Free circulation- or drive operating mode as default

The VFCCCA valve is designed for Hägglunds motors and provides free circulation or freewheeling functions.
The maximum operating pressure is 350 bar (5076 psi) and maximum flow 1000 l/min (264 gpm).

The valve is available in four configurations:
Free circulation valve Hydraulic operated with drive operating mode or freewheeling mode as default
Free circulation valve Electric operated 24VDC with drive operating mode or freewheeling mode as default

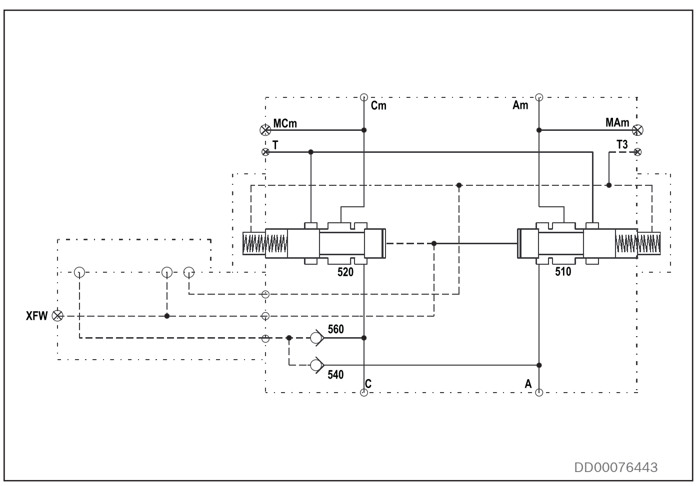
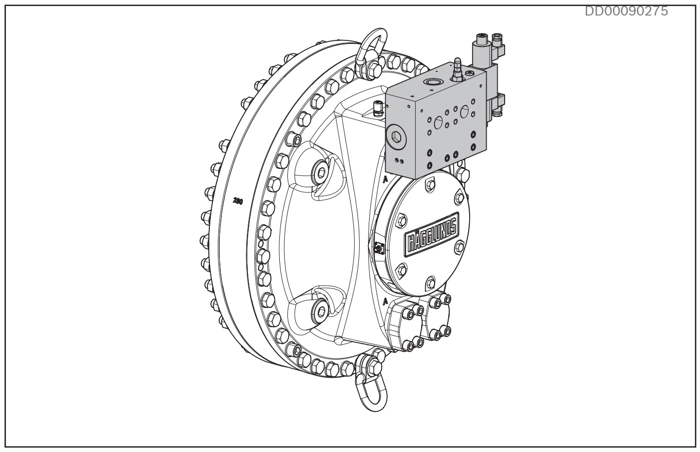


Fig. 101: Hydraulic circuit VFCCA 1000 H

10.6.6 Freewheeling valve VFWCB 600



For technical data, see document nr: **RE 15380**

Features

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

The VFWCB 600 valve is designed for Hägglunds motors and provides freewheeling of the motor by means of disconnecting the motor from the main lines and connect 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:

VFWCB 600 E	Freewheeling valve electrically operated
VFWCB 600 H	Freewheeling valve hydraulically operated
VFWCB 600 M	Freewheeling valve manually operated

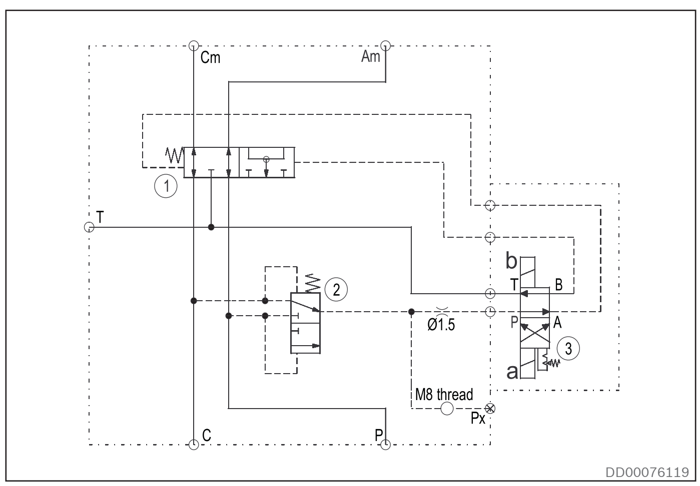
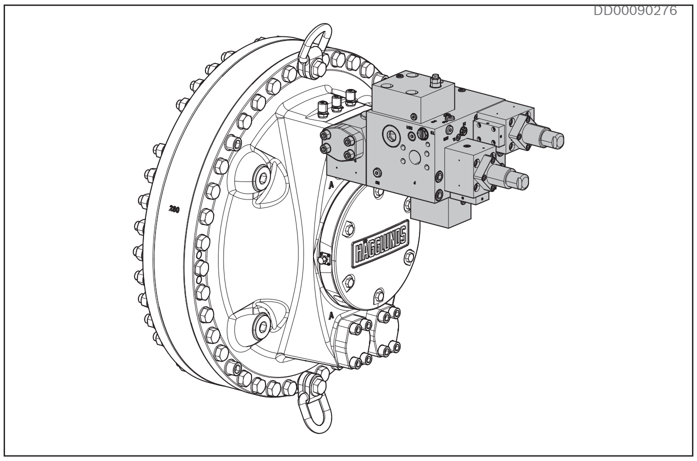


Fig. 102: Hydraulic circuit VFWCB 600

10.6.7 Four-way valve, V4WCA 1000



For technical data, see document nr: **RE 15382**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Four way directional and flow control of motor
- Proportionally controlled flow of the motor
- Counter balance function on motor pressure line

The V4WCA valve is designed for Hägglunds motors and provides four way directional and flow control of the motor. The flow is controlled proportional by external pilot pressure applied to ports X1 and X2. The valve includes a counter balance function on the motor pressure line. Maximum operating pressure is 350 bar (5076 psi) and maximum flow 1000 l/min (264 gpm).

The valve is available in one configuration:
V4WCA-1000 including adapter

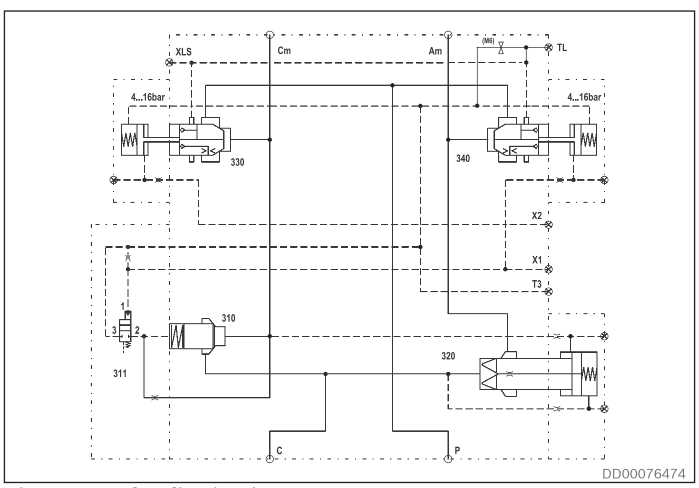
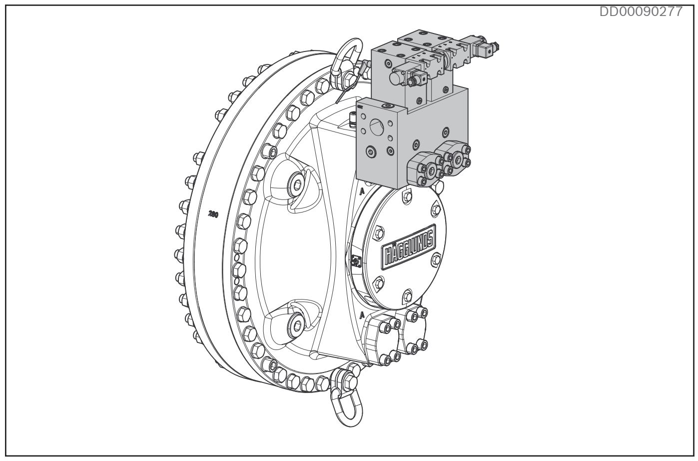


Fig. 103: Hydraulic circuit V4WCA 1000

10.6.8 Hydraulic quick stop valve, VQCB 800



For technical data, see document nr: **RE 15375**

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Fast response time

The VQCB 800 valve is designed for Hägglunds motors and provides quick stop for a roll mill rolls without stopping the electric motor and without any need of mechanical brake. A very short braking time is possible due to the small moment of inertia and quick response from hydraulic valve. Maximum operating pressure is 350 bar (5076 psi) and maximum flow 800 l/min (211 gpm).
.

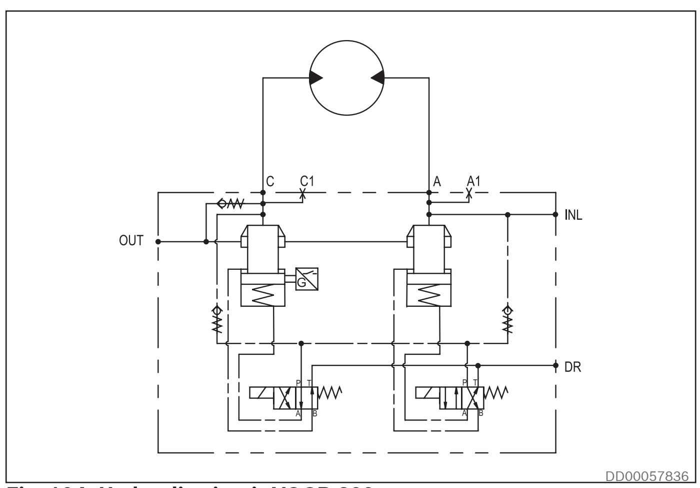


Fig. 104: Hydraulic circuit VQCB 800

10.7 Hägglunds BICA

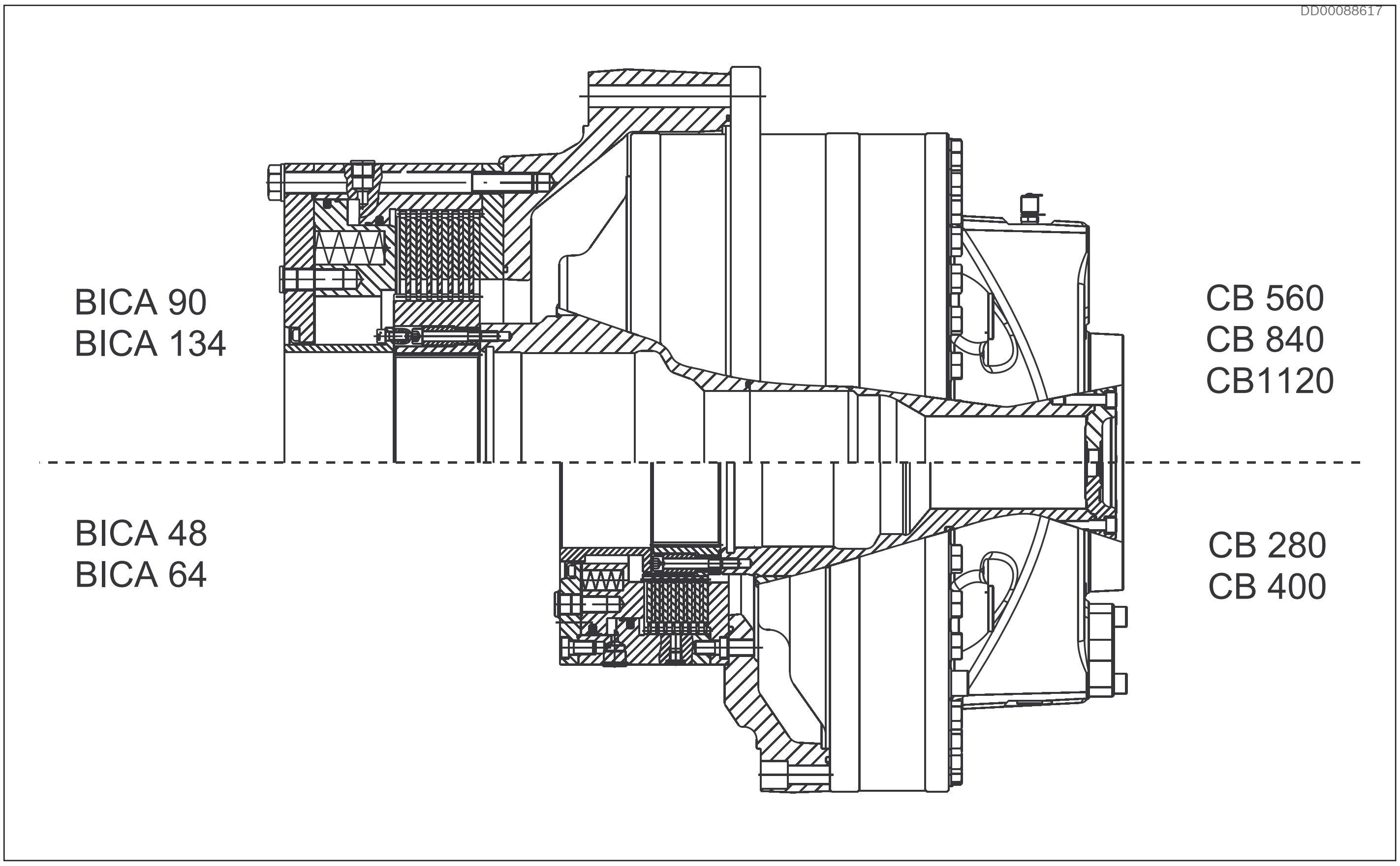


Fig. 105: CB motor with BICA brake

For technical data, see document nr: **RE 15366**

Features

- Robust design, industrial HD design
- Possibility for on – off sensor
- Torque range between 48 – 160 kNm

Description

The brakes are designed for industrial applications together with Hägglunds CB motors. The brake is made for dry operation of the discs and is not allowed for hanging load applications. BICA brakes are designed to be mounted on motors CB 280 - CB 1120. The brake is designed to be used as parking brake only.

10.8 Kit for harsh and marine environment

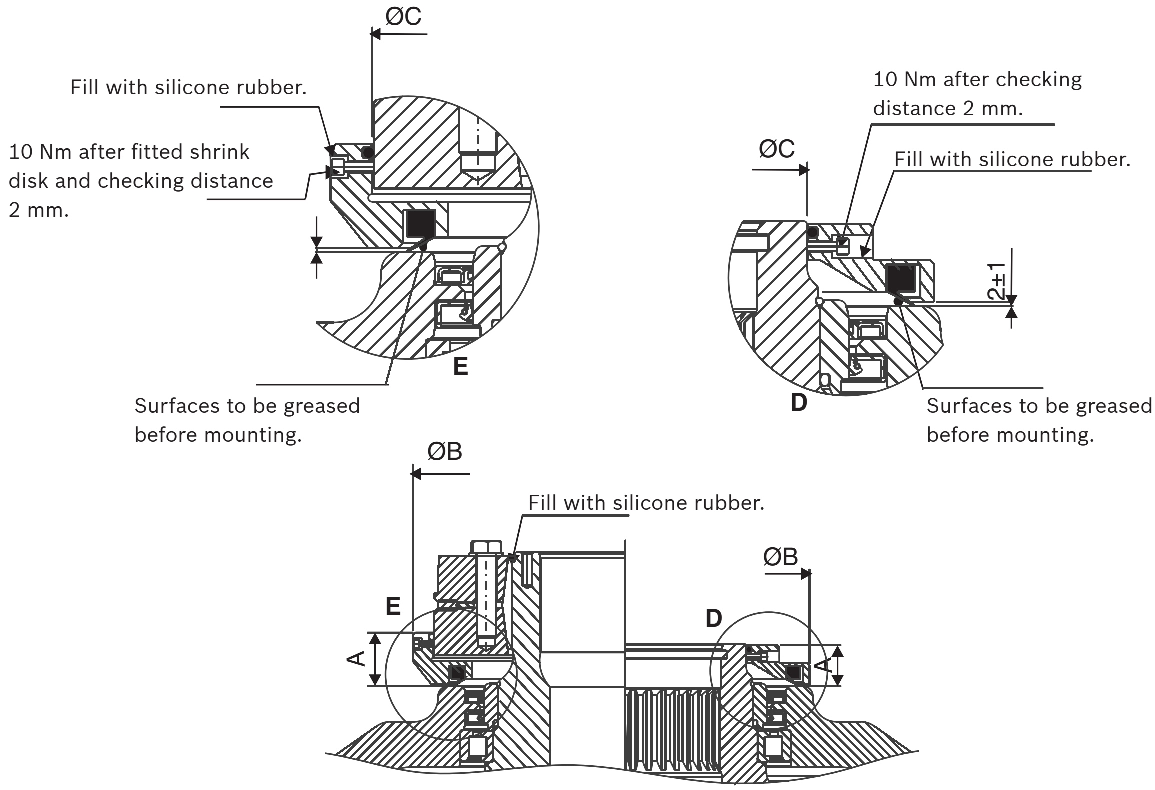


Fig. 106: Kit for harsh and marine environment

For technical data, see document nr: **RE 15364**

Features

- Protects the motor main seal
- Designed for harsh and marine environments
- Elongate the life time of the main sealings

Description

To protect the main seal, a kit with a v-ring can be mounted on the motors.
The kit is made for motors with splines and standard shrink disk coupling or hydraulic shrink disk.

11 Circuit design

11.1 Closed circuit

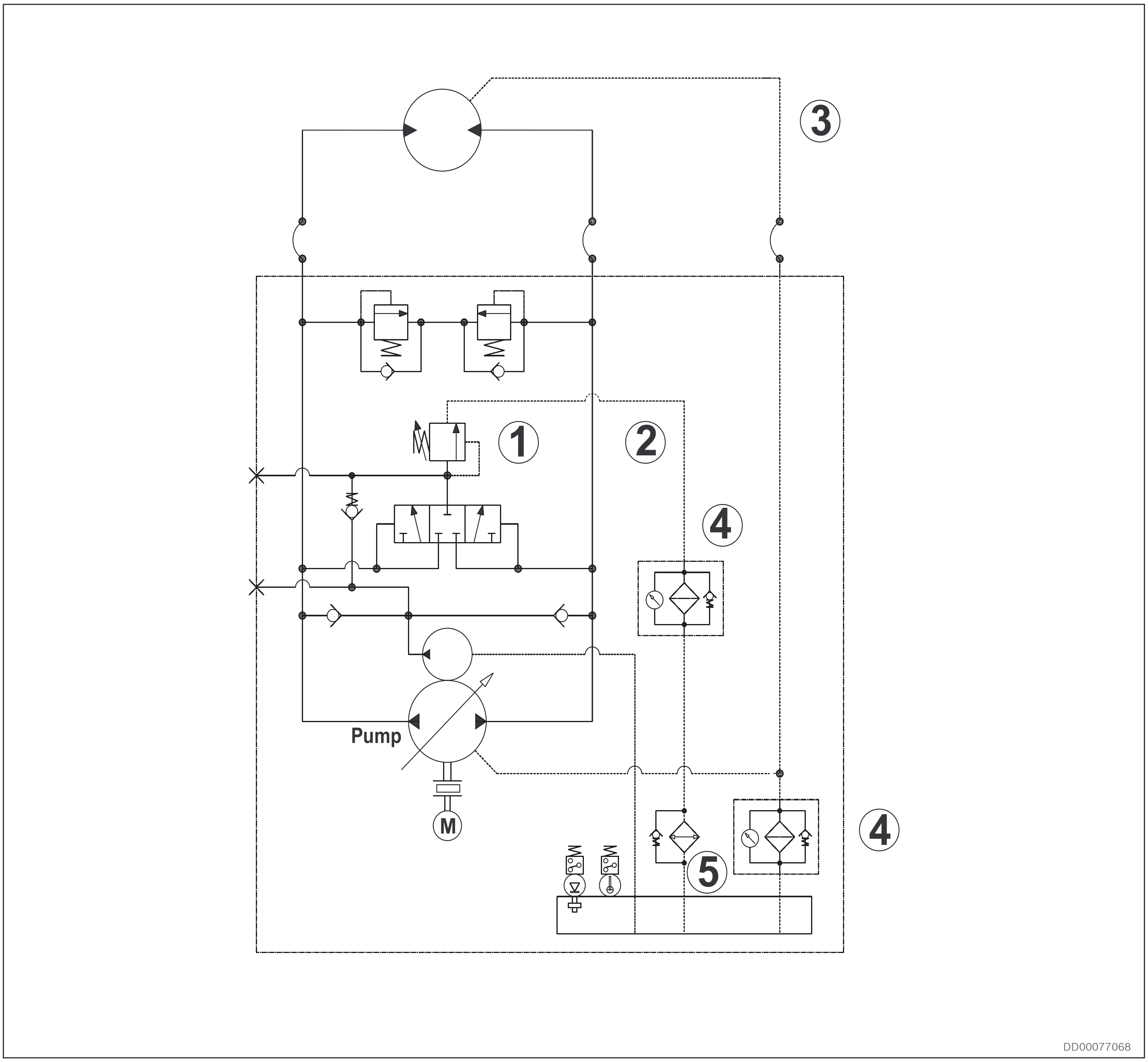


Fig. 107: Closed circuit

Things to consider:

1. Level of charge pressure.
2. Case drain flow
3. Filter
4. Cooler

11.2 Open circuit

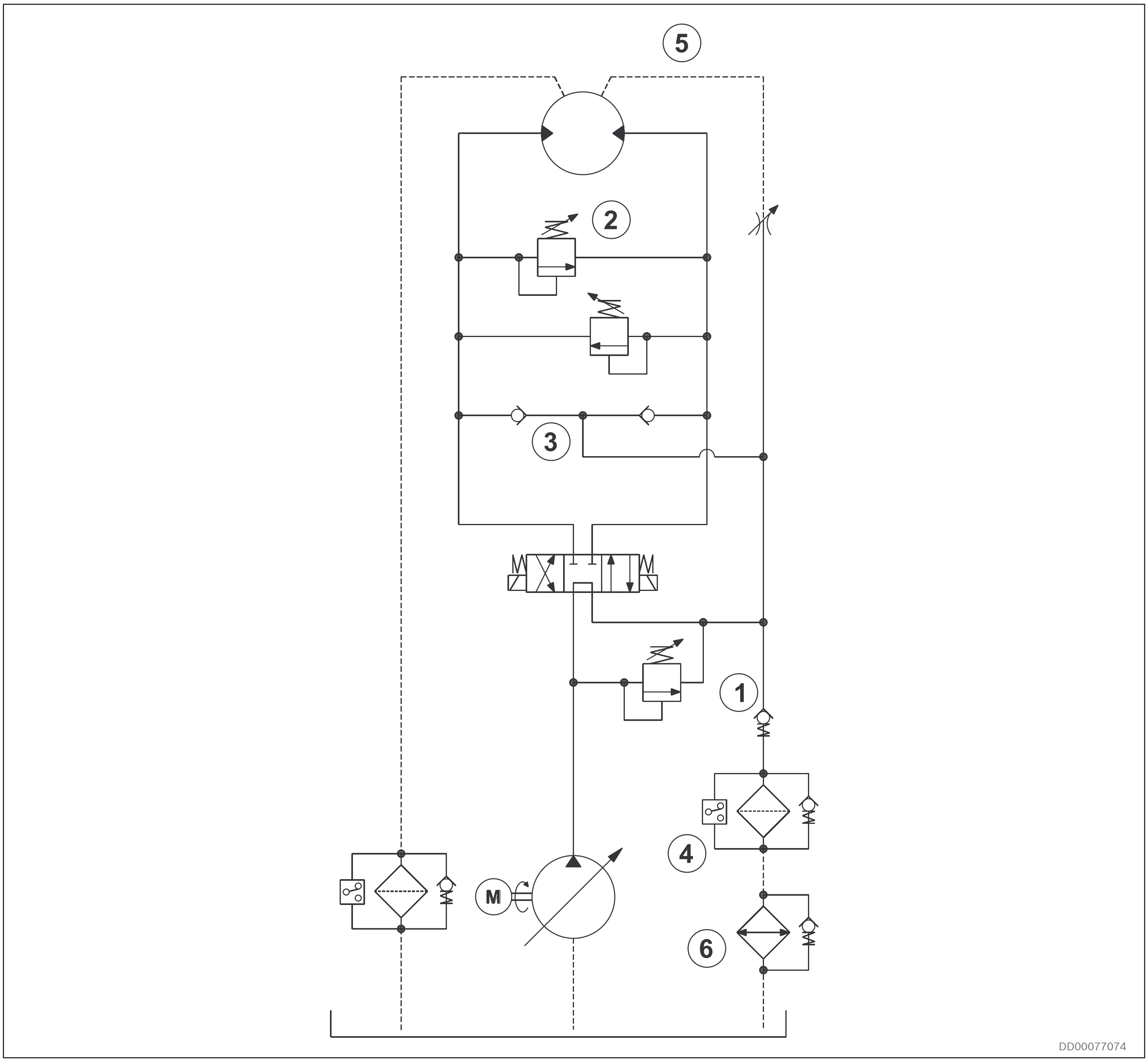


Fig. 108: Open circuit

Things to consider:

1. Counter pressure required minimum 2 bar to ensure recommended charge pressure.
2. Cross over relief valves for reduction of pressure spikes.
3. Anticavitation valves.
4. Return line filter.
5. Case flushing
6. Cooler

12 Related documents

	Title	Document no	Document type
🕮	Hägglunds CB	RE 15302-WA	Installation & maintenance manual
🕮	CB 280 S	078 5006	Dimension drawing
🕮	CB 400 S	078 5007	Dimension drawing
🕮	CB 560 S	078 5008	Dimension drawing
🕮	CB 840 S	078 5009	Dimension drawing
🕮	CB 1120 S	078 5012	Dimension drawing
🕮	CB 280 C	078 5002	Dimension drawing
🕮	CB 400 C	078 5003	Dimension drawing
🕮	CB 560 C	078 5004	Dimension drawings
🕮	CB 840 C	078 5005	Dimension drawings
🕮	CB 1120 splines, with coupling adapter	078 5011	Dimension drawings
🕮	Speed sensor, Hägglunds SPDC	RE 15350	Data Sheet
🕮	Speed sensor inductiv, Hägglunds SPDE	RE 15351	Data Sheet
🕮	Speed sensor explosion proof, Hägglunds SPDB 2 with mounting set	RE 15352	Data Sheet
🕮	Torque arms Hägglunds TCA, DTCA, DTCB	RE 15355	Data Sheet
🕮	Flushing set and Early warning kit	RE 15359	Data Sheet
🕮	Kit for harsh and marin environment	RE 15364	Data Sheet
🕮	Disc brake for Compact motors, Hägglunds BICA	RE 15366	Data Sheet
🕮	Hydraulic quick stop valve, Hägglunds VQCB 800	RE 15375	Data Sheet
🕮	Cross-over valve, Hägglunds COCB 500, COCB 1000	RE 15376	Data Sheet
🕮	Constant tension valve Hägglunds CTCA 1000	RE 15377	Data Sheet
🕮	Counter balance valve Hägglunds VCBCA 480	RE 15378	Data Sheet
🕮	Counter balance valve, Hägglunds VCBCA 1000	RE 15379	Data Sheet
🕮	Freewheeling valve, Hägglunds VFWCB 600	RE 15380	Data Sheet
🕮	Free circulation valve, Hägglunds VFCCA 1000	RE 15381	Data Sheet
🕮	Four-way valve including counter balance on load line, Hägglunds V4WCA 1000	RE 15382	Data Sheet
🕮	Hydraulic fluid quick reference	RE 15414	Data sheet

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