rexroth
A Bosch Company

Radial Piston Hydraulic motor Hägglunds CA

Valid for:

- Torque range: up to 69 kNm [up to 50 892 lb-ft]
- Speed range: up to 400 rpm
- Power range: up to 750 kW
- Maximum operating pressure: 350 bar [5 076 psi]
- Frame size: 50, 70, 100, 140 and 210
- Displacement: 1 256 to 13 200 cm^3/rev
  [76,6 to 806 in^3/rev]
- Specific torque: 20 to 210 Nm/bar
  [1 017 to 10 678 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
- Brake mounting possiblilty
- Tandem mounting possiblilty
- Up to three speed possibility

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 CA motor:

CA		50		50		S	A	0	N	0	C		02		00
01		03		04		05	06	07	08	09	10		11		12*

01	**Motor series**	
	Compact	**CA**

03	**Frame size**	
	CA 50	**50**
	CA 70	**70**
	CA 100	**100**
	CA 140	**140**
	CA 210	**210**

04	**Nominal size , specific torque, Nm/bar** *(see section 4.3)*					
	Frame size 50	**20**	**25**	**32**	**40**	**50**
		●	●	●	●	●
	Frame size 70		**40**	**50**	**60**	**70**
			●	●	●	●
	Frame size 100	**40**	**50**	**64**	**80**	**100**
		●	●	●	●	●
	Frame size 140		**80**	**100**	**120**	**140**
			●	●	●	●
	Frame size 210			**160**	**180**	**210**
				●	●	●

05	**Mounting alternatives, shaft**	
	Splines	**S**
	Shrink disc coupling	**C**

06	**Motor prepared for brake or tandem kit**	
	Motor not prepared for brake or tandem kit	**A**
	Motor prepared for brake or tandem kit [1)]	**B**

07	**Displacement shift** *(see section 5)*		
	Single speed motor	●	**0**
	2-speed motor, rotation clockwise (As viewed from shaft side and inlet to A port)	●	**R**
	2-speed motor, rotation counter clockwise (As viewed from shaft side and inlet to A port)	●	**L**

08	**Type of seal** *(see section 6)*		
	NBR (Nitrile)	●	**N**
	FPM (Viton)	●	**V**

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

10	**Increased robustness** *(see section 8)*		
	No	●	**0**
	Yes, standard DLC coating	●	**C**
	Yes, coating for increased starting efficiency	●	**D**

11	**Modification**	
	Current modification	**02**

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

● = Available – Not available

1) Brake and TA kit must be ordered separately

*) See section 9 for released special index

2 FUNCTIONAL DESCRIPTION

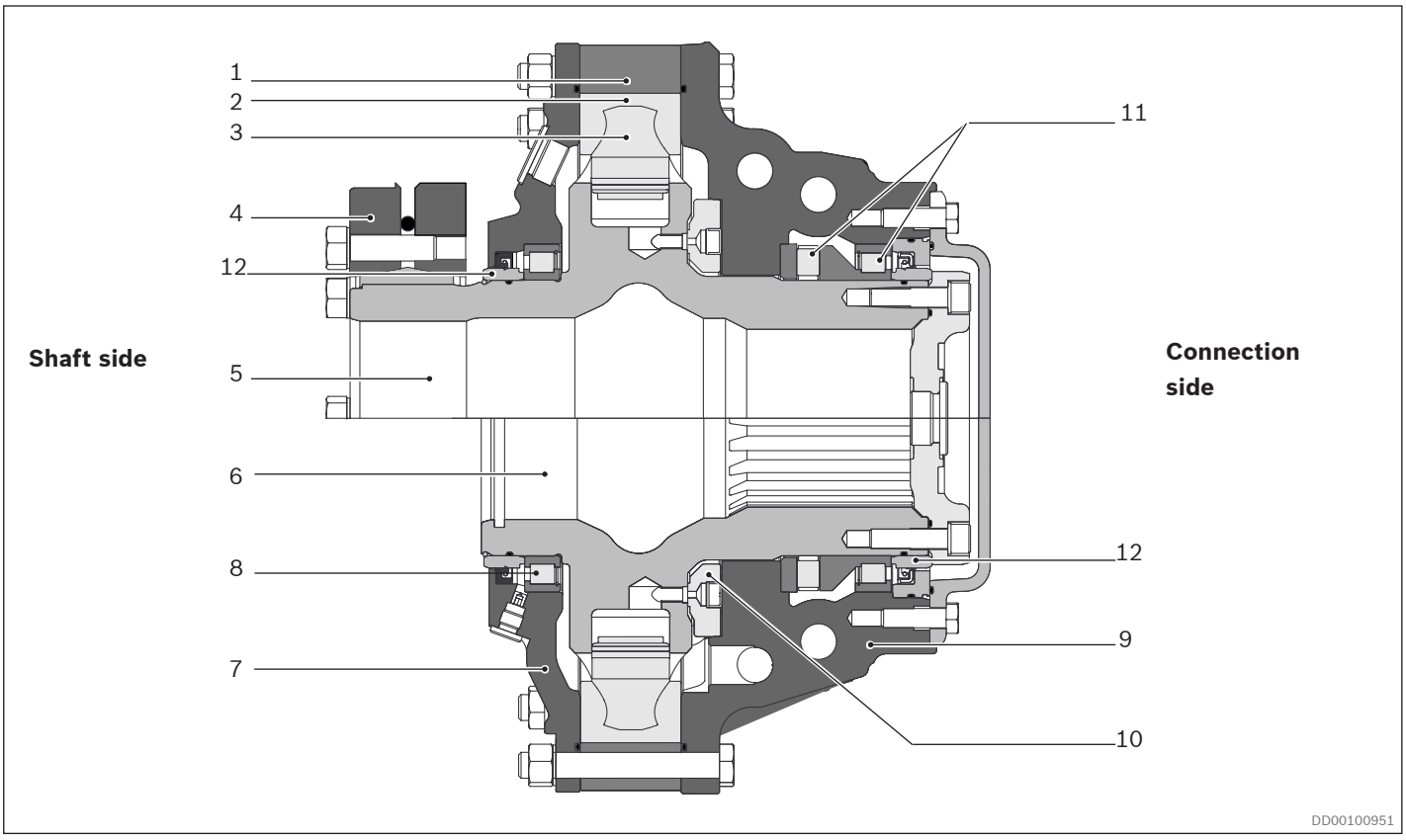


Fig. 1: Section view of radial piston hydraulic motor

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

Bosch Rexroth‘s hydraulic industrial motor Hägglunds CA 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 cylinder block. The torque is transmitted by splines or shrink disc coupling.

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

3 FLUID CONNECTIONS

3.1 Hydraulic symbol

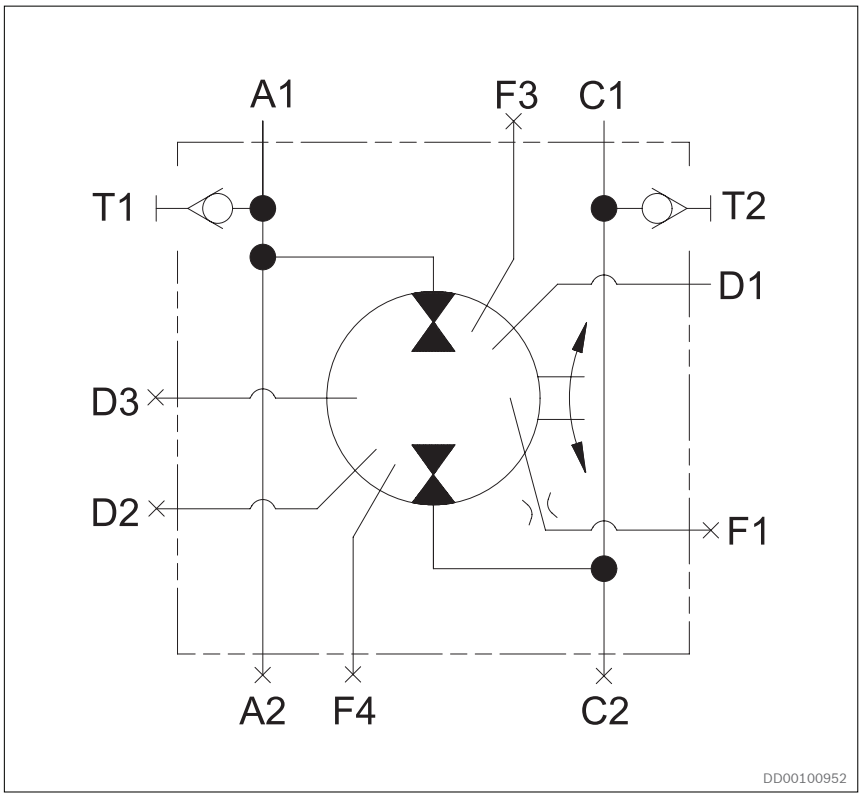


Fig. 2: Hydraulic symbol

Port locations and dimensions, see *Table 1, Fig. 3 and Fig. 4*

3.2 Port connections

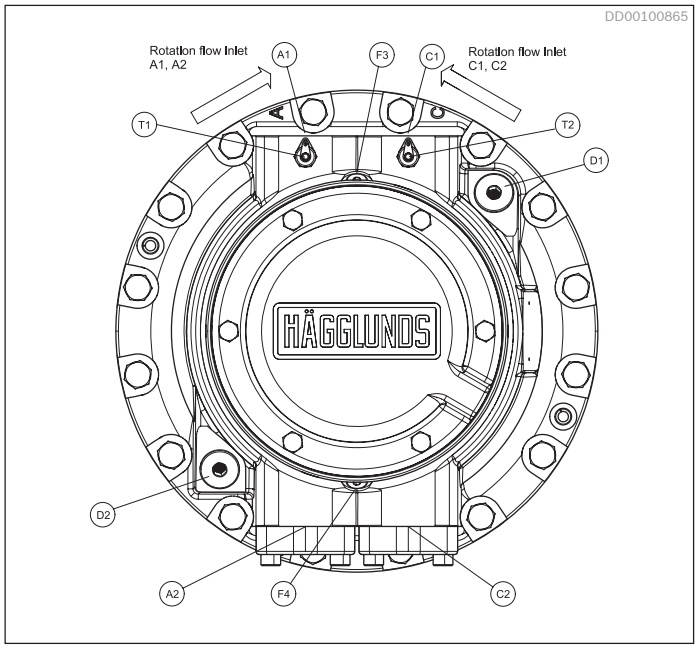


Fig. 3: Connection side of the motor

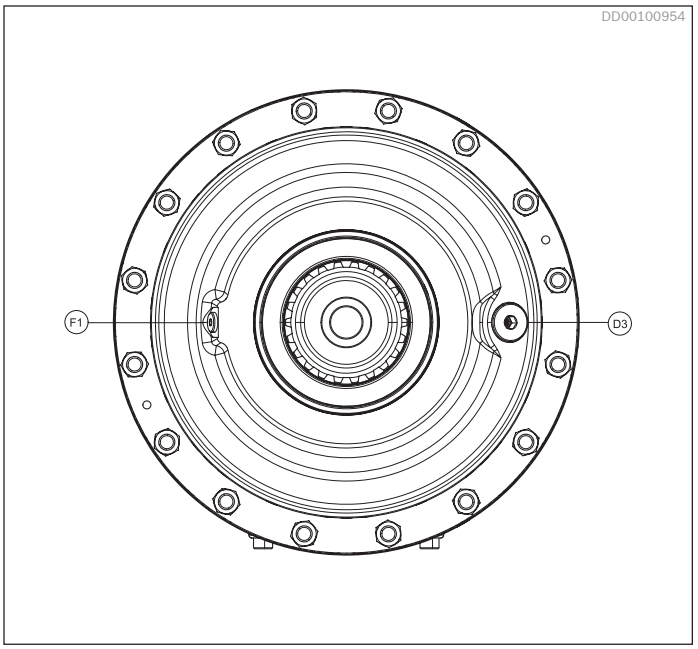


Fig. 4: Shaft side of the motor

Table 1: Port dimensions

Connection	Description	Dimensions	Remarks
A1, A2	Main connection	1 1/4" *	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" *	If C is used as the inlet, the motor shaft rotates clockwise, viewed from the motor shaft side
D1	Drain connection	G 3/4"	
D2	Alternative drain connection	G 3/4"	
D3	Alternative drain connection	G 3/4"	
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
F1	Flushing connections	G 1/4"	For flushing of radial lip seal
F3, F4	Flushing connections	G 1/4"	For flushing of motor housing and radial lip seal

*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				
			CA 50	**CA 70**	**CA 100**	**CA 140**	**CA 210**
Type of mounting			See section *11: 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	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 <280 rpm	bar	3	3	3	3	3
	>280 rpm	bar	2	2	2	2	2
	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	2.0	2.5	3.7	5.0	6.8
Moment of inertia for rotary group							
	Motor with splines	$kg \cdot m^2$	1.0	1.4	1.9	2.8	3.4
	Motor with shaft coupling	$kg \cdot m^2$	1.4	1.8	2.5	3.4	4.4
Weight							
	Motor with splines	kg	175	205	265	305	395
	Motor with shaft coupling	kg	203	232	310	347	456

[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.

Table 4: General data (US)

			Frame size				
			CA 50	**CA 70**	**CA 100**	**CA 140**	**CA 210**
Type of mounting			See section *11: 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	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 <280 rpm	psi	44	44	44	44	44
	>280 rpm	psi	29	29	29	29	29
	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	0.53	0.66	0.98	1.32	1.80
Moment of inertia for rotary group							
	Motor with splines	lb·ft²	23.7	33.0	45.0	66.0	80.0
	Motor with shaft coupling	lb·ft²	33.0	43.0	59.0	80.0	104.0
Weight							
	Motor with splines	lb	437	450	584	672	870
	Motor with shaft coupling	lb	447	512	683	765	1005

[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

4.3 Motor data

Table 5: Specific data (metric)

Frame size	Nominal size	Full displacement						Displacement shift		
		Specific torque	Displacement	Maximum torque [1]	Maximum speed [2]	Maximum operating pressure [3]	Maximum operating power [4]	Specific torque	Displacement	Maximum speed
		Nm/bar	cm3/rev	kNm	rpm	*p* bar	kW	Nm/bar	cm3/rev	rpm
CA 50	20	20	1256	6.6	400	350	275	Not recommended to be used in reduced displacement		
	25	25	1570	8.2	400	350	344			
	32	32	2010	11	400	350	440			
	40	40	2512	13	350	350	481	20	1256	350
	50	50	3140	16	280	350	481	25	1570	280
CA 70	40	40	2512	13	400	350	550			
	50	50	3140	16	320	350	550	25	1570	320
	60	60	3771	20	275	350	567	30	1886	275
	70	70	4400	23	240	350	578	35	2200	240
CA 100	40	40	2512	13	400	350	550			
	50	50	3140	16	400	350	688			
	64	64	4020	21	390	350	858			
	80	80	5024	26	310	350	853	40	2512	310
	100	100	6280	33	270	350	928	50	3140	270
CA 140	80	80	5024	26	340	350	935			
	100	100	6280	33	275	350	946	50	3140	275
	120	120	7543	39	245	350	1011	60	3771	245
	140	140	8800	46	220	350	1059	70	4400	220
CA 210	160	160	10051	53	150	350	825	80	5026	150
	180	180	11314	59	135	350	835	90	5657	135
	210	210	13200	69	115	350	830	105	6600	115

[1] Calculated as: Metric = Ts • (350-15) • 0,98
[2] Viton seals are recommended for speeds above 280 rpm
[3] The motors are designed according to DNV-rules. Test pressure 420 bar. Peak pressure 420 bar maximum, allowed up to 10 000 times.
[4] Flushing of motor case is required. See section *4.10: Flushing*

Table 6: Specific data (US)

Frame size	Nominal size	Full displacement						Displacement shift		
		Specific torque	Displacement	Maximum torque [1]	Maximum speed [2]	Maximum operating pressure [3]	Maximum operating power [4]	Specific torque	Displacement	Maximum speed
		lbf·ft/1000 psi	in3/rev	lbf·ft	rpm	*p* psi	hp	lbf·ft/1000 psi	in3/rev	rpm
CA 50	20	1017	76.6	4868	400	5000	369	Not recommended to be used in reduced displacement		
	25	1271	95.8	6048	400	5000	461			
	32	1627	122.6	8113	400	5000	590			
	40	2034	153.3	9588	350	5000	645	1017	76.7	350
	50	2543	191.6	11801	280	5000	645	1271	95.8	280
CA 70	40	2034	153.3	9588	400	5000	738			
	50	2543	191.6	11801	320	5000	738	1271	95.8	320
	60	3051	230.1	14751	275	5000	760	1526	115.1	275
	70	3560	268.5	16964	240	5000	775	1780	134.3	240
CA 100	40	2034	153.3	9588	400	5000	738			
	50	2543	191.6	11801	400	5000	923			
	64	3254	245.3	15489	390	5000	1151			
	80	4068	306.6	19177	310	5000	1144	2034	153.3	310
	100	5085	383.2	24340	270	5000	1244	2543	191.6	270
CA 140	80	4068	306.6	19177	340	5000	1254			
	100	5085	383.2	24340	275	5000	1269	2543	191.6	275
	120	6102	460.3	28765	245	5000	1356	3050	230.1	245
	140	7119	537.0	33928	220	5000	1420	3560	268.5	220
CA 210	160	8136	613.2	39091	150	5000	1106	4068	306.7	150
	180	9154	690.4	43516	135	5000	1120	4577	345.2	135
	210	10678	805.5	50892	115	5000	1113	5339	402.8	115

[1] Calculated as: US = Ts • (5076-215) • 0,98
[2] Viton seals are recommended for speeds above 280 rpm
[3] The motors are designed according to DNV-rules. Test pressure 6000 psi. Peak pressure 6000 psi maximum, allowed up to 10 000 times.
[4] Flushing of motor case is required. See section *4.10: Flushing*

4.4 Recommended charge pressure

The hydraulic system must be such that the motor will recieve sufficient charge pressure at the charge pressure port (low 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 (low 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

For motors working in braking mode (pump mode), the required charge pressure at the **inlet** port is according to diagram. See *Fig. 5 and Fig. 6.*

4.4.3 The motor working in 2-speed mode

The motor is used with a 2-speed valve, VTCA 600. Required charge pressure at inlet port for valve is according to diagram. See *Fig. 5 and Fig. 6*

Note!

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

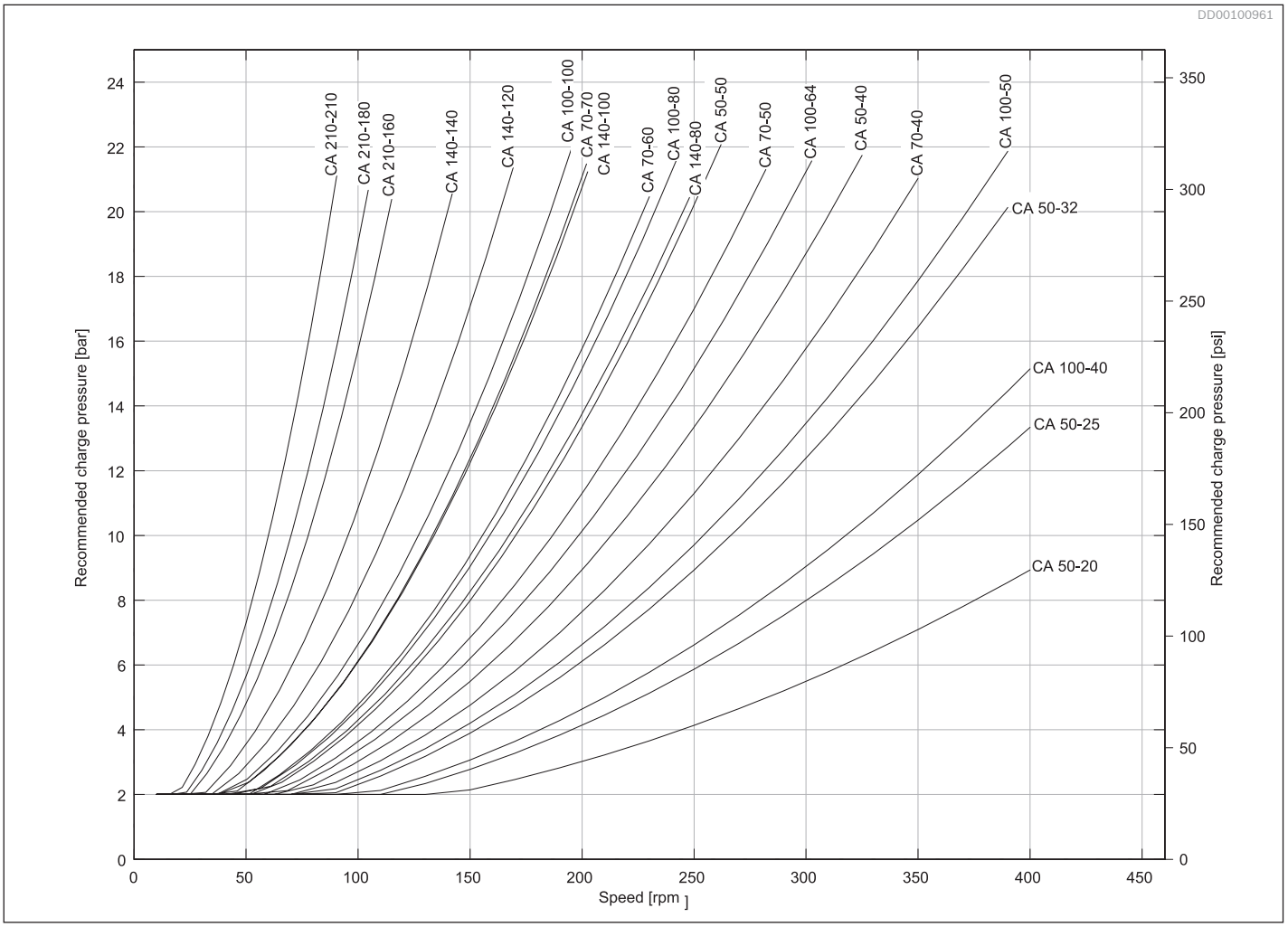


Fig. 5: Recommended charge pressure for motor workning in braking mode (pump mode), 2-port connection. Valid for oil viscosity 40 cSt.

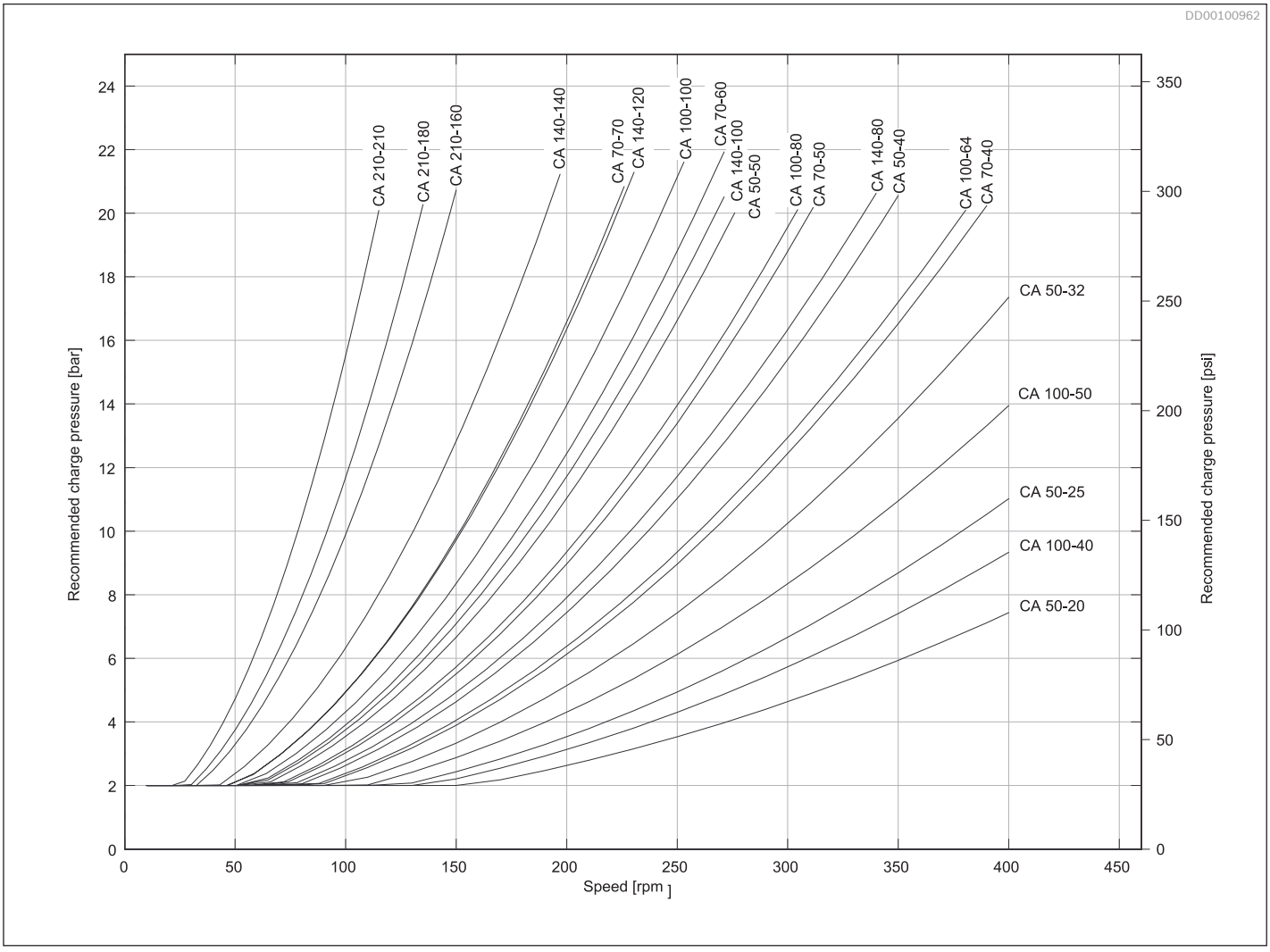


Fig. 6: Recommended charge pressure for motor workning in braking mode (pump mode), 4-port connection. Valid for oil viscosity 40 cSt.

4.5 Hydraulic fluids

The hydraulic motor Hägglunds CA 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. 7*. General recommendation is to have a system temperature of 50°C, see dotted line in *Fig. 7*. 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 10 000 cSt imparts unnecessary strain on parts.
- Running below 30 cSt may impact service life.
- Running below 20 cSt (10 cSt for option C-coated motors) 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)*.

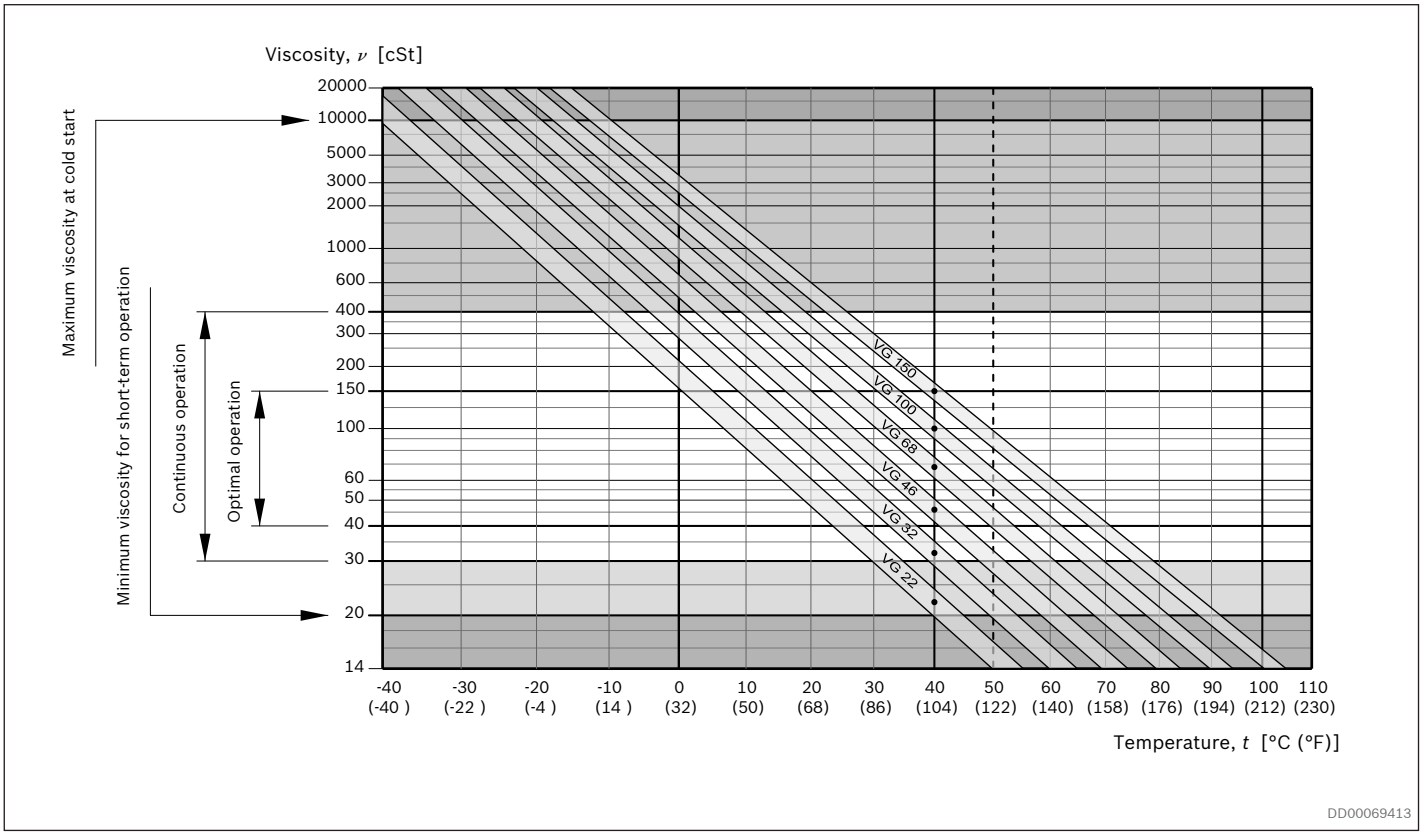


Fig. 7: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100

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.

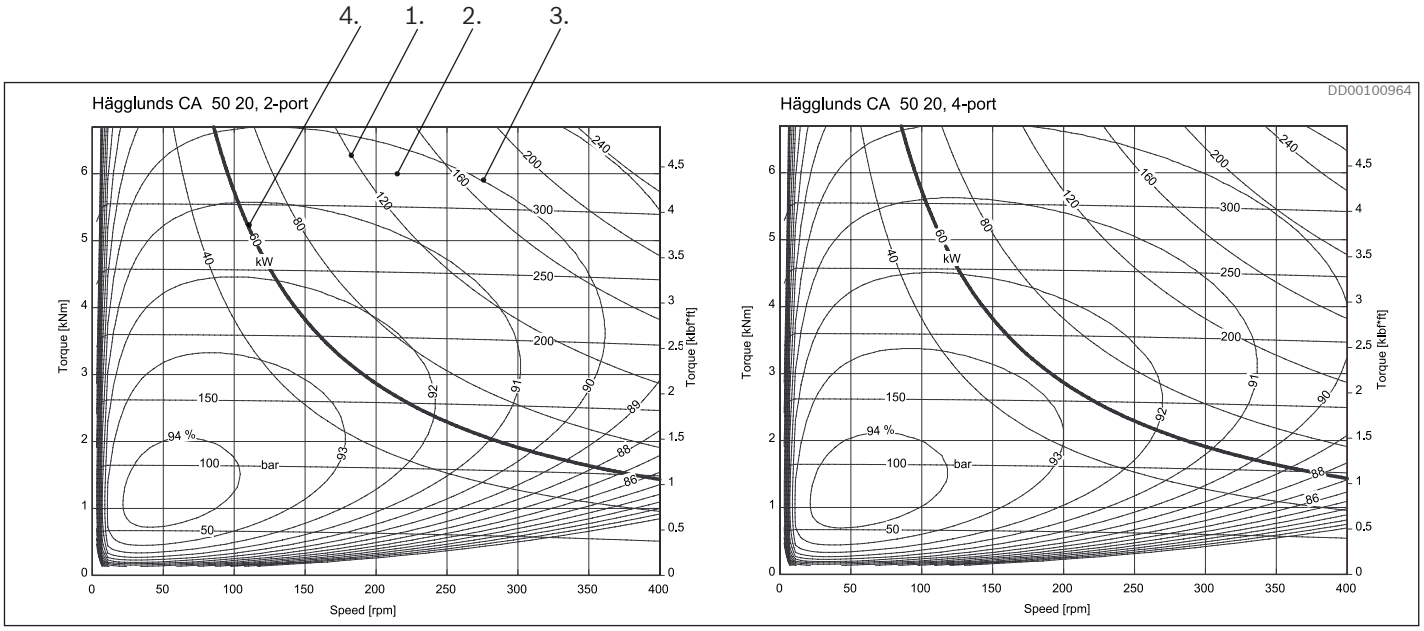


Fig. 8: CA 50 20

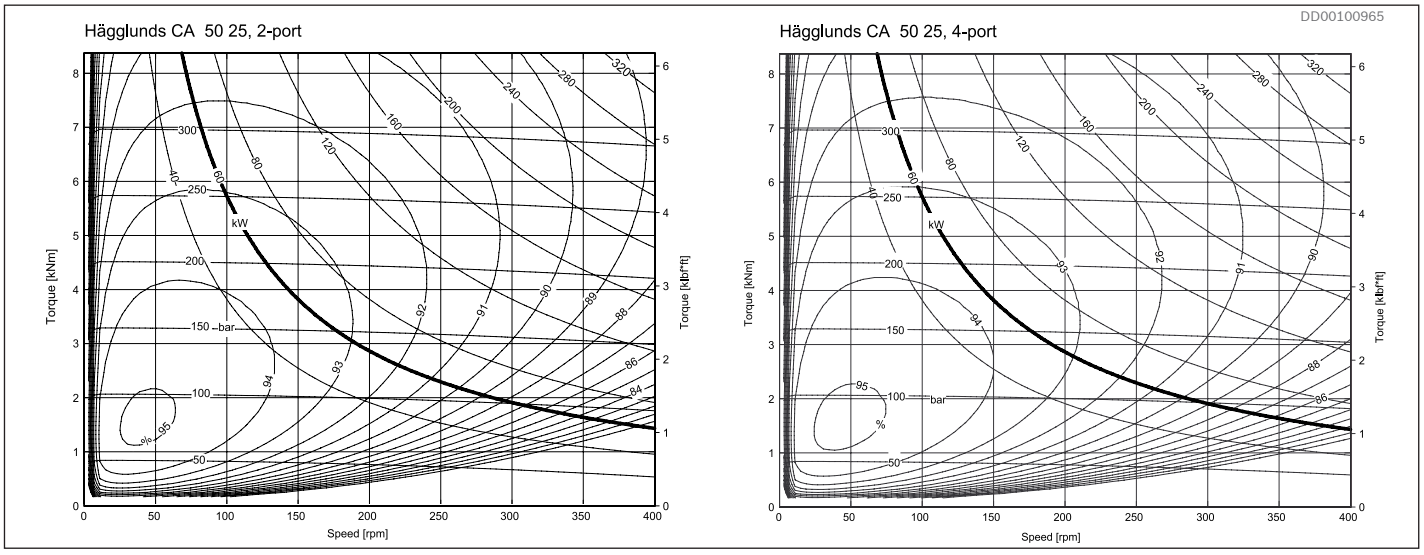


Fig. 9: CA 50 25

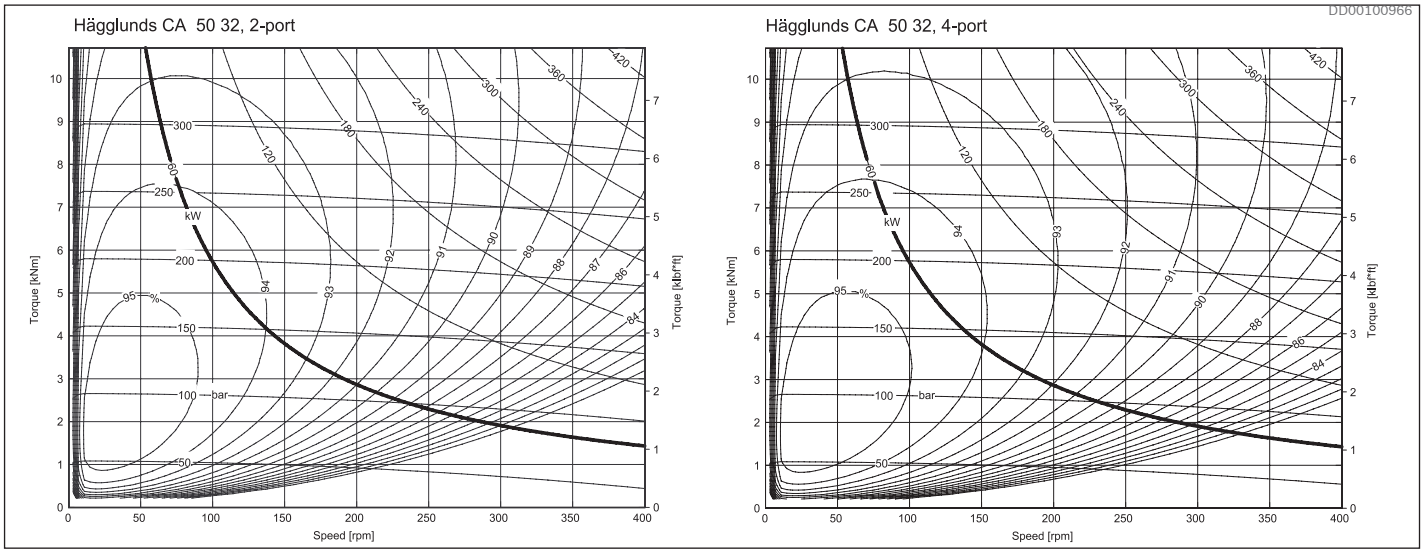


Fig. 10: CA 50 32

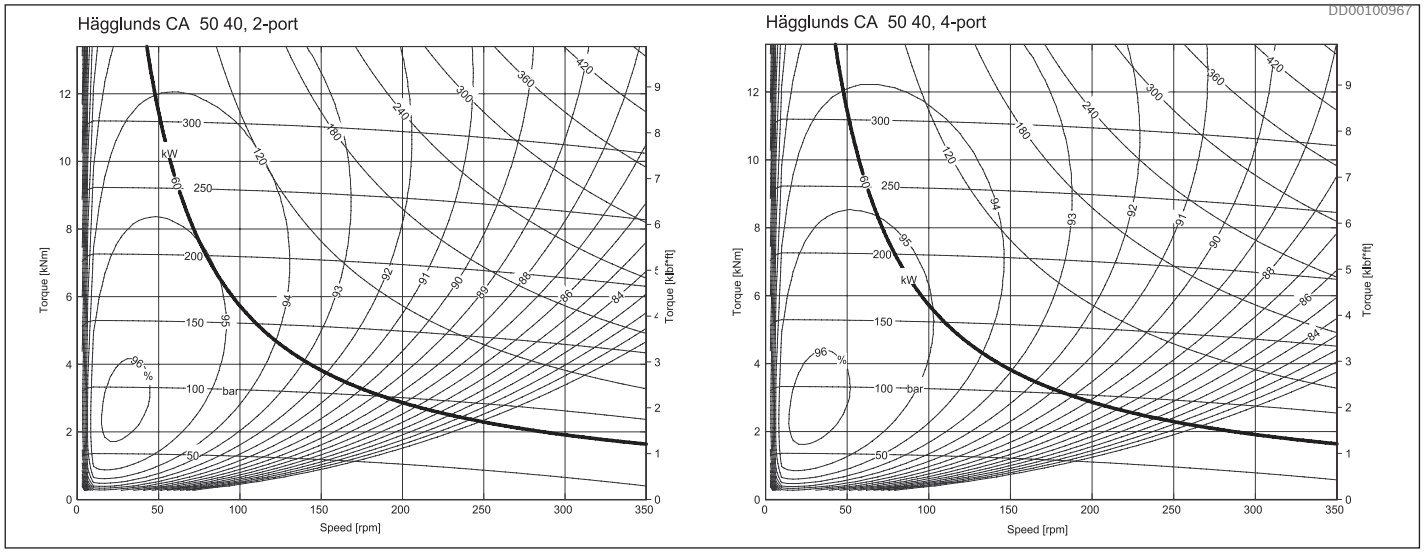


Fig. 11: CA 50 40

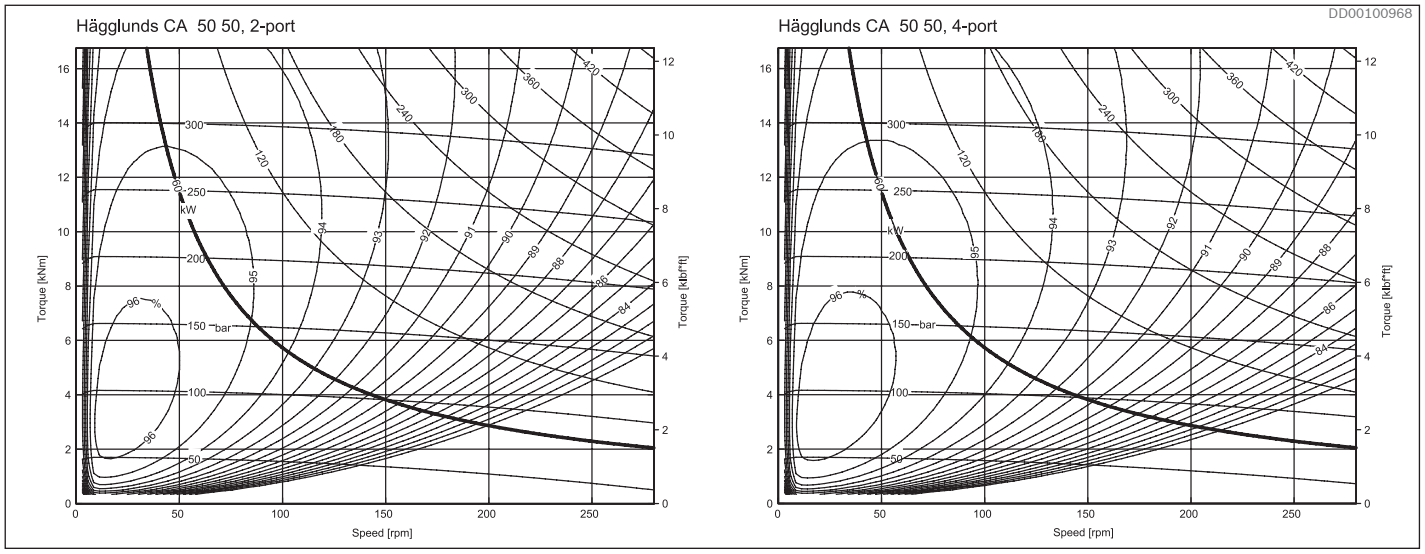


Fig. 12: CA 50 50

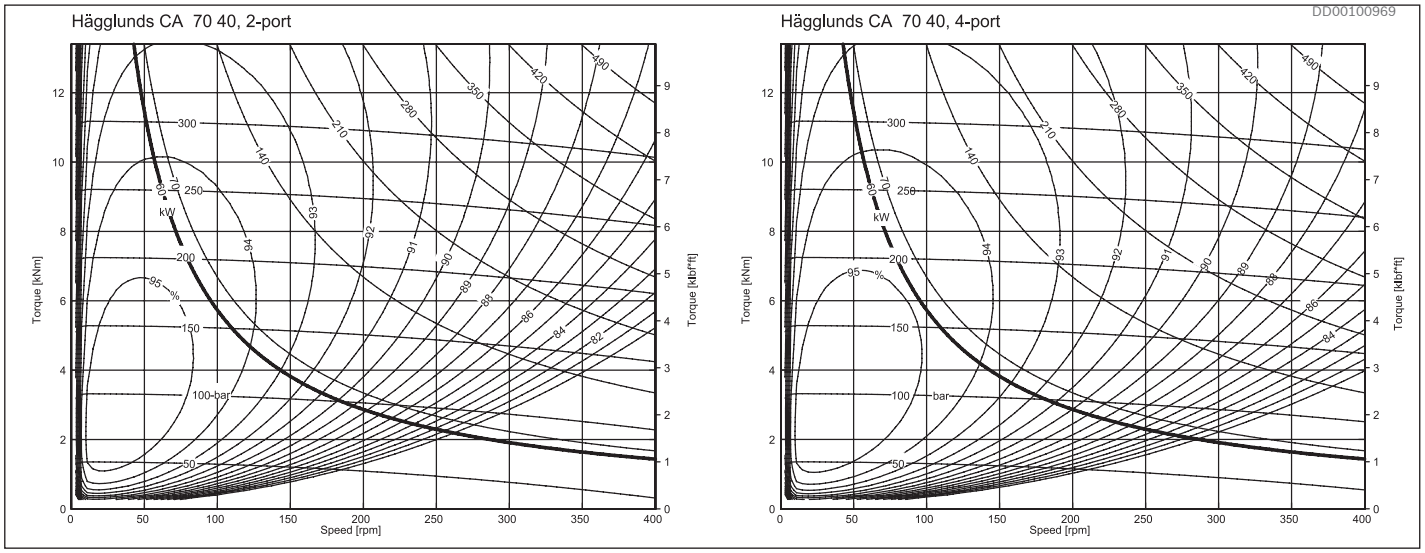


Fig. 13: CA 70 40

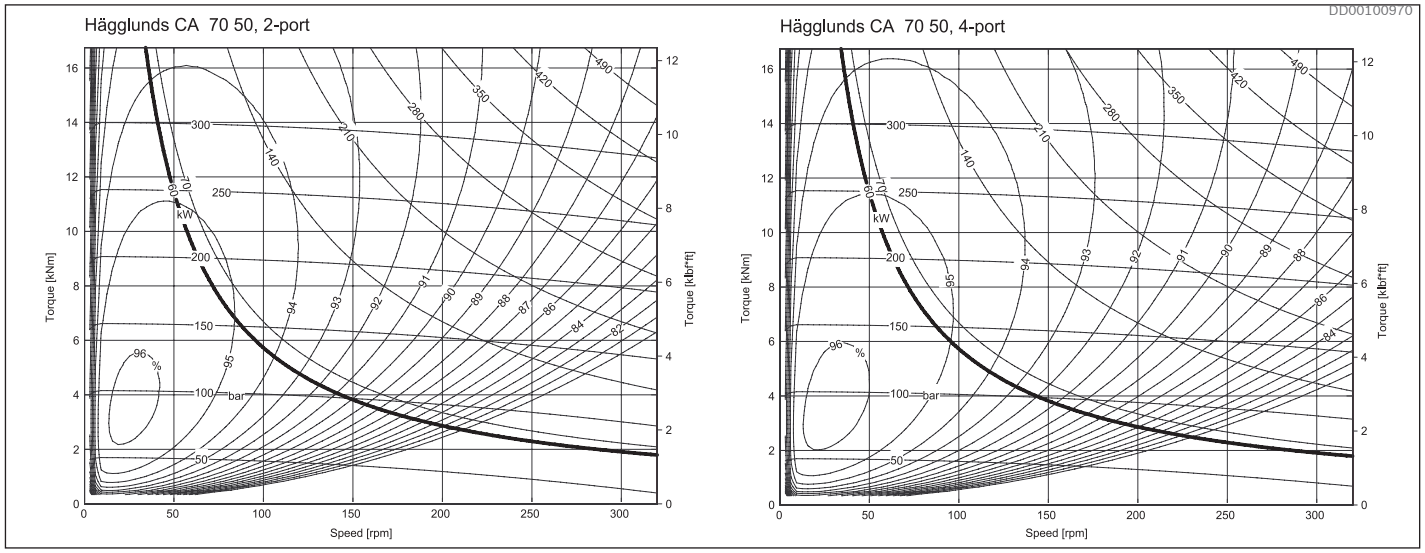


Fig. 14: CA 70 50

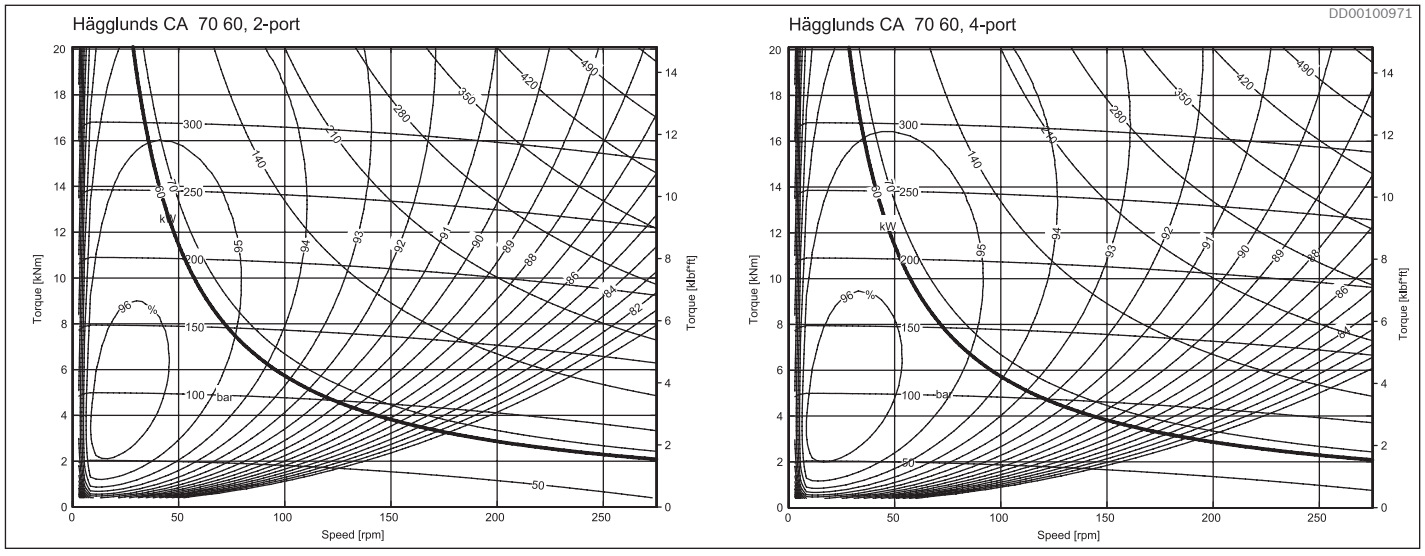


Fig. 15: CA 70 60

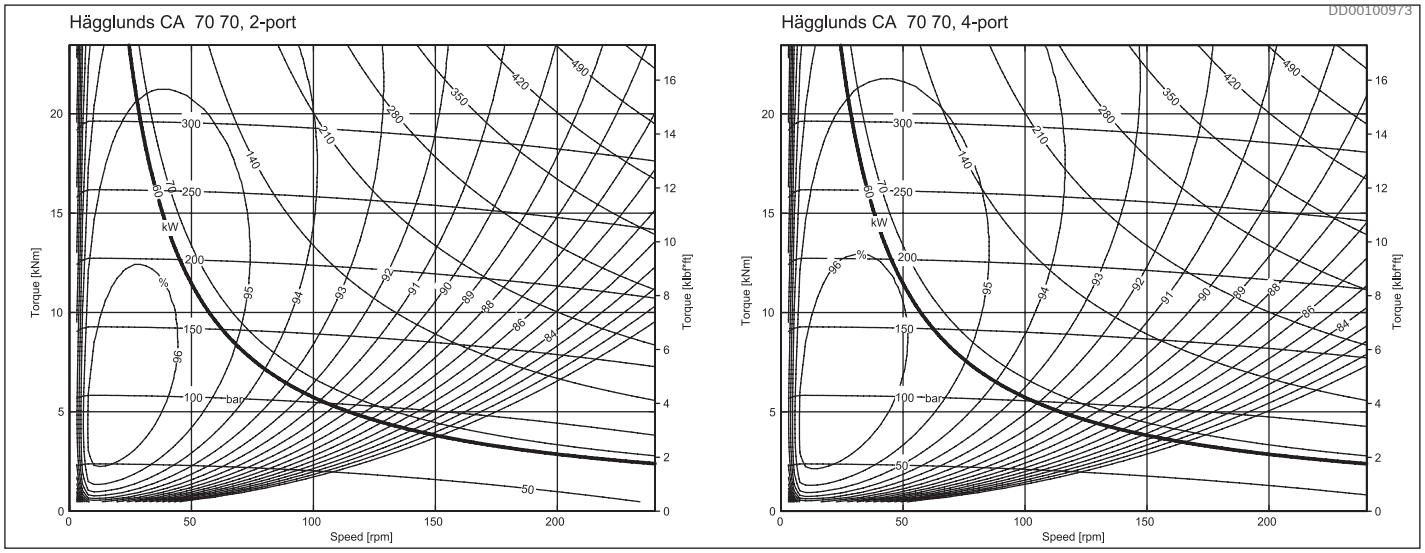


Fig. 16: CA 70 70

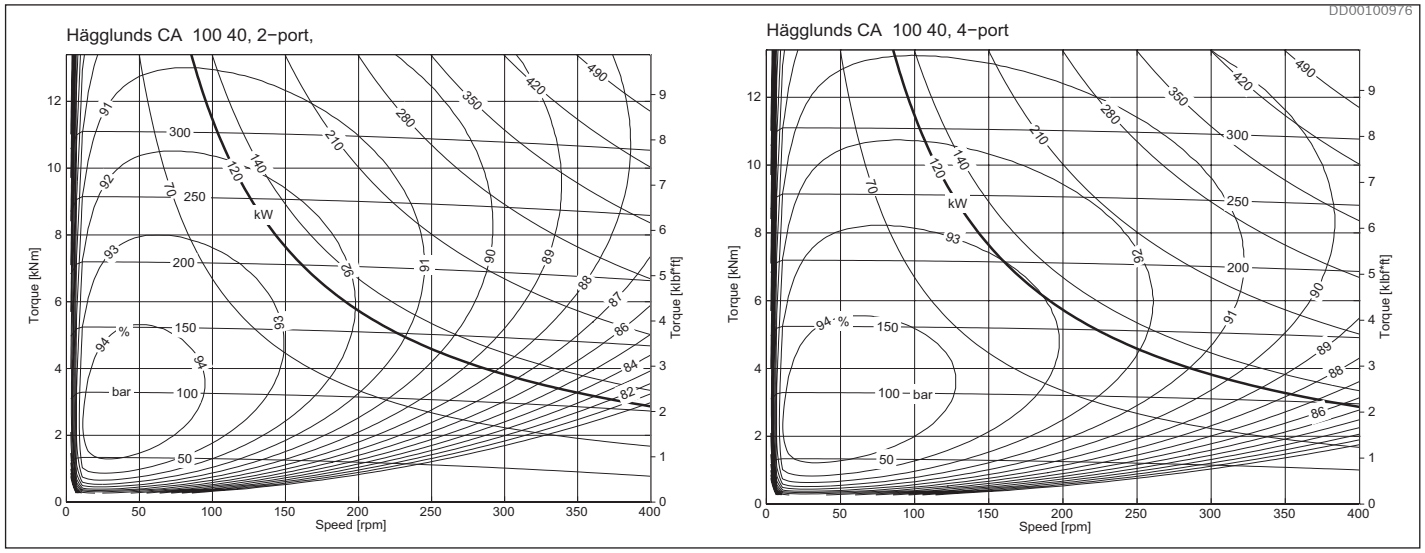


Fig. 17: CA 100 40

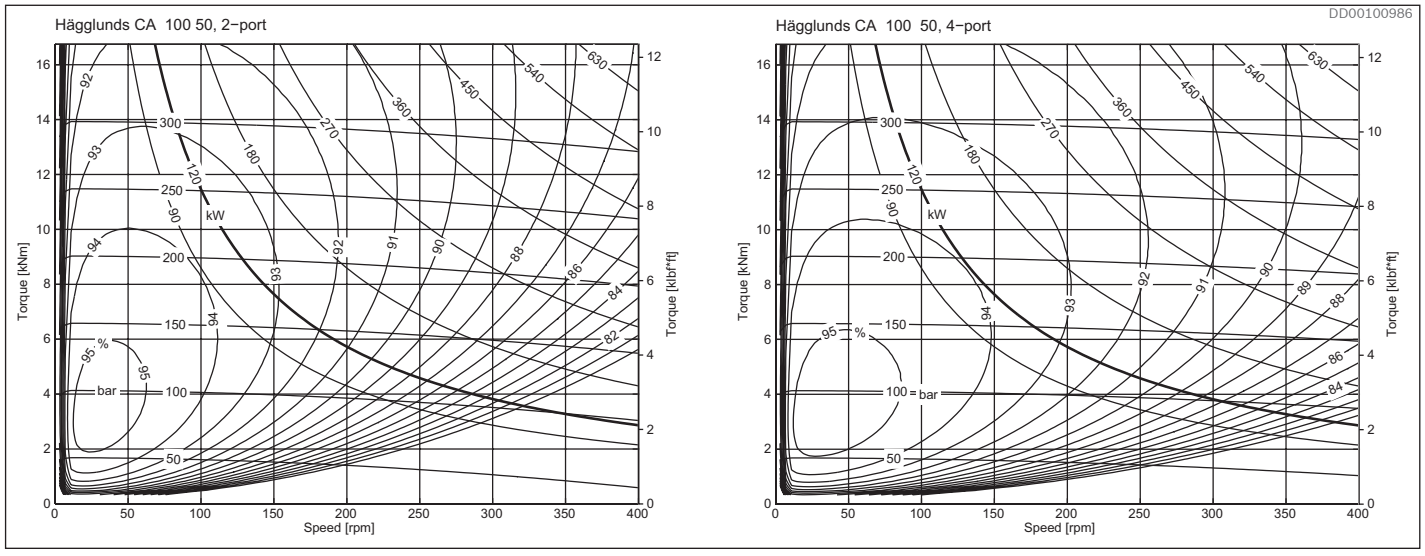


Fig. 18: CA 100 50

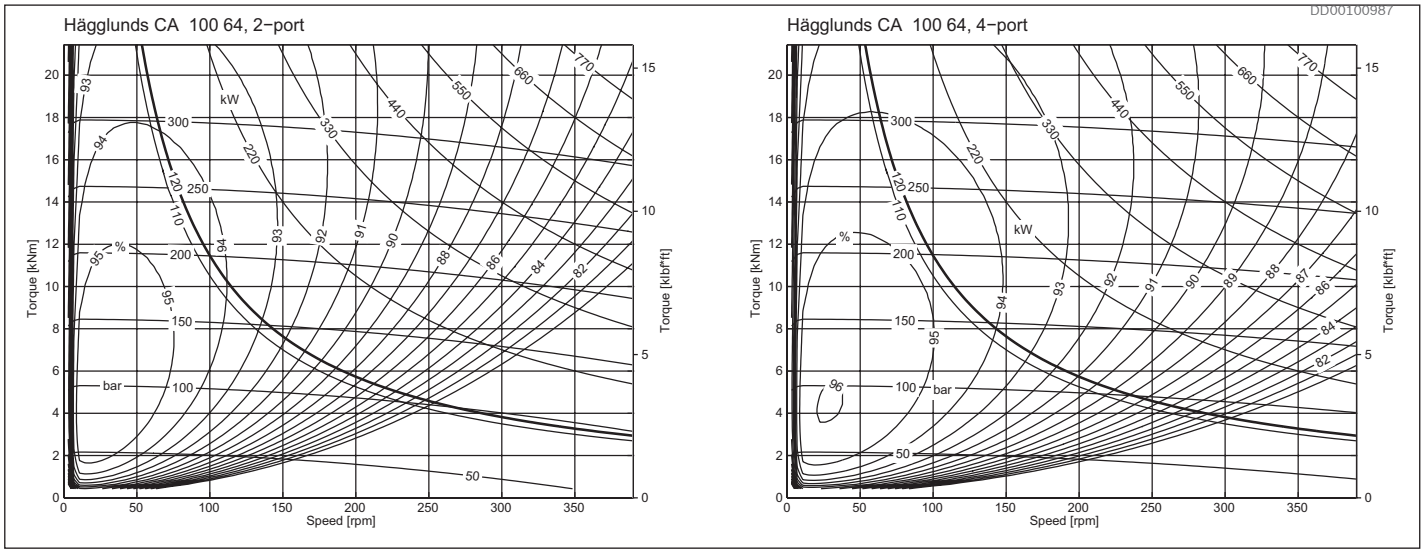


Fig. 19: CA 100 64

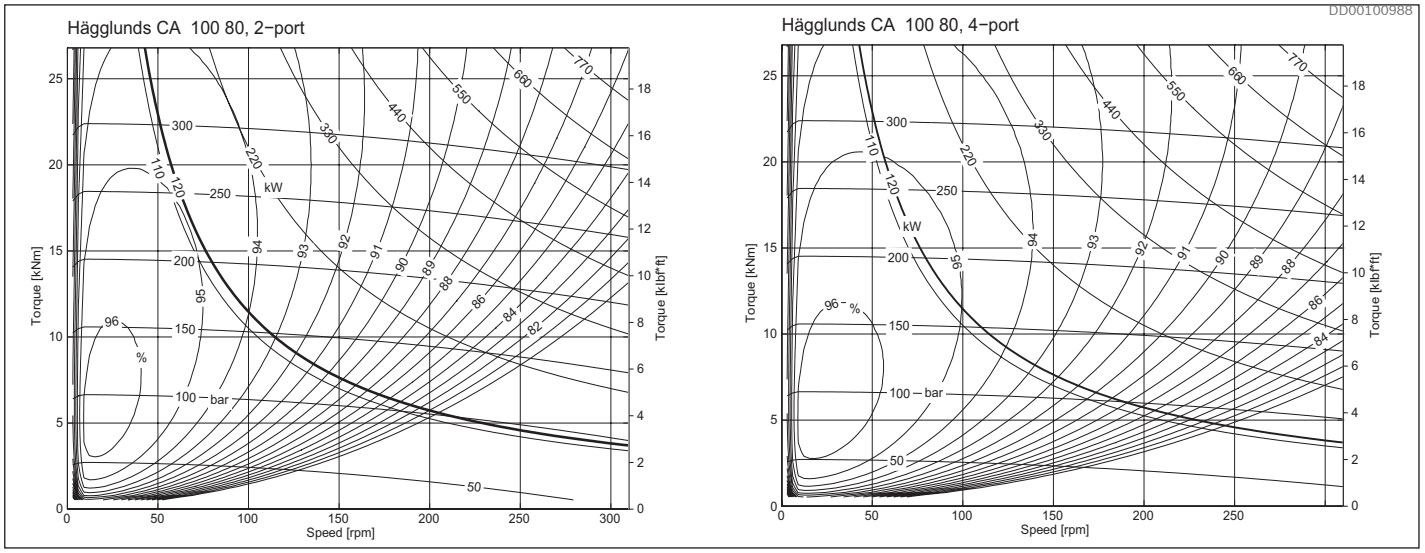


Fig. 20: CA 100 80

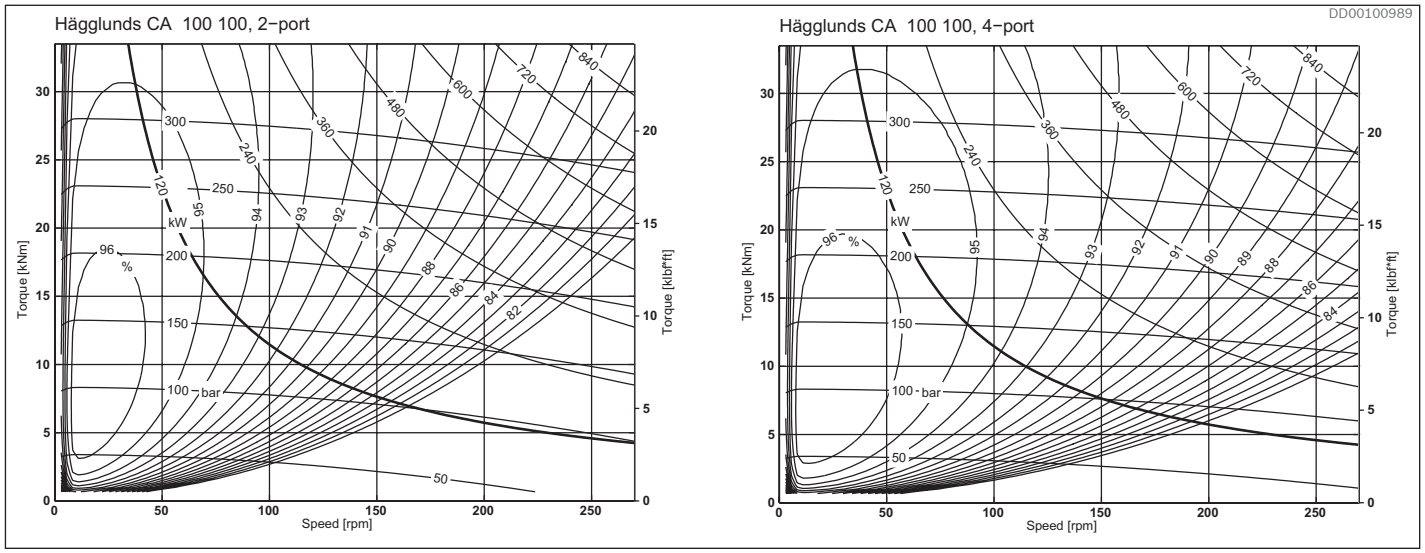


Fig. 21: CA 100 100

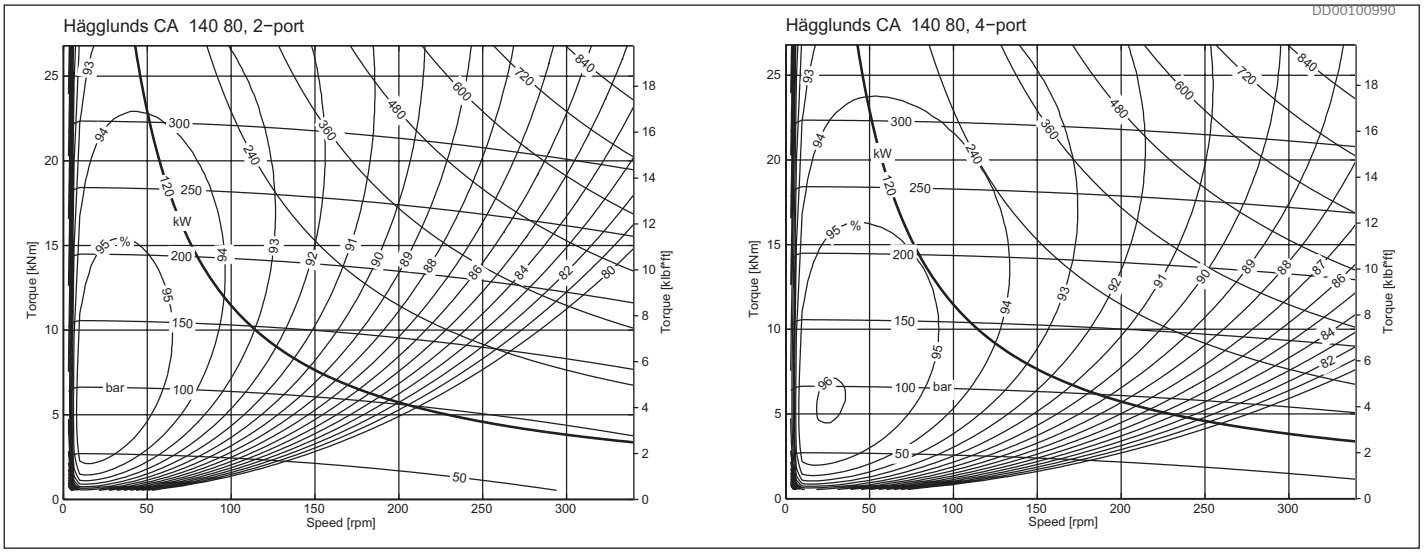


Fig. 22: CA 140 80

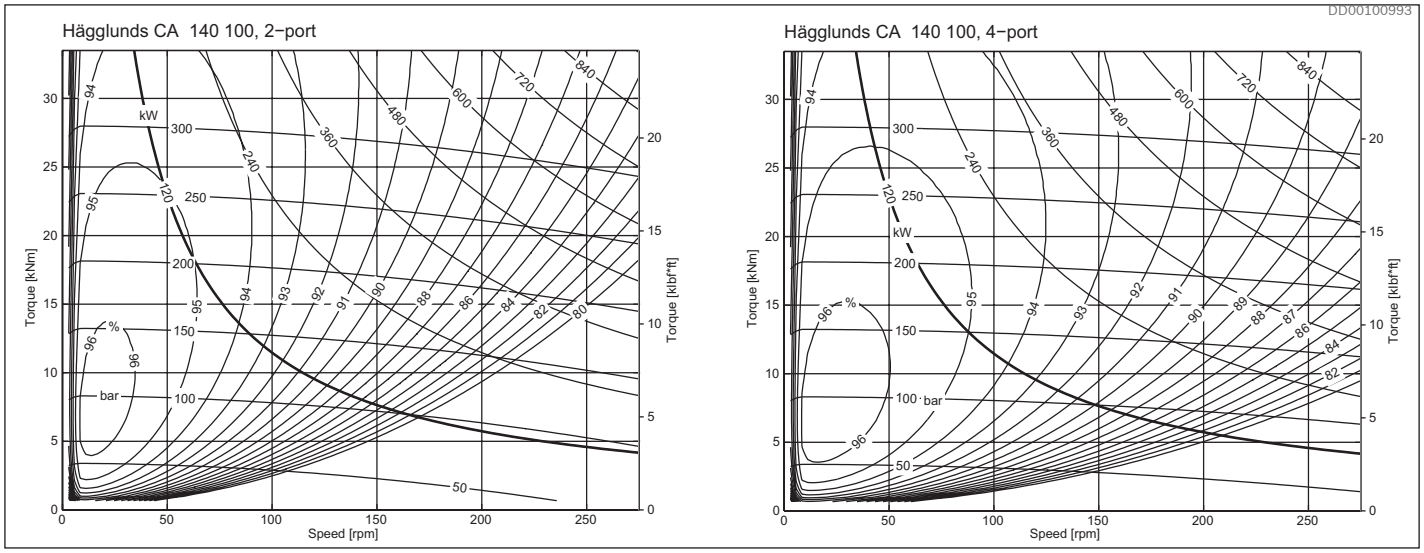


Fig. 23: CA 140 100

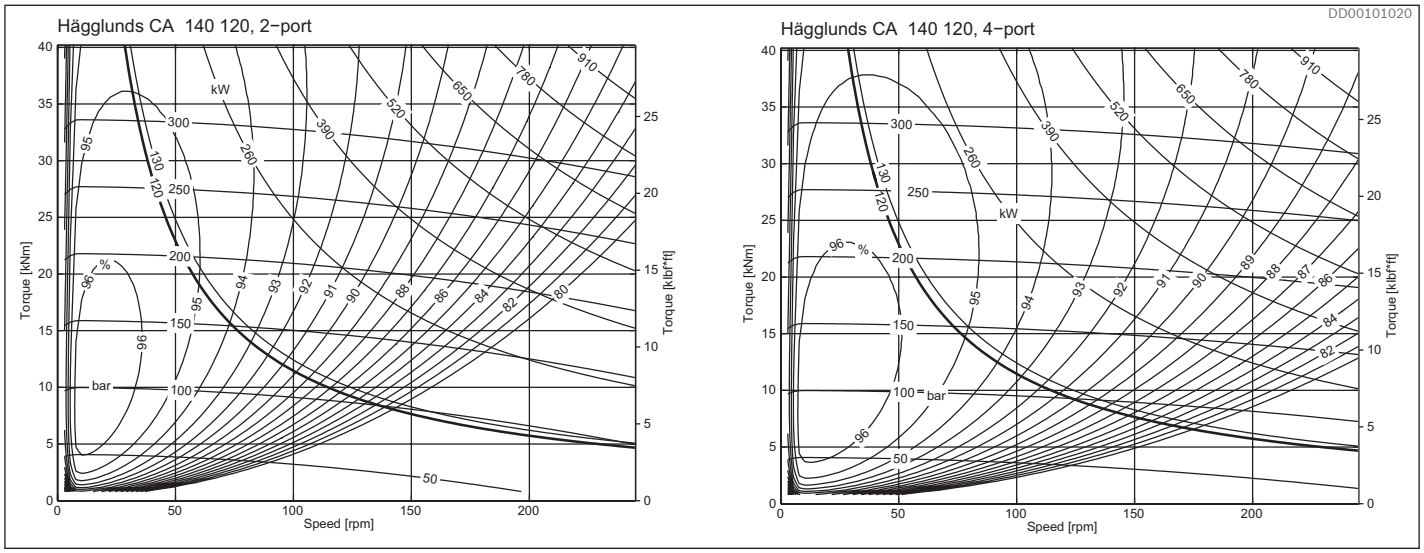


Fig. 24: CA 140 120

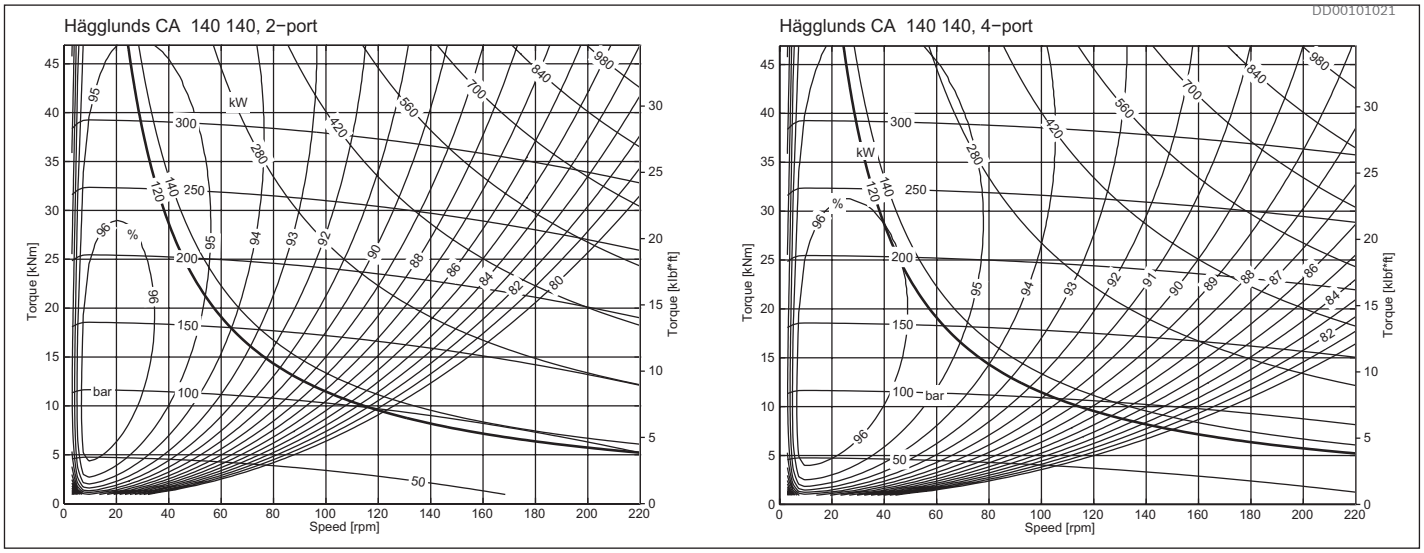


Fig. 25: CA 140 140

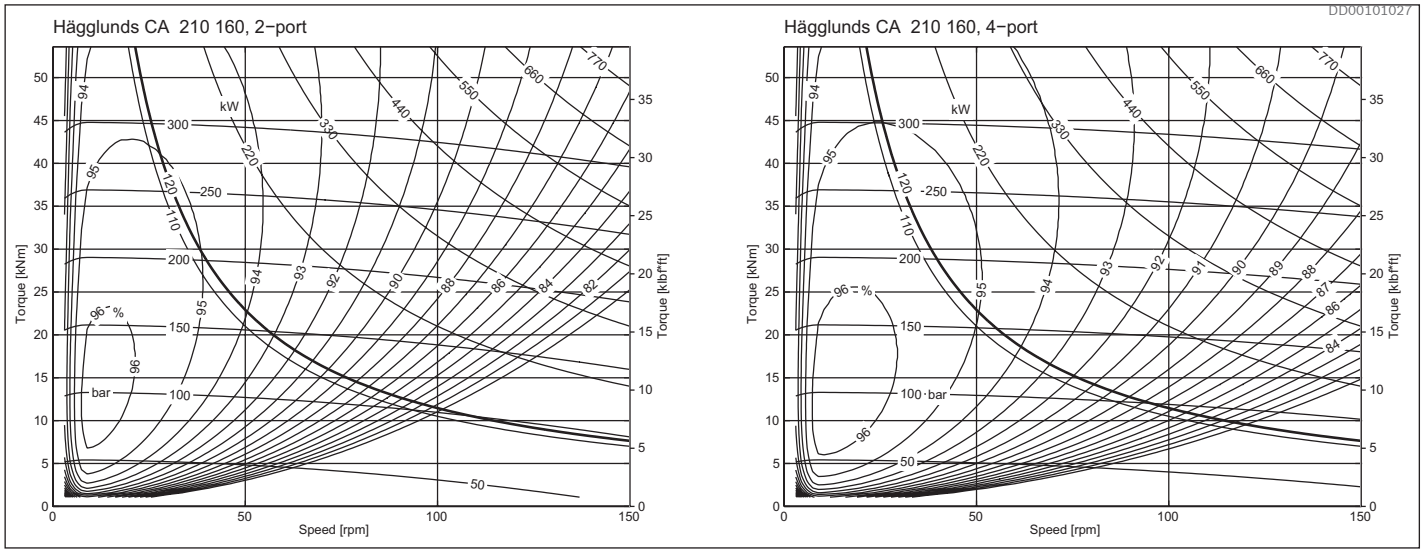


Fig. 26: CA 210 160

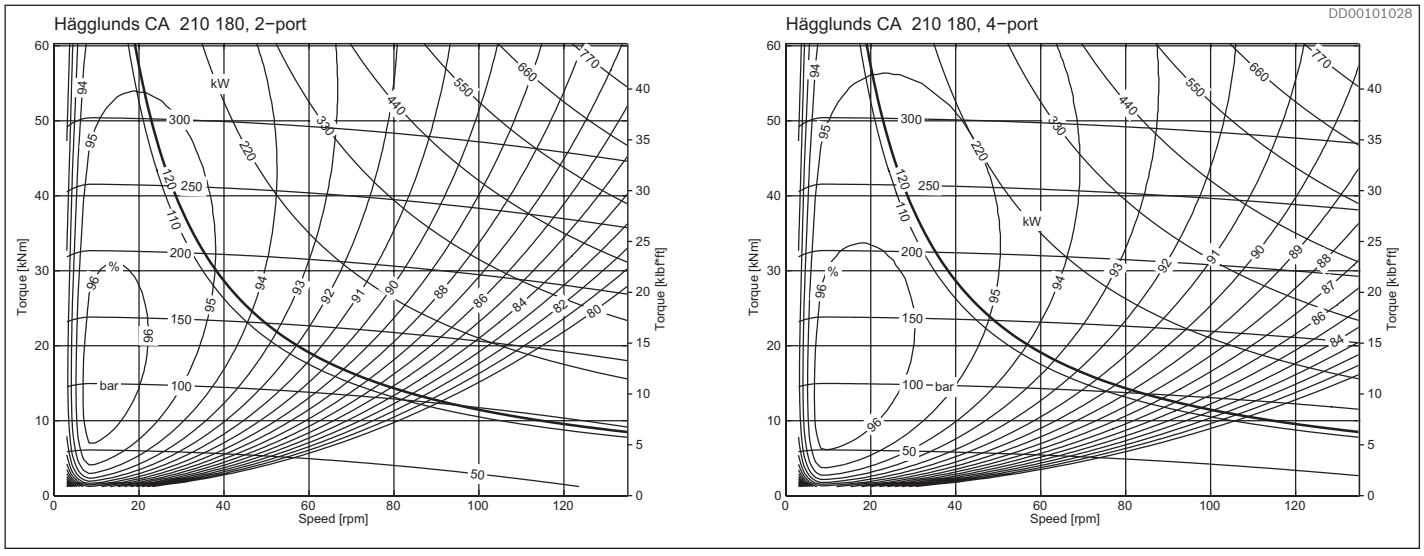


Fig. 27: CA 210 180

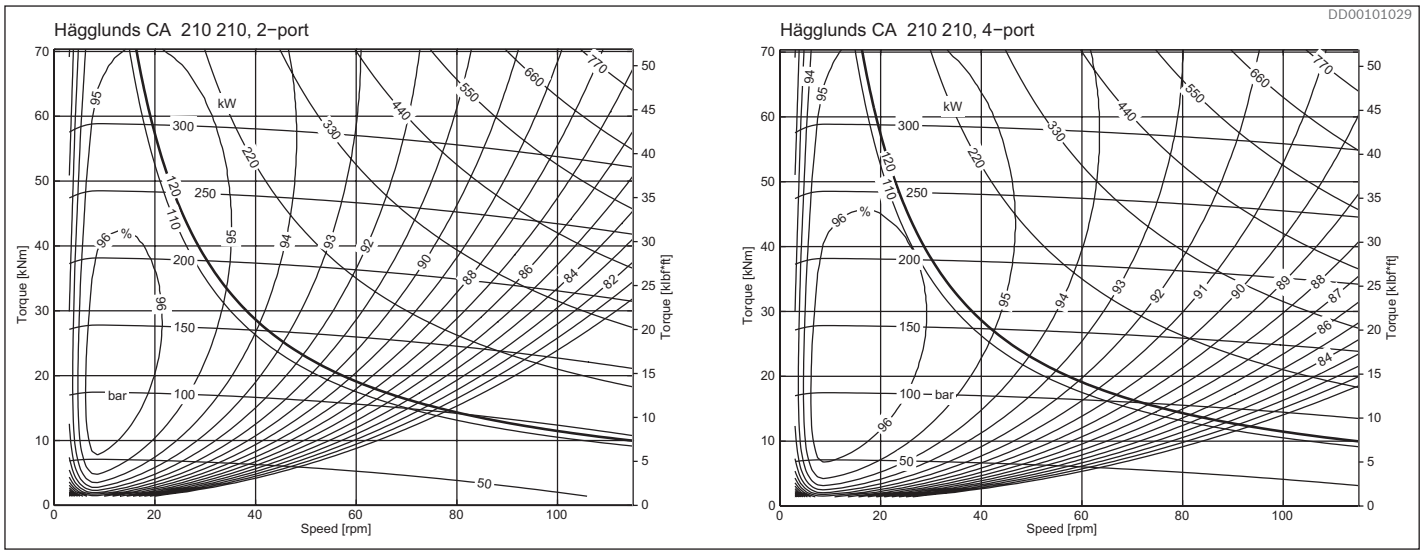


Fig. 28: CA 210 210

4.7 Pressure loss diagrams

Oil viscosity 40 cSt

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

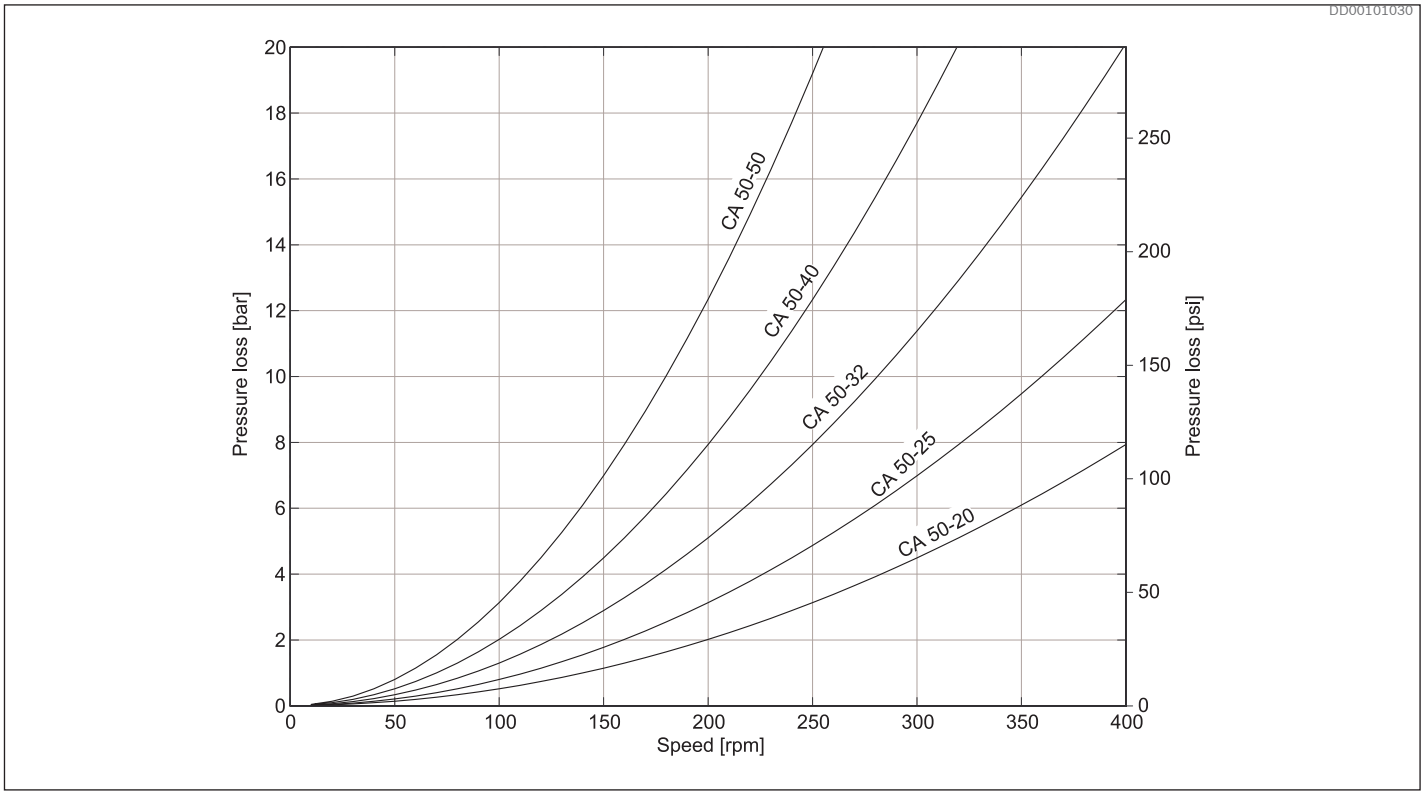


Fig. 29: CA 50 pressure loss, 2 port

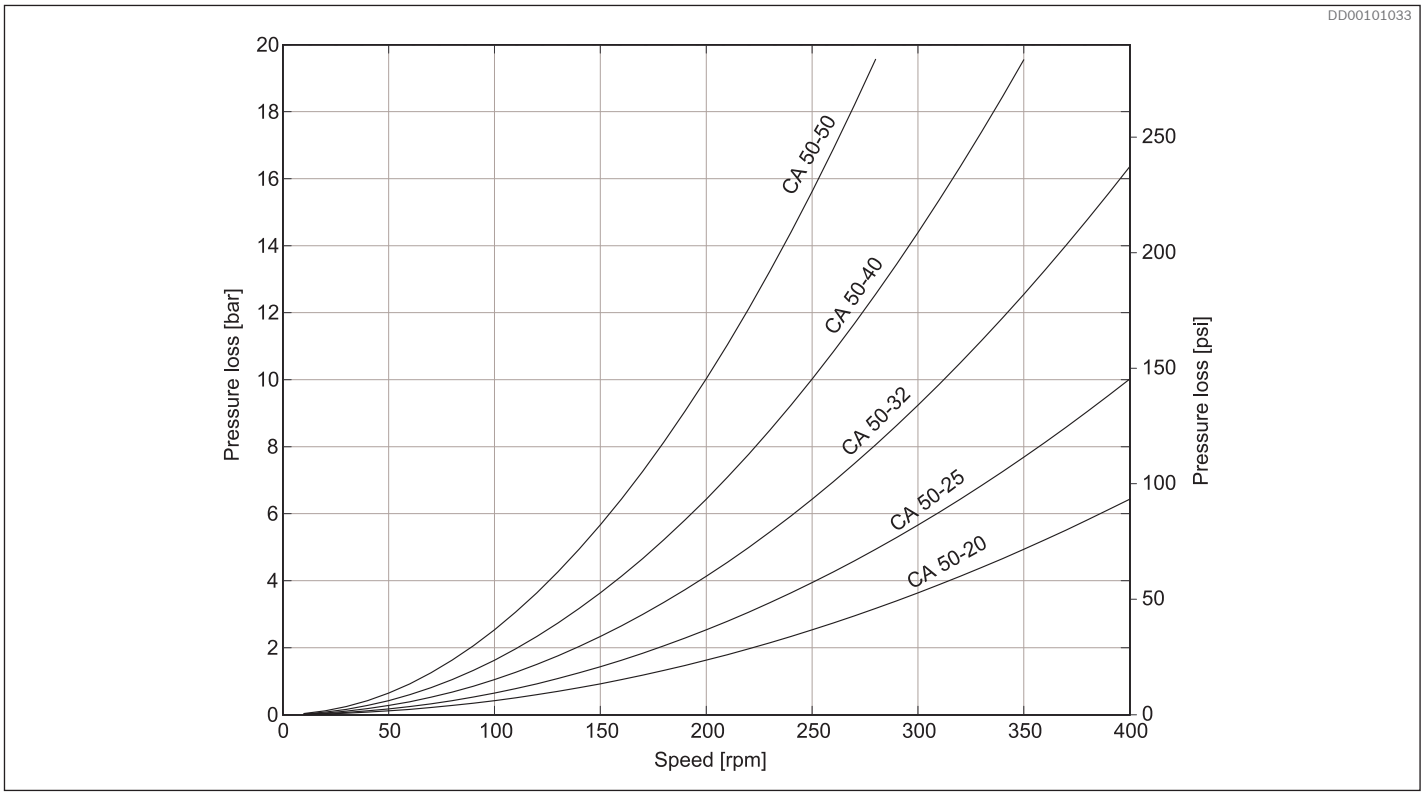


Fig. 30: CA 50 pressure loss, 4 port

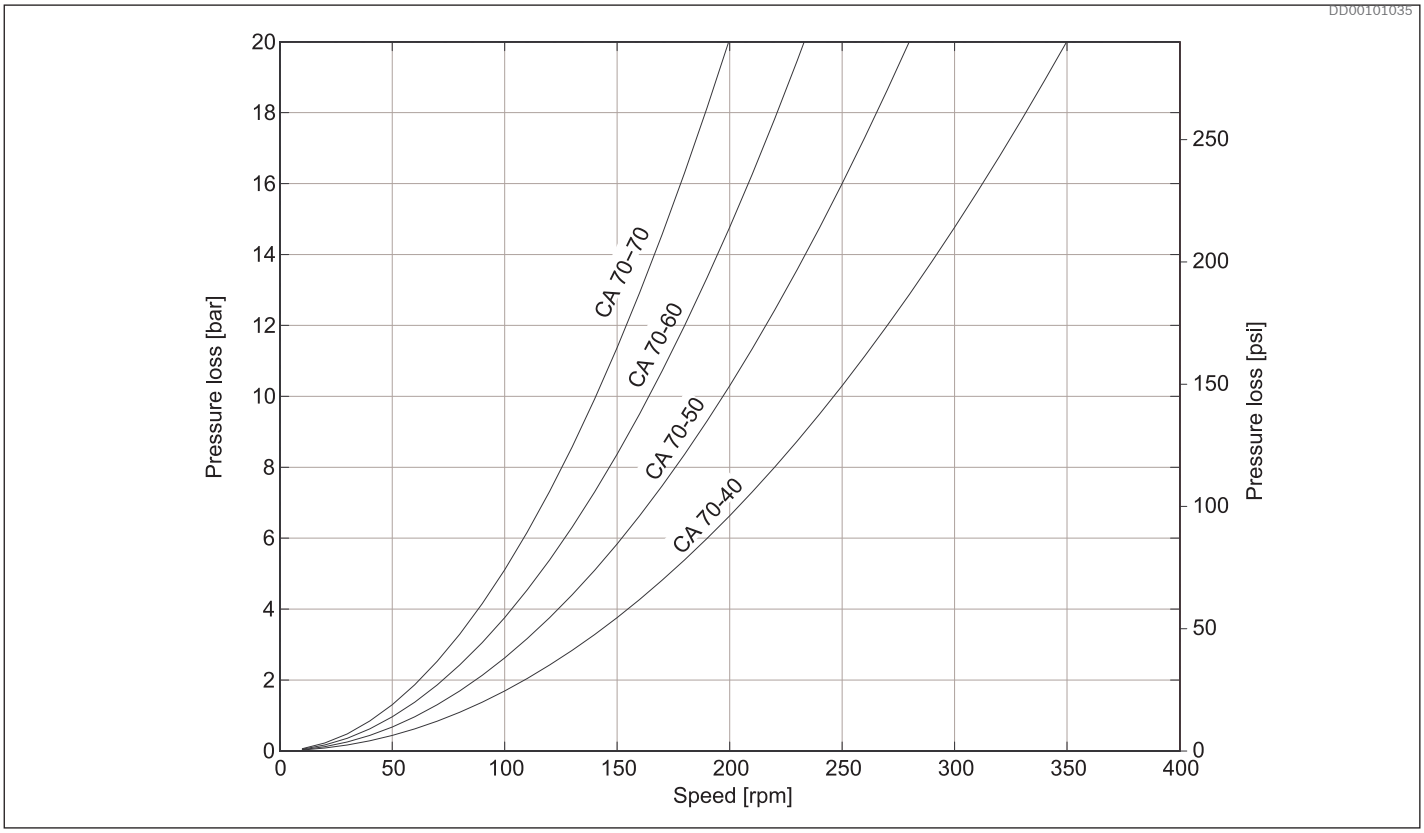


Fig. 31: CA 70 pressure loss, 2 port

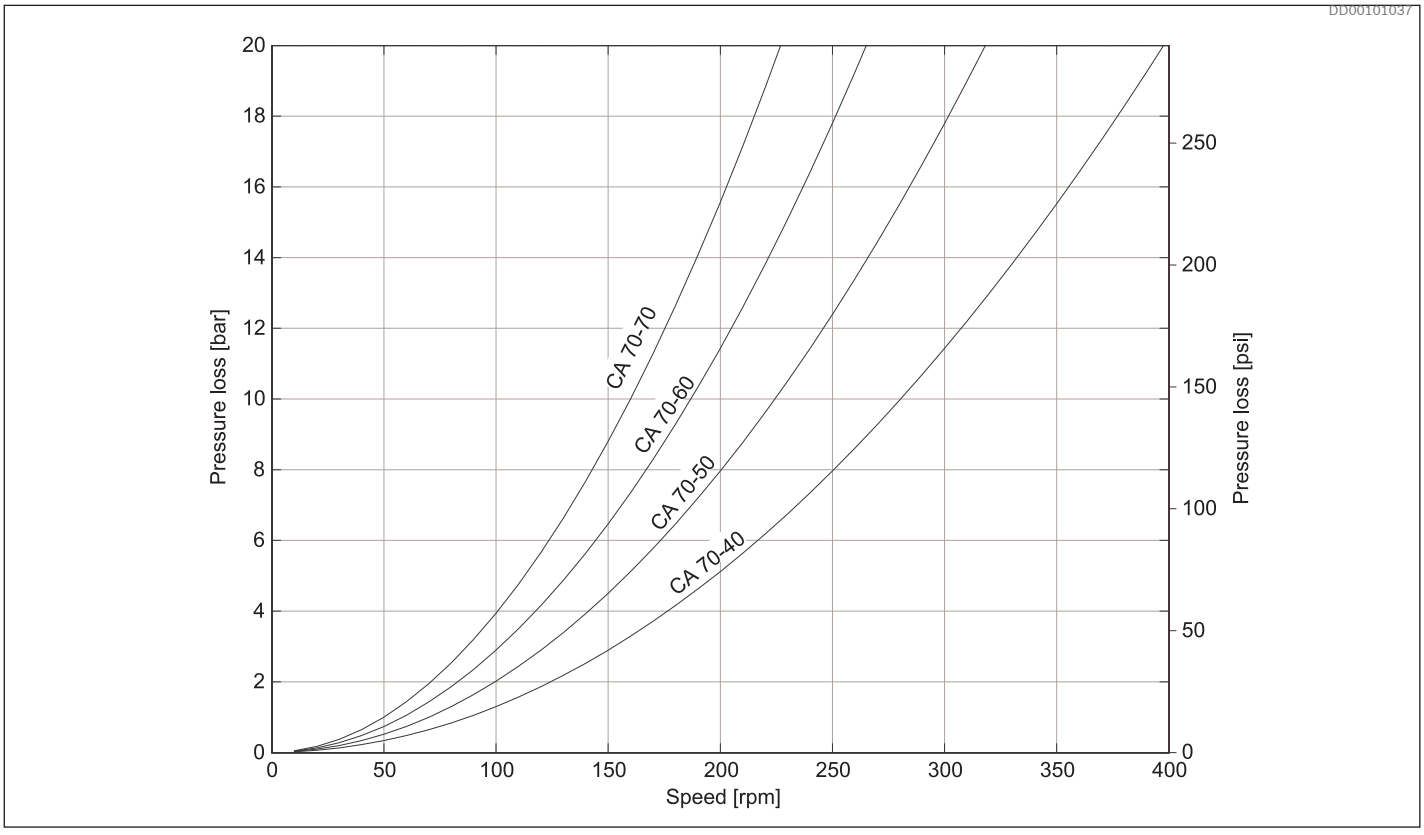


Fig. 32: CA 70 pressure loss, 4 port

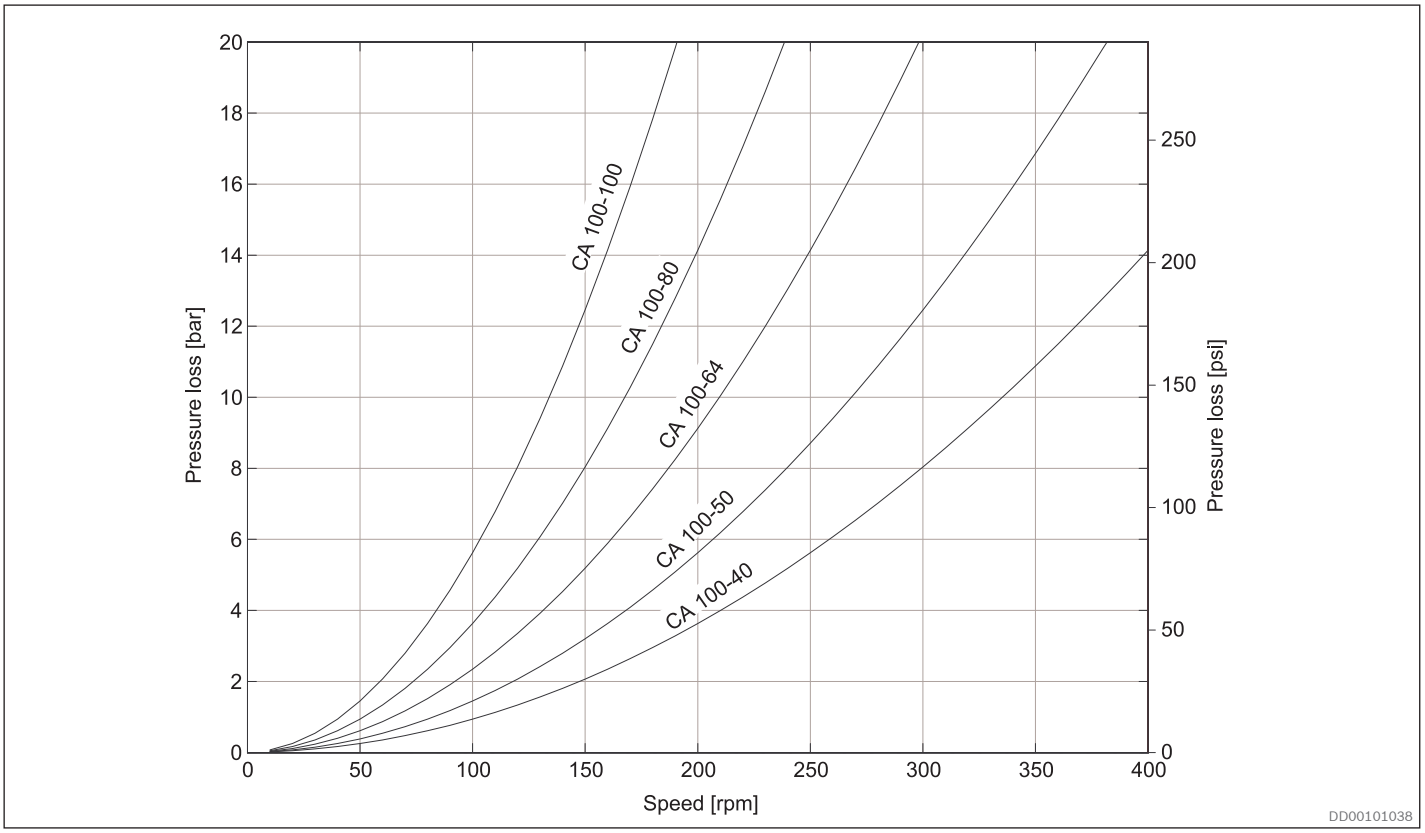


Fig. 33: CA 100 pressure loss, 2 port

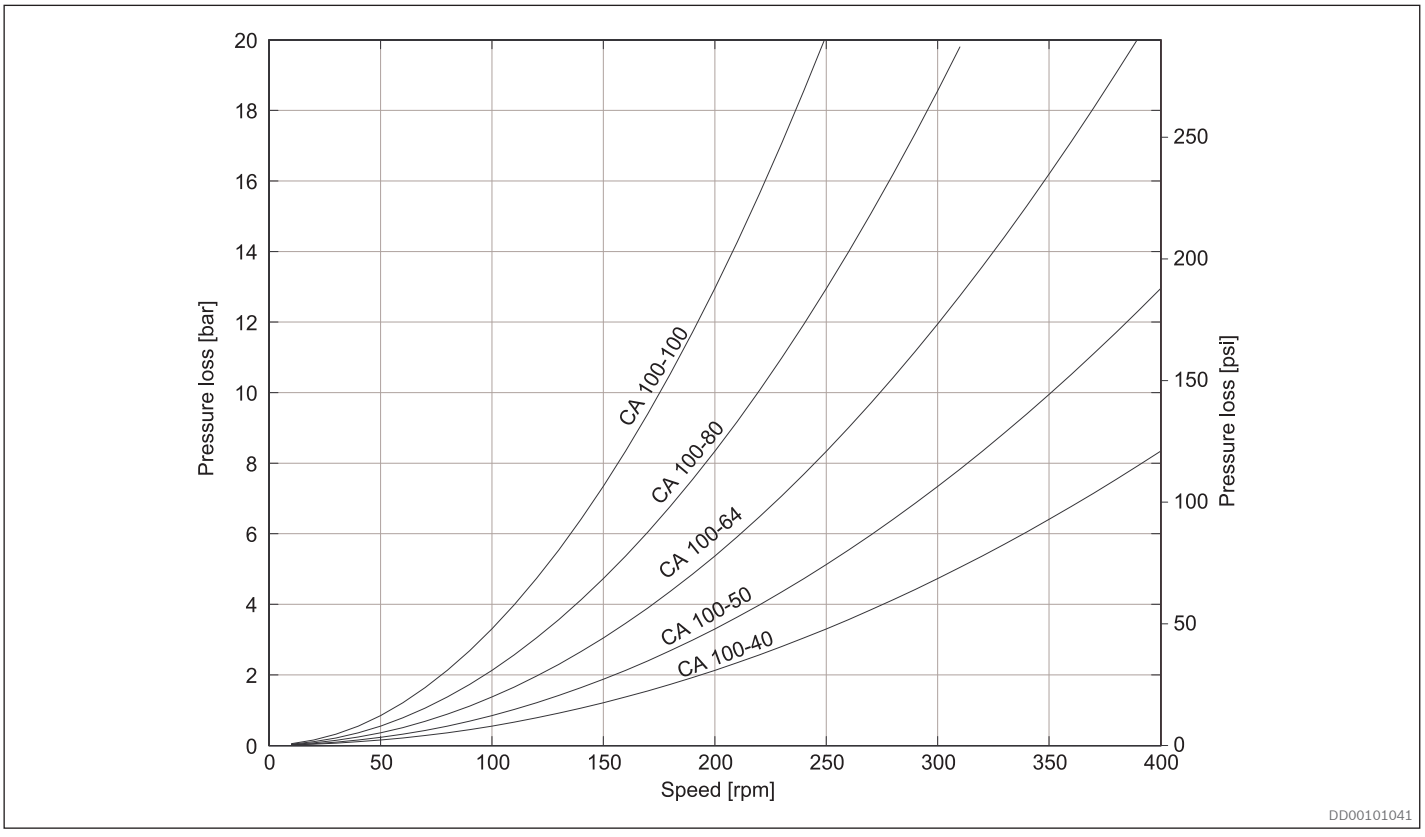


Fig. 34: CA 100 pressure loss, 4 port

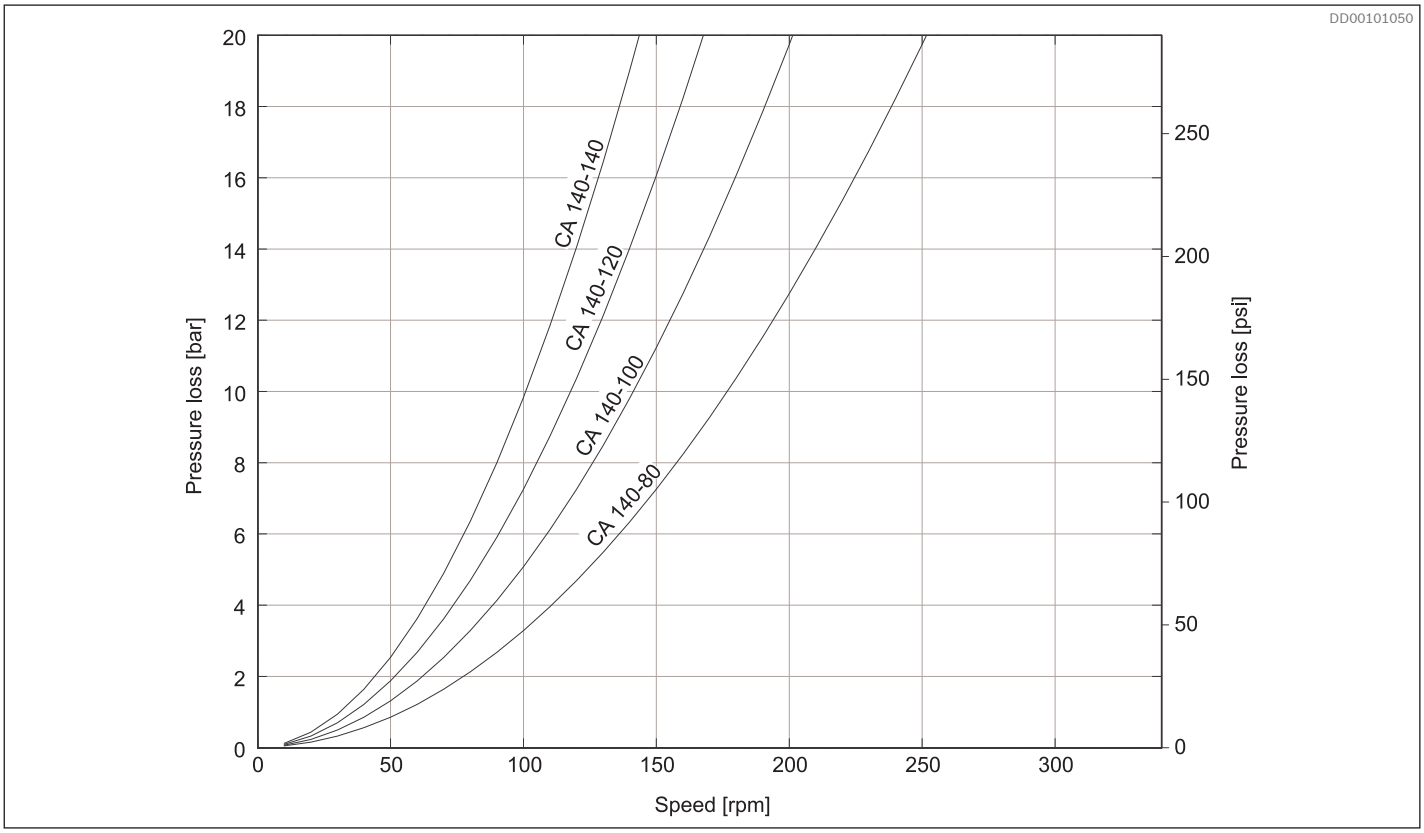


Fig. 35: CA 140 pressure loss, 2 port

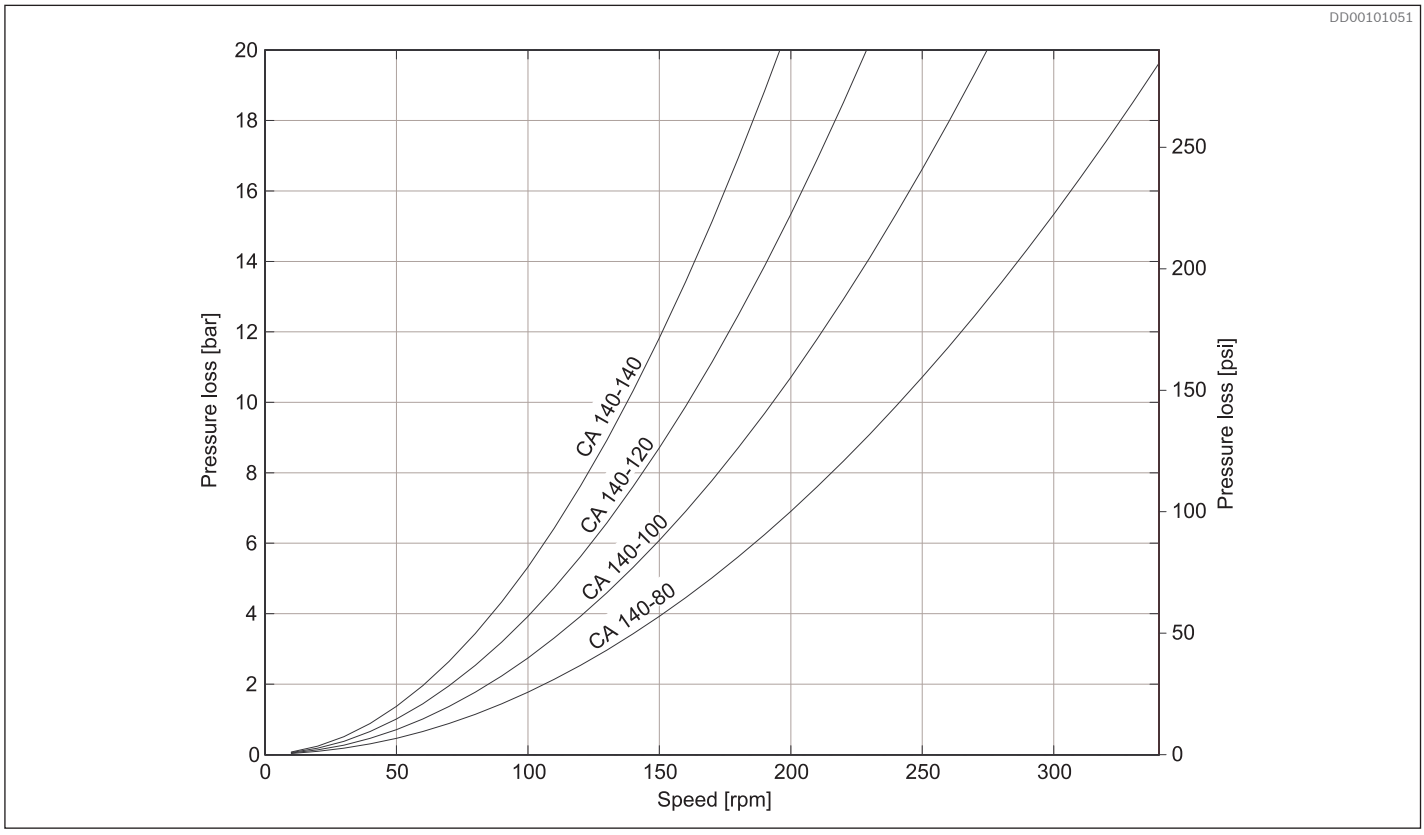


Fig. 36: CB 140 pressure loss, 4 port

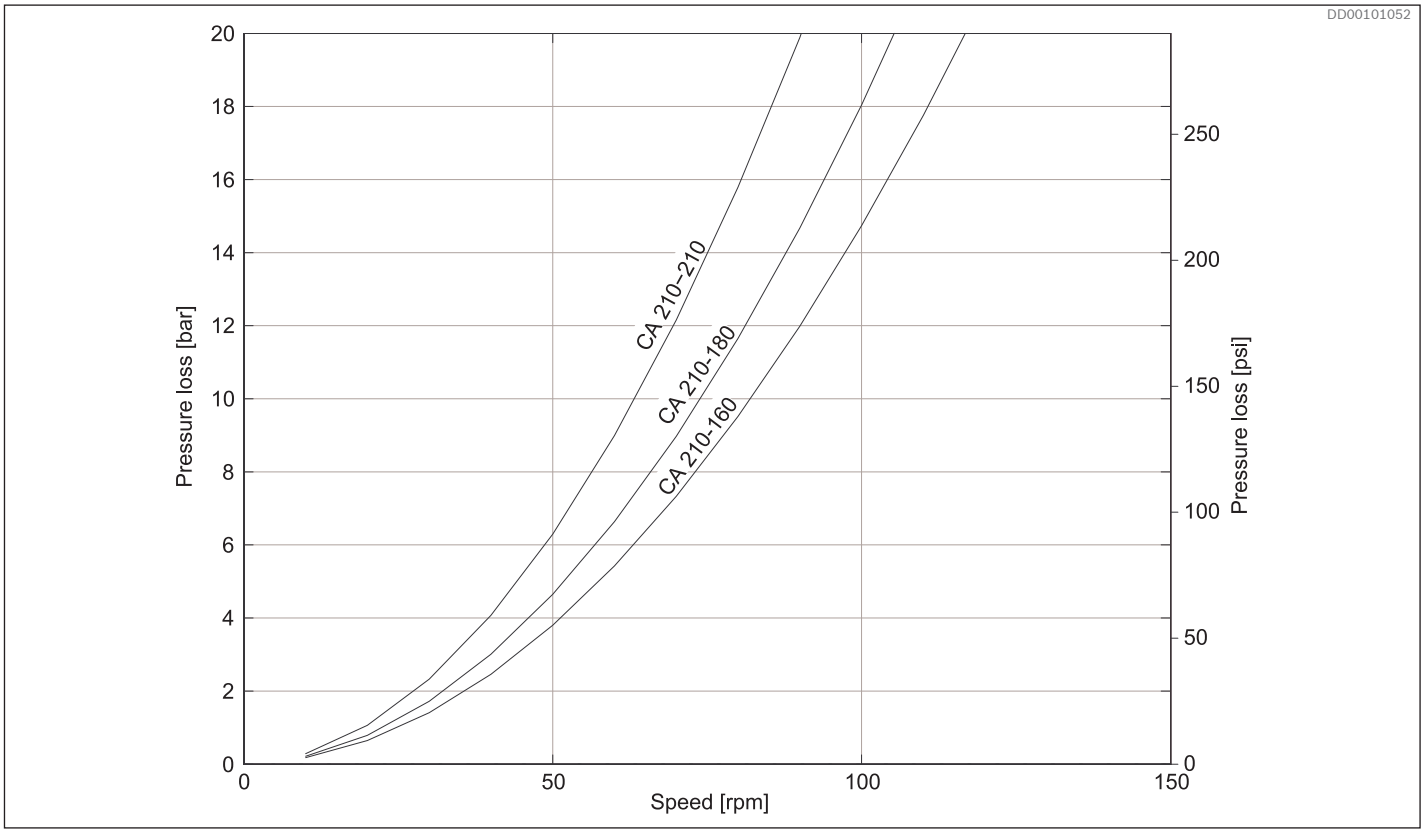


Fig. 37: CA 210 pressure loss, 2 port

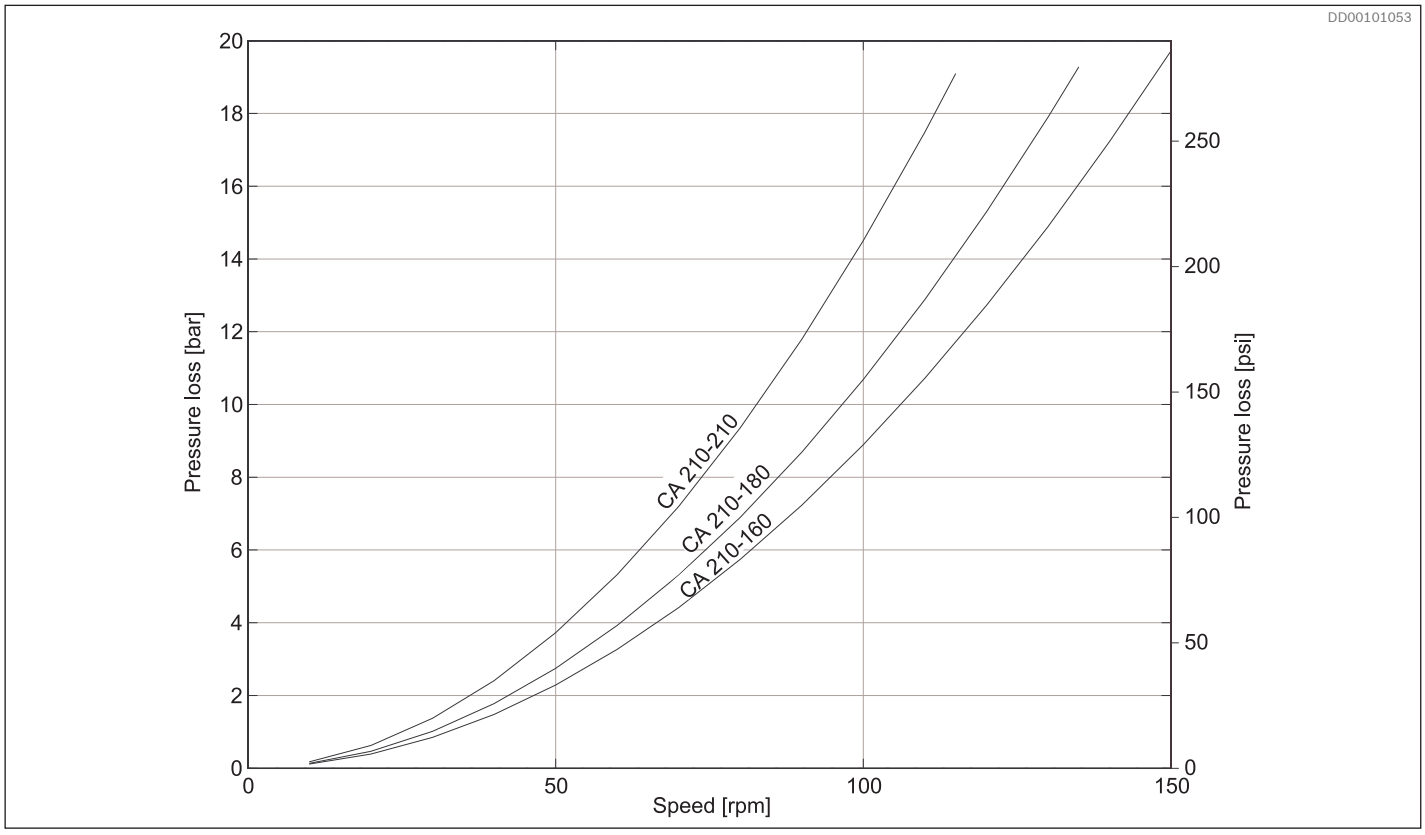


Fig. 38: CA 210 pressure loss, 4 port

4.8 Quick selection diagram

Rated life for Hägglunds CA is calculated according to DIN ISO 281 Appendix 1.

The diagram below represents the torque and speed, corresponding to a modified rating life L10mh = 20 000 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).

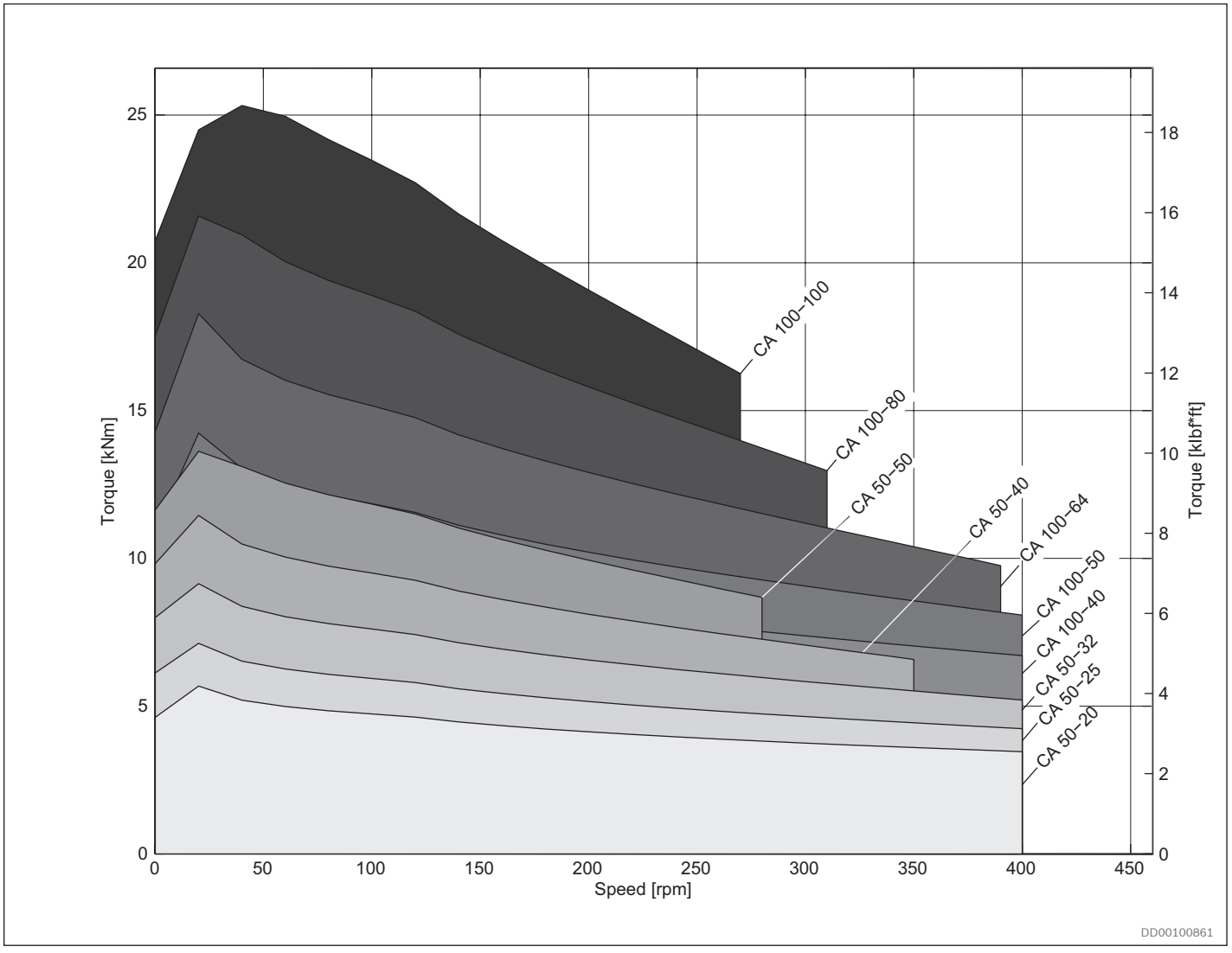


Fig. 39: Quick selection diagram CA 50, CA 100

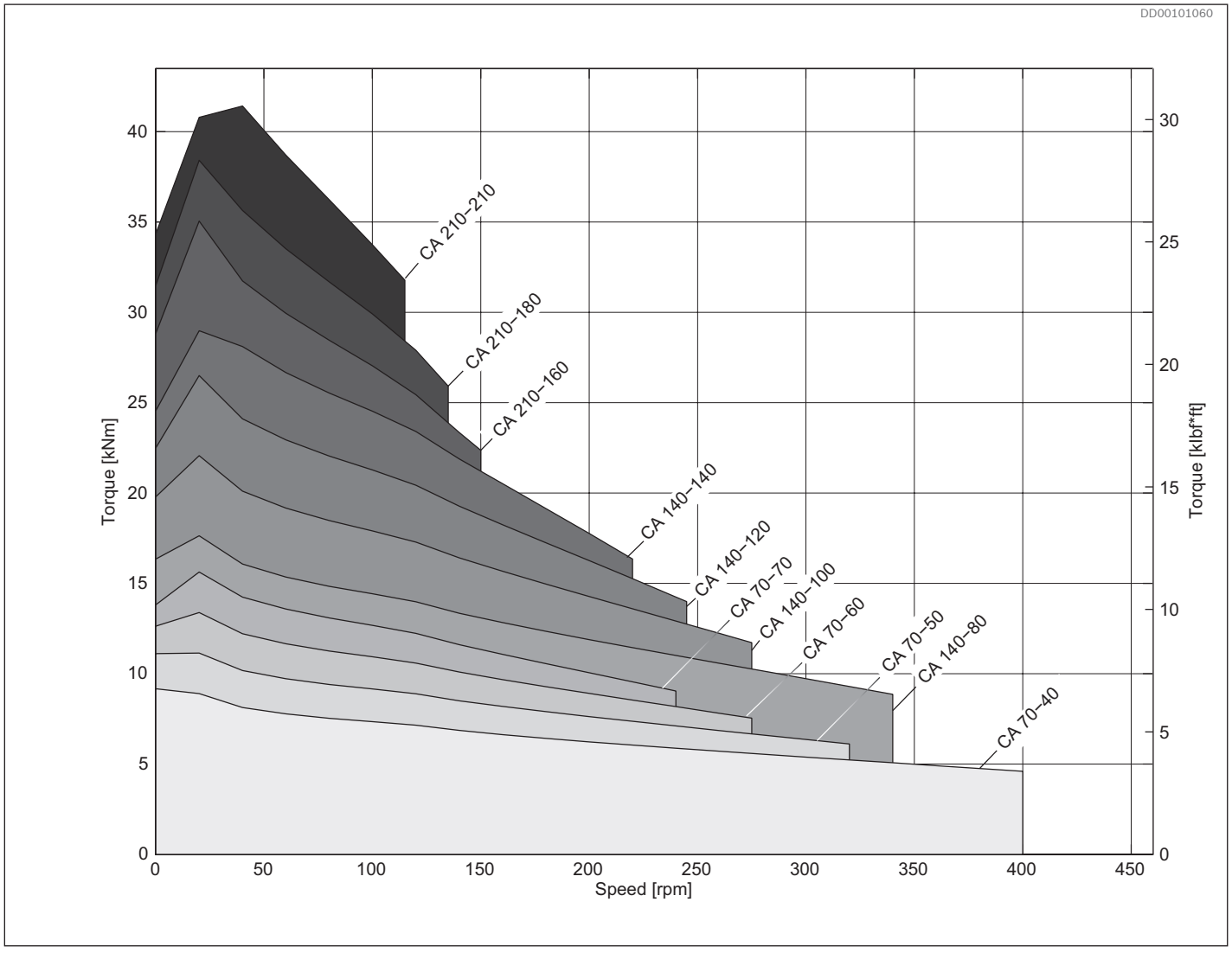


Fig. 40: Quick selection diagram CA 70, CA 140, CA 210

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

4.9 Draining, venting and flushing of the motor

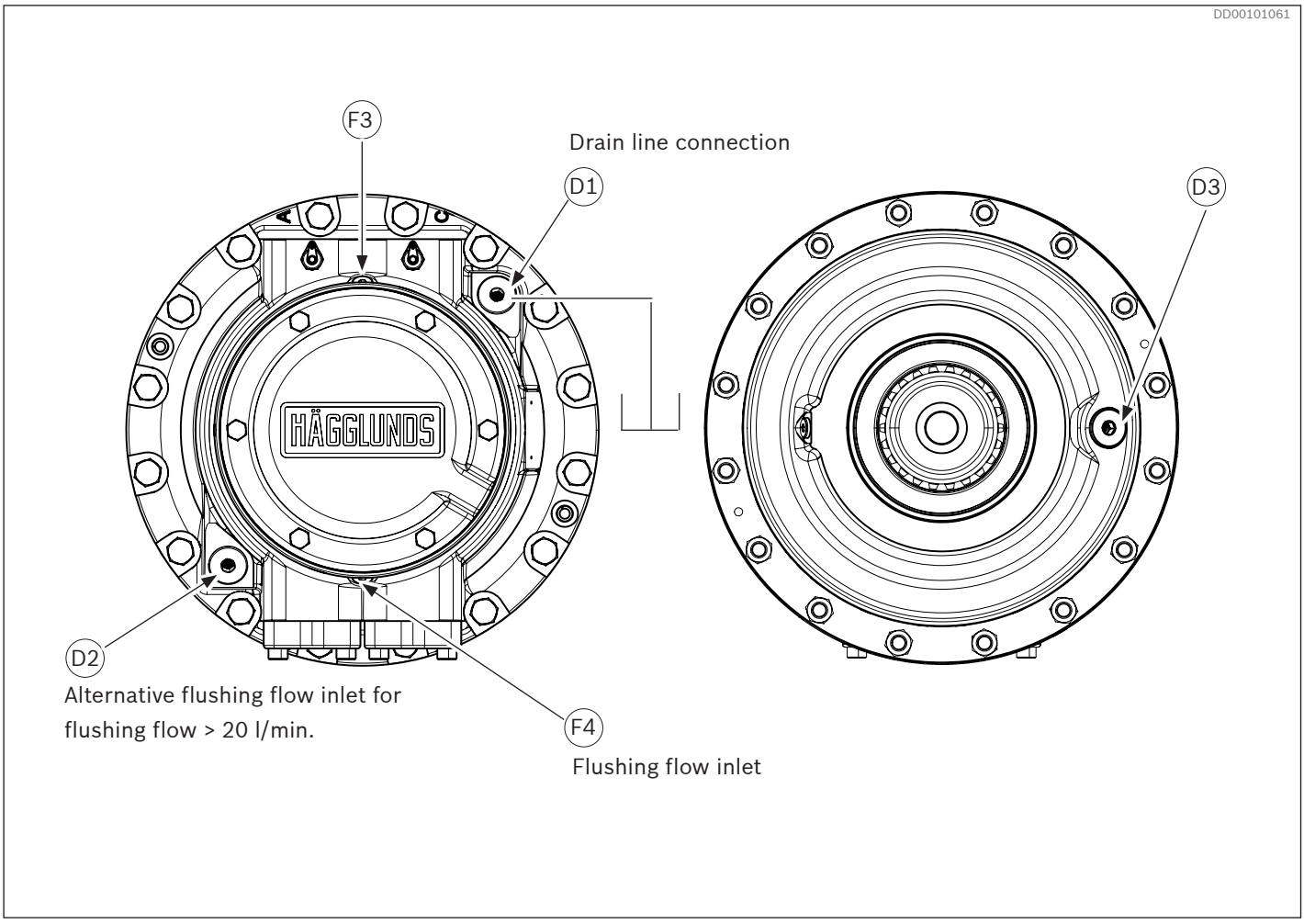


Fig. 41: Horizontal mounting

4.9.1 Horizontal mounting

When the motor is installed with the shaft in the horizontal plane, the highest of the drain outlets D1, D2 or D3 must always be used (see *Fig. 41*).
Drain line must be connected to the tank with a minimum of restrictions, to ensure that the maximum case pressure is not exceeded.

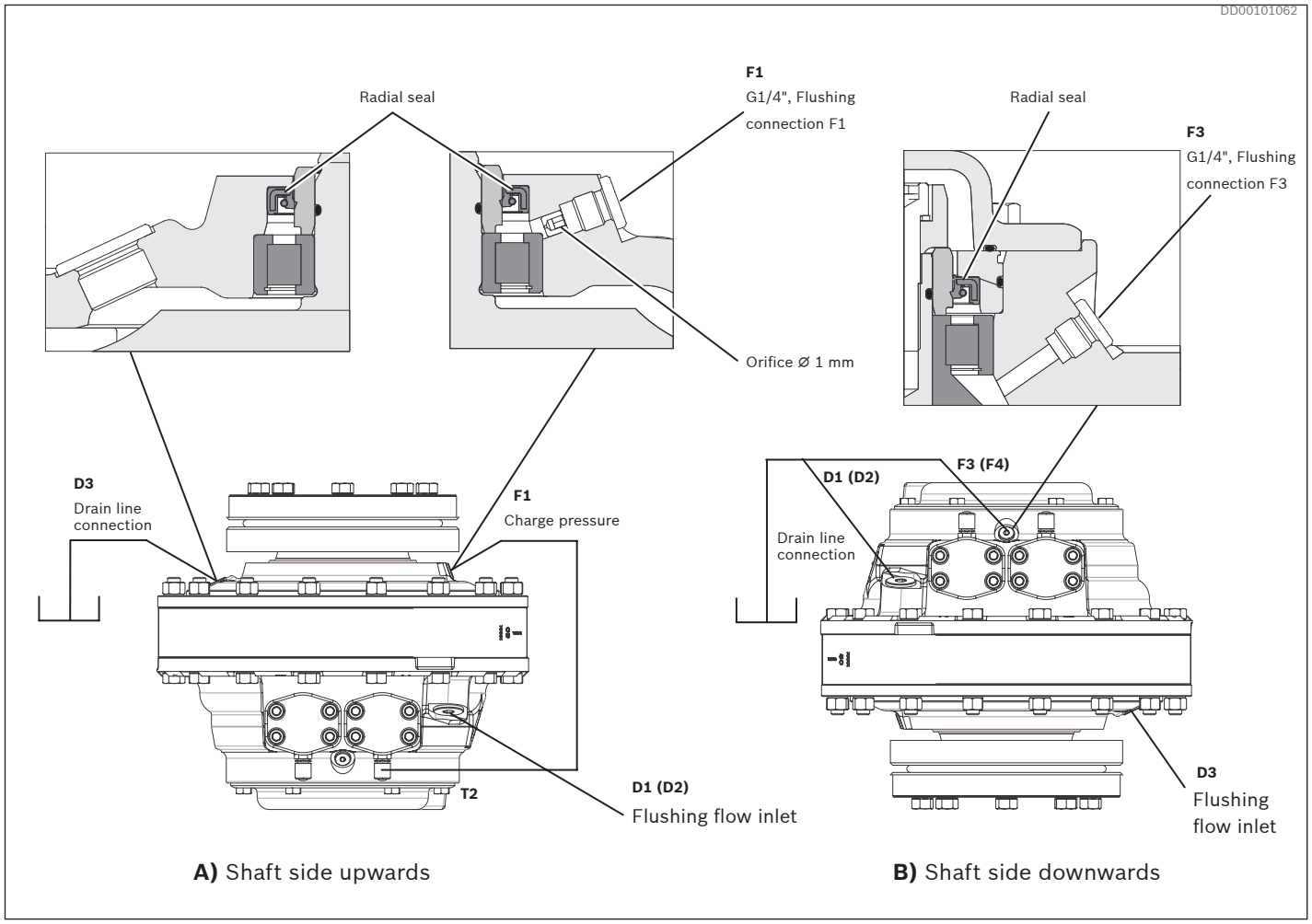


Fig. 42: Vertical mounting

4.9.2 Vertical mounting

When the motor is mounted vertically, the highest of the three drain ports D1 to D3 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. 42*, *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 or D2 in the connection block. Connect the flushing port F3 to the drain line. (See *Fig. 42* alt. *B) Shaft side downwards*).

4.10 Flushing

Flushing of motor case

The CA 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.
For flushing flow inlets, see *Fig. 41* and *Fig. 42*.
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
CA 50 / CA 70	60	80
CA 100 / CA 140 / CA 210	120	160

When the motor has 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
CA 50 / CA 70	0.4	0.54
CA 100 / CA 140 / CA 210	0.6	0.80

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. 7*.

Exemple:
Hägglunds CA 100 100 working at 250 bar and n = 50 rpm.

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

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

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

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

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. 43)*
c = 0,01

Total power = $\frac{p_{high} \cdot n \cdot V_i}{600 \cdot 1000} = \frac{250 \cdot 50 \cdot 6280}{600 \cdot 1000}$ = 130.8 kW . The motor case must be flushed

E_1 = 0.01 · 130.8 = 1.3 kW (1.8 hp)

$E_2 = \frac{2 \cdot 250}{600}$ = 0.8 kW (1.1 hp)

q flushing = 3.4 · (E_1 + E_2 - Heat transmitted to air) = 3.4 · (1.3 + 0.8 - 0.6) = 5.1 l/min
q flushing $_{US}$ = 0.67 · (E_{1US} + E_{2US} - Heat transmitted to air) = 0.67 · (1.8 + 1.0 -0.8) = 1.3 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**.

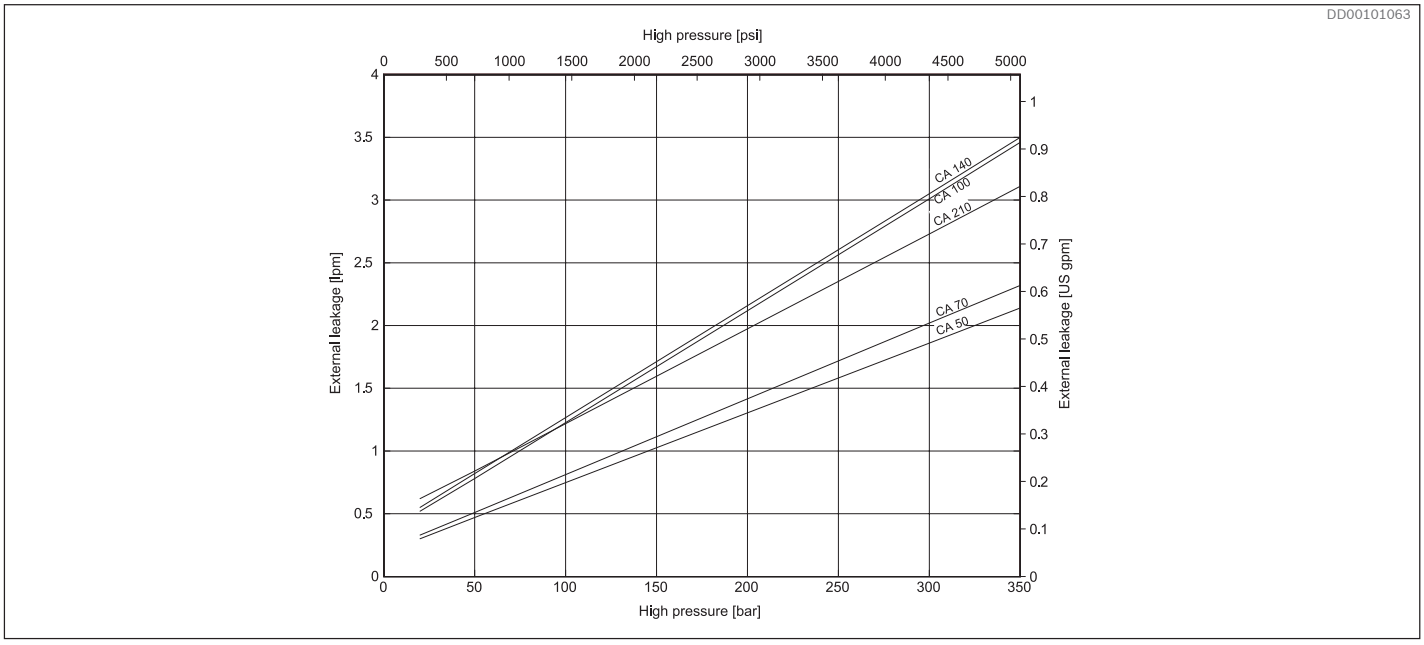


Fig. 43: External leakage

4.12 Viscosity factor K

The diagram shows the average 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.

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

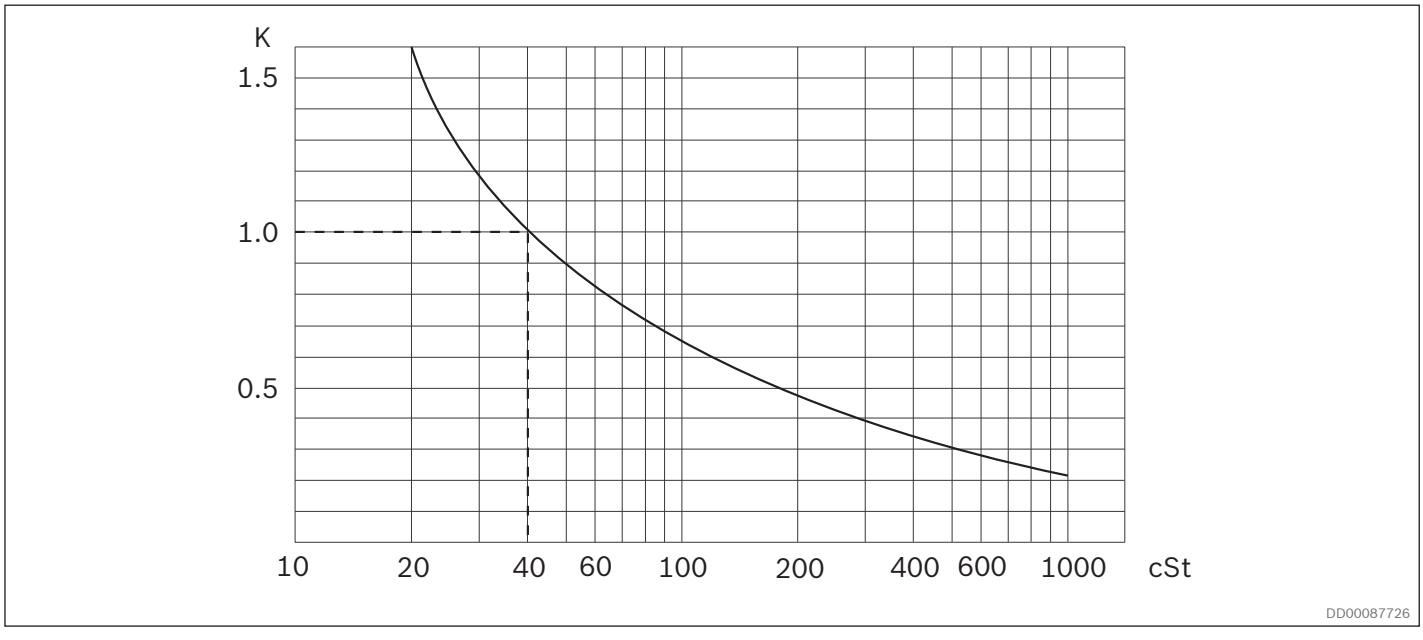


Fig. 44: Viscosity factor K

4.13 Freewheeling

4.13.1 The function of freewheeling

Hägglunds CA 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 motor housing (via drain ports D1, D2 or D3) lightly pressurized (see *Fig. 47*) while main ports A and C are without restriction drained directly to the fluid reservoir. See *Fig. 46*. 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. 45*.

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. 47 (*required case pressure).

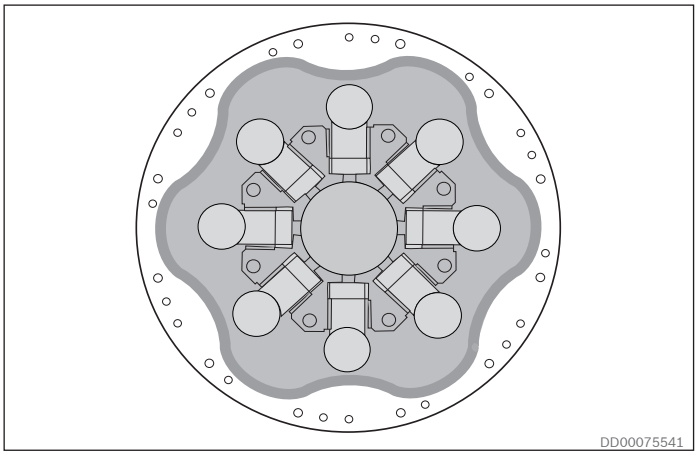


Fig. 45: Freewheeling

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.

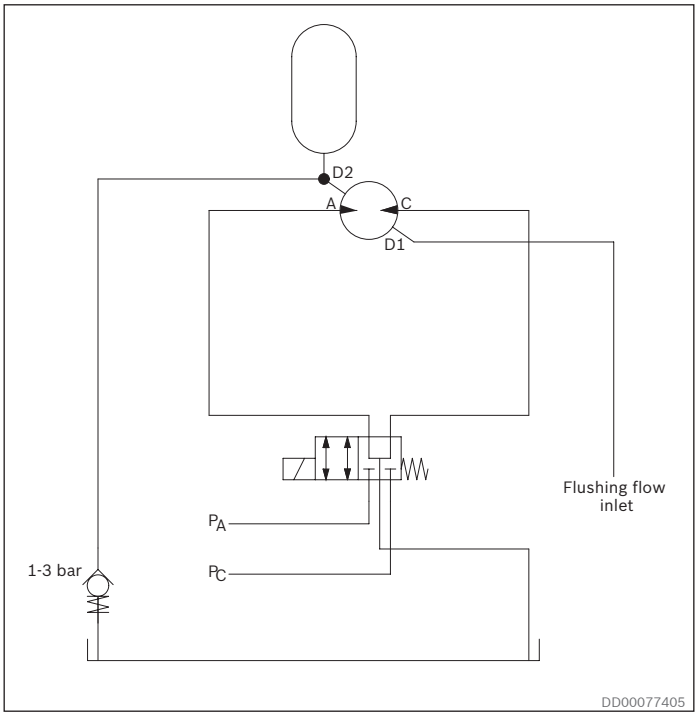


Fig. 46: Schematic principle freewheeling.

Freewheeling valve function, see *section 12.6.7 page 75*.

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

Note!
If a motor is subject to external shock loads under freewheeling operation, this must be subject to attention. Please contact Bosch Rexroth representative for further information.

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 [cm^3] or(in^3)
V_i = Total displacement of the motor [cm^3] or(in^3)
N_L = 10 (No of lobes for one camring)

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

- The motor case must be pressurized all the time when the motor is in freewheeling mode, see *Fig. 47*.
- The motor case must be flushed all the time when the motor is in frewheeling mode, see *Fig. 47*.

An accumulator can be added into the circuit to shorten the time to retract all the pistons completely, see *Fig. 46*.

An accumulator can also be added into the circuit to reduce the pressure spikes in the motor case when the pistons are extracted, see *Fig. 46*.

4.13.4 Freewheeling restrictions

Freewheeling in vertical position is restricted for multi cam-ring motors

Note!
Freewheeling in vertical position > 70 rpm may increase the risk of wear in multi cam ring motors (CA 100/140/210).
For support regarding increased robustness in vertical freewheeling, please contact your Bosch Rexroth representative.

4.13.5 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 *Fig. 47*.
Case flushing is required to prevent overheating, see diagram *Fig. 47*
Required case pressure 1.5 -2 bar (21.8-29 psi).
Case oil temperatur to be below 50°C (122°F).

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

In order to accomplish proper freewheeling, a case pressure according to *Fig. 47* 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 service life of the main radial shaft seal.

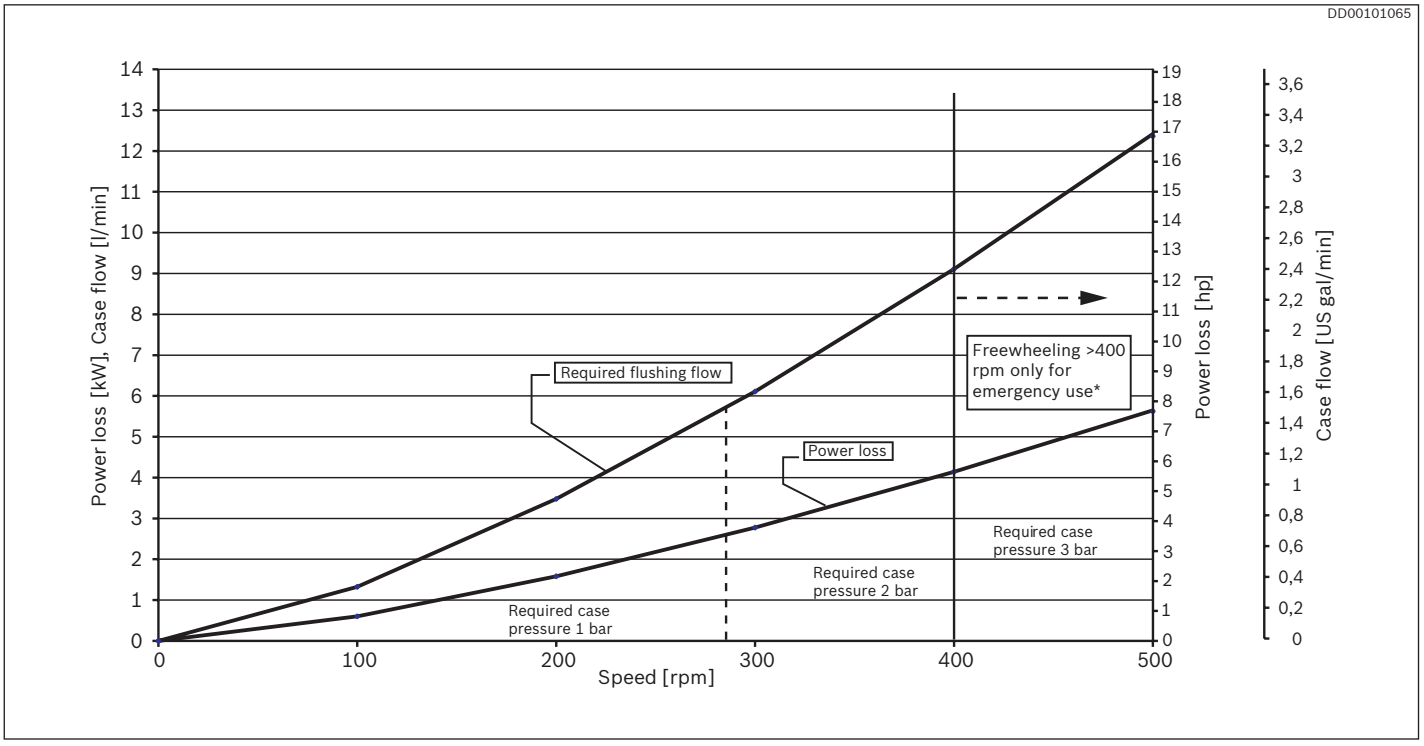


Fig. 47: Power loss freewheeling, oil viscosity 40 cSt (187 SSU)

*If the motor has been subject to freewheeling under e.g. winch quick release conditions the motor should be inspected before further use.

**Viton seals are recommended for speeds above 280 rpm.

4.14 Permissible external loads

External load with torque arm mounting

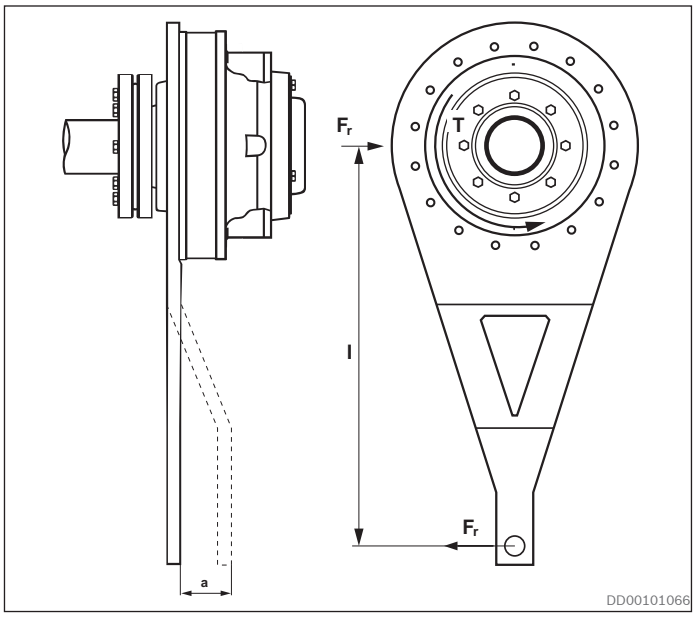


Fig. 48: Shaft mounted motor with torque arm

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

Note!
For flange mounted motor, be aware of required installation tolerances which will minimize the external forces on the motor. See **RE 15305-WA** or contact your Bosch Rexroth representative.

External load with bracket mounted motor

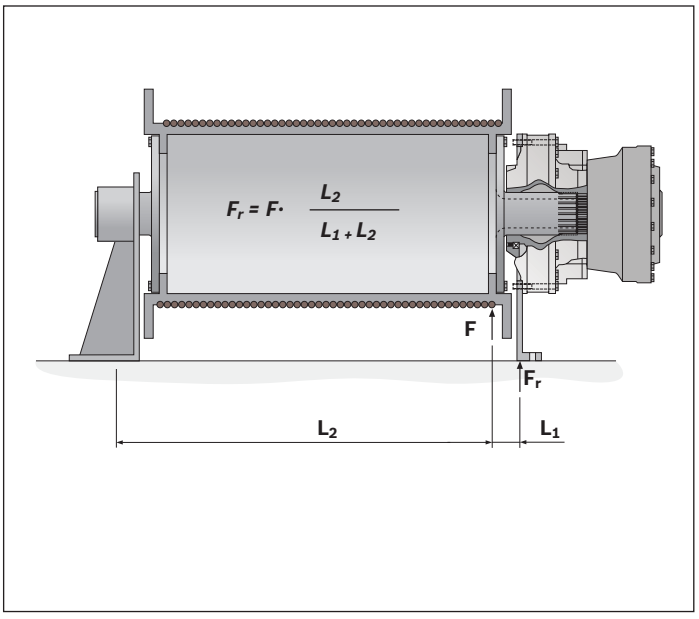


Fig. 49: Bracket mounted motor in winch - reaction forces

The bracket must be designed so it does not give extra external forces to the motor.

External load for flange mounted motor mounted with pinion drive

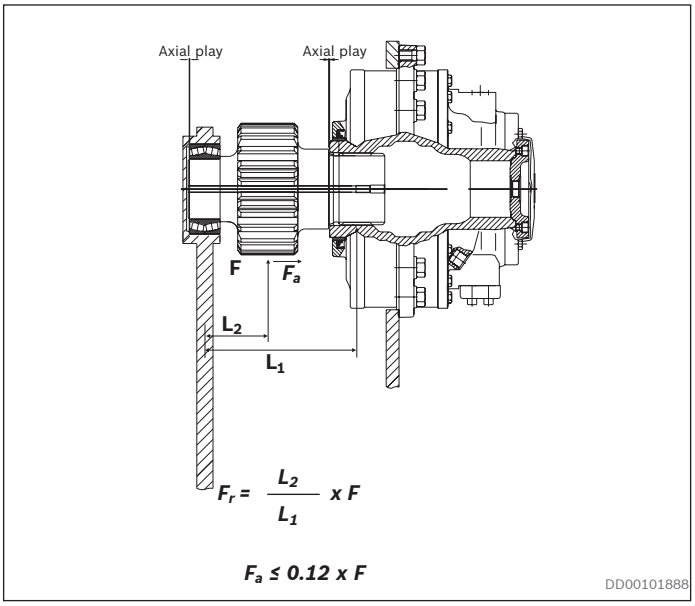


Fig. 50: Example of motor mounted with pinion drive - prefered design

4.14.1 Permissible external dynamic loads

Permissible external dynamic loads Hägglunds CA 50, CA 70

Viscosity 40 cSt/187 SSU.

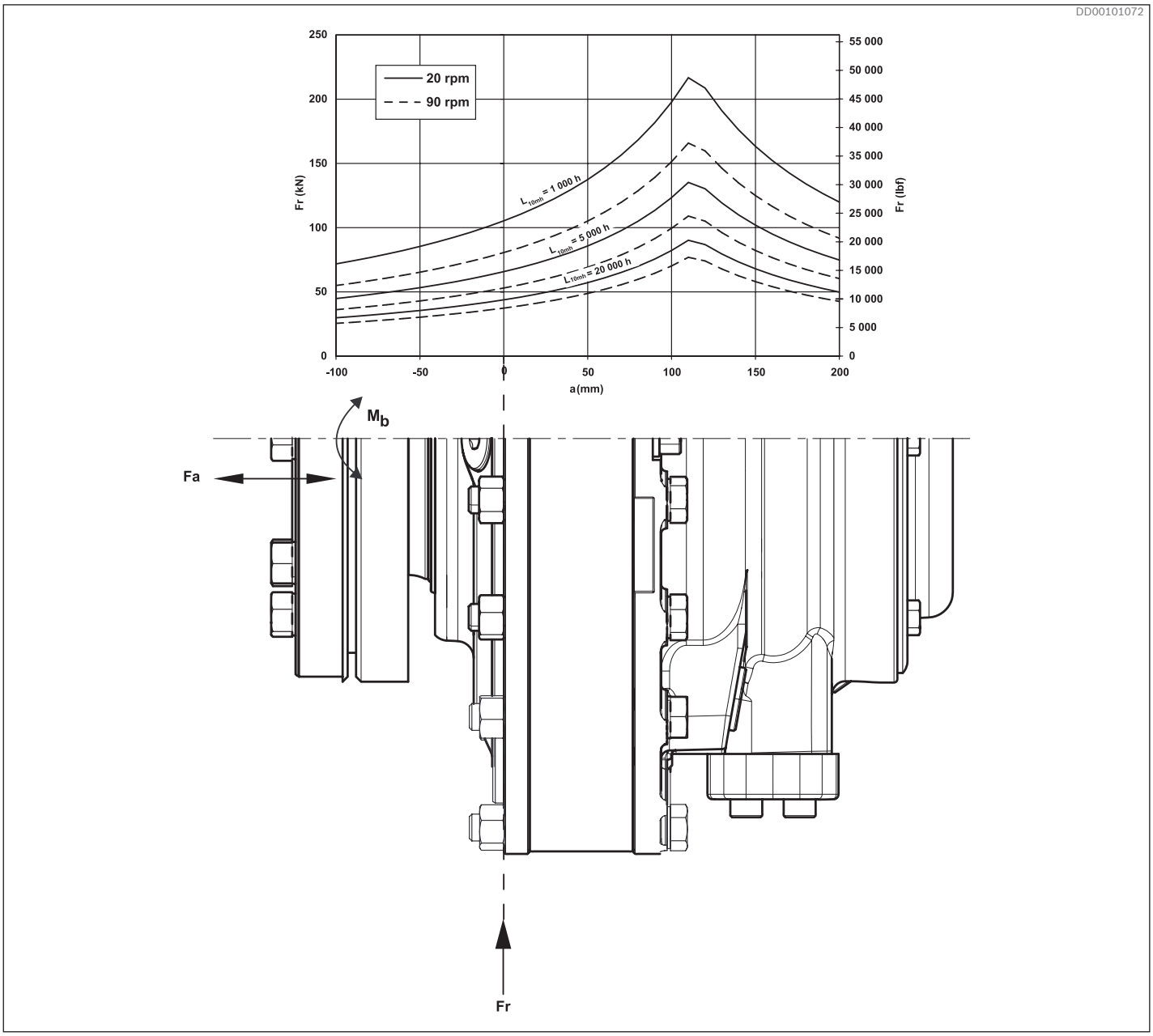


Fig. 51: Permissable external dynamic loads Hägglunds CA 50, CA 70

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 740 lbf).

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

Bending: Permissible bending moment M_b for motor with shrink disc coupling is 15 000 Nm (11 060 lbf·ft).

Permissible external dynamic loads Hägglunds CA 100, CA 140

Viscosity 40 cSt/187 SSU.

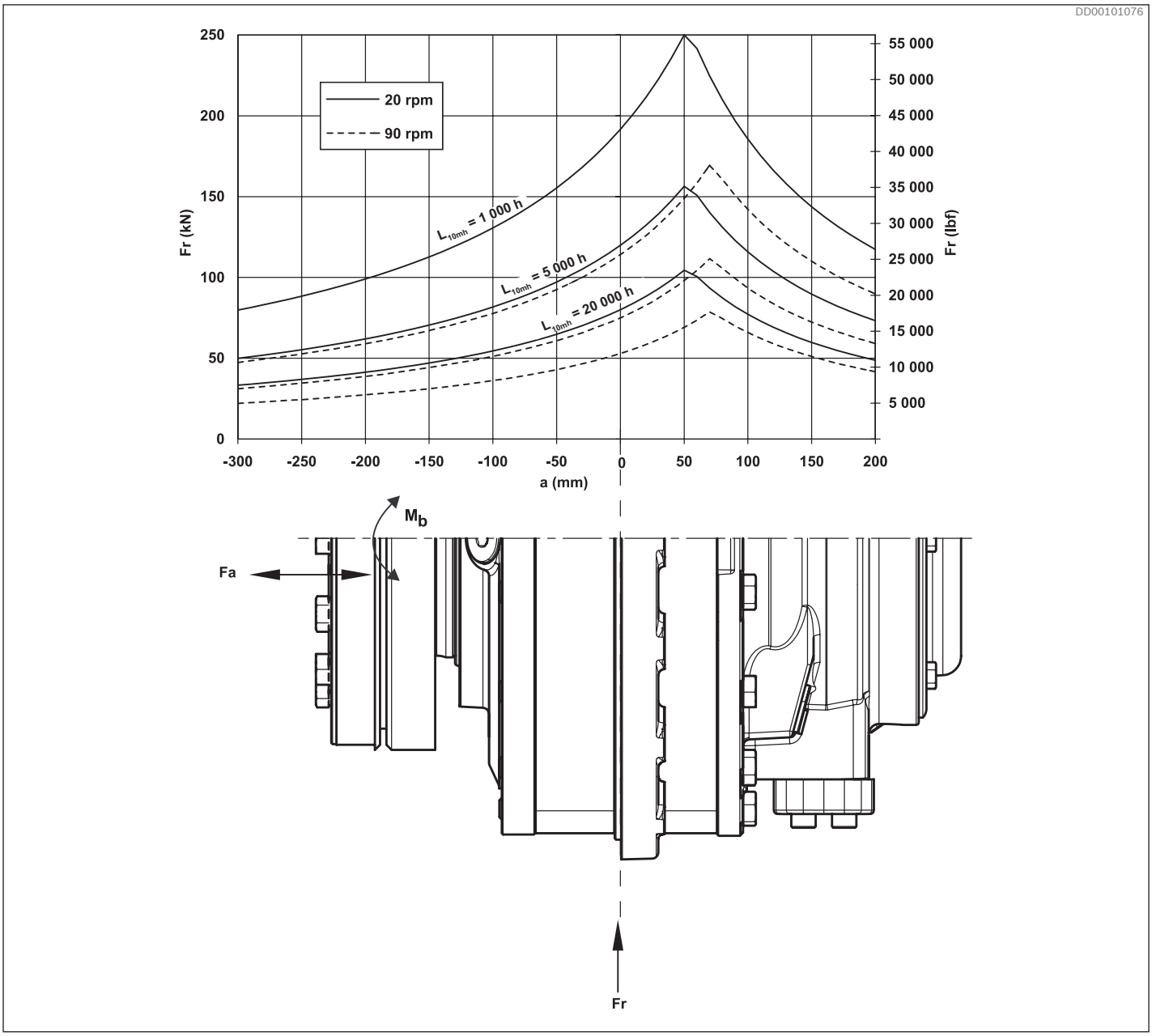


Fig. 52: Permissable external dynamic loads Hägglunds CA 100, CA 140

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 740 lbf).

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

Bending: Permissible bending moment M_b for motor with shrink disc coupling is 30 000 Nm (22 130 lbf·ft).

Permissible external dynamic loads CA 210

Viscosity 40 cSt/187 SSU.

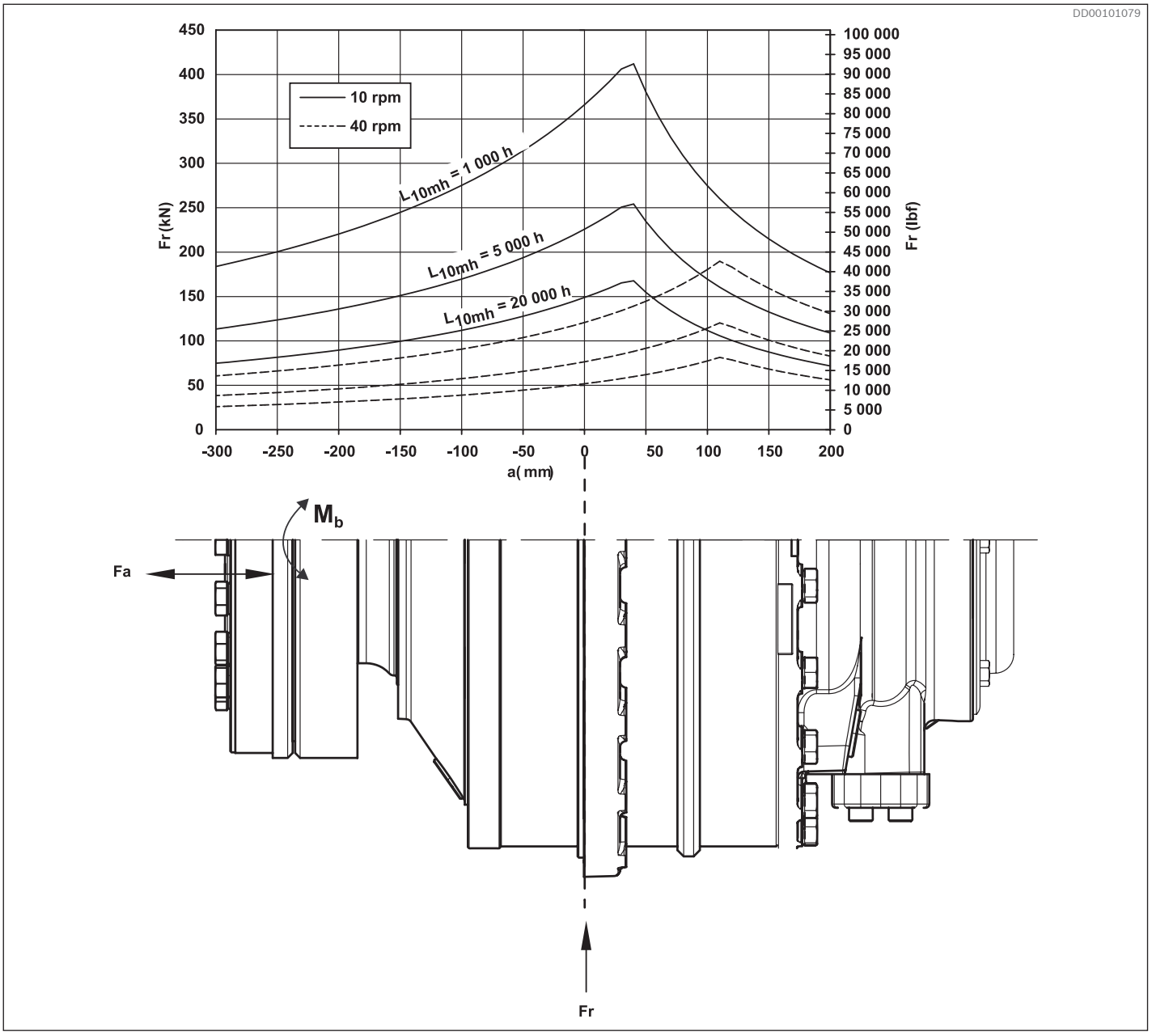


Fig. 53: Permissable external dynamic loads Hägglunds CA 210

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 740 lbf).

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

Bending: Permissible bending moment M_b for motor with shrink disc coupling is 30 000 Nm (22 130 lbf·ft).

4.14.2 Permissible external static load

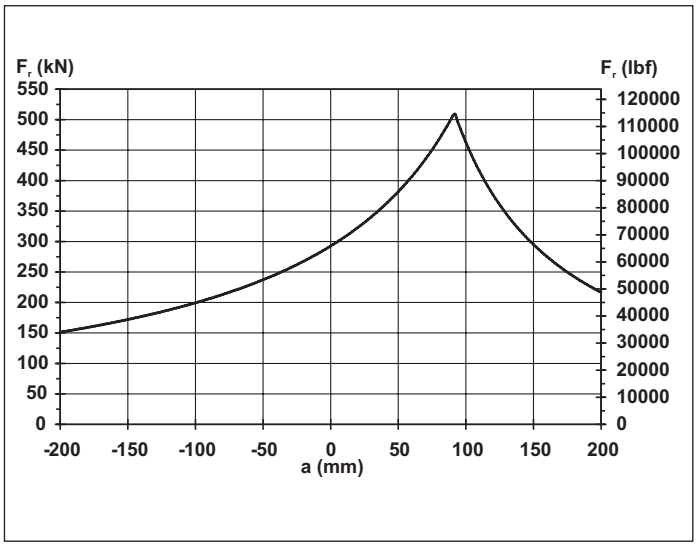


Fig. 54: Permissible external static load Hägglunds CA 50

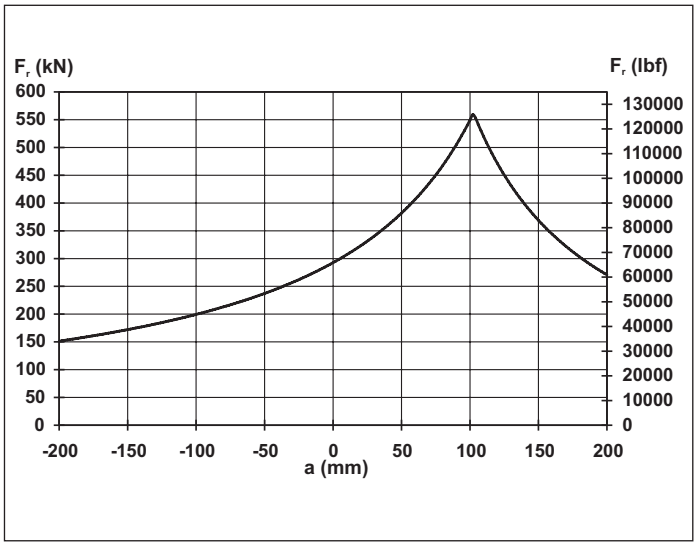


Fig. 55: Permissible external static load Hägglunds CA 70

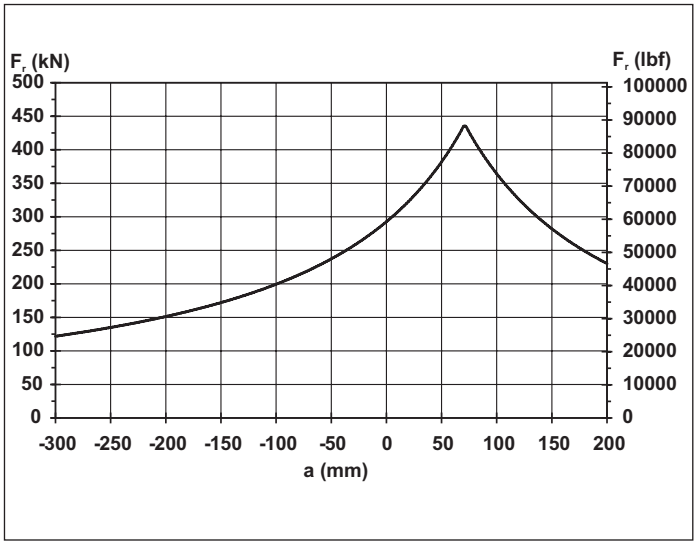


Fig. 56: Permissible external static load Hägglunds CA 100

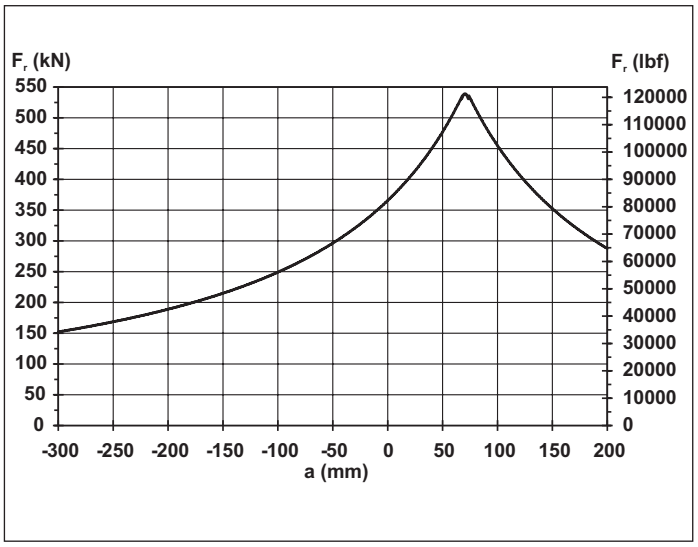


Fig. 57: Permissible external static load Hägglunds CA 140

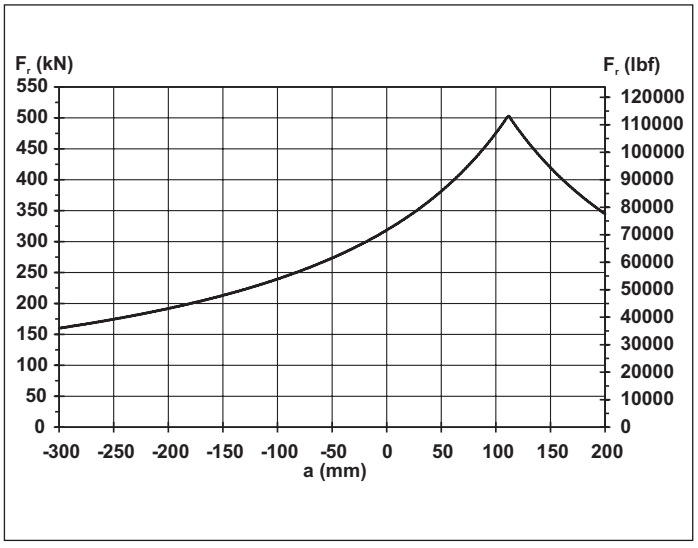


Fig. 58: Permissible external static load Hägglunds CA 210

4.15 Low speed performance

Fig. 59 to *Fig. 63* 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.

Example for CA 50:
Presume: n_{av} = 0,9 rpm and p_{max} = 50 bar
n_{av} = 0,9 gives i = 0,059 (*see Fig. 59*) and
A = 0,9 · 0,059 = 0,053 rpm.
Obtained amplitude value shall be reduced to two decimals.
n_{max} = 0,9 + 0,053 = 0,95
n_{min} = 0,9 - 0,053 = 0,85

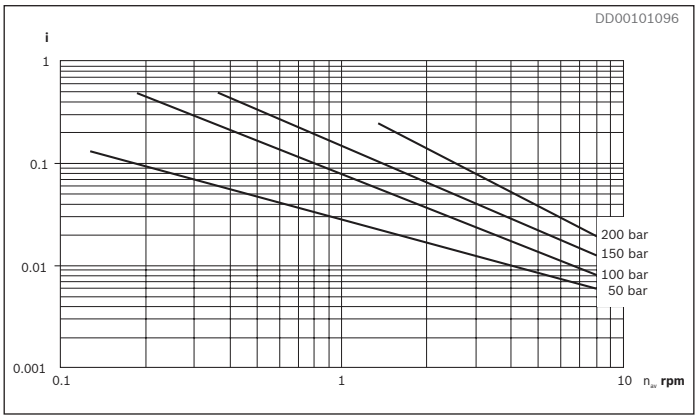


Fig. 61: Speed deviation CA 100, moment of inertia 5,0 kgm² (120 lb·ft²)

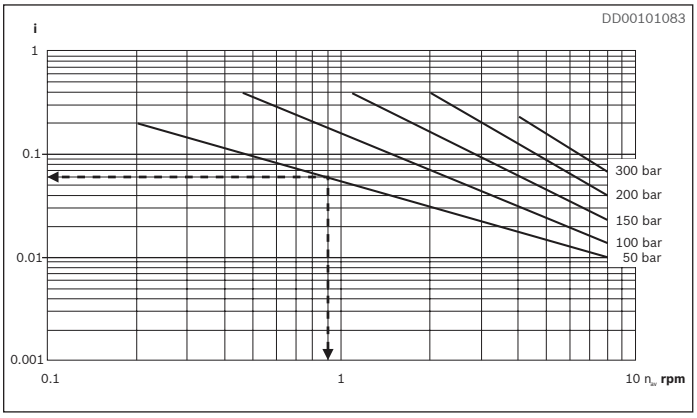


Fig. 59: Speed deviation CA 50, moment of inertia 2,8 kgm² (66 lb·ft²)

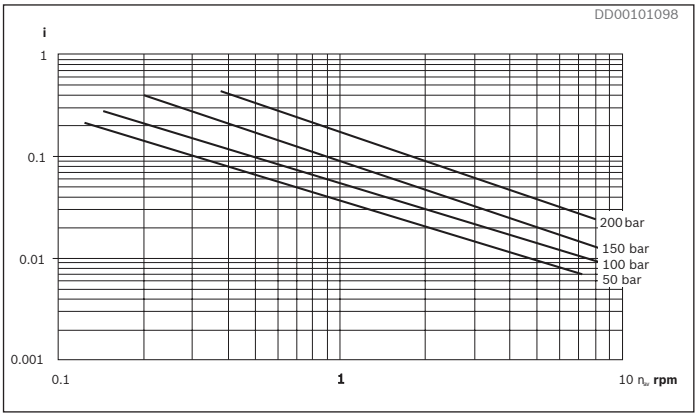


Fig. 62: Speed deviation CA 140, moment of inertia 6,8 kgm² (160 lb·ft²)

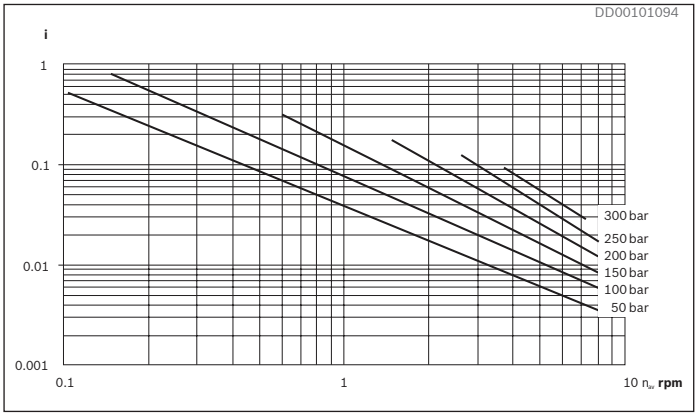


Fig. 60: Speed deviation CA 70, moment of inertia 3,6 kgm² (85 lb·ft²)

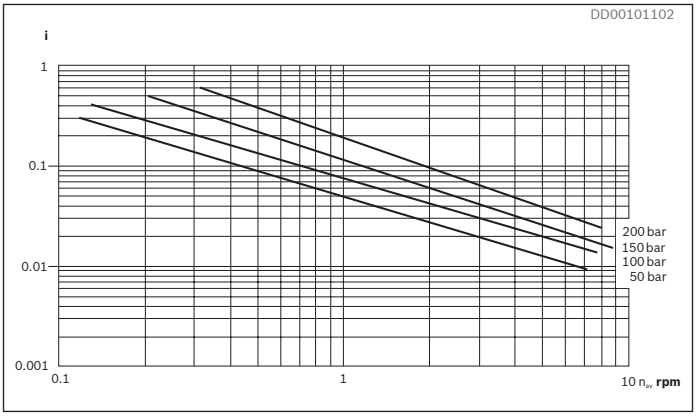


Fig. 63: Speed deviation CA 210, moment of inertia 8,8 kgm (210 lb·ft²)

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).

4.17 Sound

The emission sound pressure and sound power level have been calculated according to ISO/DIS 11203 for unattended machines. All values refer to a position of the test object > 1 m (3,28 ft)

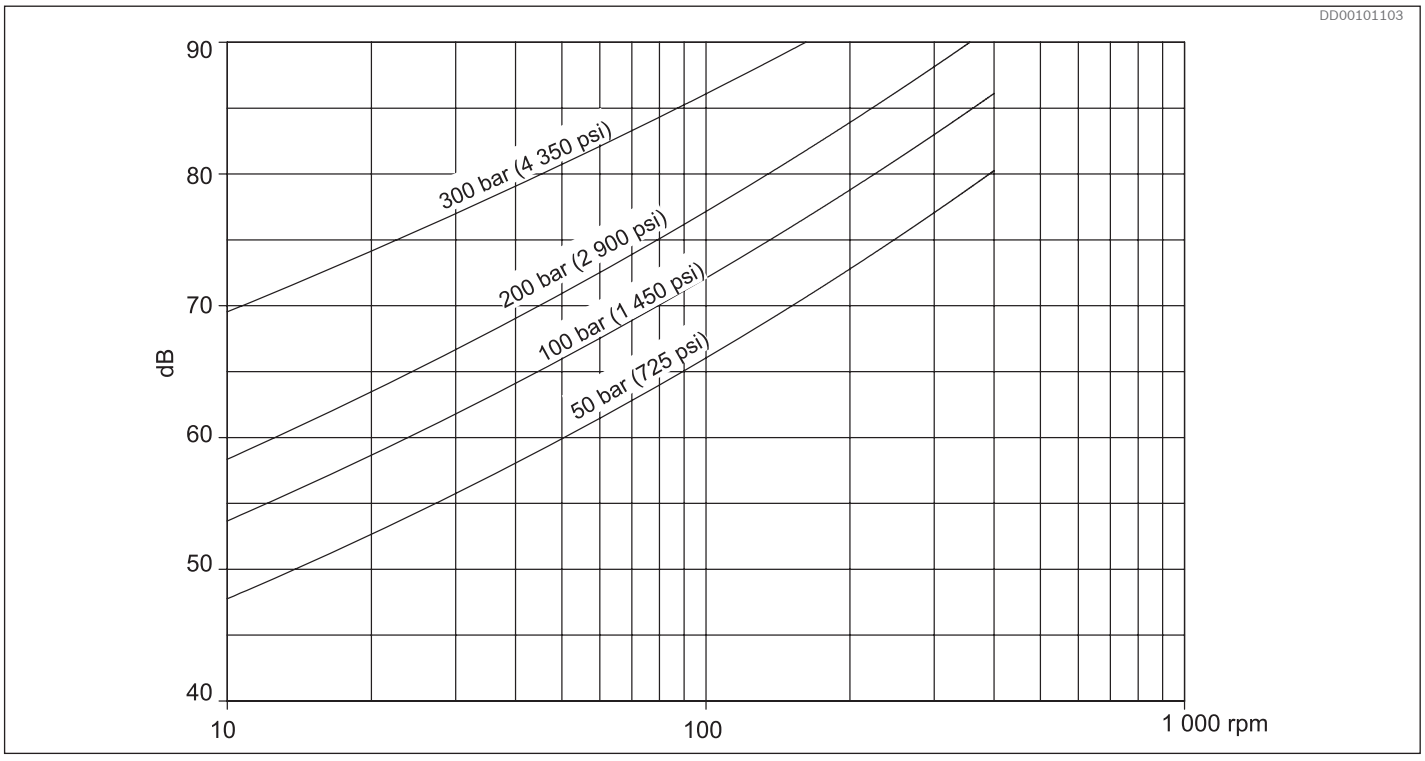


Fig. 64: A-weighted emission sound pressure level of CA 50 to CA 70

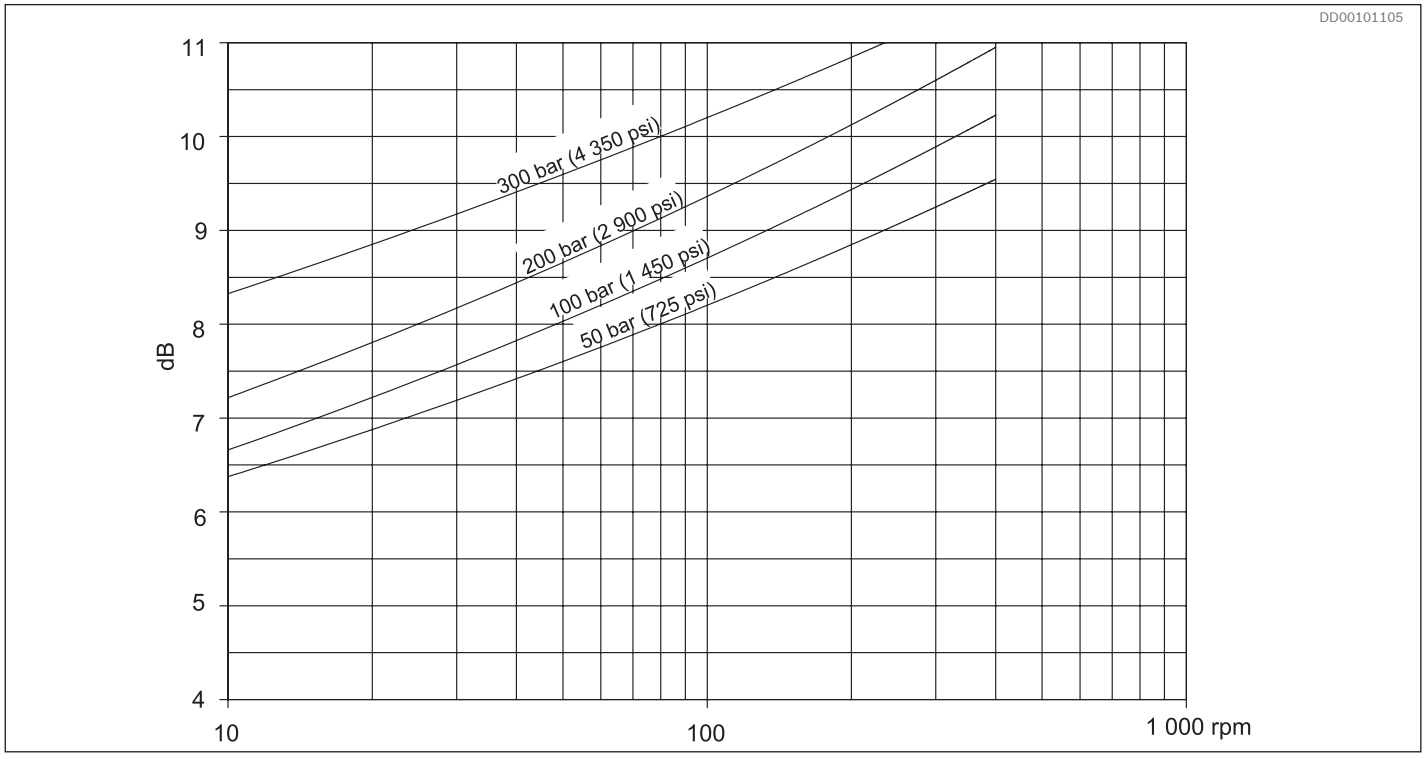


Fig. 65: A-weighted sound power level of CA 50 to CA 70

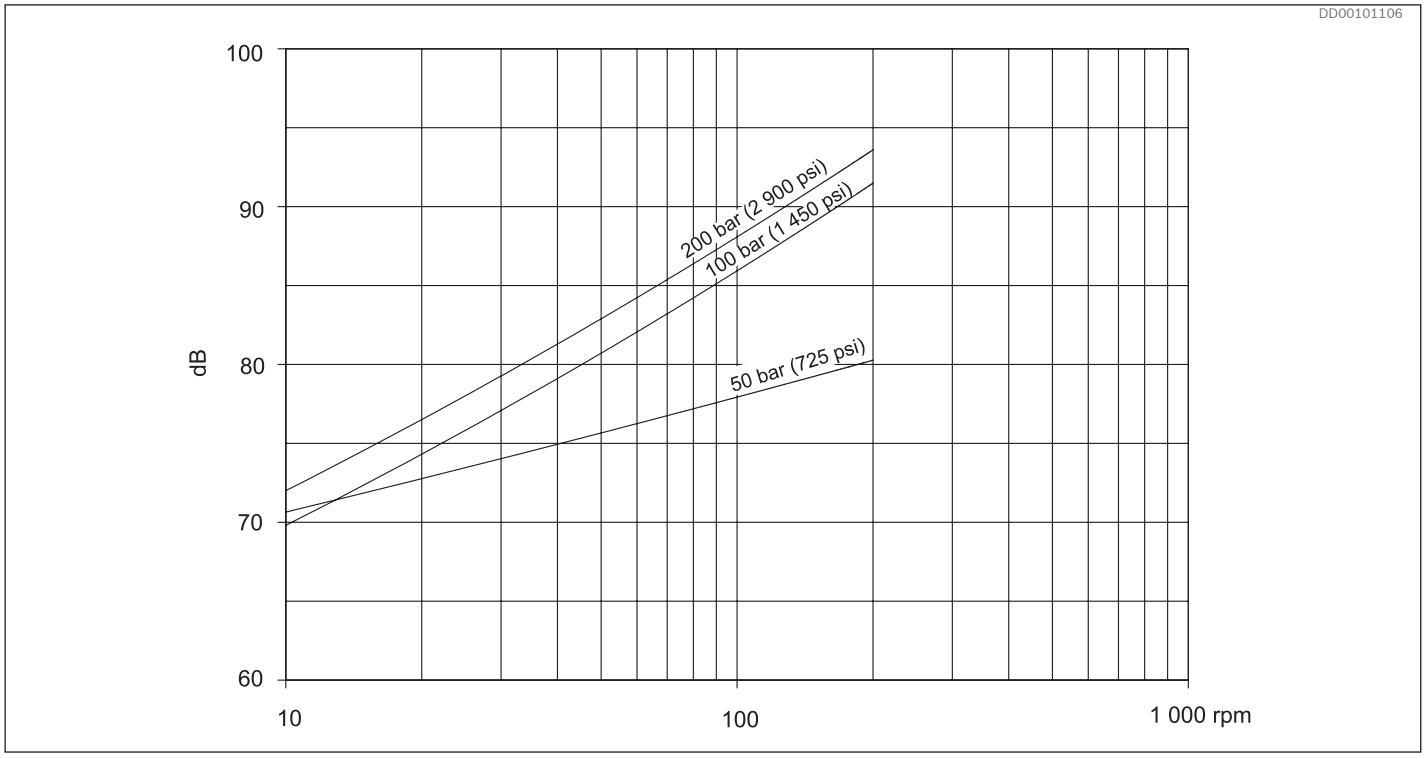


Fig. 66: A-weighted emission sound pressure level of CA 100 to CA 210

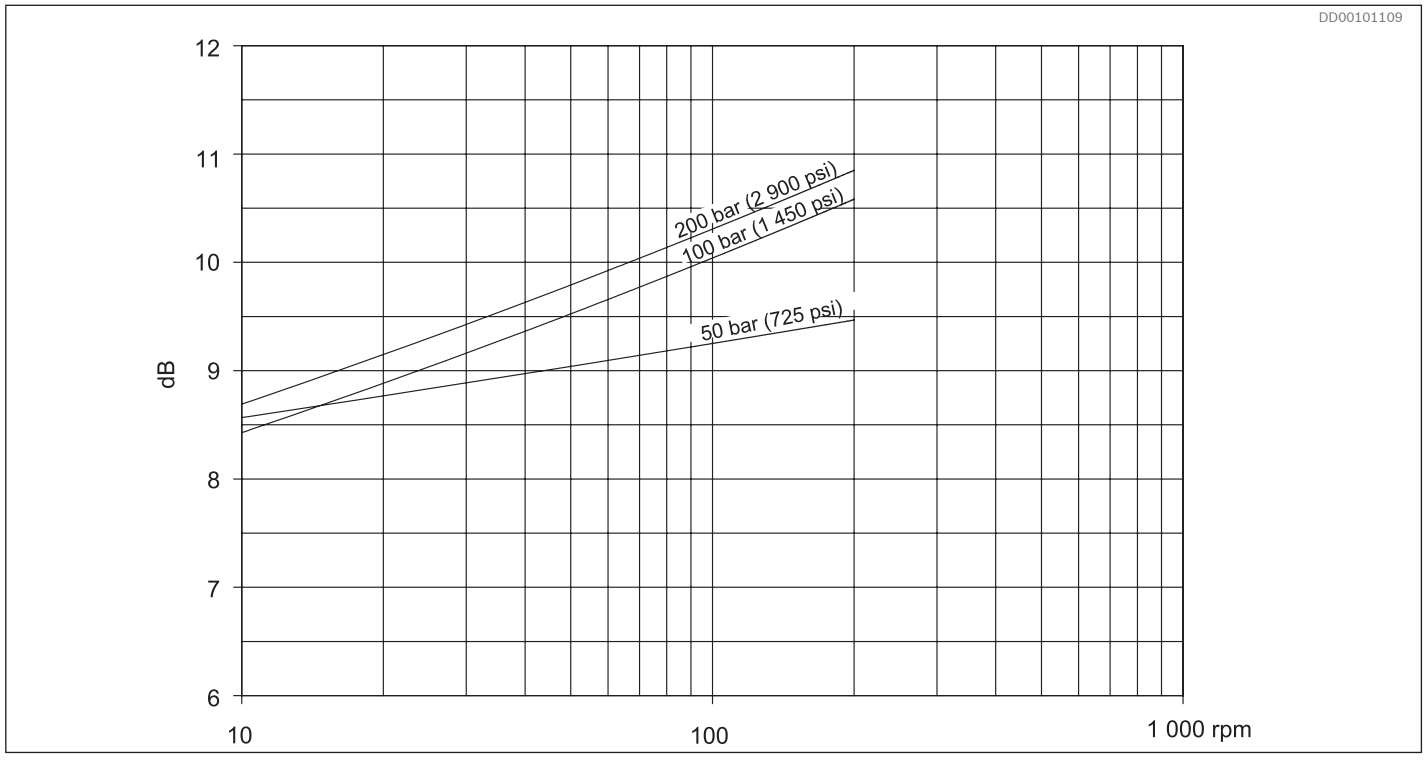


Fig. 67: A-weighted sound power level of CA 100 to CA 210

5 DISPLACEMENT SHIFT

Hägglunds CA can be configured with displacement shift (2-speed). When ordering a motor with displacement shift the main rotation, clockwise (R) or counter clockwise (L), has to be specified in the ordering code.

To be used with VTCA valve, see document: **RE 15389**

Special index 06 can be used for increased efficiency when running at higher speed in half displacement, see *9.1: Special index 06: Motor for high speed at half displacement*.

Option 0:
Standard configuration is single speed motor.

Option R:
2-speed motor used for main rotation clockwise (as viewed from shaft side and inlet to A port).

Option L:
2-speed motor used for main rotation counter-clockwise (as viewed from shaft side and inlet to A port).

Note!
Shift from full to half displacement when motor is running is allowed up to 30 rpm and when high pressure is max 150 bar with recommended charge pressure 20 bar. Shift from half to full displacement when motor is running is not allowed. Running at reversed direction in half displacement is possible, but must be limited to 210 bar.

6 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, at speed > 280 rpm or when operating with fire resistant fluids. See section *4.2: General data*, *4.13.5: Power loss freewheeling* and *4.5: Hydraulic fluids*

7 THROUGH HOLE KIT

Through hole kit (option H) enables e.g. flushing through the motor to the driven machine or the possibility to draw electric cables through the motor.

Dimension drawing
See section *14: Related documents*

Table 10: Dimensions Hägglunds CA with through hole kit

	L1			
	Splines		Shrink disc	
Motor	**mm**	**in**	**mm**	**in**
CA 50/CA 70	303	11.93	395	15.55
CA 100/CA 140	390	15.35	493	19.41
CA 210	492	19.37	631	24.84

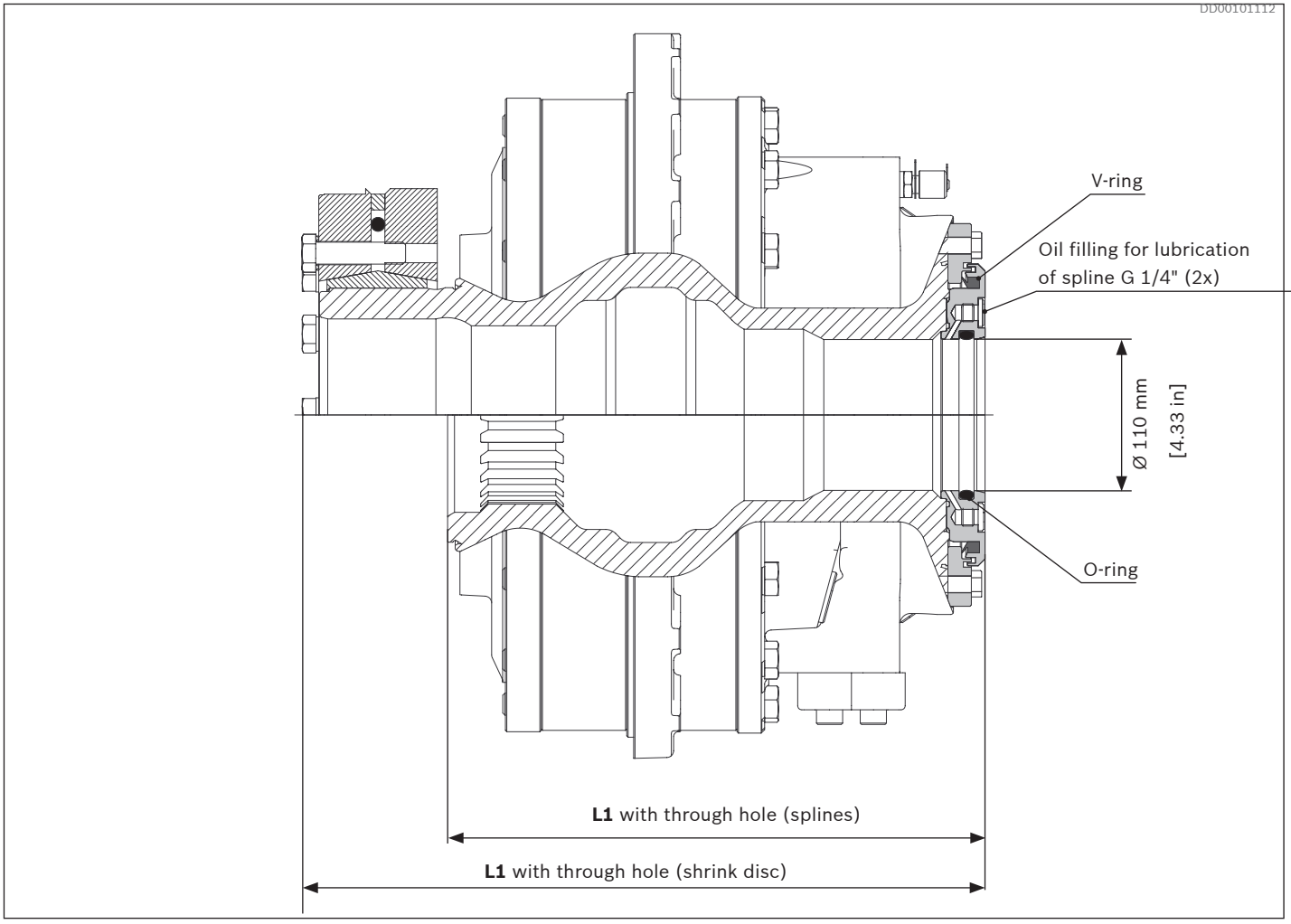


Fig. 68: Example: Hägglunds CA 140 with through hole kit

8 INCREASED ROBUSTNESS

Option 0:
CA has un-coated pistons and cam rollers as standard configuration.

Option C:
DLC (Diamond-Like Carbon) coated pistons and cam rollers shall always be used in the following cases:
– If operating speed ≤ 5rpm
– If operating speed > 100 rpm and charge pressure ≥ 50 bar

DLC (Diamond-Like Carbon) coated pistons and cam rollers are recommended in the following cases:
– When replacing an existing Hägglunds MA motor with a CA motor
– If there is a risk for cavitation in combination with shock loads
– If operating speed > 150 rpm

Option D:
This option provides increased starting efficiency with up to 6%. This option is recommended when starting effficiency is of high importance, e.g. in winches.

For industrial use with continious operation, standard coating (option C) is recommended.

9 SPECIAL INDEX MOTORS

9.1 Special index 06: Motor for high speed at half displacement

- Available for CA 70/140/210
- Available for motors with displacement shift with option R or L
- Available for motors with increased robustness with option C or D
- To be used with 2 pcs valve VTCA 600 (standard + S05) *Must be ordered separately*

The motor has both upper and lower connection surfaces adapted for displacement shift and is prepared for 2 pcs VTCA 600. All motor data exept pressure drop and recommended charge pressure are the same as for same size of standard CA motor. See VTCA 600 data sheet RE 15389 for more information.

Note!
S-index 06 motors with two VTCA 600 are not allowed for hanging load applications.

Note!
Not recommended for motors with reduced displacement due to starting efficiency see motor data *Table 5 and Table 6*.

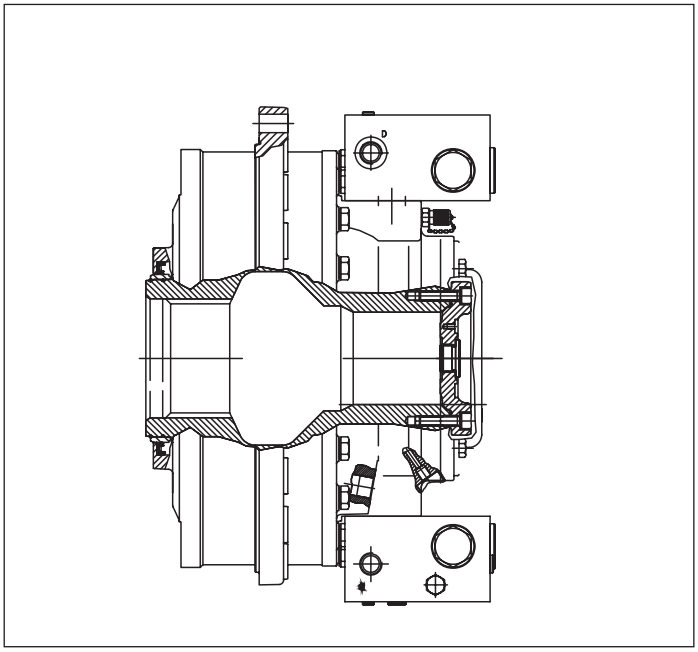


Fig. 69: CA motor with S-index 06 and 2pcs VTCA valves

9.2 Special index 11: Motor for submerged applications

- Available for CA 50/70/100/140/210.
- Available for splines motors
- Motor partly sealed off
- Max depth in water is 70 m (230 ft)

Recommended to be flange mounted with o-ring according to *Fig. 70.* For dimension drawing for design of flange, see section *14 Related documents*.

To be ordered separately

- O-rings, see *Table 11*
- Painting system C5M-Corrosivity category Very High is recommended

Table 11: Material ID O-ring

Motor type	Material ID
CA 50	R913021837
CA 70	R939051432
CA 100	R913021837
	R939005821
CA 140/ CA 210	R913018886
	R939051432

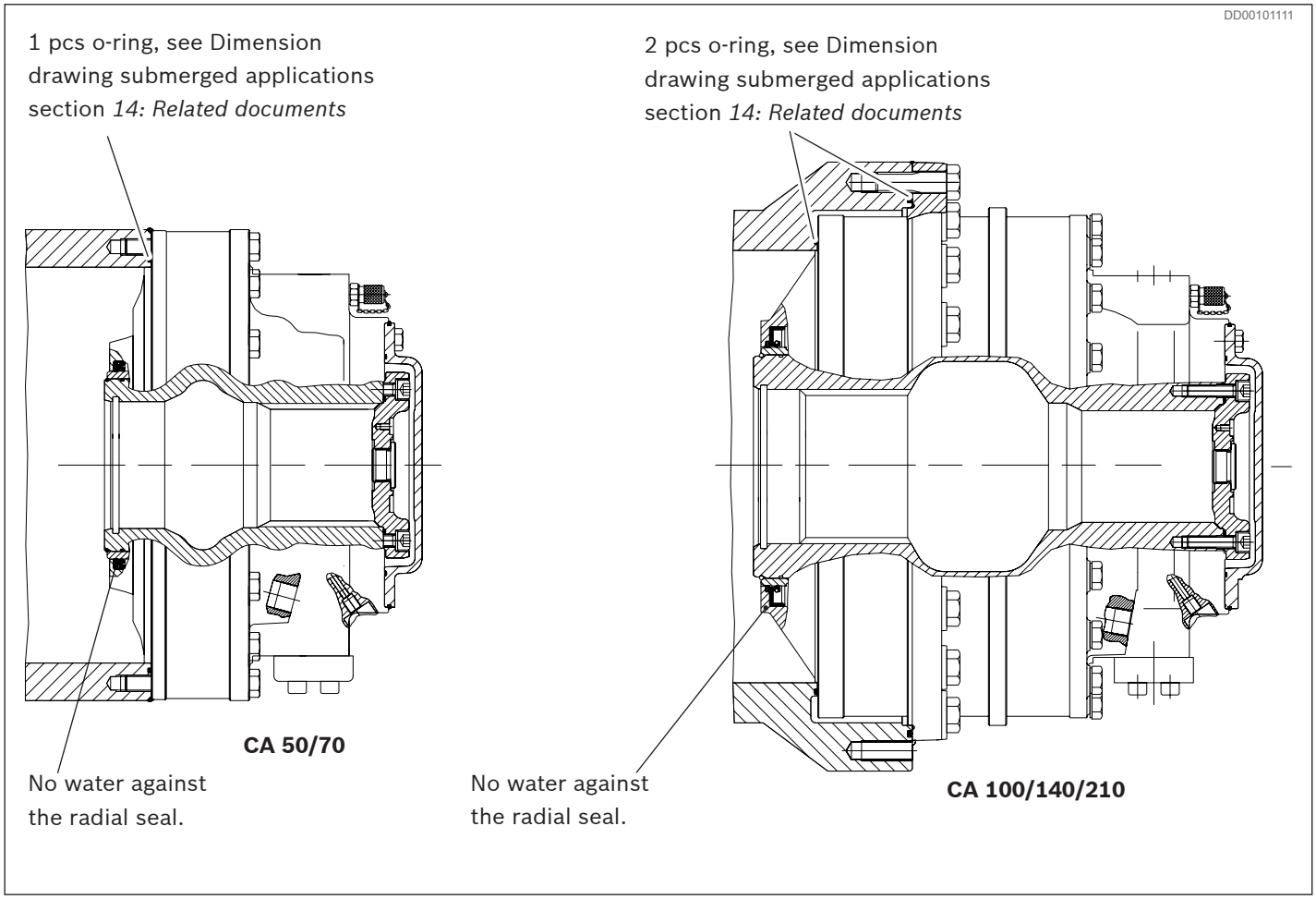


Fig. 70: CA motor for submerged application

9.3 Special index 13: Motor with reduced noise level

- Available for CA 50/70/100/140/210
- Motor equipped with low noise distributor

Table 12: Sound level reduction for special index 13 motors at 150 bar (2175 psi) operating pressure

Speed rpm	Sound level reduction' dB
10 - 100	3.5
100 - 140	3.0
140 - 200	1.5

*Standard motor sound level see *4.17*

The pressure drop will increase 15% compared to a standard motor.

9.4 Special index 15 and 42: Motor for displacement shift with very high efficiency

- Available for CA 100/140
- Motor equipped with two connection blocks
- Only available for below motor configurations
  - Spline motors
  - Viton seals
  - Motors not prepared for brake
  - Coated piston sets (option C)
- Up to three speed possibilities, with use of cam rings with different sizes and freewheeling of one camring

Note!
For special index motors with two connection blocks: Free wheeling of upper cam ring is in general not allowed above 70 rpm for vertically mounted motor. For applications outside this restriction, please contact Bosch Rexroth representative.

Required charge pressure according to CA 50 for CA 100 S15 and according to CA 70 for CA 140 S15.

For dimension drawings of special index 15 and 42 motors and shafts, see *14 Related documents*

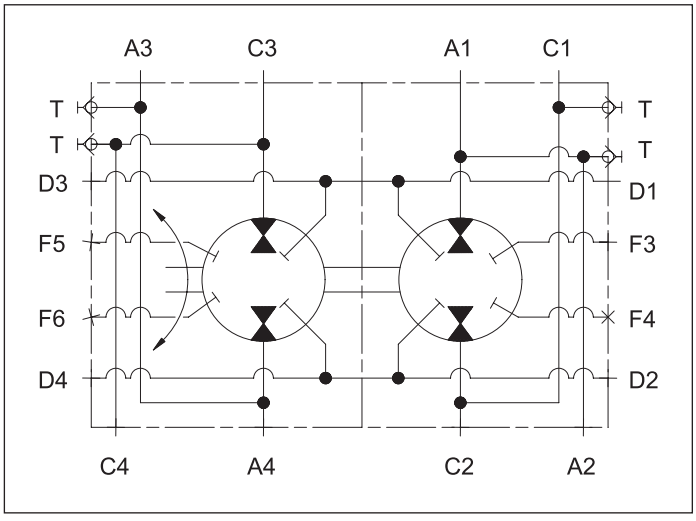


Fig. 71: Hydraulic symbol special index motors 15 and 42

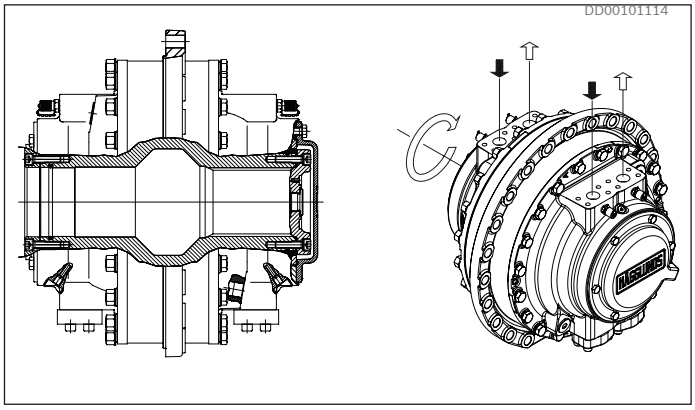


Fig. 72: Center flange mounted CA special index 15

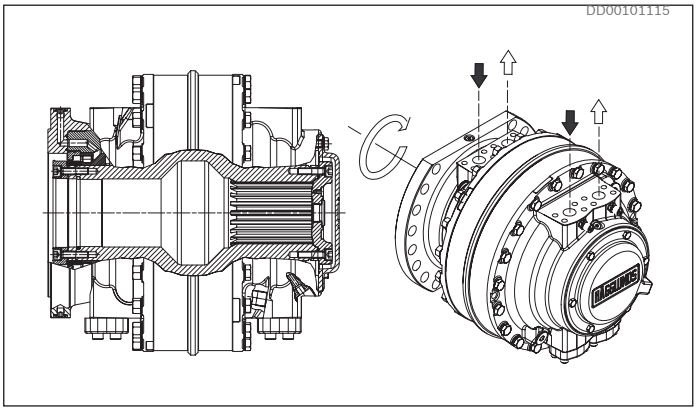


Fig. 73: Front flange mounted CA special index 42

Table 13: Motor data full displacement

Motor type	Displacement			Specific torque		Max. speed
	V_i $\frac{cm^3}{rev}$	V_i $\frac{in^3}{rev}$	T_s $\frac{Nm}{bar}$	T_s $\frac{lbf \cdot ft}{1000\ psi}$	n $\frac{rev}{min}$	
CA 100 40*	2512		153.3	40	2034	400
CA 100 50*	3140		191.6	50	2543	400
CA 100 64*	4020		245.3	64	3254	400
CA 100 80*	5024		306.6	80	4068	350
CA 100 100*	6280		383.2	100	5085	280
CA 140 80**	5024		306.6	80	4068	400
CA 140 100**	6280		383.2	100	5085	320
CA 140 120**	7543		460.3	120	6102	275
CA 140 140**	8800		537	140	7119	240

Table 14: Motor data displacement shift freewheeling

Motor type	Displacement shift, freewheeling shaft side			Displacement shift, freewheeling end cover side		
	Displacement		Max. speed	Displacement		Max. speed
	$\frac{cm^3}{rev}$	$\frac{in^3}{rev}$	rpm	$\frac{cm^3}{rev}$	$\frac{in^3}{rev}$	rpm
CA 100 40*	1256	76.6	400	1256	76.6	400
CA 100 50*	1570	95.8	400	1570	95.8	400
CA 100 64*	2010	122.6	400	2010	122.6	400
CA 100 80*	2512	153.3	350	2512	153.3	350
CA 100 100*	3140	191.6	280	3140	191.6	280
CA 140 80**	2512	153.3	400	2512	153.3	400
CA 140 100**	3771	230.1	275	2512	153.3	400
CA 140 120**	4400	268.5	240	3140	191.6	320
CA 140 140**	4400	268.5	240	4400	268.5	240

*Servicelife according to one CA 50 in half displacement and two CA 50 in full displacement.

** Servicelife according to CBP 140, when used in full displacement, and according to CA 70, when used in half displacement.

The motors are designed according to DNV-rules. Max pressure 350 bar/5000 psi. Test pressure 420 bar/6000 psi. Peak/transient pressure 420 bar/6000 psi maximum, allowed to occur 10000 times.

9.5 Special index 28: Motor for high external load

- Available for CA 70/140/210
- Motor with reinforced main bearing
- Only available for spline motors

For dimension drawings, see *14 Related documents.*

Permissible external dynamic loads for CA 70 S-index 28
Viscosity 40 cSt/187 SSU.

Example:
To find F_r for an overhang gear drive you must calculate the motor torque with the gear angle (normally 20 deg) $F_r = \frac{T \times 2}{\cos 20 \times d}$

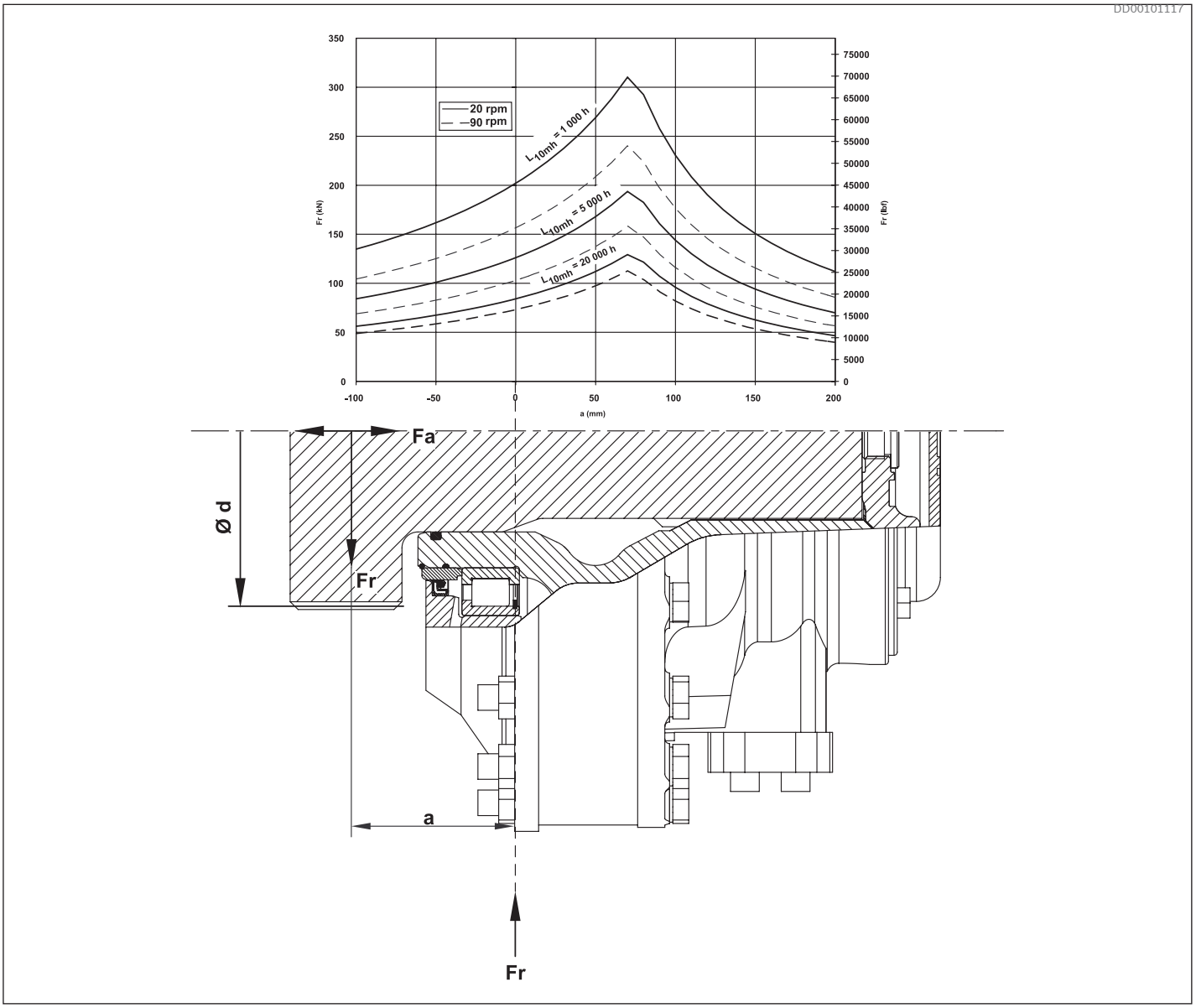


Fig. 74: Permissable external dynamic loads for CA 70 S-index 28

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 740 lbf).

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

Permissible external dynamic loads for CA 140 S-index 28

Viscosity 40 cSt/187 SSU.

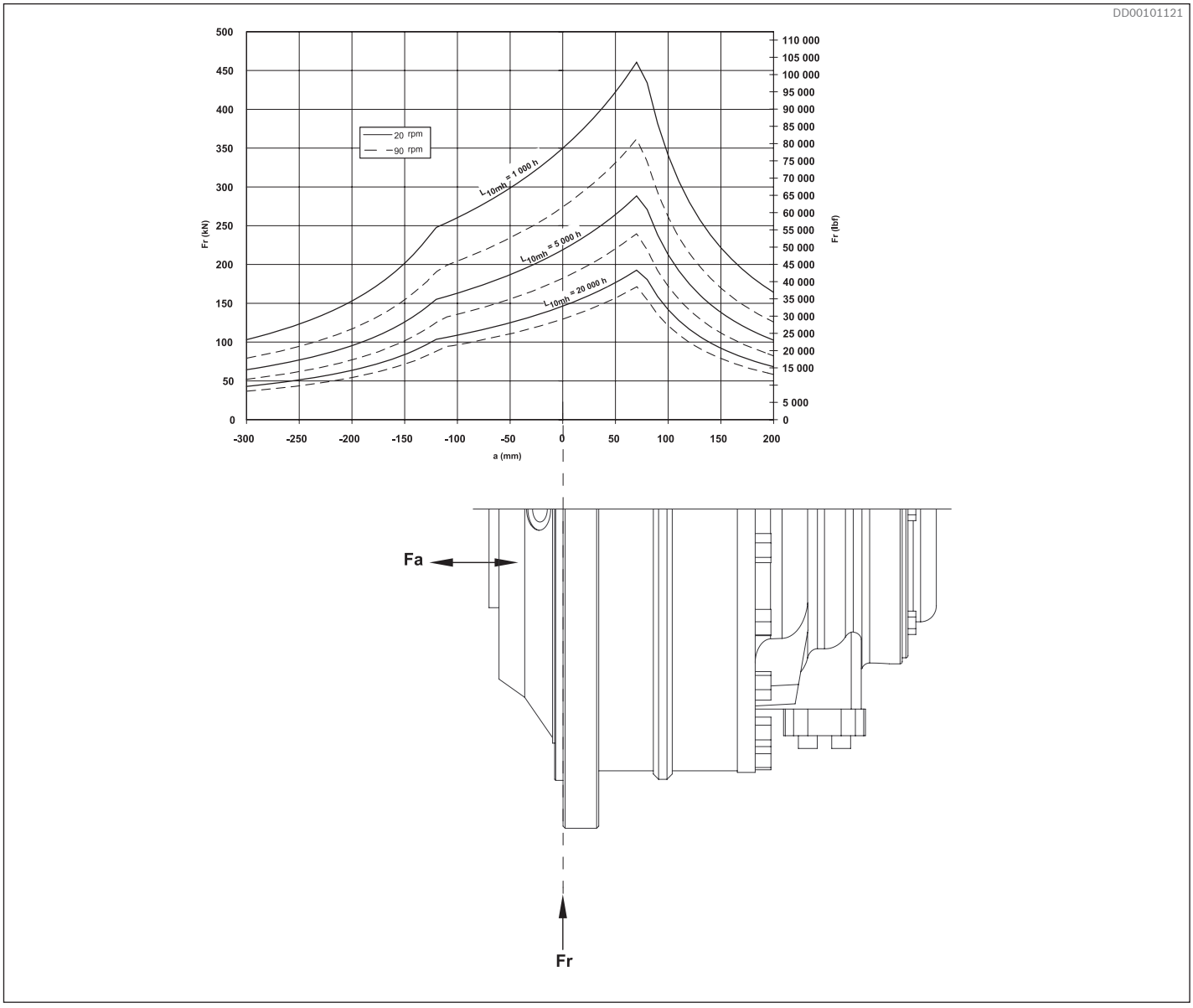


Fig. 75: Permissable external dynamic loads for CA 140 S-index 28

Axial loads: Permissible axial load for intermittent duty F_a = 30 000 N (6 740 lbf).

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

Permissible external dynamic loads CA 210 S-index 28

Viscosity 40 cSt/187 SSU.

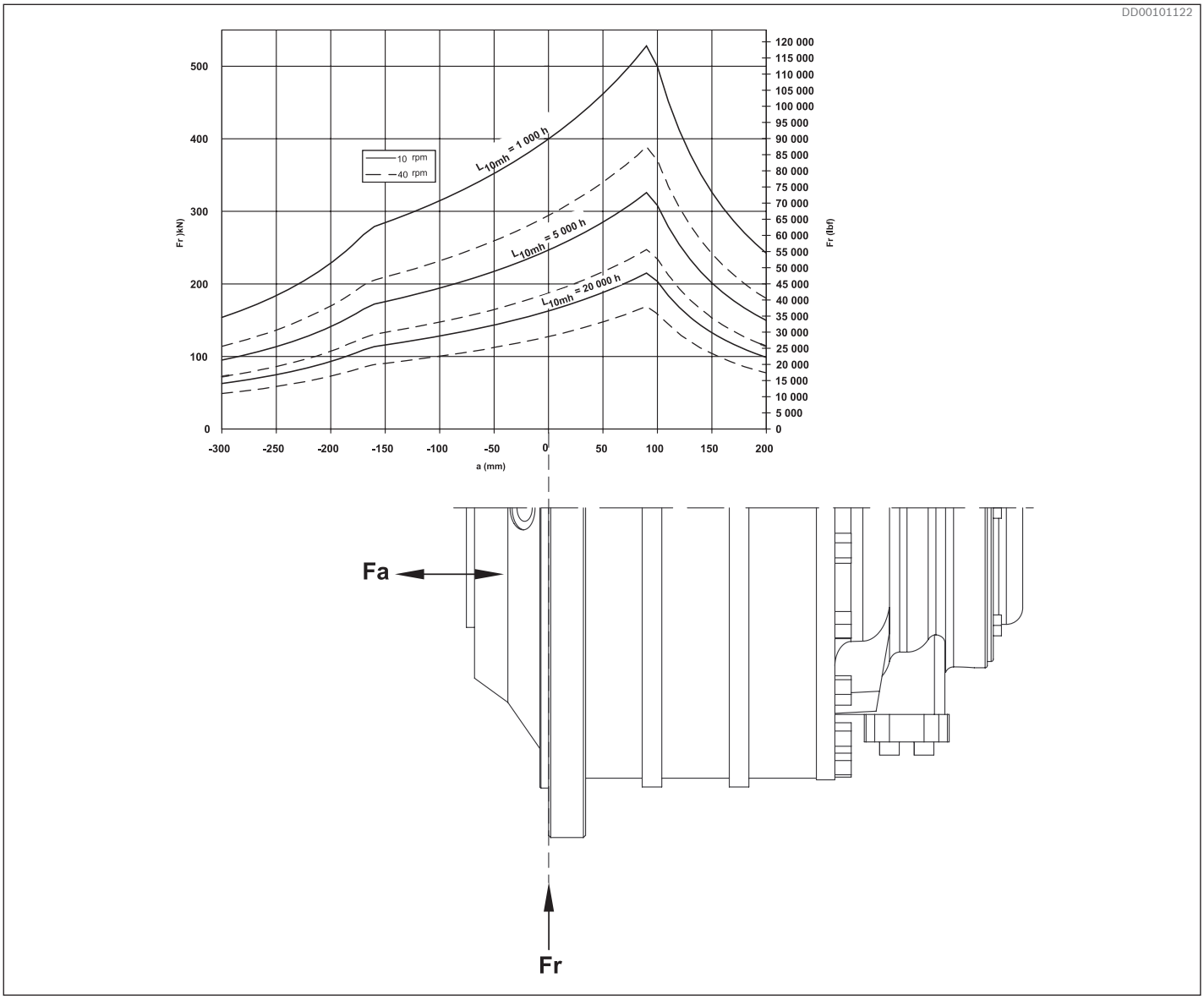


Fig. 76: Permissable external dynamic loads for CA 210 special index 28

Axial loads: Permissible axial load for intermittent duty
F_a = 30 000 N (6 740 lbf).

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

Permissible external static load for S-index 28

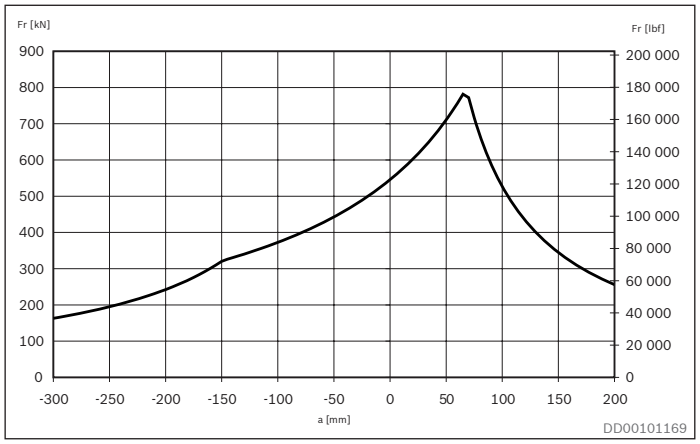


Fig. 77: Permissible external static load for CA 70 S-index 28

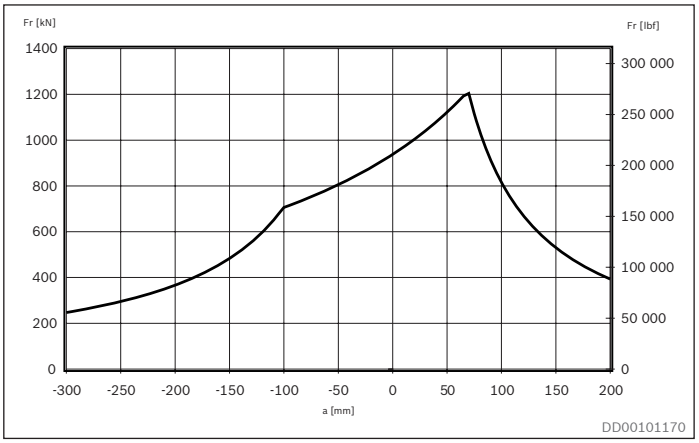


Fig. 78: Permissible external static load for CA 140 S-index 28

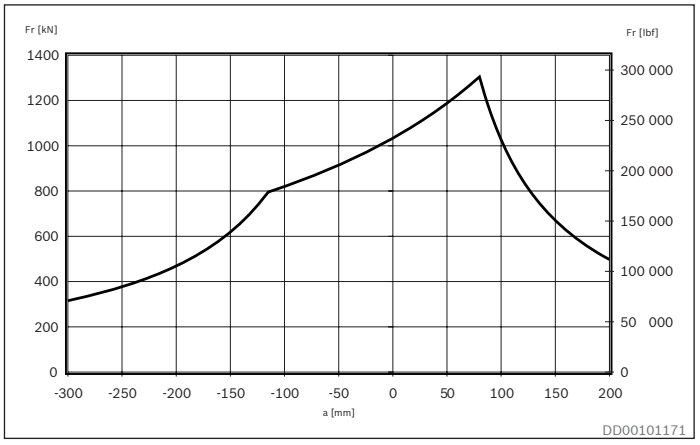


Fig. 79: Permissible external static load for CA 210 S-index 28

9.6 Special index 33: Motor for marine environment

- Available for CA 50/70/100/140/210
- Motor equipped with shaft side wear ring of stainless steel
- Motor equipped with test connections of stainless steel

To be ordered separately

- Painting system C5M-Corrosivity category Very High is recommended

10 DIMENSIONS / INTERFACE

10.1 Dimensions

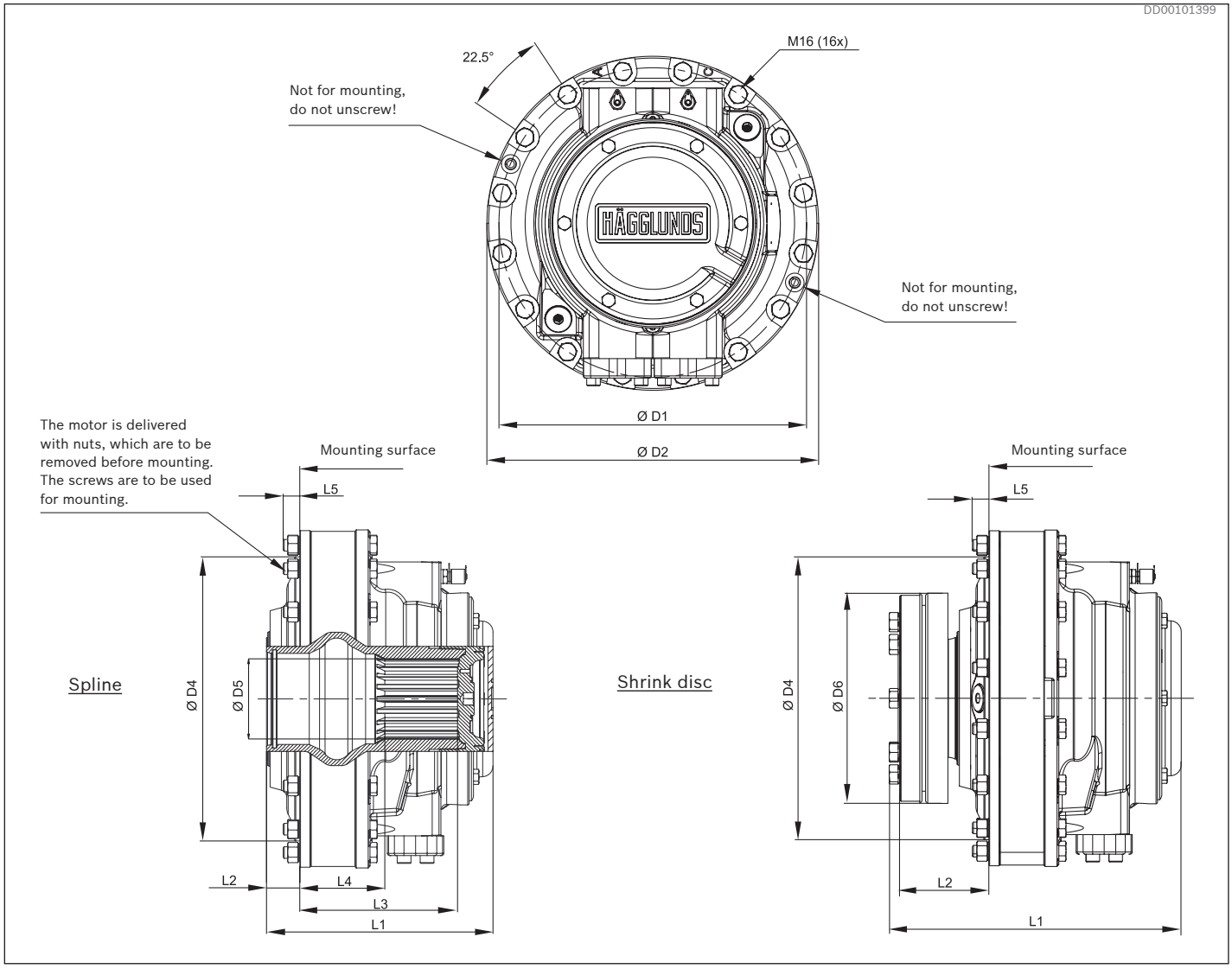


Fig. 80: CA 50

Table 15: Dimensions CA 50

			Dimensions			
			Splines		Shrink disc	
			mm	in	mm	in
D1	Pitch diameter		430	16.93	430	16.93
D2	Outer diameter		464	18.27	464	18.27
D4	Guide diameter		390	15.35	390	15.35
D5	Spline size	DIN 5480	N120 x 5 x 30 x 22 x 9H		-	-
D6	Shrink disc diameter		-	-	290	11.42
L1	Total length	***Without through hole***	312.5	12.30	404.5	15.93
L2	Length to hollow shaft		46.5	1.83	126	4.96
L3	Length to spline end		218	8.58	-	-
L4	Length to spline		117.5	4.63	-	-
L5	Protruding length of screws		23	0.91	23	0.91

For dimension drawings CA 50, see section *14: Related documents*

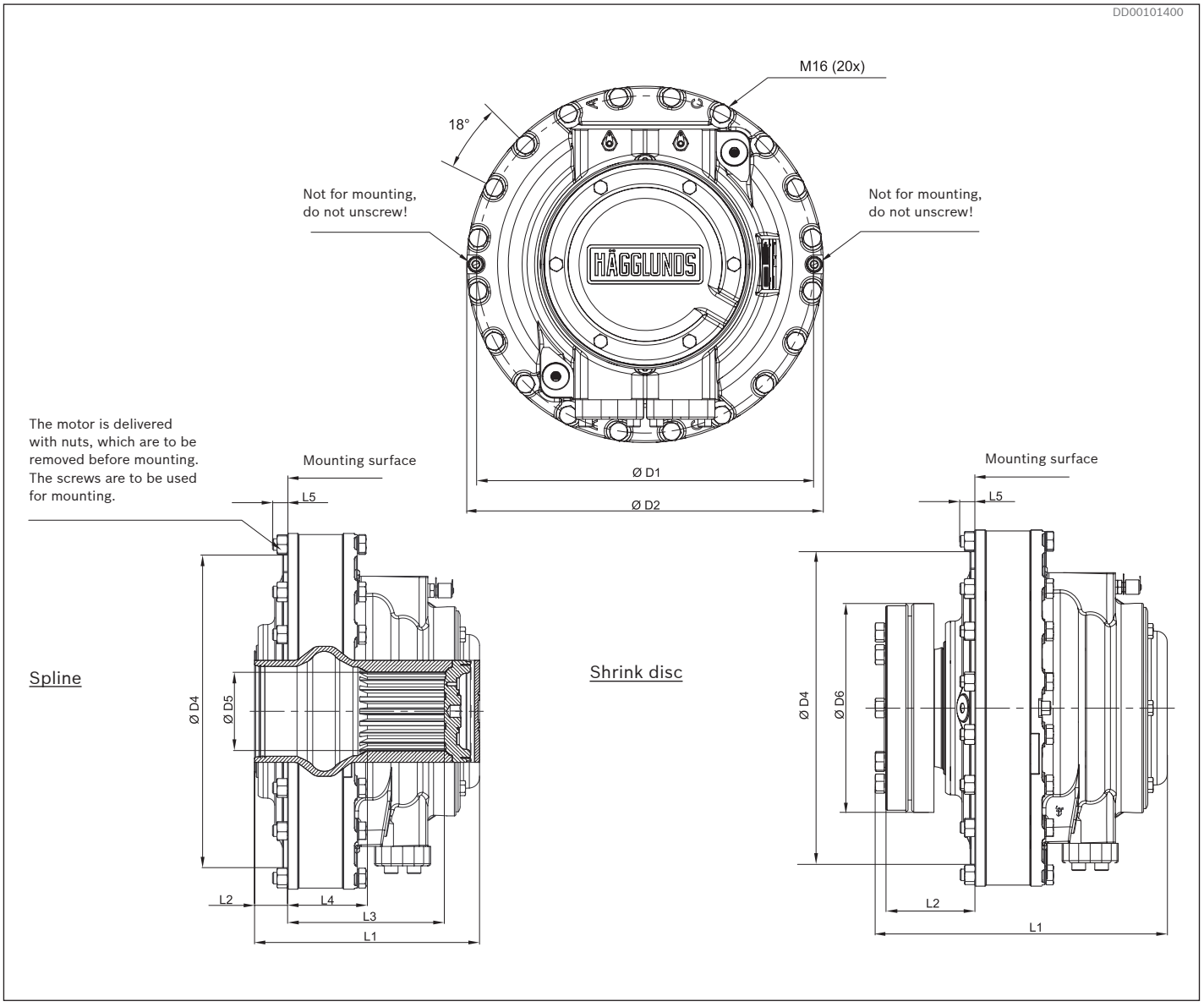


Fig. 81: CA 70

Table 16: Dimensions CA 70

			Dimensions			
			Splines		Shrink disc	
			mm	in	mm	in
D1	Pitch diameter		470	18.50	470	18.50
D2	Outer diameter		495	19.49	495	19.49
D4	Guide diameter		435	17.13	435	17.13
D5	Spline size	DIN 5480	N120 x 5 x 30 x 22 x 9H		-	-
D6	Shrink disc diameter		-	-	290	11.42
L1	Total length	***Without through hole***	312.5	12.30	404.5	15.93
L2	Length to hollow shaft		46.5	1.83	126	4.96
L3	Length to spline end		218	8.58	-	-
L4	Length to spline		111	4.37	-	-
L5	Produting length of screws		23	0.91	23	0.91

For dimension drawings CA 70, see section *14: Related documents*

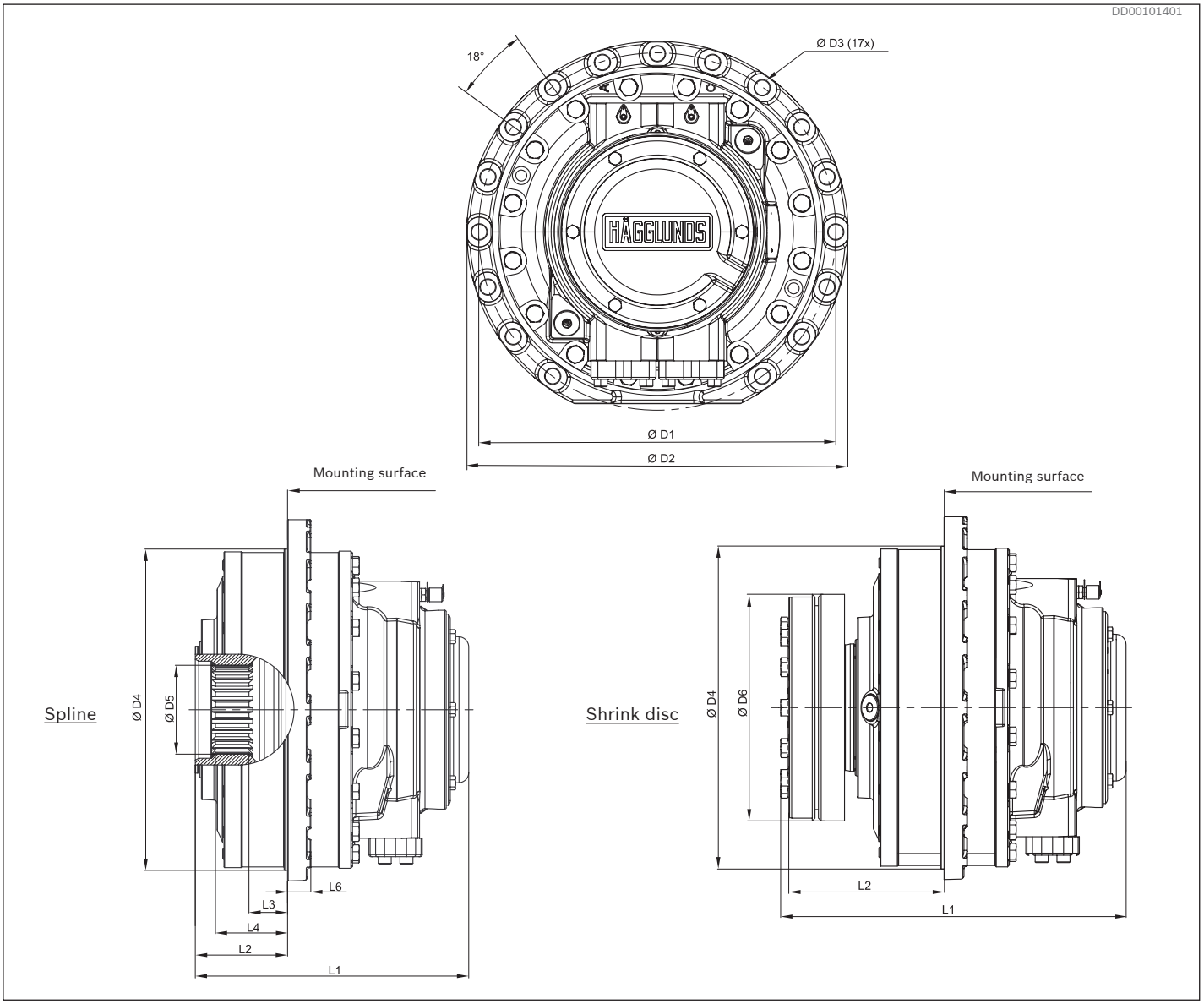


Fig. 82: CA 100

Table 17: Dimensions CA 100

			Dimensions			
			Splines		Shrink disc	
			mm	in	mm	in
D1	Pitch diameter		520	20.47	520	20.47
D2	Outer diameter		560	22.05	560	22.05
D3	Screw hole		22	0.87	22	0.87
D4	Guide diameter		470	18.50	470	18.50
D5	Spline size	DIN 5480	N140 x 5 x 30 x 26 x 9H		-	-
D6	Shrink disc diameter		-	-	330	12.99
L1	Total length	***Without through hole***	399.5	15.73	505	19.88
L2	Length to hollow shaft		135.5	5.33	229	9.02
L3	Length to spline end		56.5	2.22	-	-
L4	Length to spline		105.5	4.15	-	-
L6	Thickness of mounting ring		34	1.34	34	1.34

For dimension drawings CA 100, see section *14: Related documents*

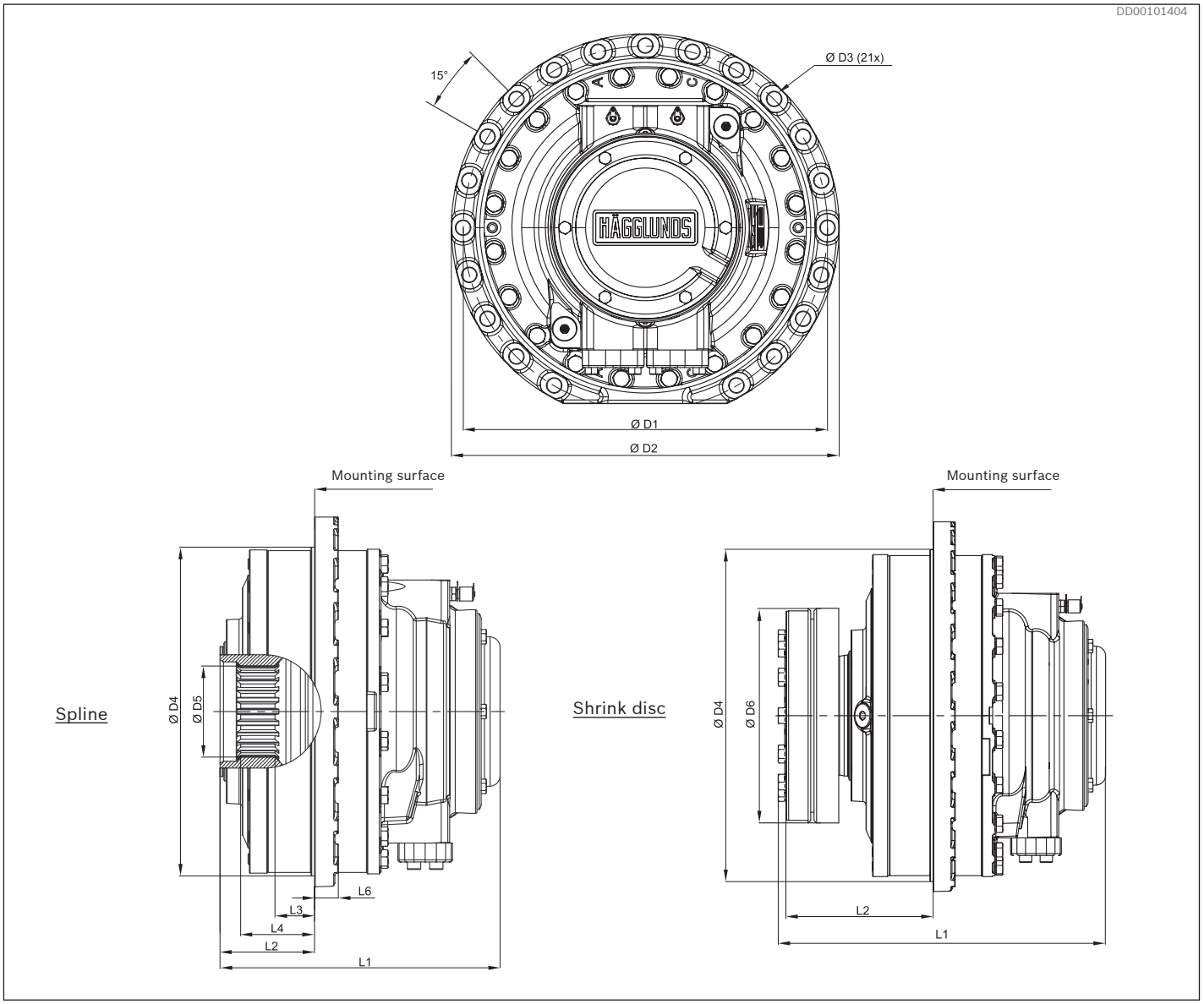


Fig. 83: CA 140

Table 18: Dimensions CA 140

			Dimensions			
			Splines		Shrink disc	
			mm	in	mm	in
D1	Pitch diameter		560	22.05	560	22.05
D2	Outer diameter		600	23.62	600	23.62
D3	Screw hole		22	0.87	22	0.87
D4	Guide diameter		510	20.08	510	20.08
D5	Spline size	DIN 5480	N140 x 5 x 30 x 26 x 9H		-	-
D6	Shrink disc diameter		-	-	330	12.99
L1	Total length	***Without through hole***	399.5	15.73	505	19.88
L2	Length to hollow shaft		135	5.31	229	9.02
L3	Length to spline end		35	1.38	-	-
L4	Length to spline		105.5	4.15	-	-
L6	Thickness of mounting ring		34	1.34	34	1.34

For dimension drawings CA 140, see section *14: Related documents*

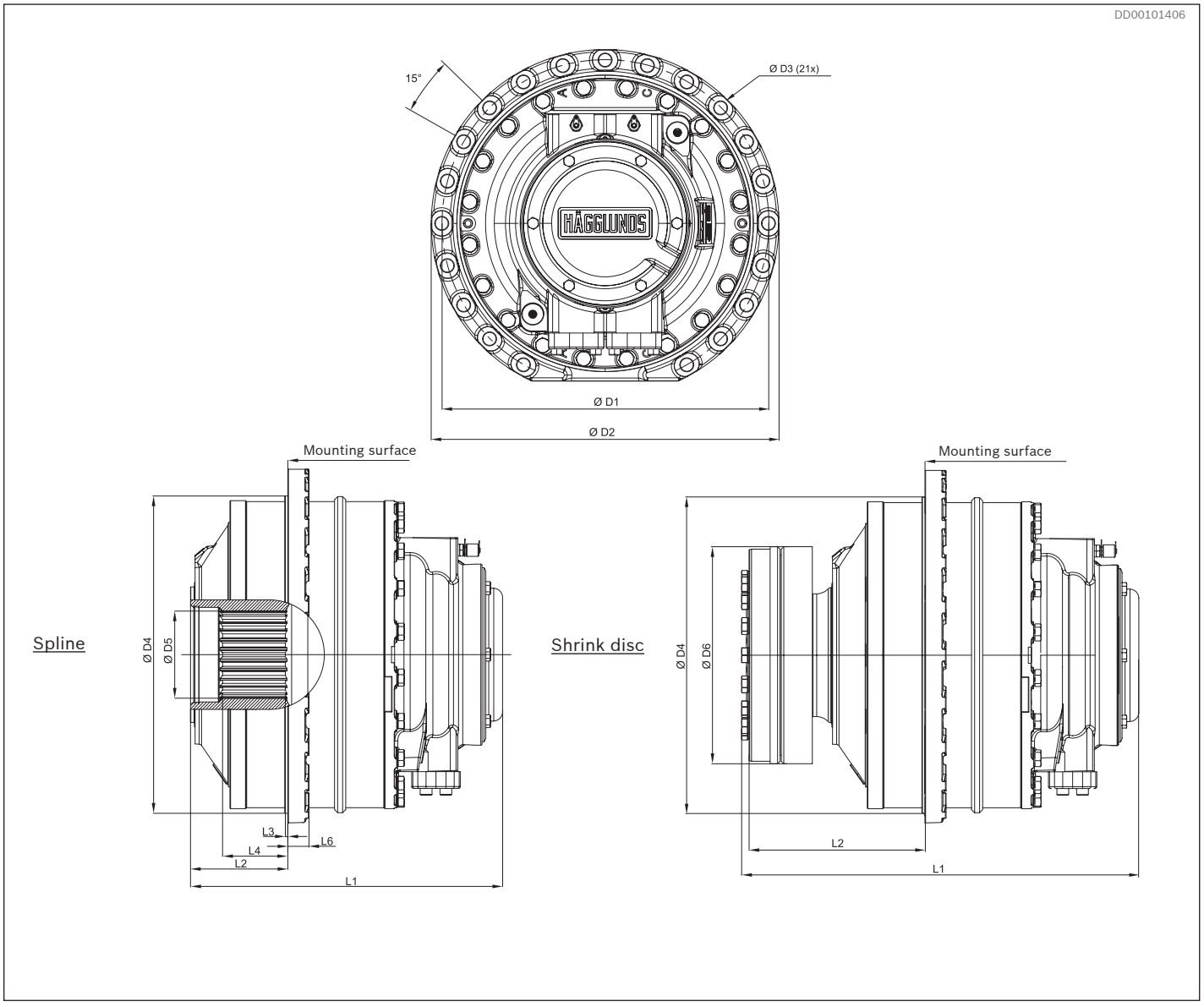


Fig. 84: CA 210

Table 19: Dimensions CA 210

		Dimensions			
		Splines		Shrink disc	
		mm	in	mm	in
D1	Pitch diameter	560	22.05	560	22.05
D2	Outer diameter	600	23.62	600	23.62
D3	Screw hole	22	0.87	22	0.87
D4	Guide diameter	510	20.08	510	20.08
D5	Spline size DIN 5480	N150 x 5 x 30 x 28 x 9H		-	-
D6	Shrink disc diameter	-	-	350	13.78
L1	Total length ***Without through hole***	501	19.72	644.5	25.37
L2	Length to hollow shaft	156.5	6.16	288	11.34
L3	Length to spline end	4	0.16	-	-
L4	Length to spline	105	4.13	-	-
L6	Thickness of mounting ring	34	1.34	34	1.34

For dimension drawings CA 210, see section *14: Related documents*

11 MOUNTING ALTERNATIVES

11.1 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 machine. To avoid wear in the splines, the installation before mounting of motor must be within the specified tolerances in *Fig. 85* For requirements of spline shaft, see section *14: Related documents*

11.1.1 Flange mounting with splines

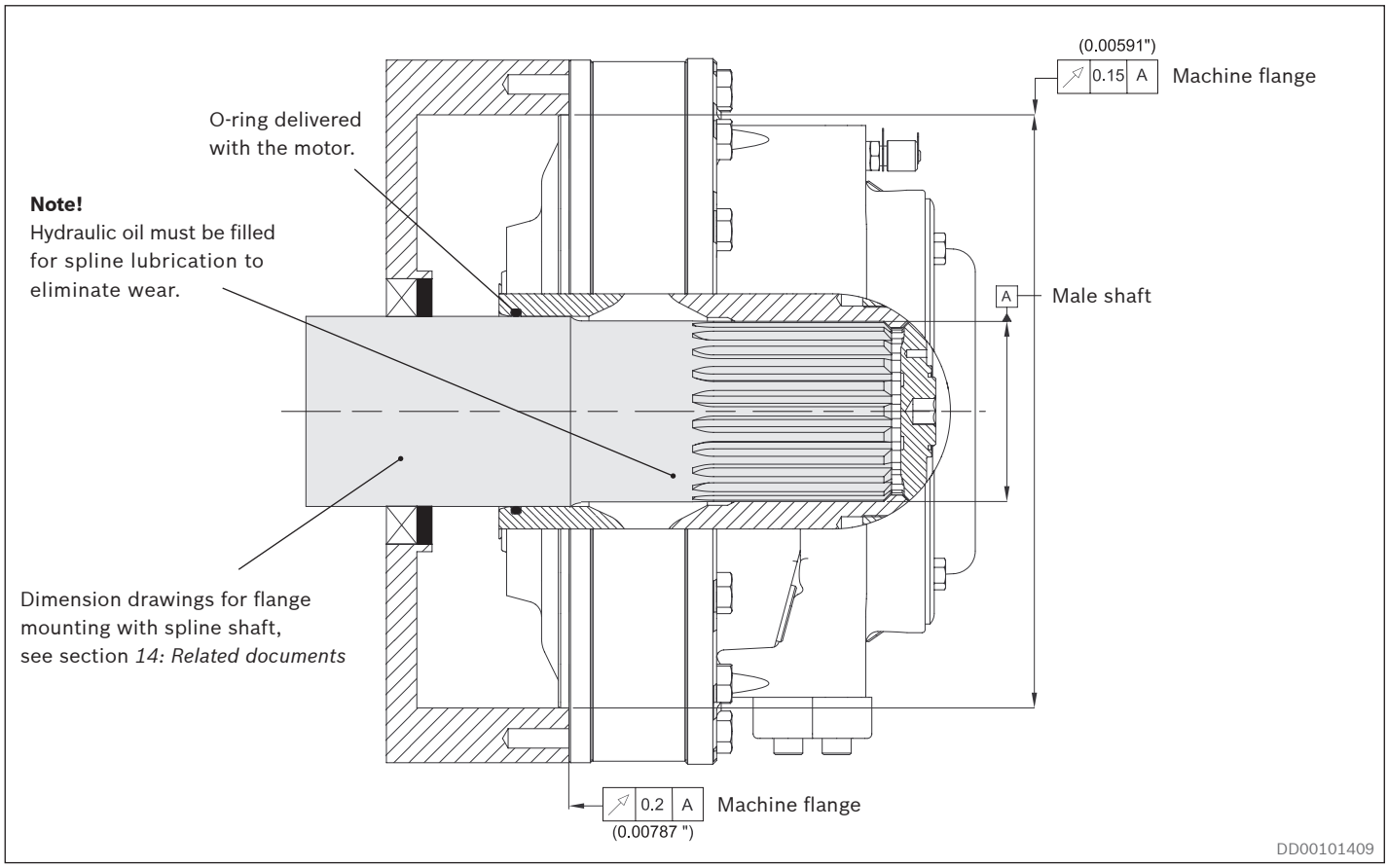


Fig. 85: Example: Flange mounting of CA 50 with splines

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
- Space saving

Note!
Flange mounting is only recommended for spline motors. Flange mounting gives high risk for overloading of motor main bearing. Always check that the shaft and motor bearings are statically determined.

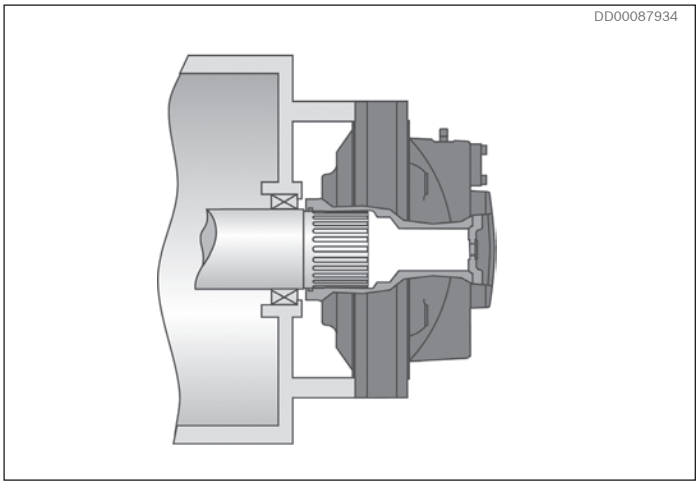


Fig. 86: Example: Flange mounted motor with spline and low radial load from driven shaft.

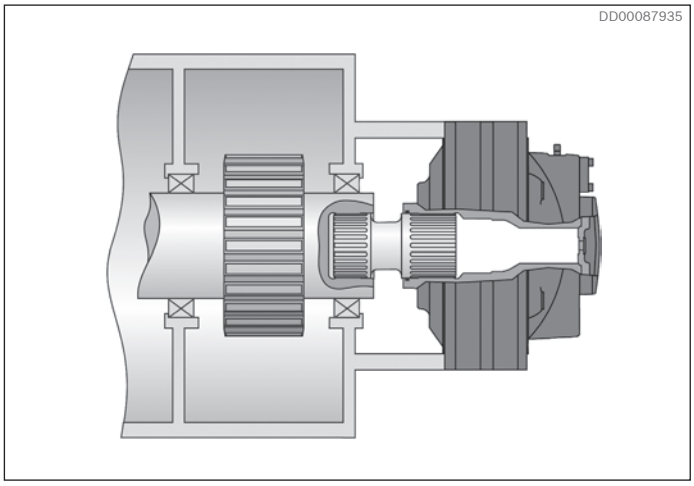


Fig. 87: Example: Flange mounted motor with spline to avoid high radial load from driven shaft.

Design of spline shaft

Table 20: Spline designation shaft

	Spline		
Frame size	**CA 50, CA 70**	**CA 100, CA 140**	**CA 210**
Designation: Standard DIN 5480	W120x5x30x22x8f	W140x5x30x26x8f	W150x5x30x28x8f

Table 21: 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)

For shaft dimension drawings see section *14: Related documents*

11.1.2 Torque arm mounting with splines

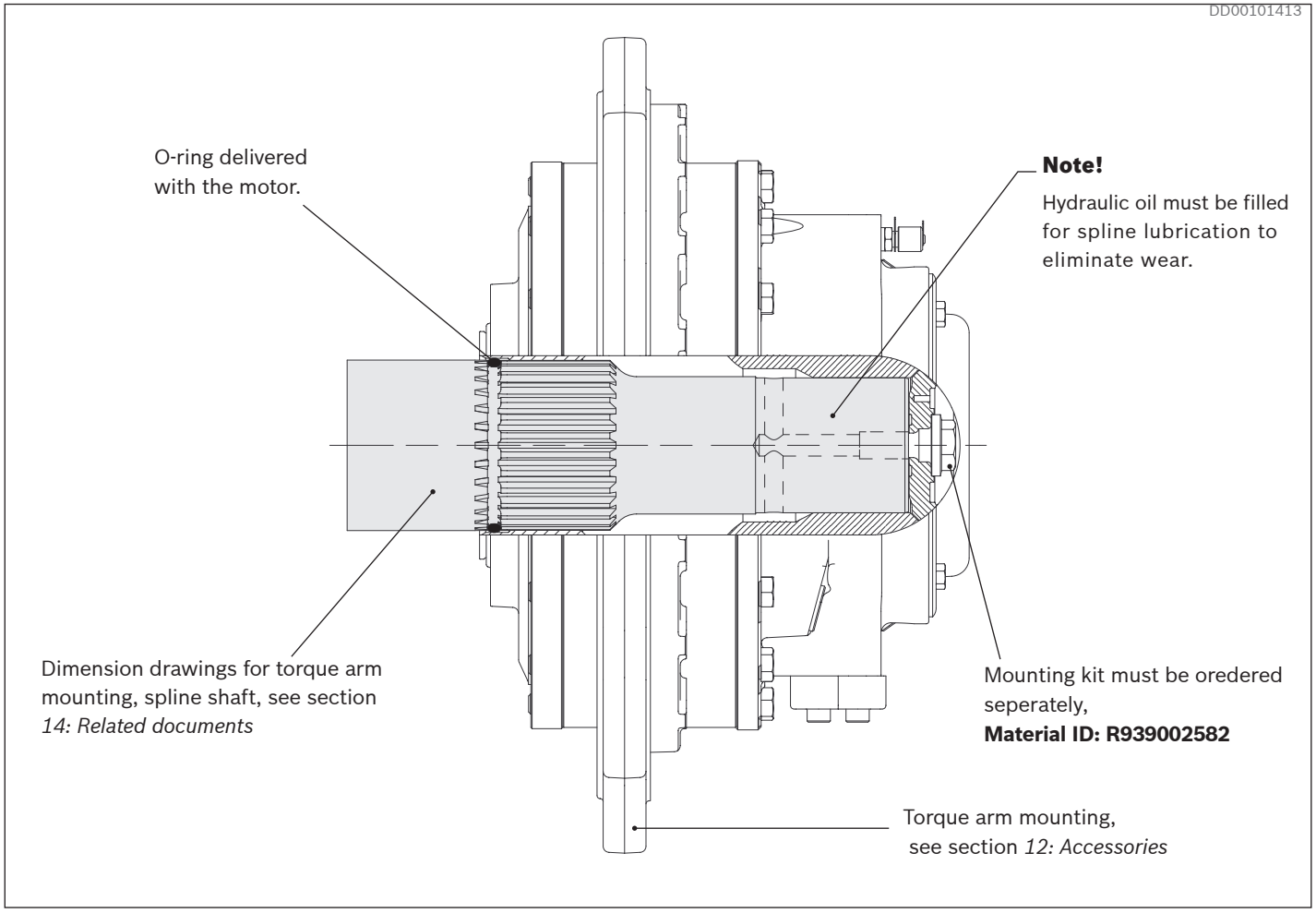


Fig. 88: Example: Torque arm mounting of CA 100 with splines

Recommended material in the shaft, see *Table 21*.
Spline designation shaft, see *Table 20*.

11.1.3 Torque arm mounting on plain shaft

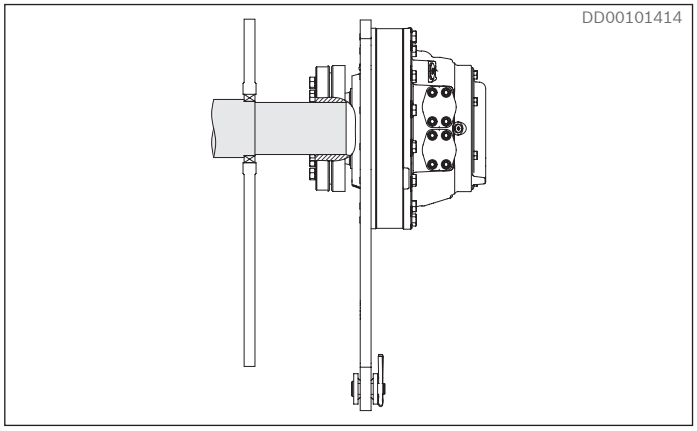


Fig. 89: Example: Torque arm mounted motor with shrink disc

Design of plain shaft

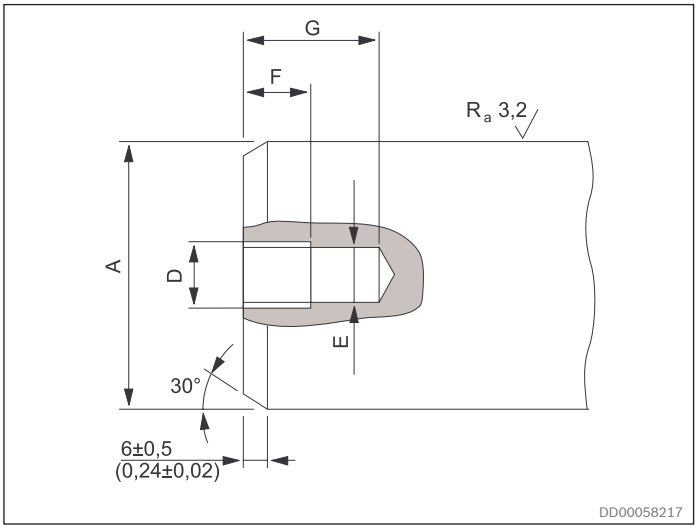


Fig. 90: Shaft end, normally loaded

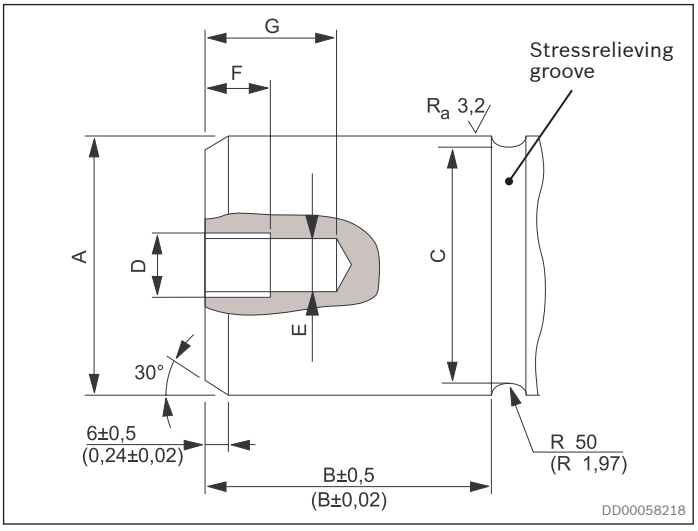


Fig. 91: Shaft end, heavily loaded

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 22: Shaft recommendations

Dim		CA 50/CA 70	CA 100/CA 140	CA 210
A	mm	ø 120 $^{0}_{-0,025}$	ø 140 $^{0}_{-0,025}$	ø 160 $^{0}_{-0,025}$
	in	ø 4,7244 $^{0}_{-0,00098}$	ø 5,5118 $^{0}_{-0,00098}$	ø 6,2992 $^{0}_{-0,00098}$
B	mm	71,5	84,5	105
	in	2,81	3,33	4,13
C	mm	ø 116	ø 133	ø 153
	in	ø 4,57	ø 5,24	ø 6,02

Table 23: Thread dimensions for assembly tool in plain shaft

Measures	Dimensions, threads for assembly tool			
D	M20		UNC 5/8"	
E	ø >17 mm	ø 0,67 in	ø >13,5 mm	ø 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 24: Recommended material in the plain shaft

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

12 ACCESSORIES

12.1 Torque arms

Mounting alternatives

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

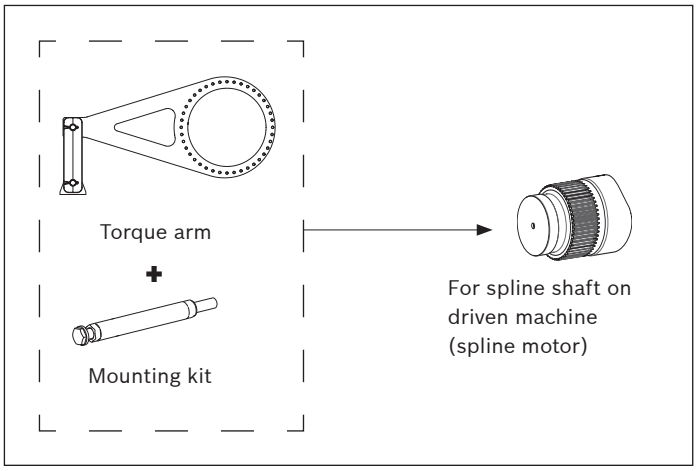


Fig. 92: Single ended torque arm mounting for spline shaft

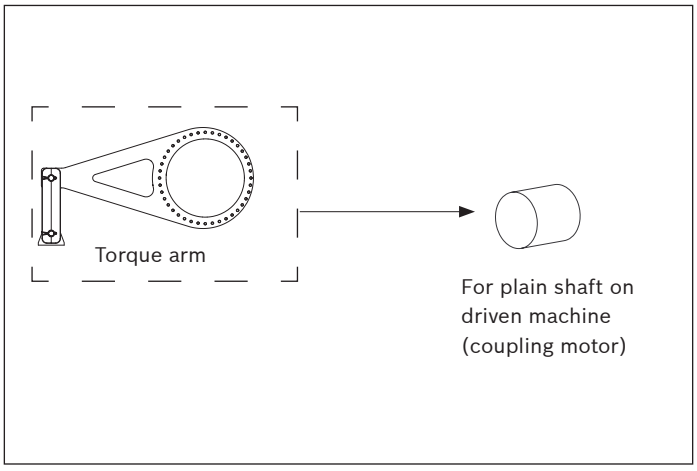


Fig. 93: Single ended torque arm mounting for plain shaft

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.

Features

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

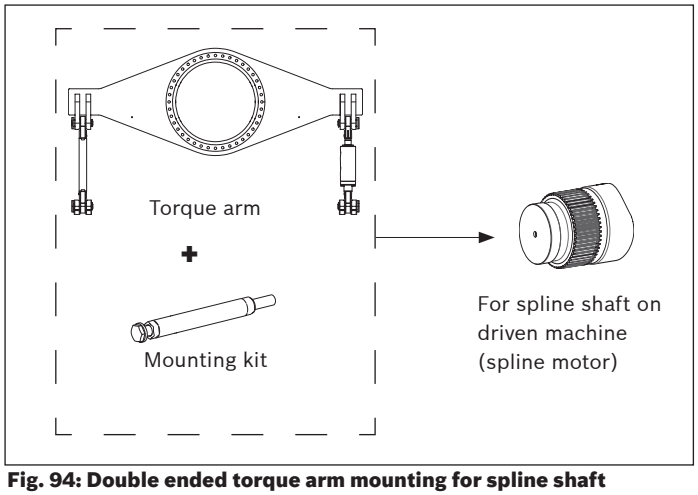


Fig. 94: Double ended torque arm mounting for spline shaft

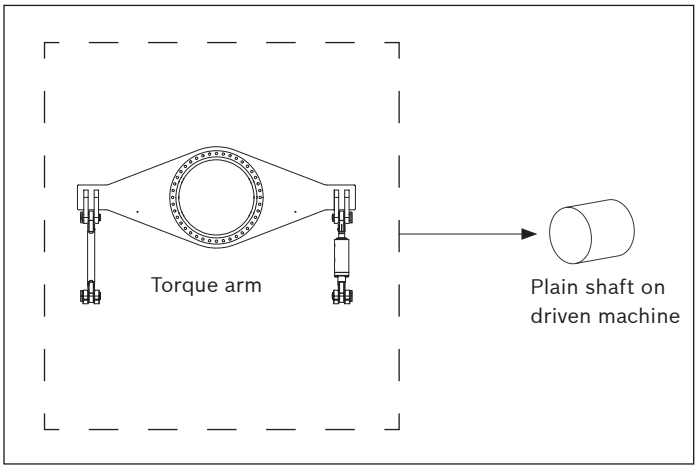


Fig. 95: Double ended torque arm mounting with plain shaft

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.

Features

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

12.2 Flushing set and Early warning kit

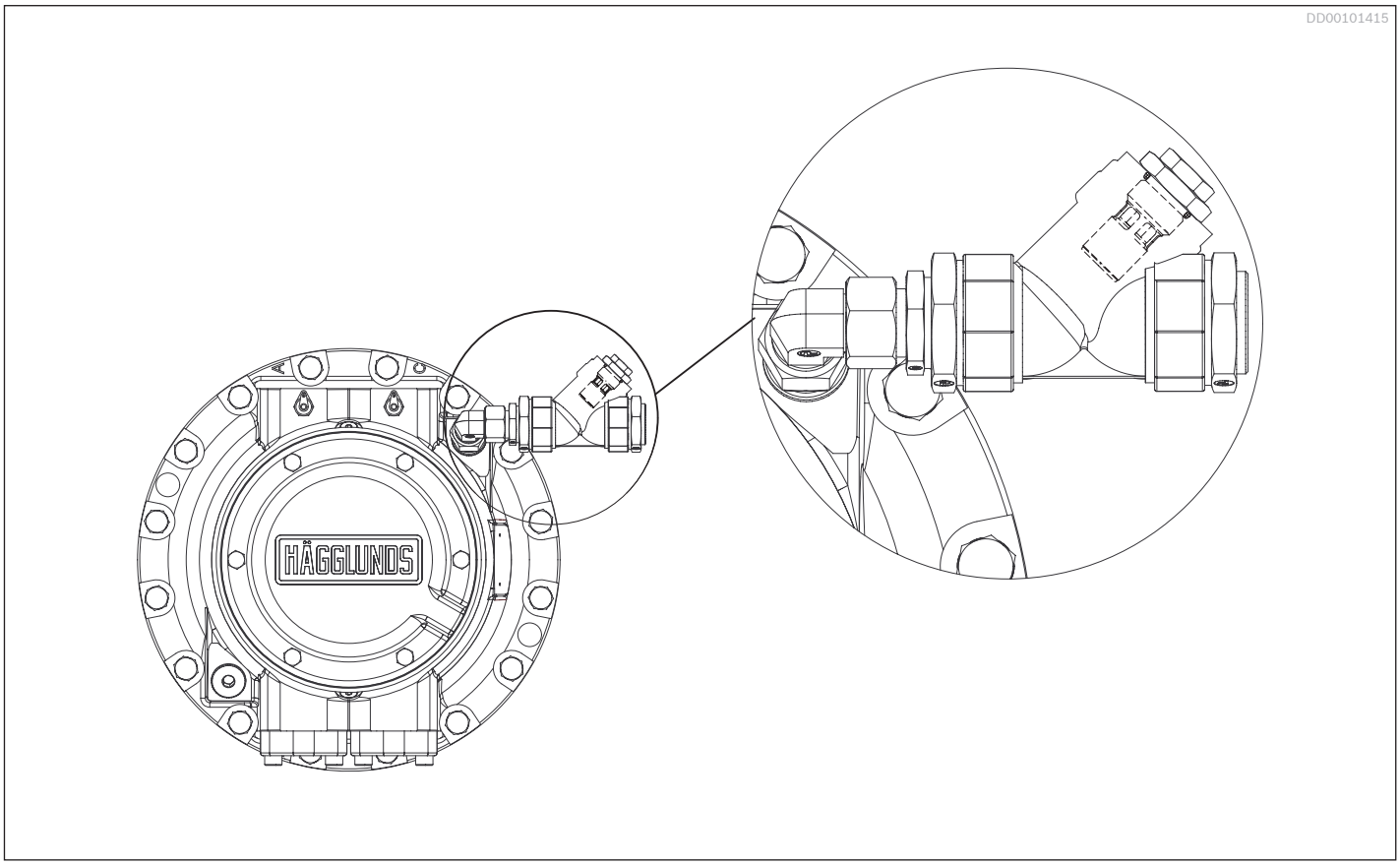


Fig. 96: Flushing set and Early warning kit including magnetic plug mounted on CA

For technical data, see document: **RE 15359** (Not available yet. Please contact your Bosch Rexroth representative)

For inspection and maintenance routines, see *Installation and maintenance manual*: **RE 15305-WA**.

Features

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

Description

The flushing set includes 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 Hägglunds CA 50 to CA 210.

12.3 Tandem kit

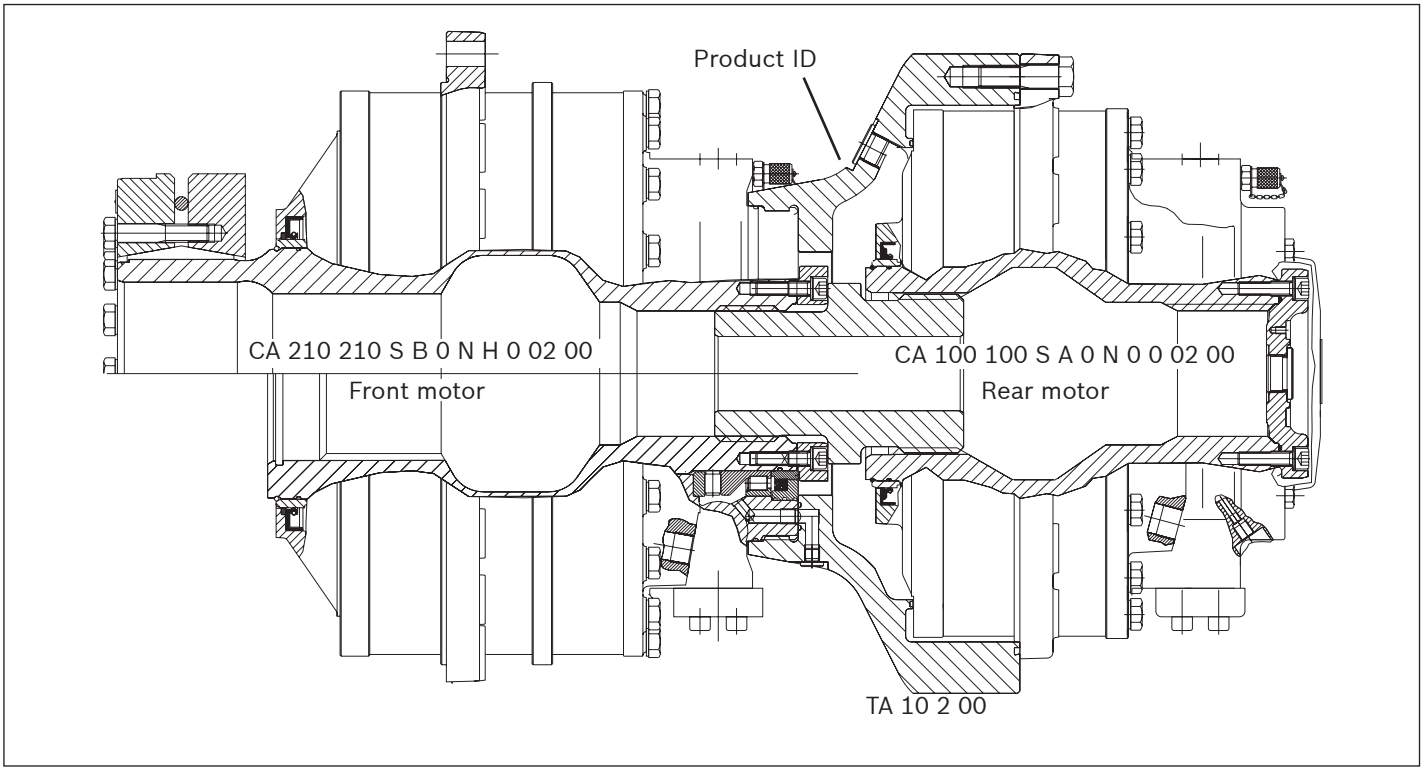


Fig. 97: Example: CA 210 210 S B 0 N H 0 02 00 + TA 10 2 00 + CA 100 100 S A 0 N 0 0 02 00

For technical data, see document: **RE 15356** (Not available yet. Please contact your Bosch Rexroth representative)

For inspection and maintenance routines, see *Installation and maintenance manual*: **RE 15305-WA**.

Features

- Enable more torque with the same occupied diameter
- Enable possibility for displacement shift through free-wheeling of rear or front motor

Description

The Hägglunds CA motor can be used in tandem mounting. The front motor is then prepared for tandem mounting (B motor) and connected to the rear motor (standard splines motor) with a tandem kit.

12.4 Temperature sensor

Function

The temperature sensor is mounted in port D2, see *Fig. 99* 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: R939054551
(Adapter G3/4 to G1/4 included)

Table 25: Technical data, Pt 100/4-20 mA sensor

Sensor length l	30 mm (1.18 in)
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)

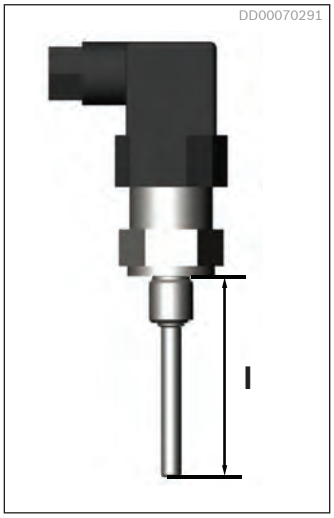


Fig. 98: Temperature sensor

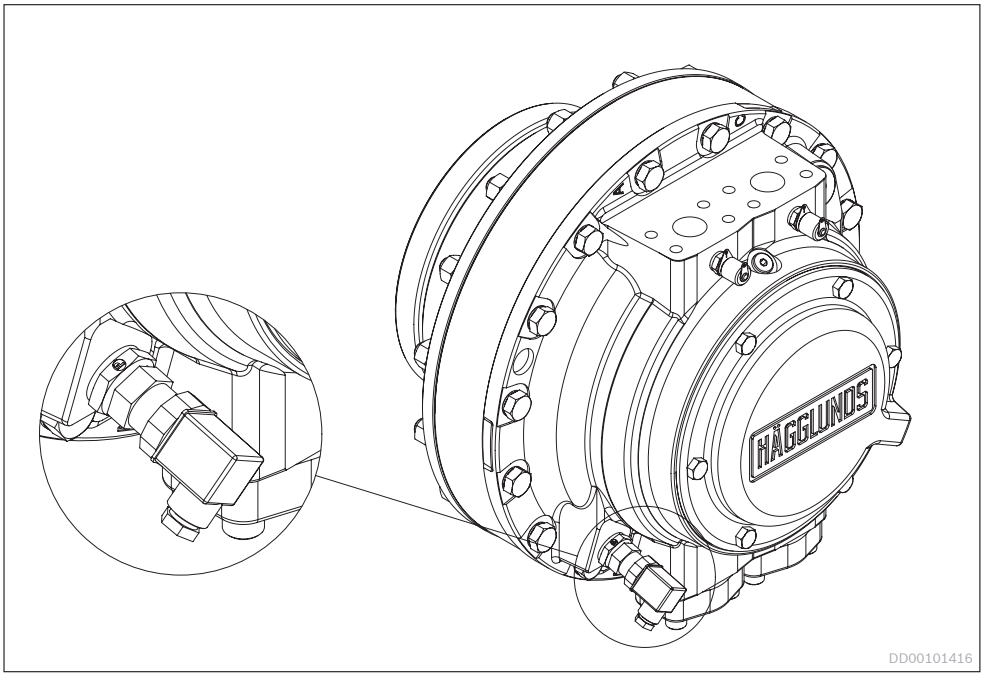


Fig. 99: Temperature sensor mounted on CA motor

12.5 Speed sensor

12.5.1 Hägglunds CA with SPDC

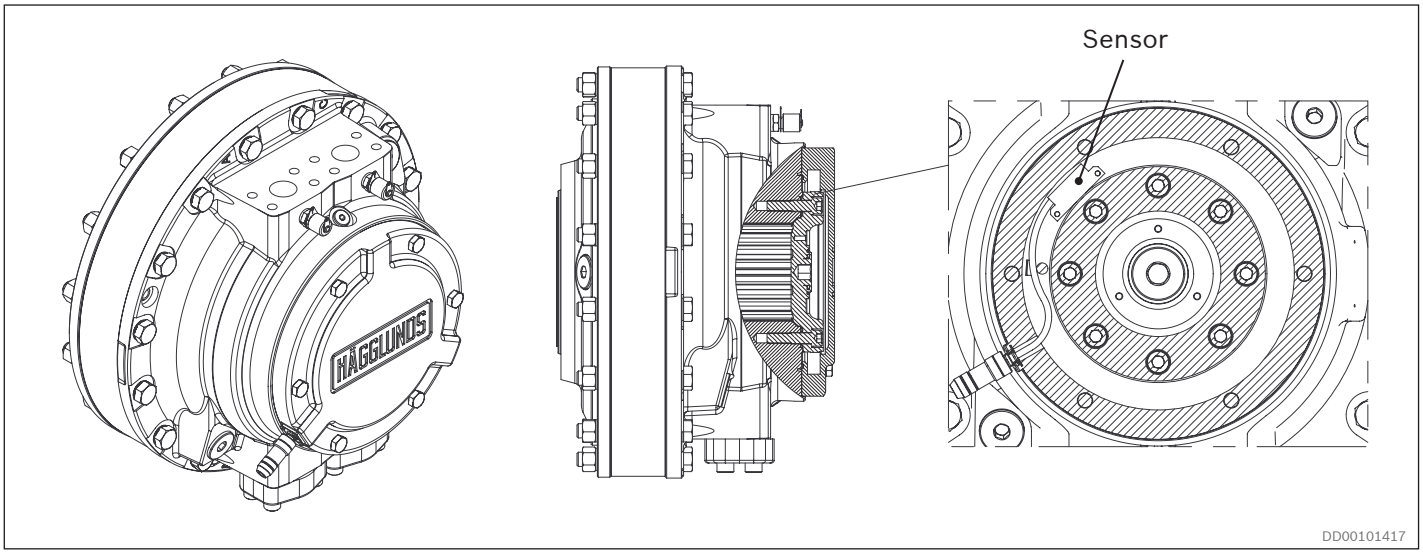


Fig. 100: CA motor with SPDC

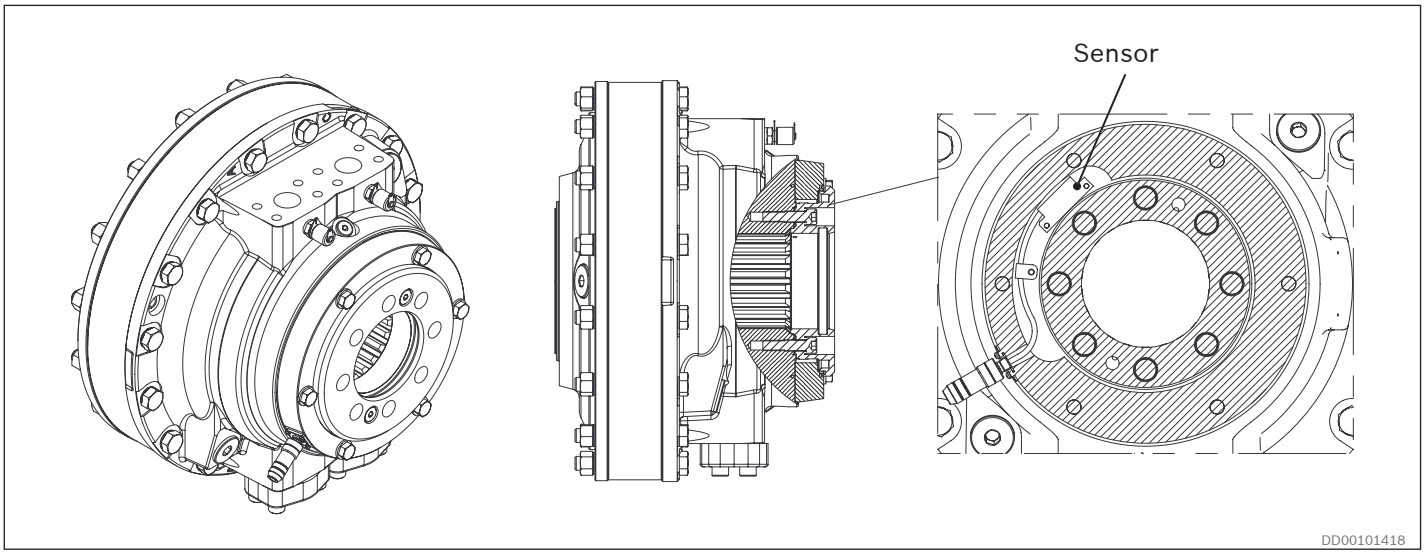


Fig. 101: CA motor with through hole and SPDC

For technical data, see document: **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 sensor 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.

12.5.2 Explosion proof speed sensor SPDB 2

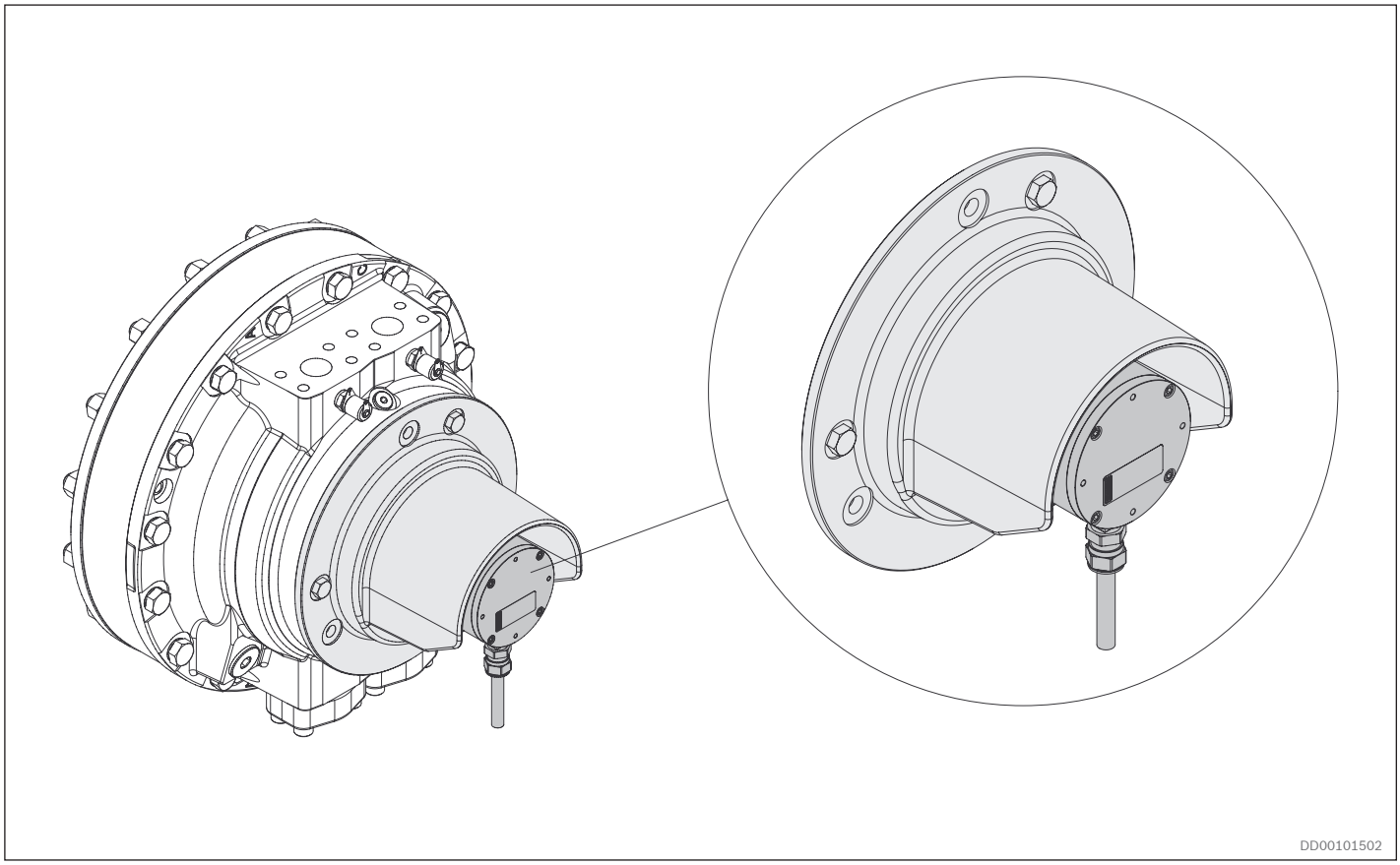


Fig. 102: SPDB 2

For technical data, see document: **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 junction box to simplify connection

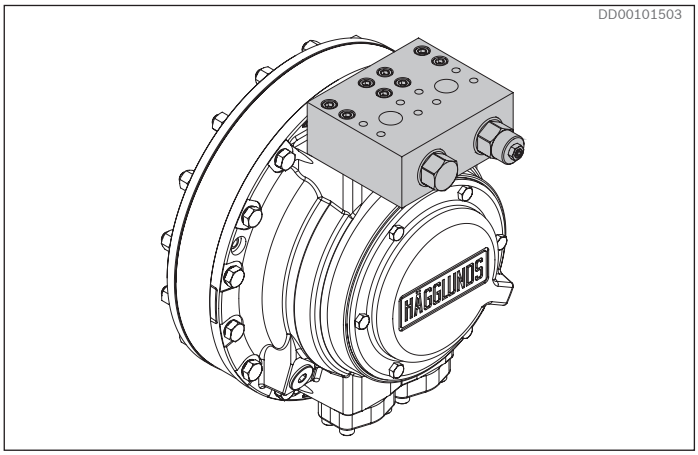
Description

Speed sensor Hägglunds SPDB 2 is a digital incremental encoder.

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

12.6 Valves

12.6.1 Counter balance valve, VCBCA 480



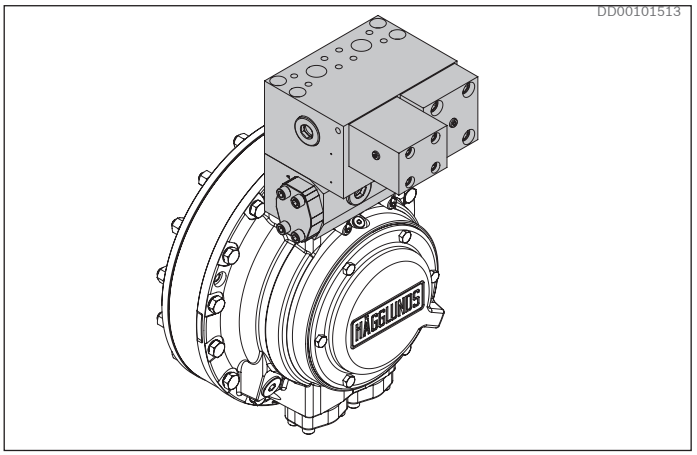
For technical data, see document: **RE 15378**

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).

12.6.2 Counter balance valve, VCBCA 1000



For technical data, see document: **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).

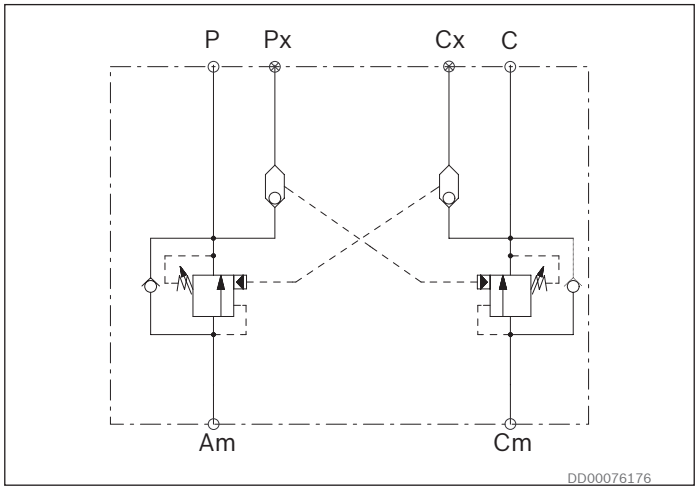


Fig. 103: Hydraulic circuit VCBCA 480 00 00 A

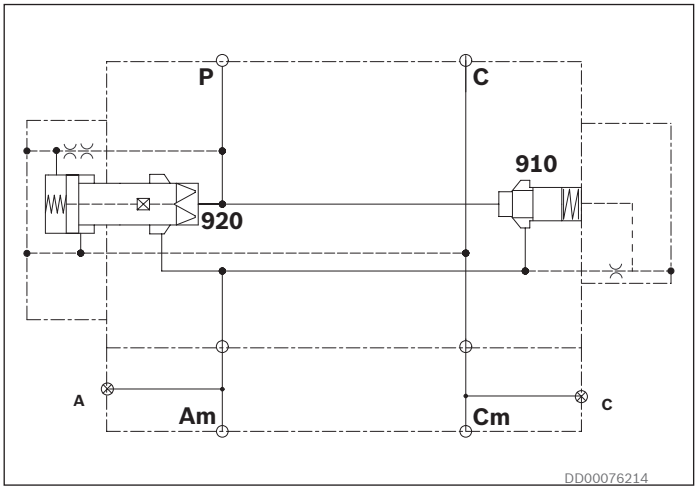
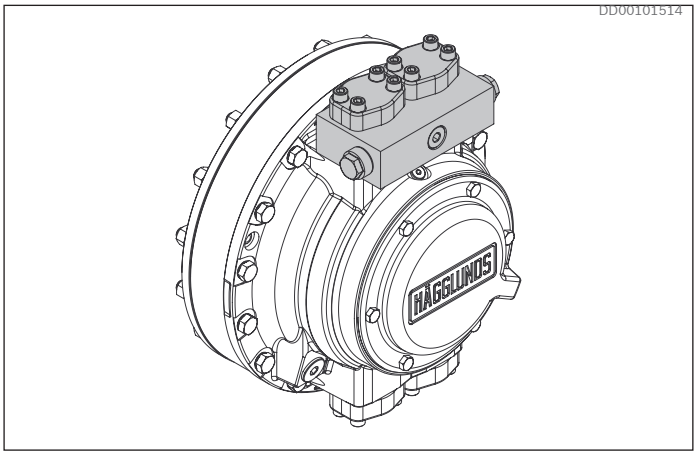


Fig. 104: Hydraulic circuit VCBCA 1000 00

12.6.3 Cross-over valve, COCA 300



For technical data, see document: **RE 15386** (Not available yet. Please contact your Bosch Rexroth representative)

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Protect the motor from high pressure peaks
- Provides cavitation protection

The valve COCA 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 and maximum flow 300 l/min (78 gpm) (5076 psi) but can be delivered with preset level 210 bar (3045 psi), 280 bar (4061 psi) and 300 bar (4351 psi).
Pressure setting is made without charge pressure.

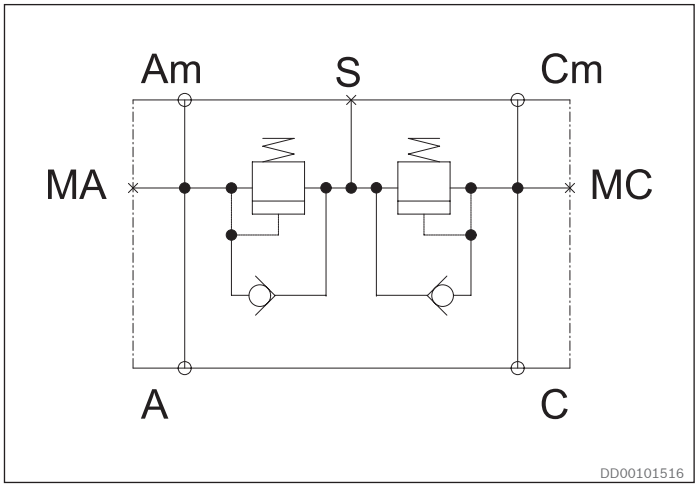
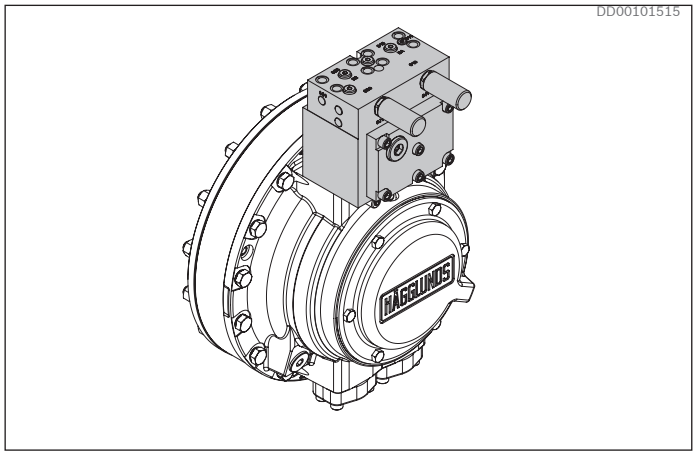


Fig. 105: Hydraulic circuit COCA 300

12.6.4 Cross-over valves, COCB 700 and COCB 1000



For technical data, see document: **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).

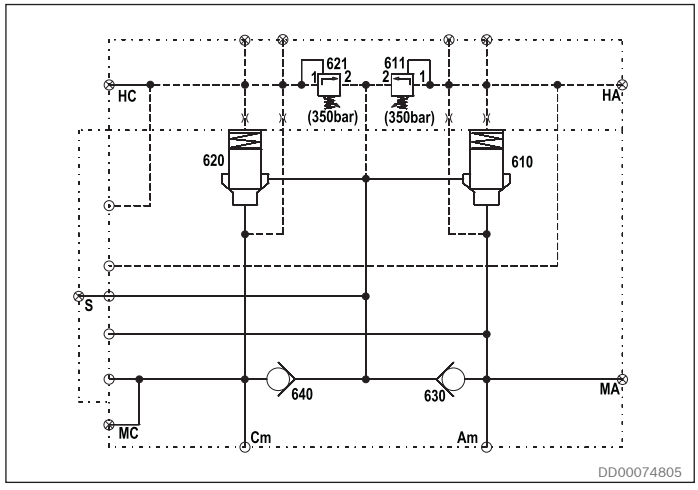
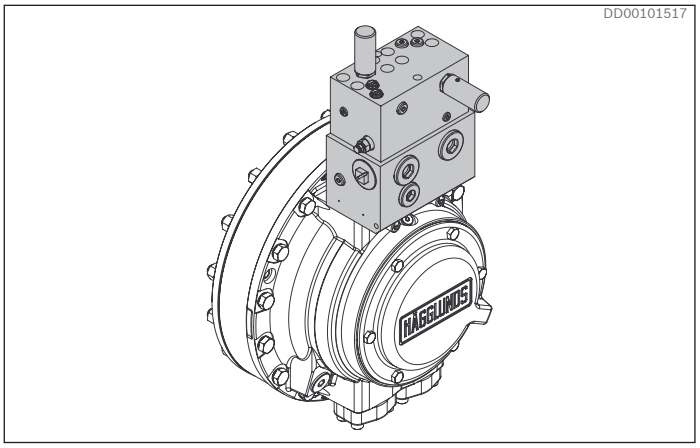


Fig. 106: Hydraulic circuit COCB 1000 1

12.6.5 Constant tension valve, CTCA 1000



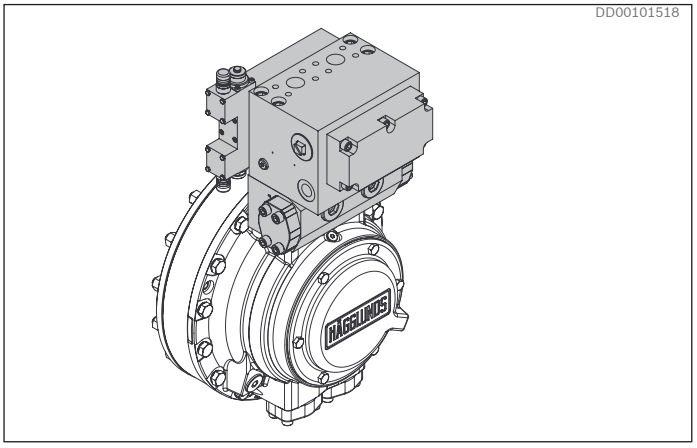
For technical data, see document: **RE 15377**

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 braking 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)

12.6.6 Free circulation valve, VFCCA 1000



For technical data, see document **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 VFCCA 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

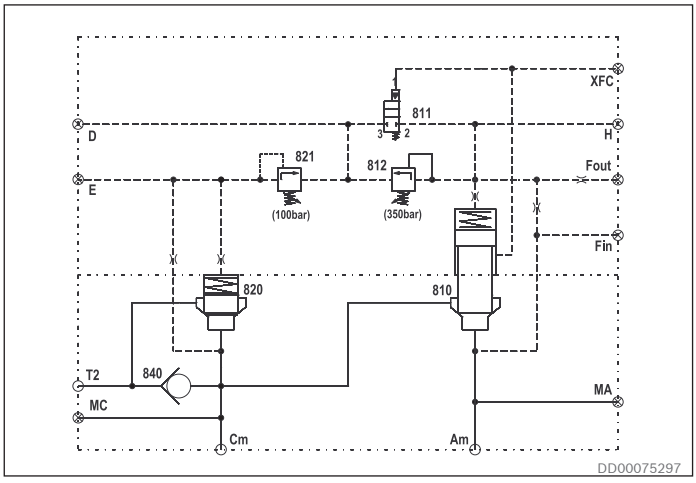


Fig. 107: Hydraulic circuit CTCA 1000

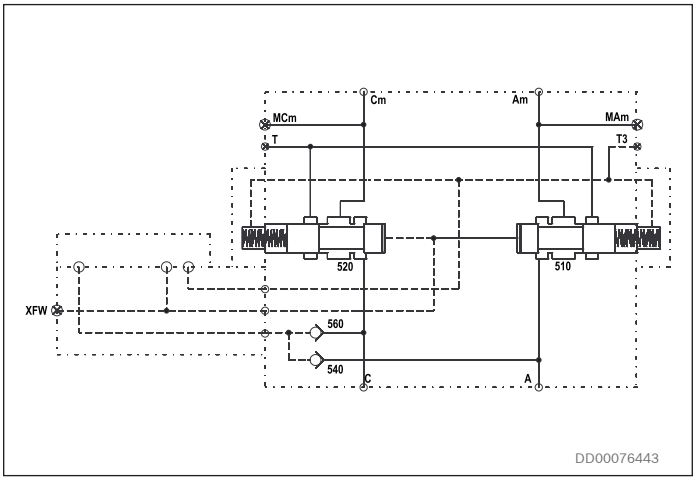
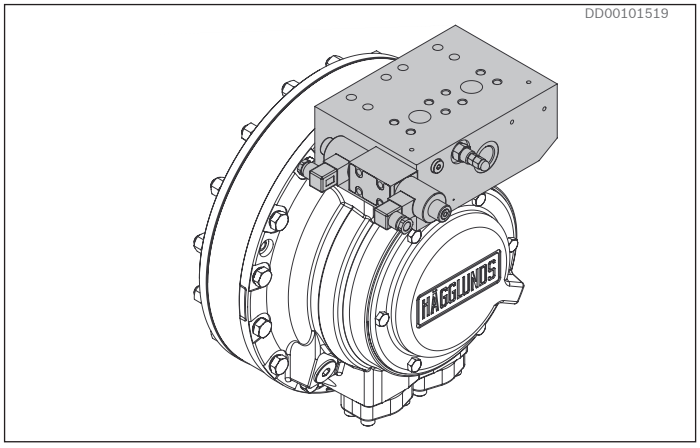


Fig. 108: Hydraulic circuit VFCCA 1000 H

12.6.7 Freewheeling valve, VFWCB 600



For technical data, see document: **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

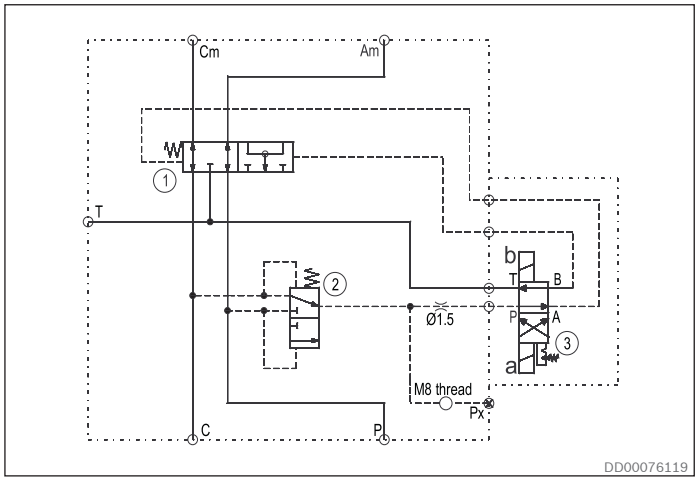
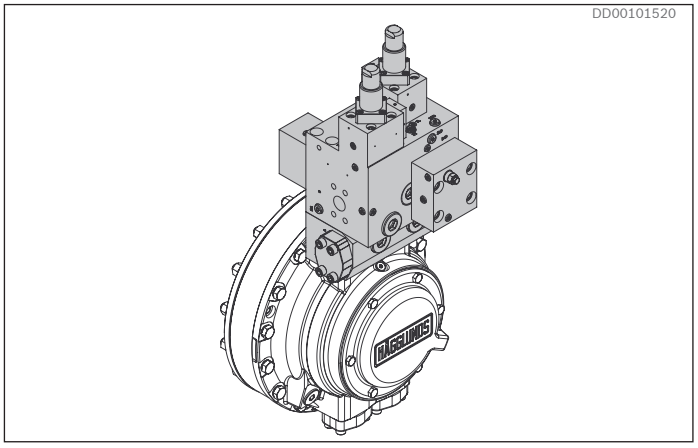


Fig. 109: Hydraulic circuit VFWCB 600 E

12.6.8 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 proportionally 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

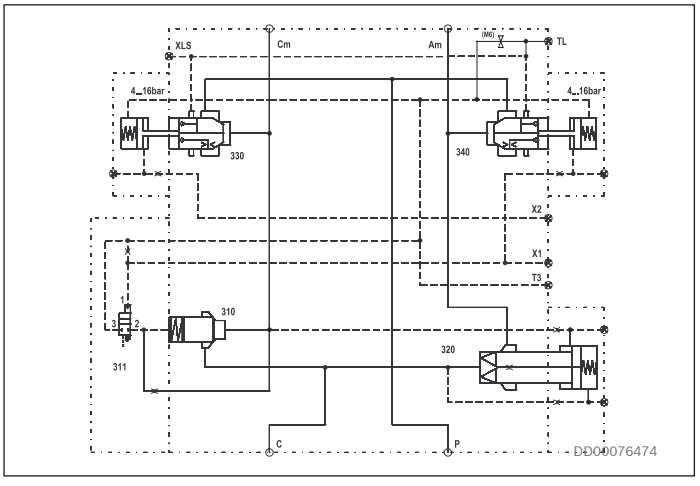
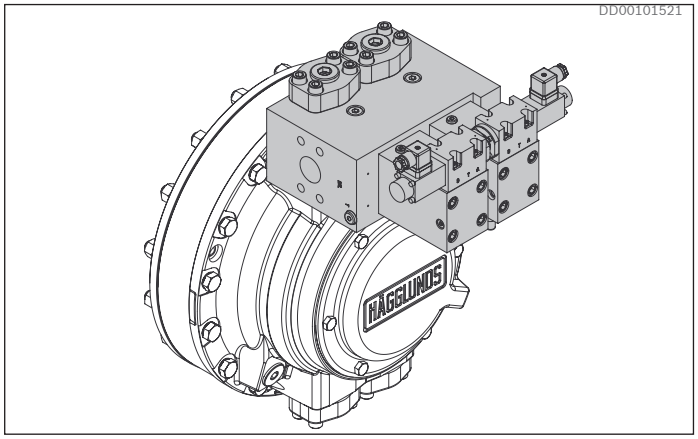


Fig. 110: Hydraulic circuit V4WCA 1000

12.6.9 Hydraulic quick stop valve, VQCB 800



For technical data, see document: **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 low moment of inertia of the hydraulic motor and quick response from hydraulic valve.
Maximum operating pressure is 350 bar (5076 psi) and maximum flow 800 l/min (211 gpm).

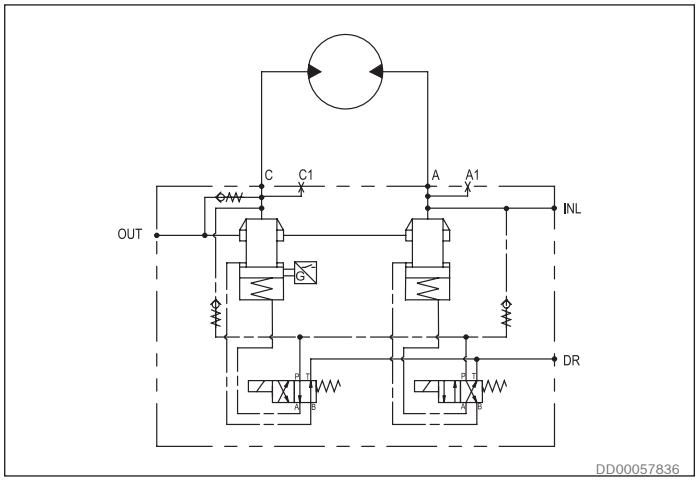
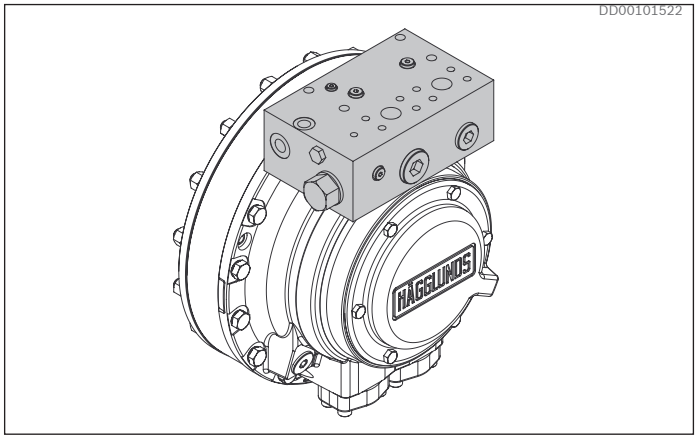


Fig. 111: Hydraulic circuit VQCB 800

12.6.10 Two speed valve, VTCA 600



For technical data, see document: **RE 15389**

Features

- Available for motors with displacement shift with option R or L
- Compact and robust design
- Multifunctional
- Can be mounted directly on Hägglunds motors
- Built in brake control function
- Exchange of oil in motor case
- Possibility for internal control pressure

The valve VTCA 600 is designed for Hägglunds Compact CA 50-210 motors in 2-speed configuration to provide displacement shift from full to half displacement while running up to 30 rpm and high pressure maximum 150 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 torque compared to full displacement.

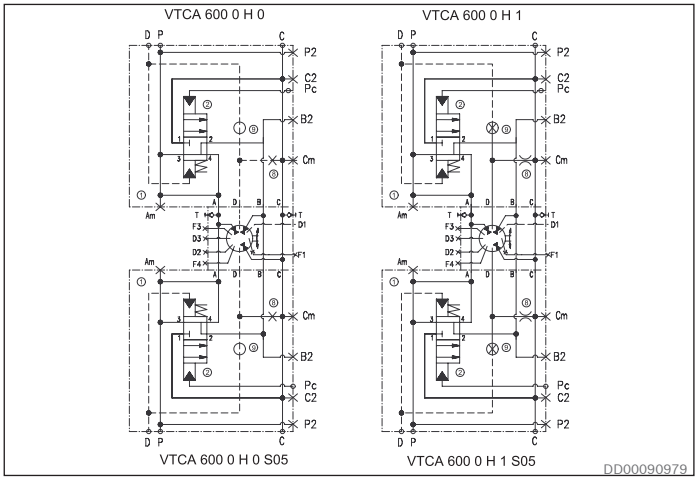
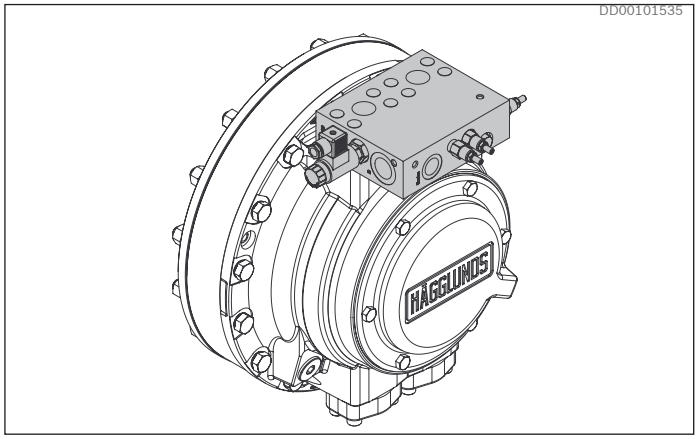


Fig. 112: Hydraulic circuit with S-index 06 motor + VTCA 600 std + VTCA 600 S-index 05

12.6.11 Brake opening valve, VBO



For technical data, see document: **RE 15385** (Not available yet. Please contact your Bosch Rexroth representative)

Features

- Compact and robust design
- Mounted directly on Hägglunds motors
- Secure correct pilot pressure for brakes

The valve VBO (X) is designed for Hägglunds motors and provides controlled brake release pressure on Hägglunds MDA brakes. The brake function is electrically or hydraulically operated. The shuttle valve allows pilot pressure to be selected from the high-pressure motor line and the flow is controlled by a flow control valve. A pressure reducing valve and a pressure relief valve are mounted in serial to secure correct level of pilot pressure. The reducing valve is pre-set to 20 bar (290 psi) for minimum control pressure and pressure relief valve is pre-set to 25 bar (363 psi) for maximum pressure to protect the brake from shock load. The valve is not recommended in hanging load applications.

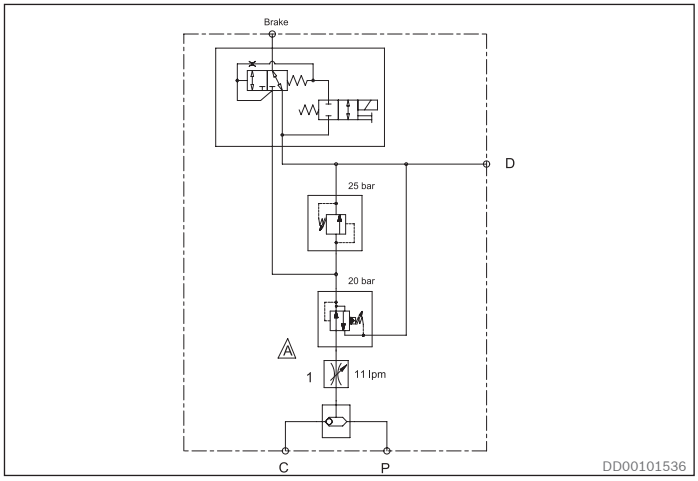


Fig. 113: Hydraulic circuit VBO E

12.7 Brakes

12.7.1 Hägglunds BICA

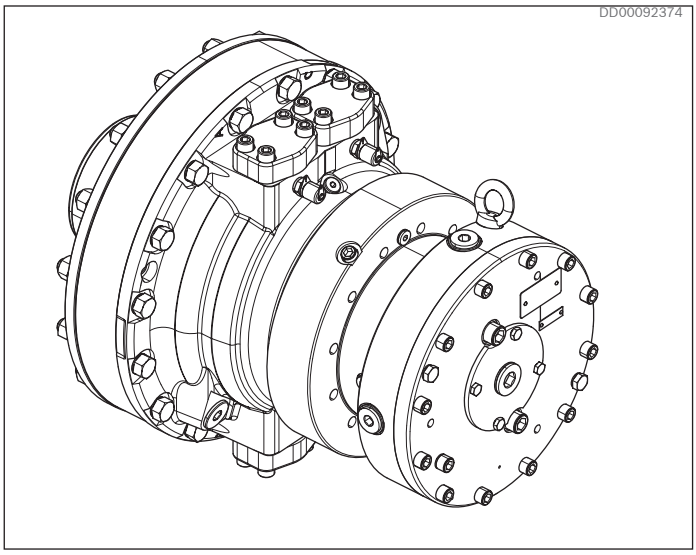


Fig. 114: CA motor with BICA brake

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

Features

- Robust design, industrial design
- Possibility for inductive position sensor
- Static braking torque range between 13 – 37 kNm
- Manual emergency release
- Version for explosive environment (ATEX) available
- Parking brake

Description

The brakes are designed for industrial applications. The brake is made for dry operation of the discs and is not allowed for hanging load applications. BICA 13 to 37 are designed to be mounted on CA motors prepared for brake (option B). The brake is designed to be used as parking brake only.

12.7.2 Hägglunds MDA

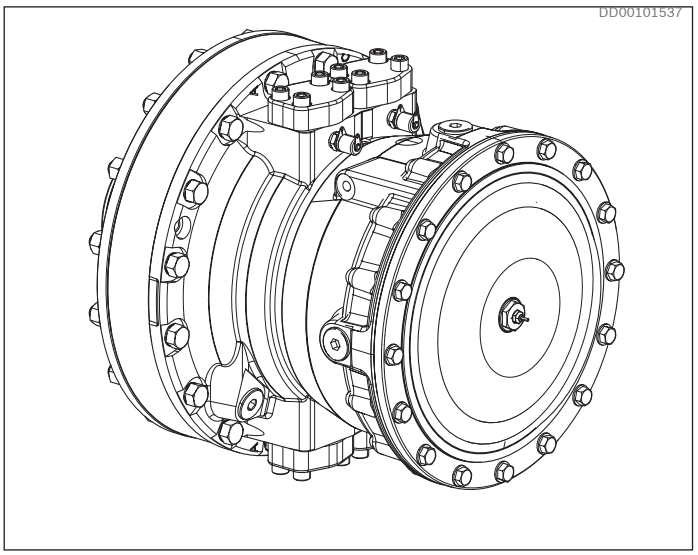


Fig. 115: CA motor with MDA brake

For technical data, see document: **RE 15358** (Not available yet. Please contact your Bosch Rexroth representative)

Features

- Robust design, suitable for marine environment
- Possibility for inductive position sensor
- Static braking torque range between 15,8 - 95,0 kNm
- Version for explosive environment (ATEX) available
- Parking brake and emergency brake
- Type approval according to DNV, standard for certification of lifting appliances No 2.22

Description

The brake is designed for marine applications together with Hägglunds CA motors. It is a multi disc brake type with rotating disc centre and a stationary housing. The MDA brake is a wet brake where the discs are running in oil bath. MDA 5 to 10 are designed to be mounted on CA motors prepared for brake (option B). The brake is designed to be used as parking brake but can also be used as an emergency brake.

12.8 Kit for harsh and marine environment

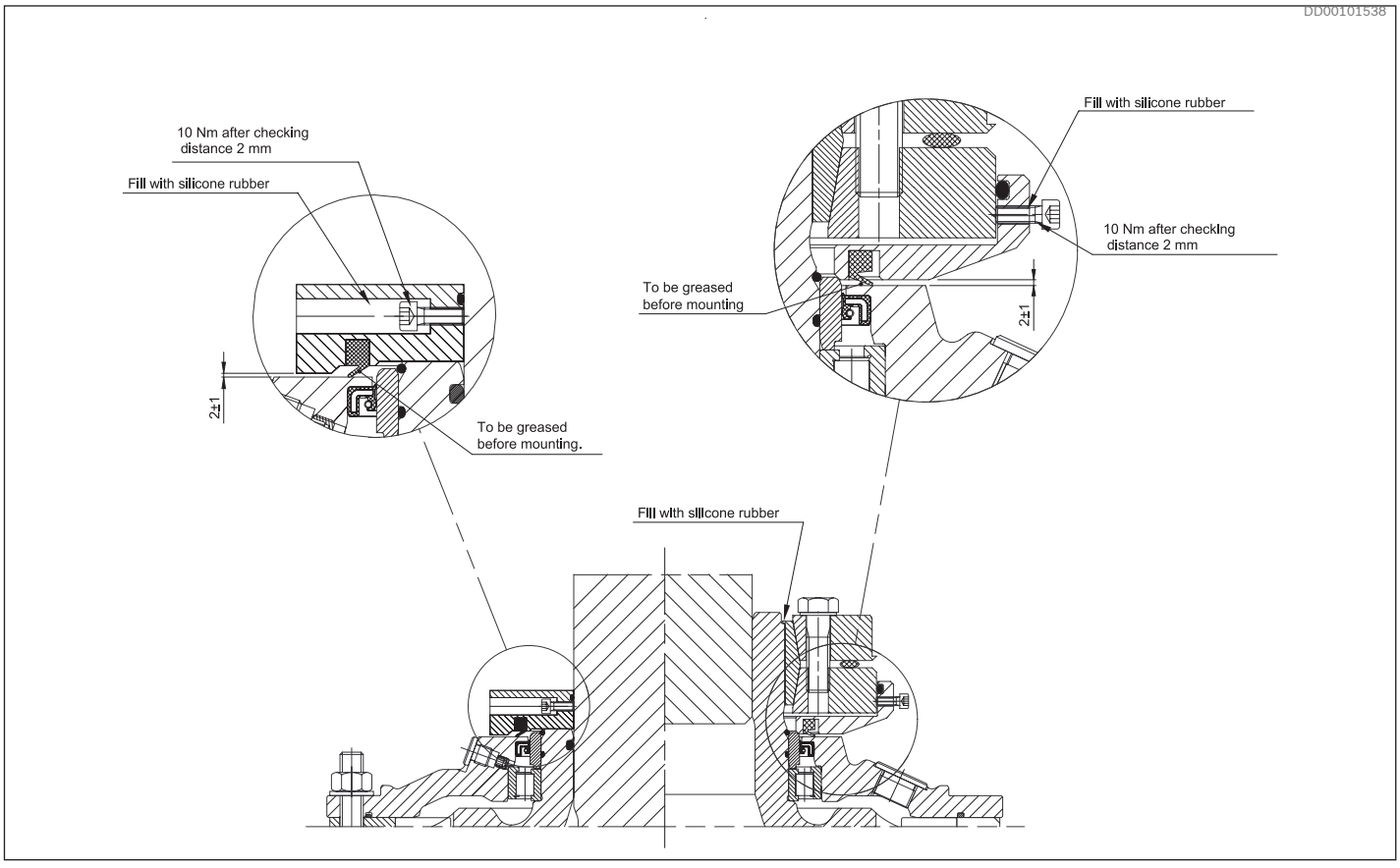


Fig. 116: Kit for harsh and marine environment

For technical data, see document nr: **RE 15364** (Not available yet. Please contact your Bosch Rexroth representative)

Features

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

Description

Consists of a kit including a v-ring for protection of the main sealing of the motor.
Kits are available for spline motors and coupling motors.

13 CIRCUIT DESIGN

13.1 Closed circuit

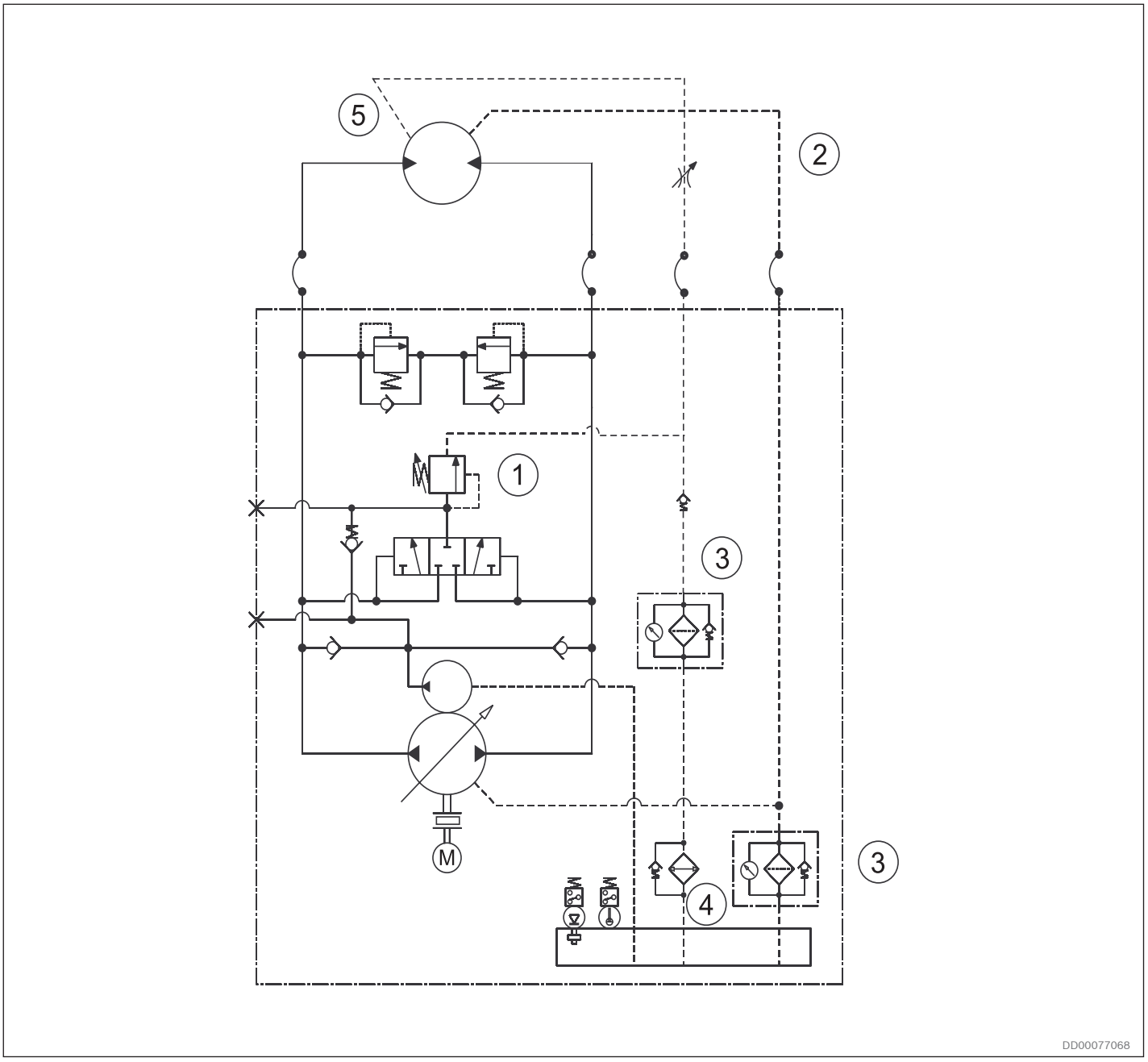


Fig. 117: Example closed circuit

Things to consider:

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

13.2 Open circuit

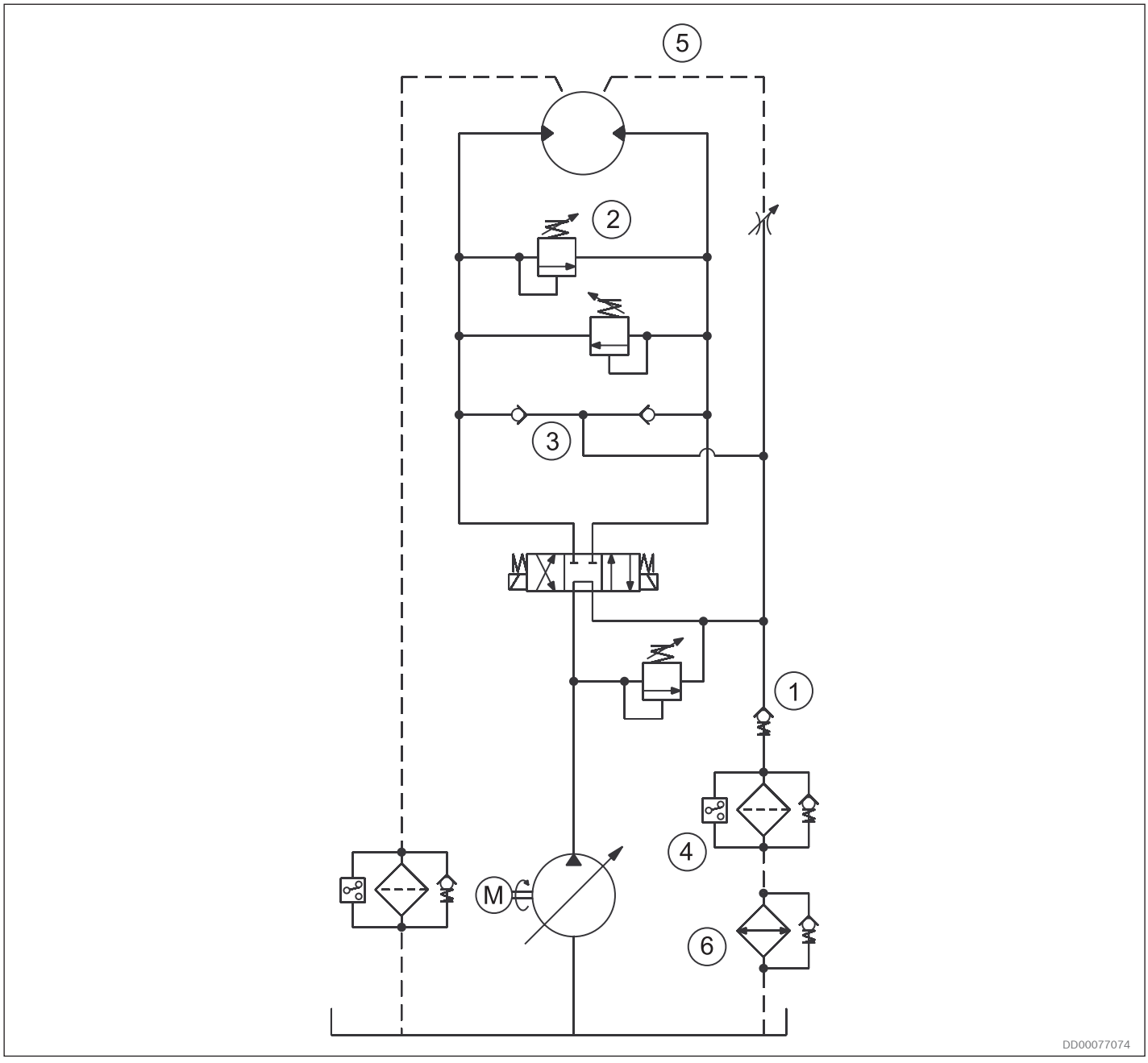


Fig. 118: Example open circuit

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

14 RELATED DOCUMENTS

	Title	Document no	Document type
🕮	Hägglunds CA	RE 15305-WA	Installation & maintenance manual
🕮	CA 50 S	178 1651	Dimension drawing
🕮	CA 70 S	178 1950	Dimension drawing
🕮	CA 100 S	178 1803	Dimension drawing
🕮	CA 140 S	178 2133	Dimension drawing
🕮	CA 210 S	178 2327	Dimension drawing
🕮	CA 50 C	178 1650	Dimension drawing
🕮	CA 70 C	178 2087	Dimension drawing
🕮	CA 100 C	178 1911	Dimension drawing
🕮	CA 140 C	178 2134	Dimension drawing
🕮	CA 210 C	178 2352	Dimension drawing
🕮	CA 70 S06	078 1035	Dimension drawing
🕮	CA 140 S06	178 2520	Dimension drawing
🕮	CA 210 S06	178 2808	Dimension drawing
🕮	CA 100 S15	078 0330	Dimension drawing
🕮	CA 140 S15	178 2521	Dimension drawing
🕮	CA 70 S28	178 2896	Dimension drawing
🕮	CA 140 S28	178 2891	Dimension drawing
🕮	CA 210 S28	178 2884	Dimension drawing
🕮	CA 100 S42	078 1857	Dimension drawing
🕮	CA 140 S42	078 1305	Dimension drawing
🕮	Shaft CA 50 / CA 70 splines, flange mounted	278 2230	Dimension drawing
🕮	Shaft CA 50 / CA 70 splines, external load and torque arm	278 2231	Dimension drawing
🕮	Shaft CA 50 / CA 70 splines, motor with brake and torque arm	278 2232	Dimension drawing
🕮	Shaft CA 50 / CA 70 splines, flange mounted with brake	278 2233	Dimension drawing
🕮	Shaft CA 100 / CA 140 splines, flange mounted	278 2234	Dimension drawing
🕮	Shaft CA 100 / CA 140 splines, external load and torque arm	278 2235	Dimension drawing
🕮	Shaft CA 100 / CA 140 splines, with brake MDA 10 and torque arm	278 2236	Dimension drawing
🕮	Shaft CA 210 splines, flange mounted	278 2237	Dimension drawing
🕮	Shaft CA 210 splines, external load and torque arm	278 2238	Dimension drawing
🕮	Shaft CA 210 splines, motors with brake and torque arm	278 2239	Dimension drawing
🕮	Shaft CA 140 S15 with splines, flange mounted	278 2302	Dimension drawing
🕮	Shaft CA 140 S15 with splines, external load & torque arm	278 2303	Dimension drawing
🕮	Shaft CA 70 S28	278 2244	Dimension drawing
🕮	Shaft CA 70 S28, for motor with brake MDA 5-10	278 2245	Dimension drawing
🕮	Shaft CA 140 S28	278 2242	Dimension drawing
🕮	Shaft CA 140 S28, for motor with brake MDA 5-10	278 2243	Dimension drawing
🕮	Shaft CA 210 S28	278 2240	Dimension drawing
🕮	Shaft CA 210 S28, for motor with brake MDA 5-10	278 2241	Dimension drawing
🕮	Through hole kit CA 50 / CA 70 / CA 100 / CA 140 / CA 210	378 2537	Dimension drawing
🕮	Submerged flange design	178 3119	Dimension drawing

	Title	Document no	Document type
🕮	Speed sensor, Hägglunds SPDC	RE 15350	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
🕮	Tandem motors, Hägglunds TA	RE 15356	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
🕮	Brake Hägglunds MDA	RE 15358	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
🕮	Hägglunds cross-over valve COCA 300	RE 15386	Data sheet
🕮	Hägglunds brake opening valve VBO	RE 15385	Data sheet
🕮	Two speed valve, VTCA 600	RE 15389	Data Sheet
🕮	Hydraulic fluid quick reference	RE 15414	Data Sheet

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