



DATA SHEET

Radial piston hydraulic motor Hägglunds CA

VALID FOR

- Torque range: up to 78 kNm [up to 57 530 lbf-ft]
- Speed range: up to 400 rpm
- Power range: up to 1 059 kW [1 420 hp]
- Maximum operating pressure: 350 bar [5 076 psi]
- Frame size: 50, 70, 100, 140, 210 and 280
- Displacement: 1 256 to 17 600 cm³/rev [76.6 to 1 074 in³/rev]
- Specific torque: 20 to 280 Nm/bar [1 017 to 14 240 lbf-ft/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)
- Through hole diameter 110 mm
- Brake mounting possibility
- Tandem mounting possibility
- Up to three speed possibility
- Option for explosive environment available
- Minimum viscosity 10 cSt (option C)
- Environmentally acceptable lubricants (EAL) ready

CONTENTS

1	Ordering code.....4	10	Explosive environment.....63
2	Functional description6	10.1	How to order 63
3	Fluid connections7	10.2	Dimensioning 63
3.1	Hydraulic symbol..... 7	10.3	Limitations & Requirements..... 64
3.2	Port connections 8	11	Dimensions / Interface65
4	Technical data9	11.1	Dimensions 65
4.1	Calculation fundamentals..... 9	12	Mounting alternatives71
4.2	General data..... 10	12.1	General information 71
4.3	Motor data 12	12.1.1	Flange mounting with splines..... 71
4.4	Recommended charge pressure..... 14	12.1.2	Torque arm mounting with splines 73
4.4.1	The motor working in driving mode only..... 14	12.1.3	Torque arm mounting on plain shaft 74
4.4.2	The motor working in braking mode 14	13	Accessories75
4.4.3	The motor working in 2-speed mode 14	13.1	Torque arms 75
4.5	Hydraulic fluids 16	13.2	Flushing set and Early warning kit 76
4.6	Overall efficiency..... 17	13.3	Tandem kit 77
4.7	Pressure loss diagrams..... 26	13.4	Temperature sensors 78
4.8	Quick selection diagram 32	13.4.1	Pt100/4-20 mA sensor..... 78
4.9	Draining, venting and flushing of the motor.... 36	13.4.2	Sensor for explosive environment..... 79
4.9.1	Horizontal mounting 36	13.5	Speed sensor 80
4.9.2	Vertical mounting 37	13.5.1	Hägglunds CA with SPDC 80
4.10	Flushing 38	13.5.2	Speed sensor SPDB 2 81
4.11	External leakage 39	13.5.3	Absolute Rotary Encoder, ABRA..... 81
4.12	Viscosity factor K..... 39	13.6	Valves 82
4.13	Freewheeling 40	13.6.1	Counter balance valve, VCBCA 480..... 82
4.13.1	The function of freewheeling 40	13.6.2	Cross-over valve, COCA 300 82
4.13.2	Circuit design 40	13.6.4	Hydraulic quick stop valve, VQCC 800..... 83
4.13.3	Oil volume for freewheeling 41	13.6.3	Cross-over valve, COCC 1200 83
4.13.4	Freewheeling restrictions 41	13.6.5	Freewheeling valve, VFWCB 600..... 84
4.13.5	Power loss freewheeling..... 42	13.6.6	Brake opening valve, VBO 84
4.14	Permissible external loads 43	13.6.7	Two speed valve, VTCA 600 85
4.14.1	Permissible external dynamic loads 44	13.7	Brakes 86
4.15	Low speed performance 48	13.7.1	Hägglunds BICA 86
4.16	Painting system 49	13.7.2	Hägglunds MDA..... 86
4.17	Sound 50	13.8	Kit for harsh and marine environment..... 87
5	Displacement shift52	14	Circuit design88
6	Type of seal52	14.1	Closed circuit..... 88
7	Through hole kit53	14.2	Open circuit 89
8	Increased robustness54	15	Related documents90
9	Special index motors54		
9.1	Special index 06:..... 54		
9.2	Special index 11: 55		
9.3	Special index 13: 56		
9.4	Special index 15 and 42: 56		
9.5	Special index 28: 58		
9.6	Special index 33: 61		
9.7	Special index 101:..... 62		

1 Ordering code

In order to identify Hägglands 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 Hägglands 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			
	CA 280												280			
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
														•	•	•
Frame size 280													240	260	280	
													•	•	•	
05	Mounting alternatives, shaft															
	Splines												S			
	Shrink disc coupling ¹⁾												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) 2)}												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) ¹⁾											•	R			
	2-speed motor, rotation counter clockwise (As viewed from shaft side and inlet to A port) ¹⁾											•	L			

1) Not valid for CA280

2) Brake and TA kit must be ordered separately

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 ³⁾		01-99
	Special index ³⁾		100-999

● = Available - Not available

3) See section 9 for released special index

2 Functional description

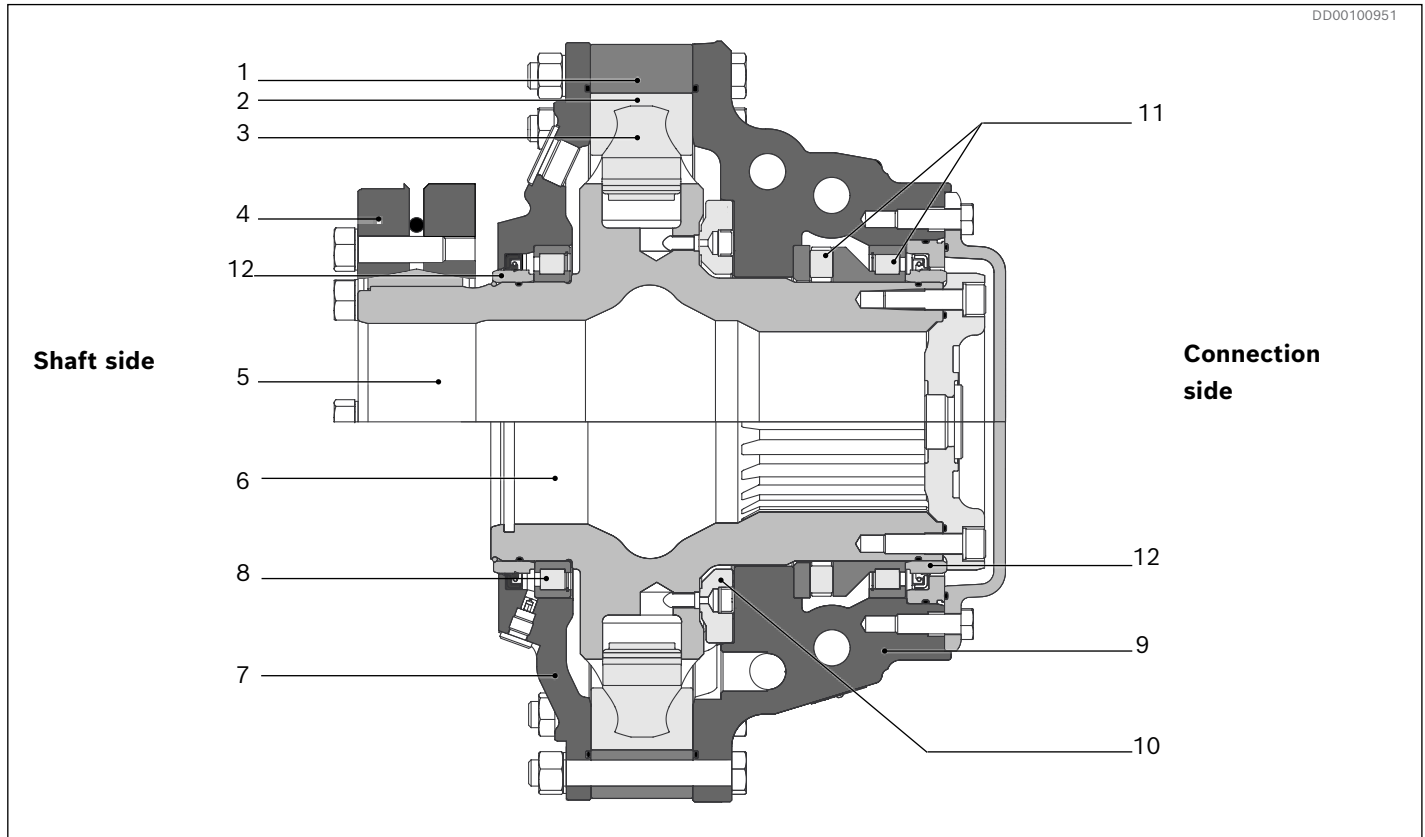


Fig. 1: Section view of radial piston hydraulic motor

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

Bosch Rexroth's hydraulic industrial motor Hägglunds 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

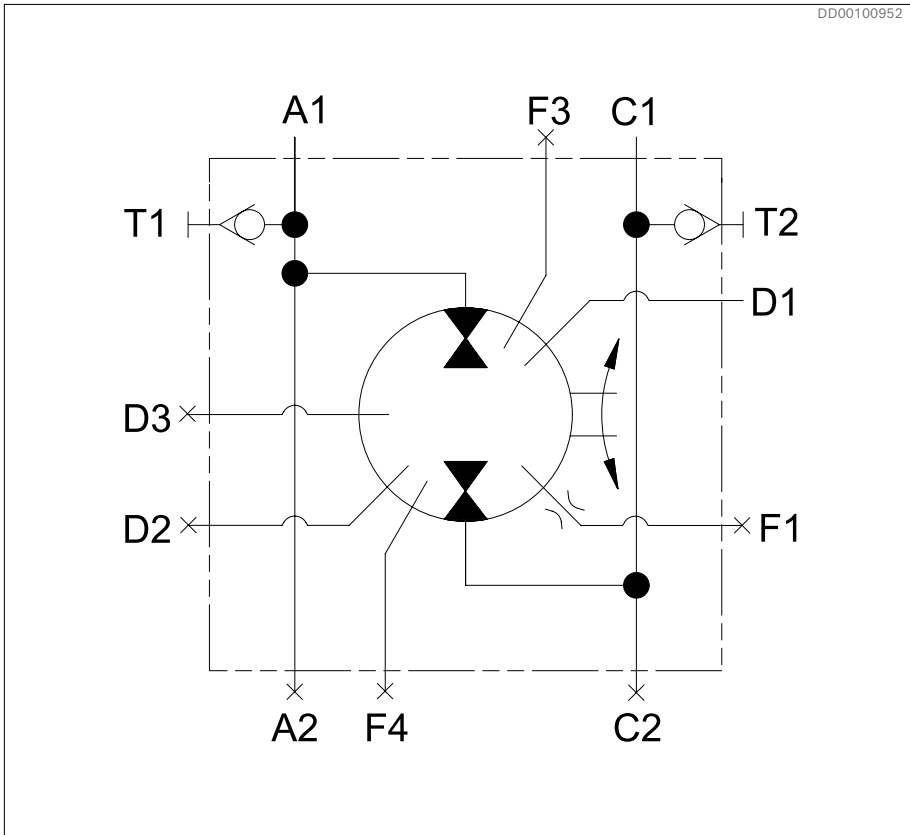


Fig. 2: Hydraulic symbol

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

3.2 Port connections

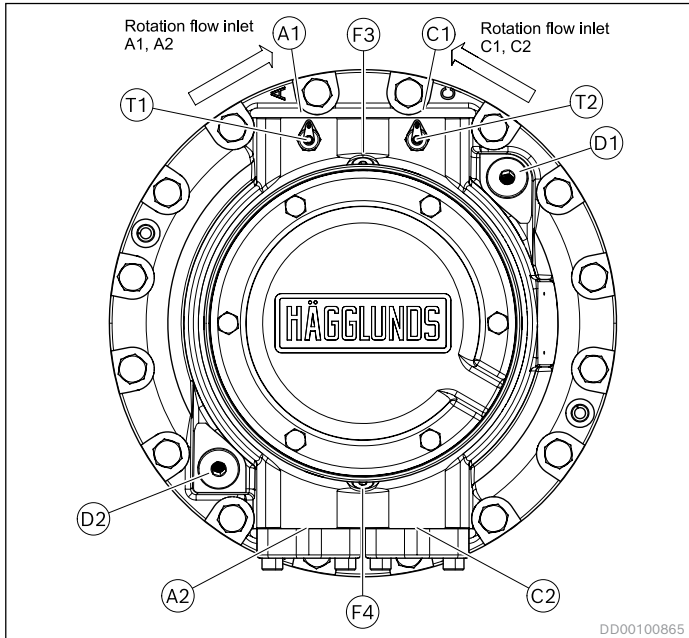


Fig. 3: Connection side of the motor

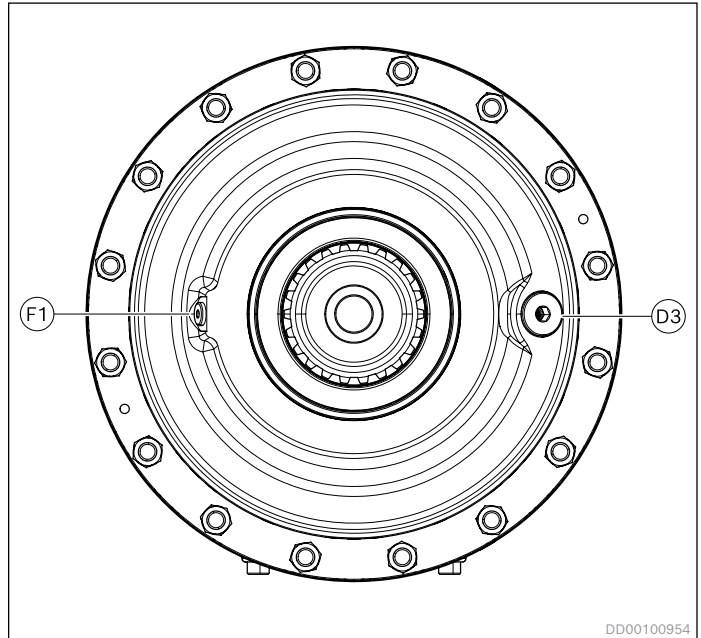


Fig. 4: Shaft side of the motor

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"	Or alternative flushing connection**
D3	Alternative drain connection	G 3/4"	
T1	Test connection	G 1/4"	Used to measure pressure and/or temperature at the main connections. Minimes M16
T2	Test connection	G 1/4"	
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).

** See section 4.9

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 ($\eta_m=98\%$)	$T = T_s \cdot (p - \Delta p_l - p_c) \cdot \eta_m$	(Nm)	$T = \frac{T_s \cdot (p - \Delta p_l - p_c) \cdot \eta_m}{1000}$ (lbf·ft)
Pressure required ($\eta_m=98\%$)	$p = \frac{T}{T_s \cdot \eta_m} + \Delta p_l + p_c$	(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	CA 280	
Type of mounting			See section 12: <i>Mounting alternatives</i>						
Port connections			See section 3.2: <i>Port connections</i>						
External loads			See section 4.14: <i>Permissible external loads</i>						
Hydraulic fluids			See section 4.5: <i>Hydraulic fluids</i>						
Explosive environment			See section 10: <i>Explosive environment</i>						
Pressure	Maximum operating pressure ¹⁾	bar	350	350	350	350	350	300	
	Maximum peak pressure ²⁾	bar	420	420	420	420	420	420	
	Intermittent operation below 5 rpm ³⁾	bar	420	420	420	420	420	420	
	Charge pressure	bar	See section 4.4: <i>Recommended charge pressure</i>						
	Maximum case pressure <280 rpm	bar	3	3	3	3	3	3	
		>280 rpm	bar	2	2	2	2	2	2
Maximum case peak pressure ⁴⁾	bar	8	8	8	8	8	8		
Temperature limits of case drain oil									
Seal type: NBR (Nitrile)									
	Minimum	°C	-35	-35	-35	-35	-35	-35	
	Maximum	°C	+70	+70	+70	+70	+70	+70	
Seal type: FPM (Viton)									
	Minimum	°C	-20	-20	-20	-20	-20	-20	
	Maximum	°C	+100	+100	+100	+100	+100	+100	
Oil volume in motor case			l	2.0	2.5	3.7	5.0	6.8	8.8
Moment of inertia for rotary group									
	Motor with splines	kg·m ²	1.0	1.4	1.9	2.8	3.4	4.8	
	Motor with shaft coupling	kg·m ²	1.4	1.8	2.5	3.4	4.4	-	
Weight									
	Motor with splines	kg	175	205	265	305	395	485	
	Motor with shaft coupling	kg	203	232	310	347	456	-	

- 1) The operating pressure corresponds to the maximum allowed design pressure.
- 2) Peak pressure 420 bar maximum, allowed to occur at a single operating period of max. 1 second.
Total amount of single operation periods = 1 000 000 times
- 3) Intermittent operation 10% /min is allowed below 5 rpm for option C (coated)
- 4) 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	CA 280	
Type of mounting			See section 12: <i>Mounting alternatives</i>						
Port connections			See section 3.2: <i>Port connections</i>						
External loads			See section 4.14: <i>Permissible external loads</i>						
Hydraulic fluids			See section 4.5: <i>Hydraulic fluids</i>						
Explosive environment			See section 10: <i>Explosive environment</i>						
Pressure	Maximum operating pressure ¹⁾	psi	5076	5076	5076	5076	5076	4351	
	Maximum peak pressure ²⁾	psi	6091	6091	6091	6091	6091	6091	
	Intermittent operation below 5 rpm ³⁾	psi	6091	6091	6091	6091	6091	6091	
	Charge pressure	psi	See section 4.4: <i>Recommended charge pressure</i>						
	Maximum case pressure <280 rpm	psi	44	44	44	44	44	44	
		>280 rpm	psi	29	29	29	29	29	29
Maximum case peak pressure ⁴⁾	psi	116	116	116	116	116	116		
Temperature limits of case drain oil									
Seal type: NBR (Nitrile)									
	Minimum	°F	-31	-31	-31	-31	-31	-31	
	Maximum	°F	+158	+158	+158	+158	+158	+158	
Seal type: FPM (Viton)									
	Minimum	°F	-4	-4	-4	-4	-4	-4	
	Maximum	°F	+212	+212	+212	+212	+212	+212	
Oil volume in motor case			US gal	0.53	0.66	0.98	1.32	1.80	2.32
Moment of inertia for rotary group									
	Motor with splines	lb·ft ²	23.7	33.0	45.0	66.0	80.0	104	
	Motor with shaft coupling	lb·ft ²	33.0	43.0	59.0	80.0	104.0	-	
Weight									
	Motor with splines	lb	437	450	584	672	870	1069	
	Motor with shaft coupling	lb	447	512	683	765	1005	-	

- 1) The operating pressure corresponds to the maximum allowed design pressure.
- 2) Peak pressure 6091 psi maximum, allowed to occur at a single operating period of max. 1 second.
Total amount of single operation periods = 1 000 000 times
- 3) Intermittent operation 10% /min is allowed below 5 rpm for option C (coated)
- 4) 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	cm ³ /rev	kNm	rpm	p bar	kW	Nm/bar	cm ³ /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			
CA 280	240	240	15080	67	30	300	211						
	260	260	16340	73	30	300	228						
	280	280	17600	78	30	300	246						

1) Calculated as: Metric = $T_s \cdot (350-15) \cdot 0,98$, for all CA motors except CA 280.

For CA 280 motors, Metric = $T_s \cdot (300-15) \cdot 0,98$

2) Viton seals are recommended for speeds above 280 rpm

3) Peak pressure 420 bar maximum, allowed to occur at a single operating period of max. 1 second.

Total amount of single operation periods = 1 000 000 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	in ³ /rev	lbf·ft	rpm	p psi	hp	lbf·ft/1000 psi	in ³ /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			
CA 280	240	12205	921	49417	30	4350	283						
	260	13222	997	53842	30	4350	306						
	280	14239	1074	57715	30	4350	330						

1) Calculated as: $US = Ts \cdot (5076-215) \cdot 0,98$, for all CA motors except CA 280.
For CA 280 motors, $US = Ts \cdot (4351-215) \cdot 0,98$

2) Viton seals are recommended for speeds above 280 rpm

3) Peak pressure 6091 psi maximum, allowed to occur at a single operating period of max. 1 second.
Total amount of single operation periods = 1 000 000 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 receive 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 data sheet [RE 15389](#)

Note!

The diagrams are valid for 1 bar (14.5 psi) case pressure.

With increasing case pressure the charge pressure must be increased accordingly.

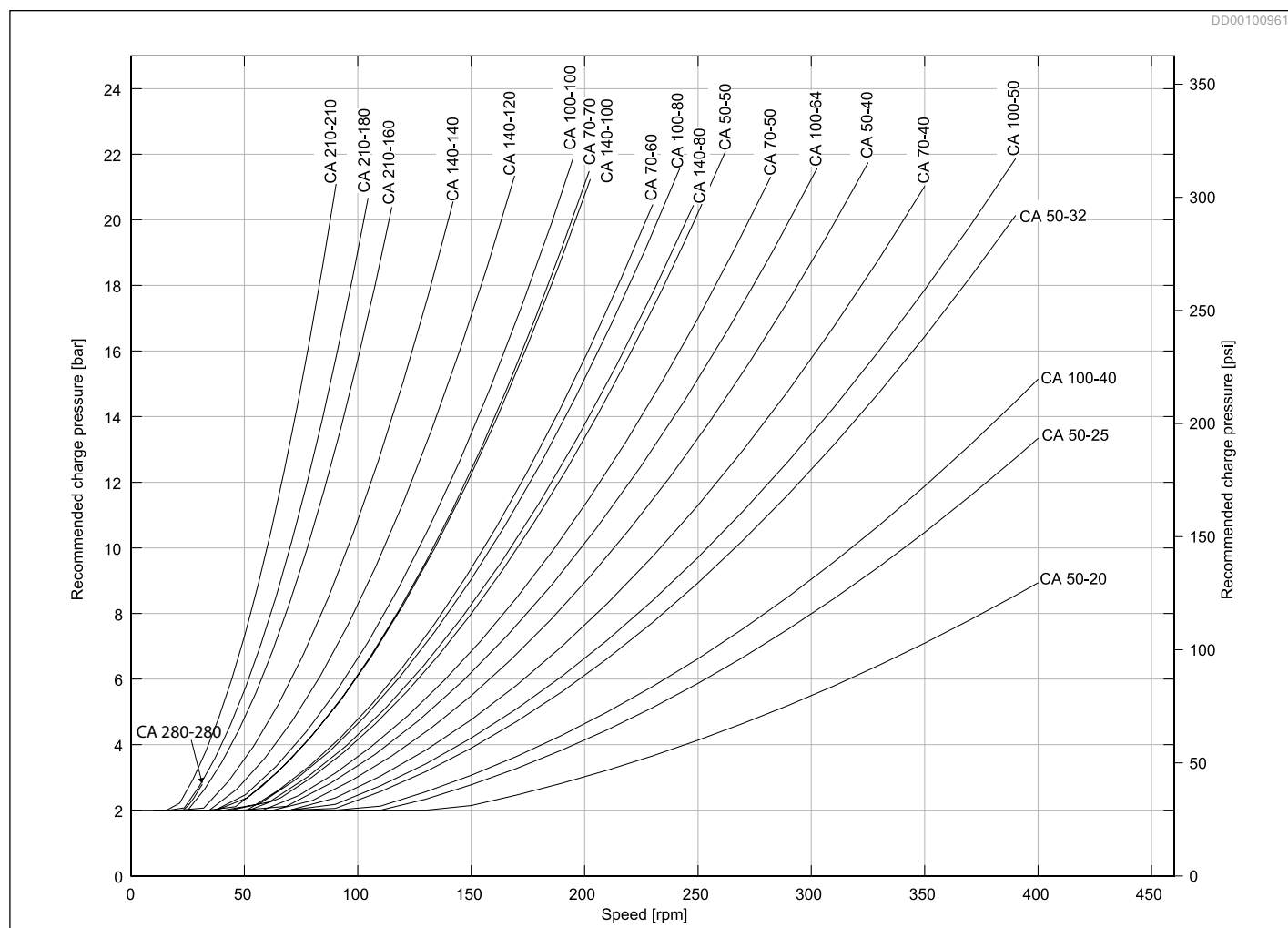


Fig. 5: Recommended charge pressure for motor working in braking mode (pump mode), 2-port connection. Valid for oil viscosity 40 cSt.

DD00100962

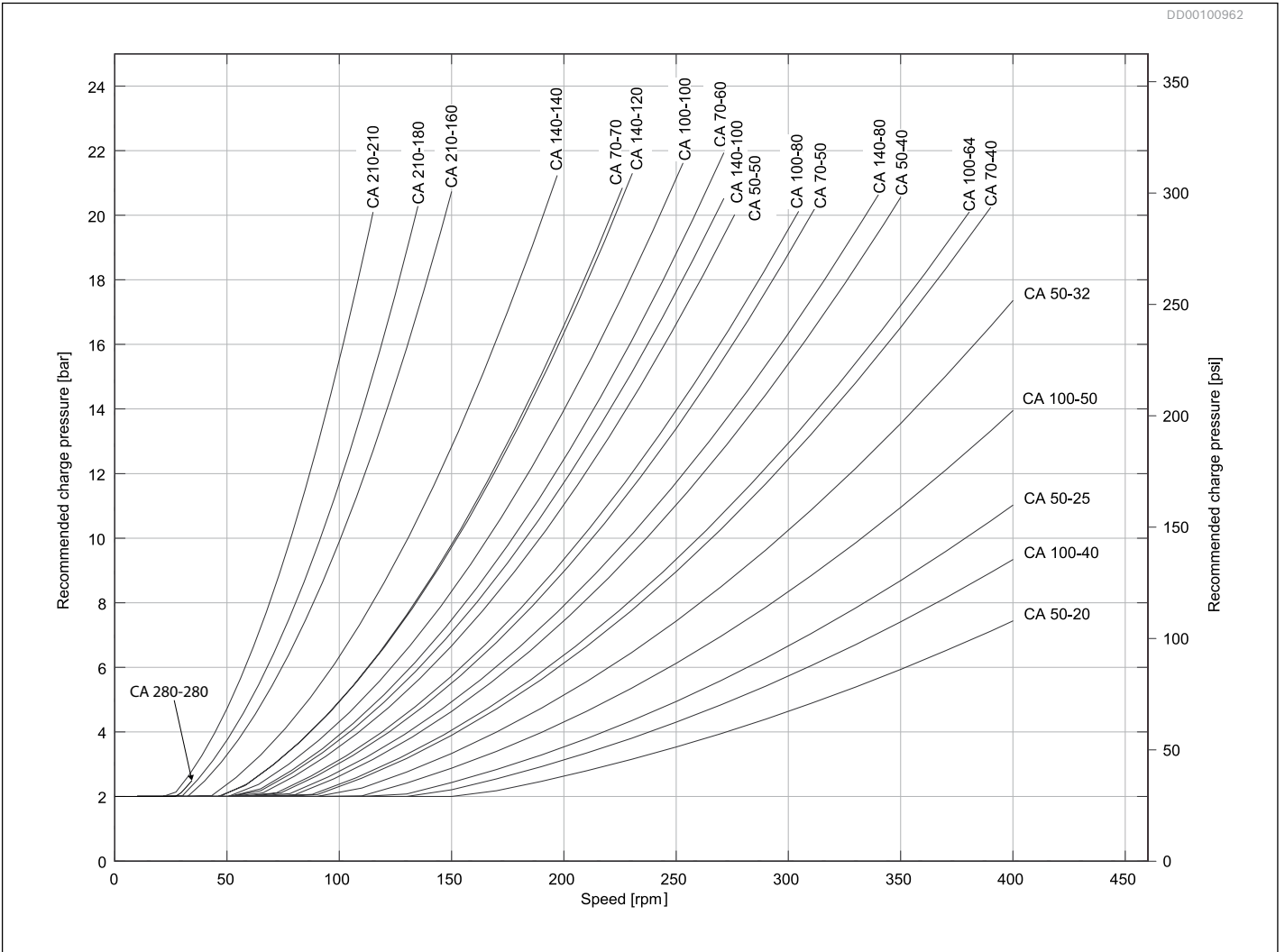


Fig. 6: Recommended charge pressure for motor working in braking mode (pump mode), 4-port connection. Valid for oil viscosity 40 cSt.

4.5 Hydraulic fluids

The hydraulic motor H ä g g l u n d s 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 contaminated 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.
- Minimum 20 cSt for standard option 0.
- Minimum 10 cSt for option C-coated.

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

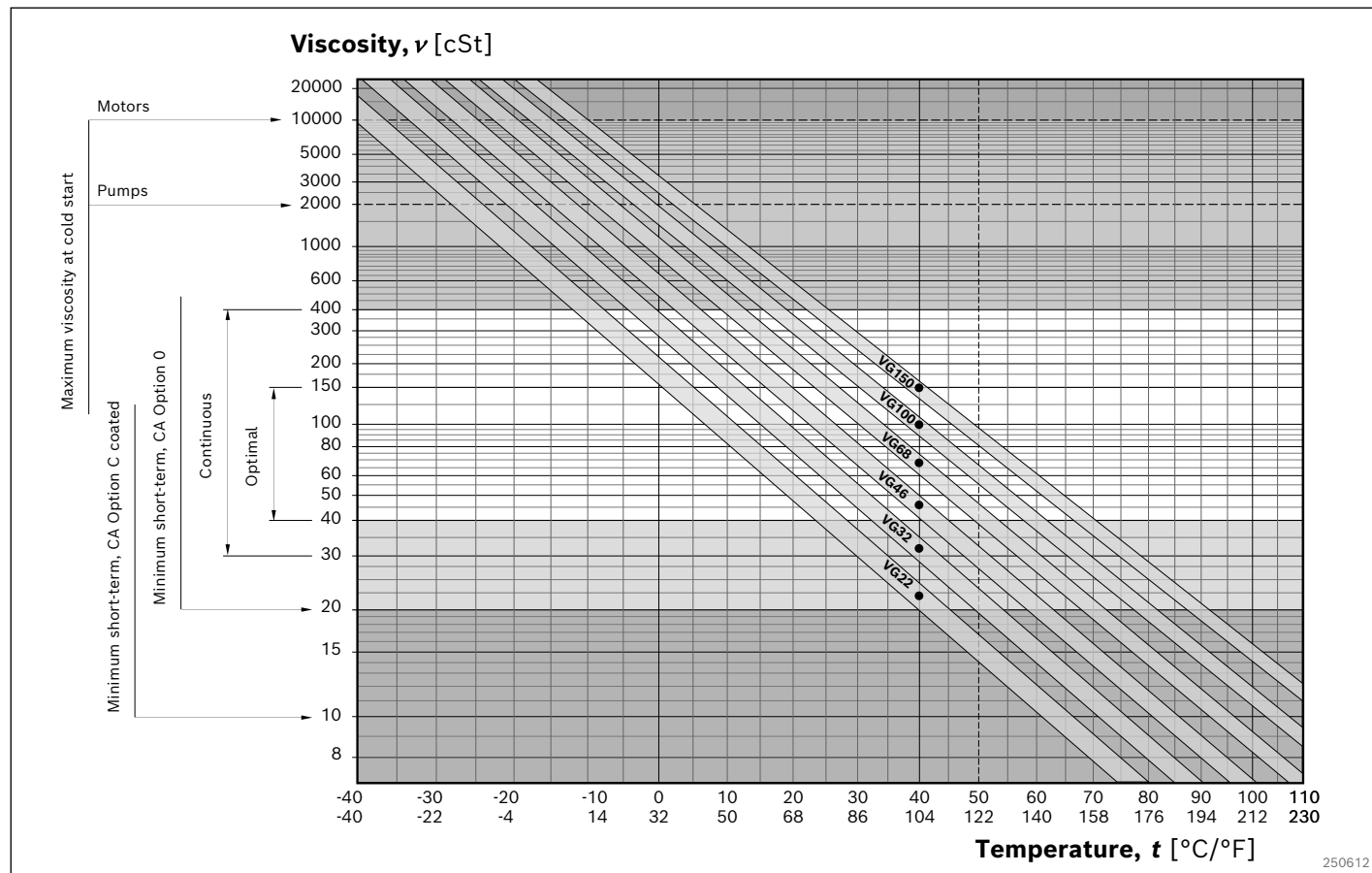


Fig. 7: Selection diagram for viscosity ranges with straight fluids, i.e. viscosity index 100

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.

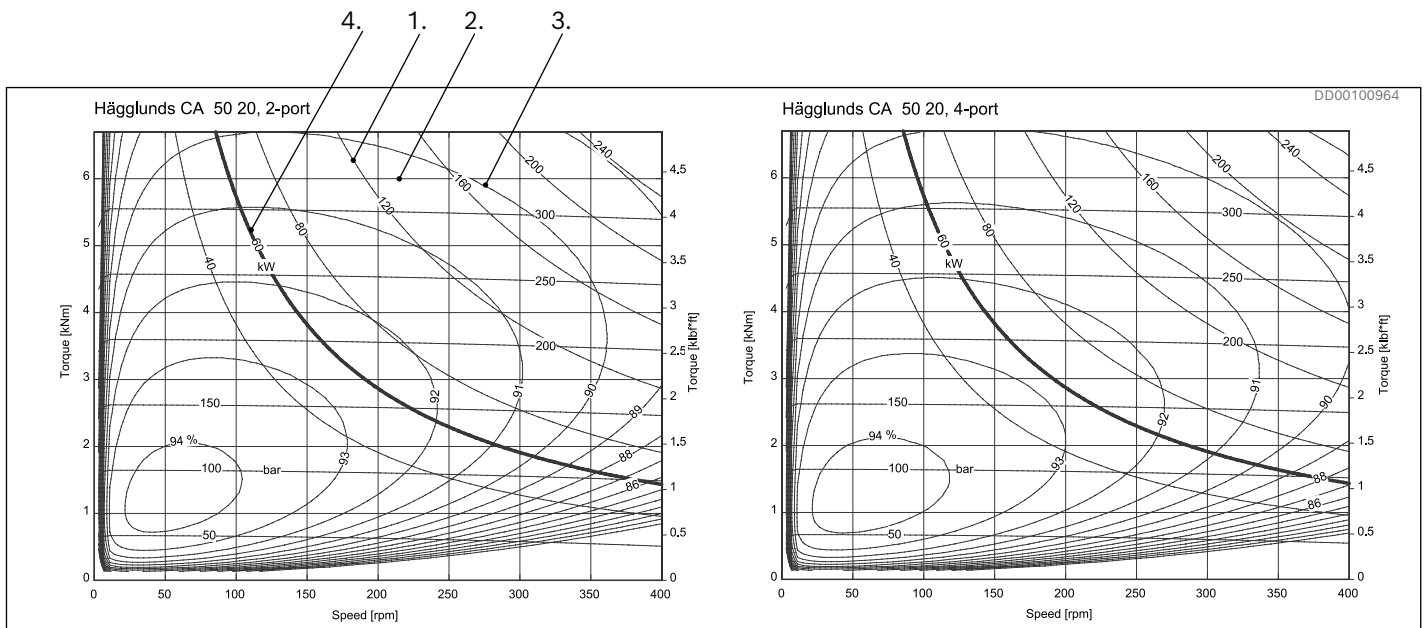


Fig. 8: CA 50 20

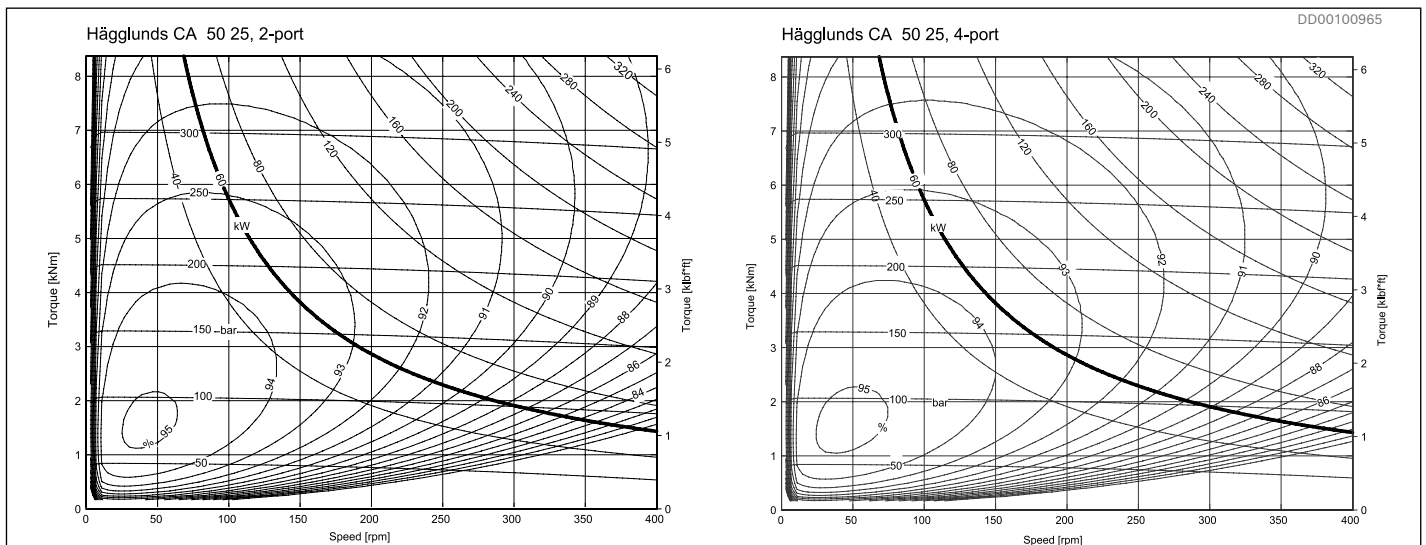


Fig. 9: CA 50 25

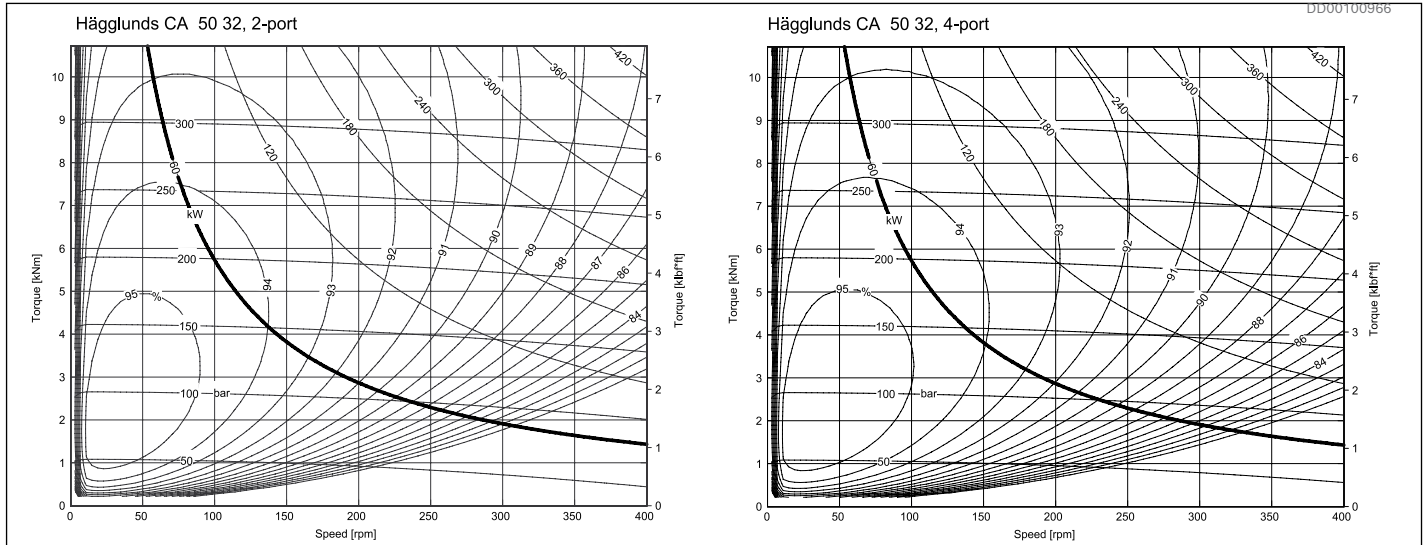


Fig. 10: CA 50 32

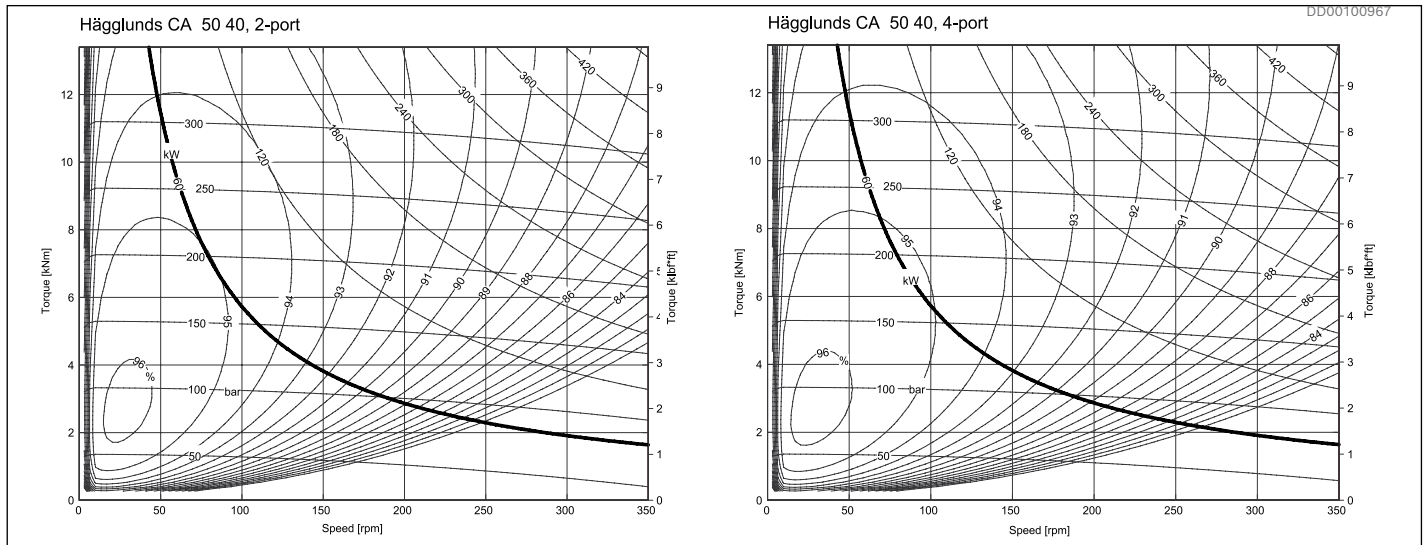


Fig. 11: CA 50 40

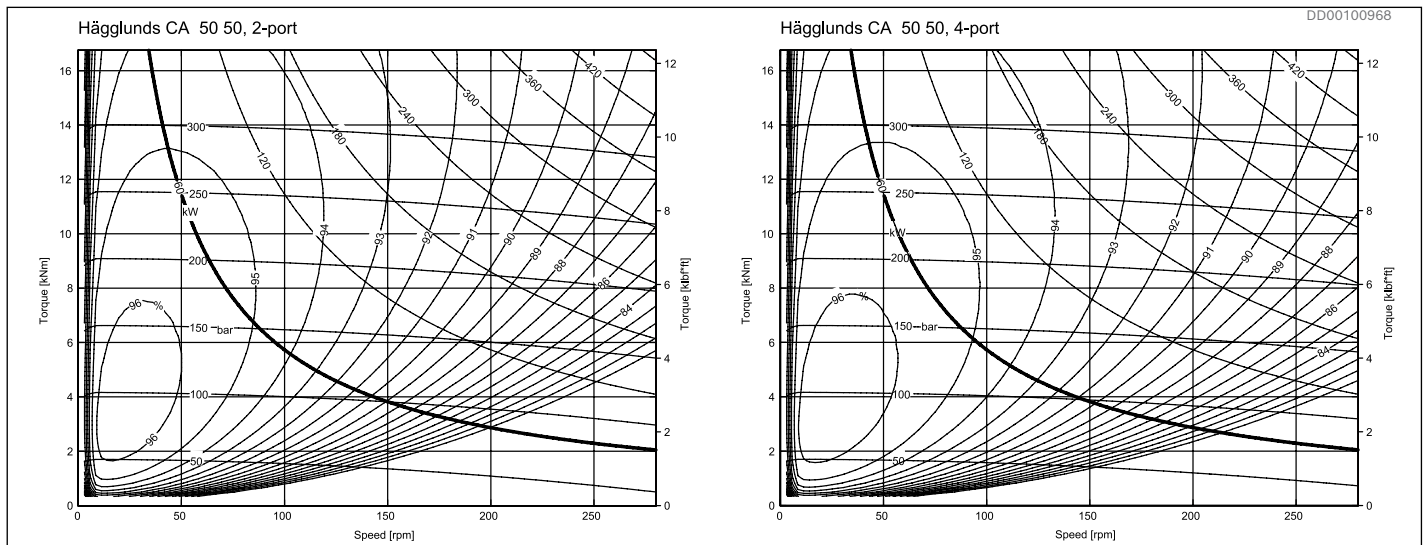


Fig. 12: CA 50 50

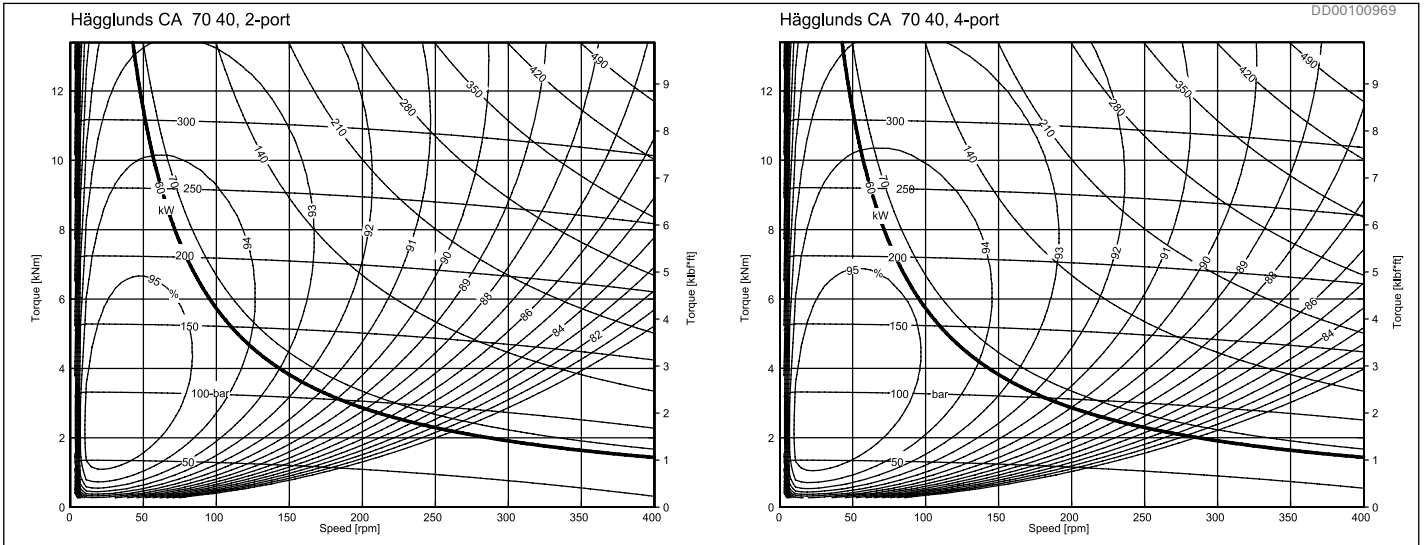


Fig. 13: CA 70 40

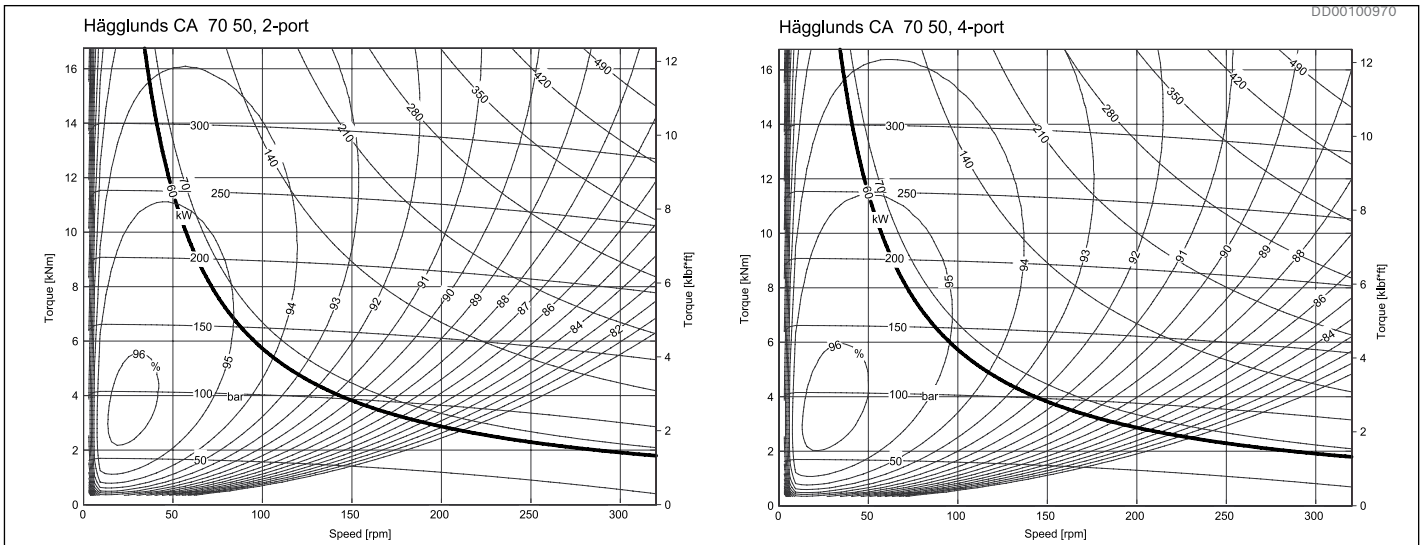


Fig. 14: CA 70 50

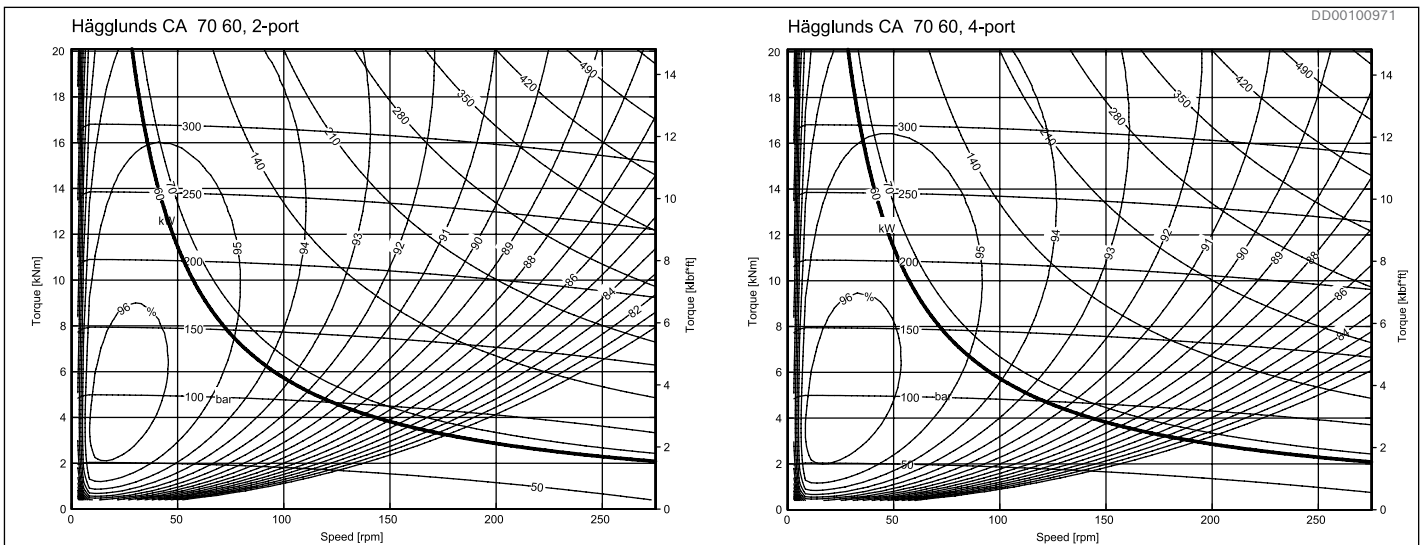


Fig. 15: CA 70 60

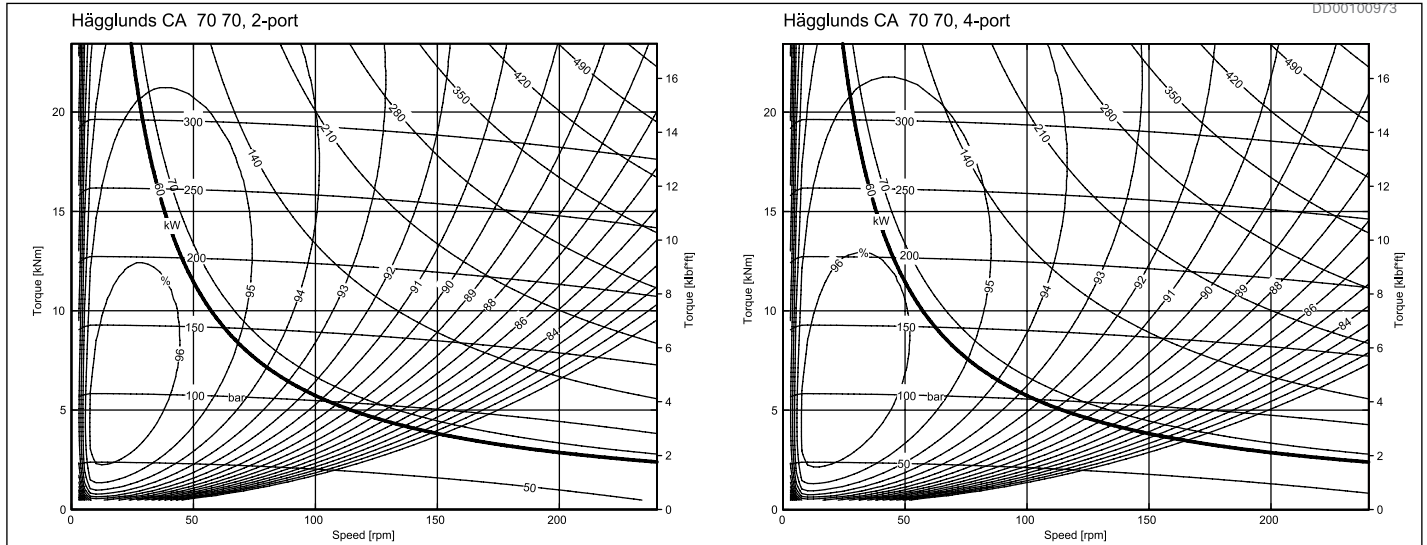


Fig. 16: CA 70 70

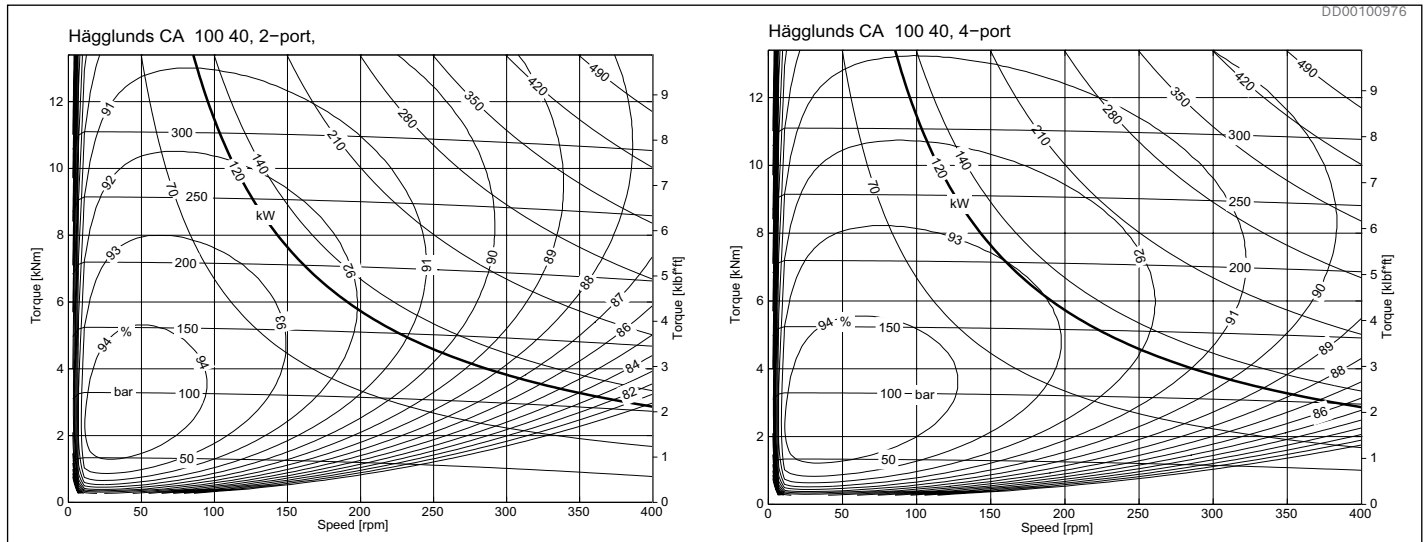


Fig. 17: CA 100 40

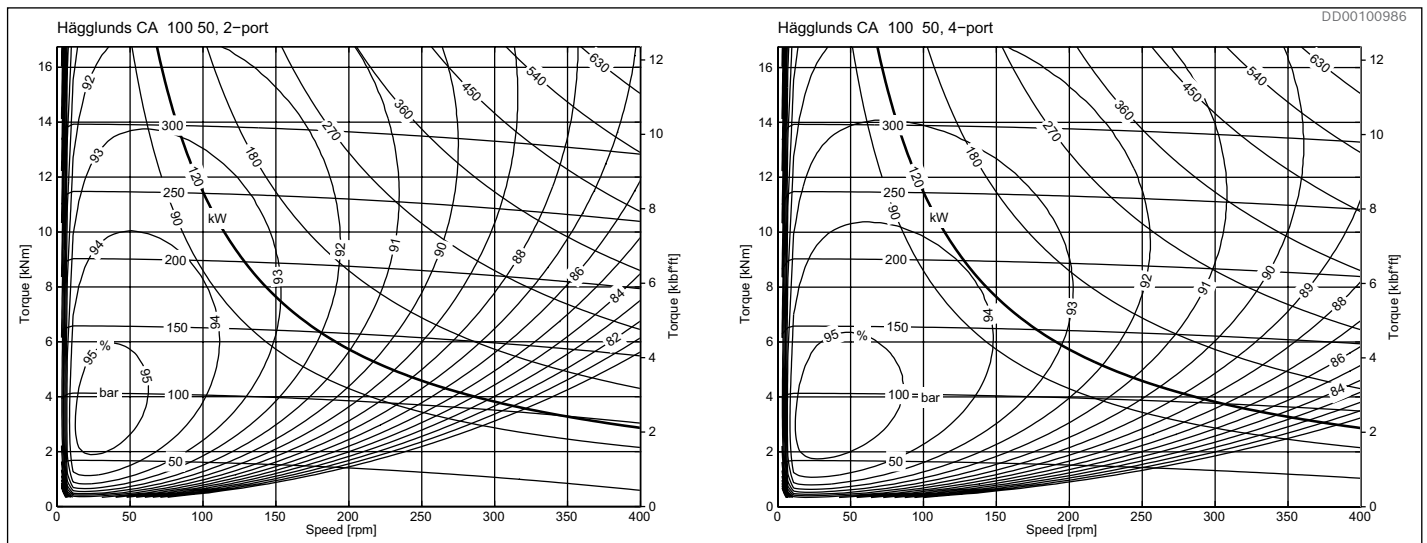


Fig. 18: CA 100 50

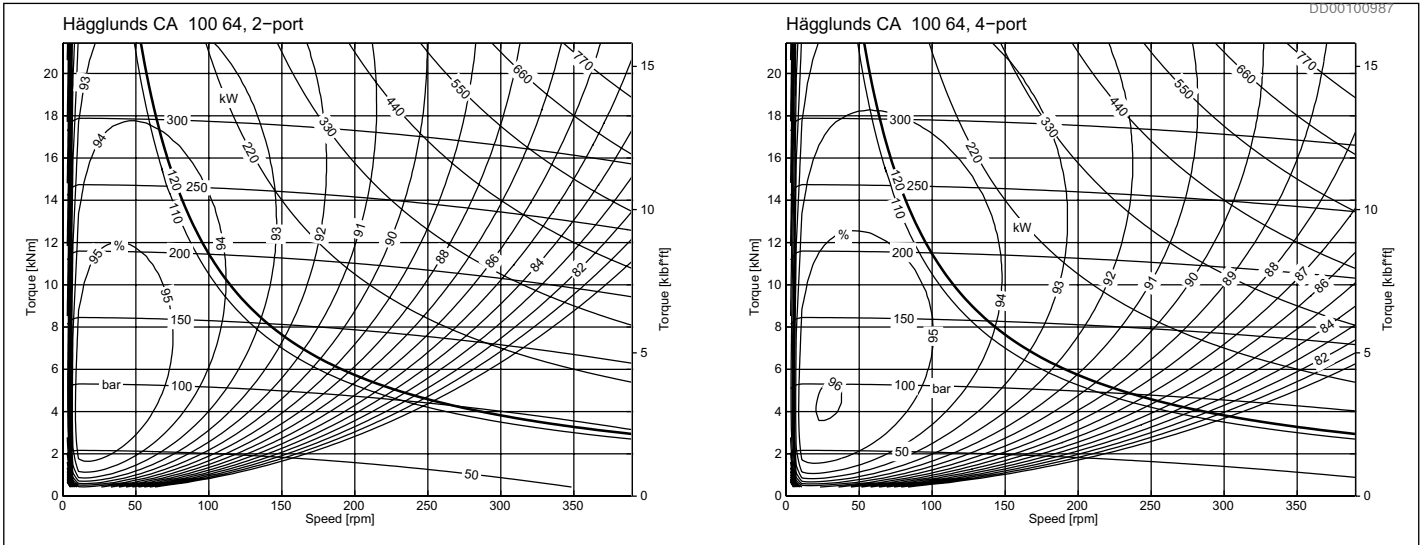


Fig. 19: CA 100 64

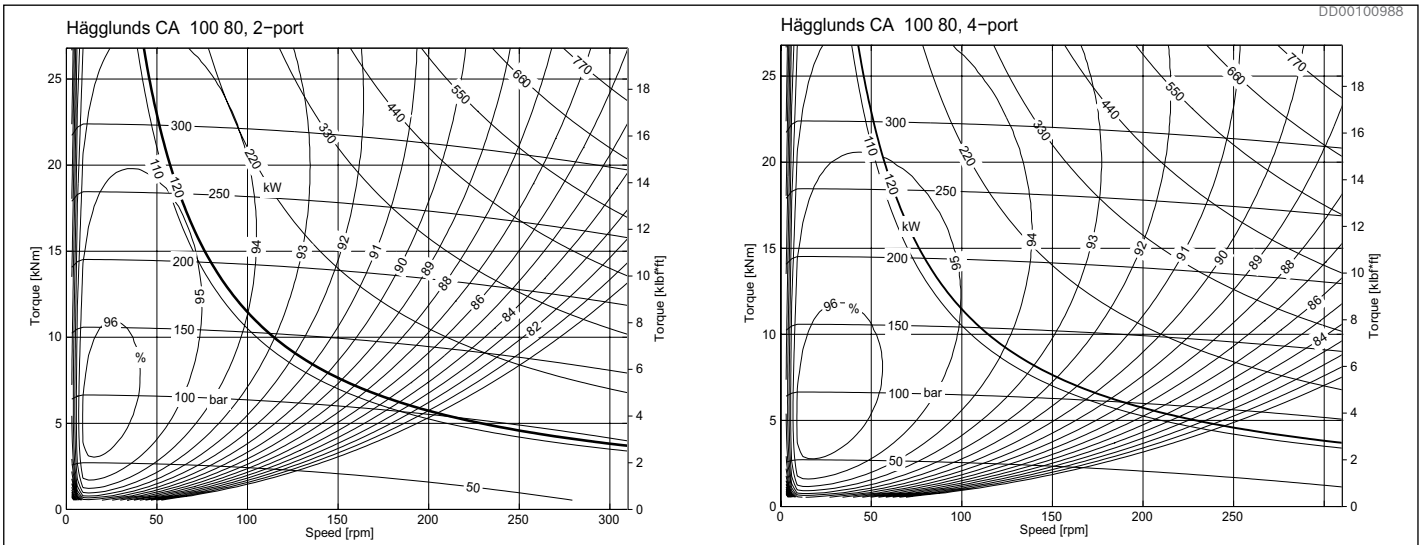


Fig. 20: CA 100 80

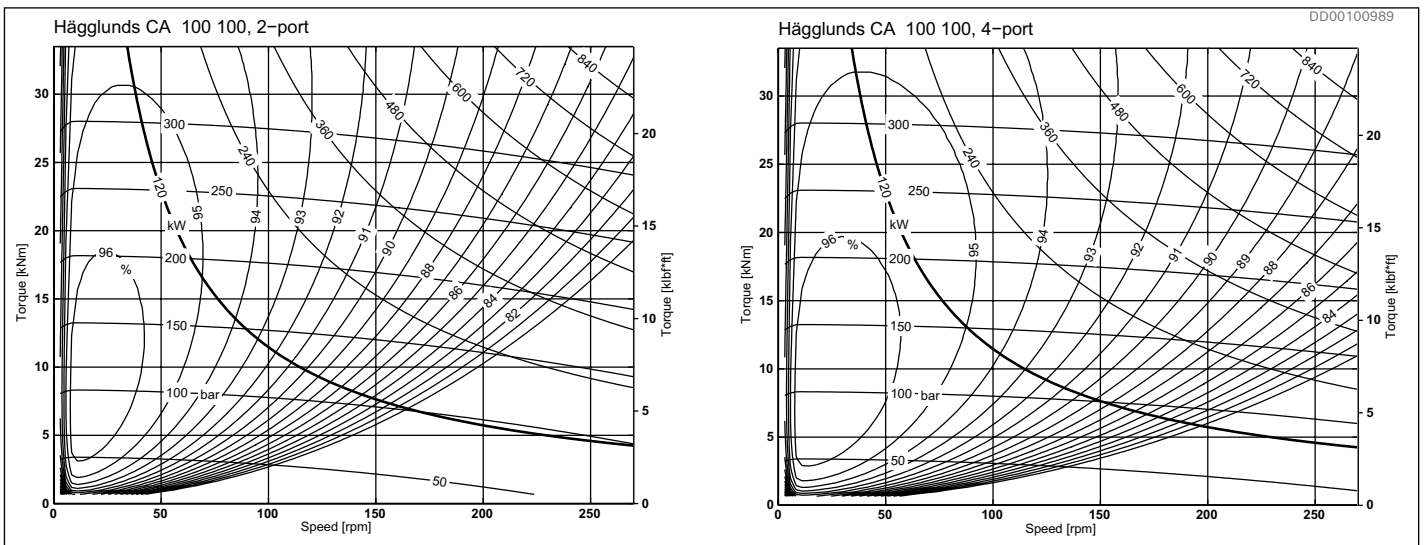


Fig. 21: CA 100 100

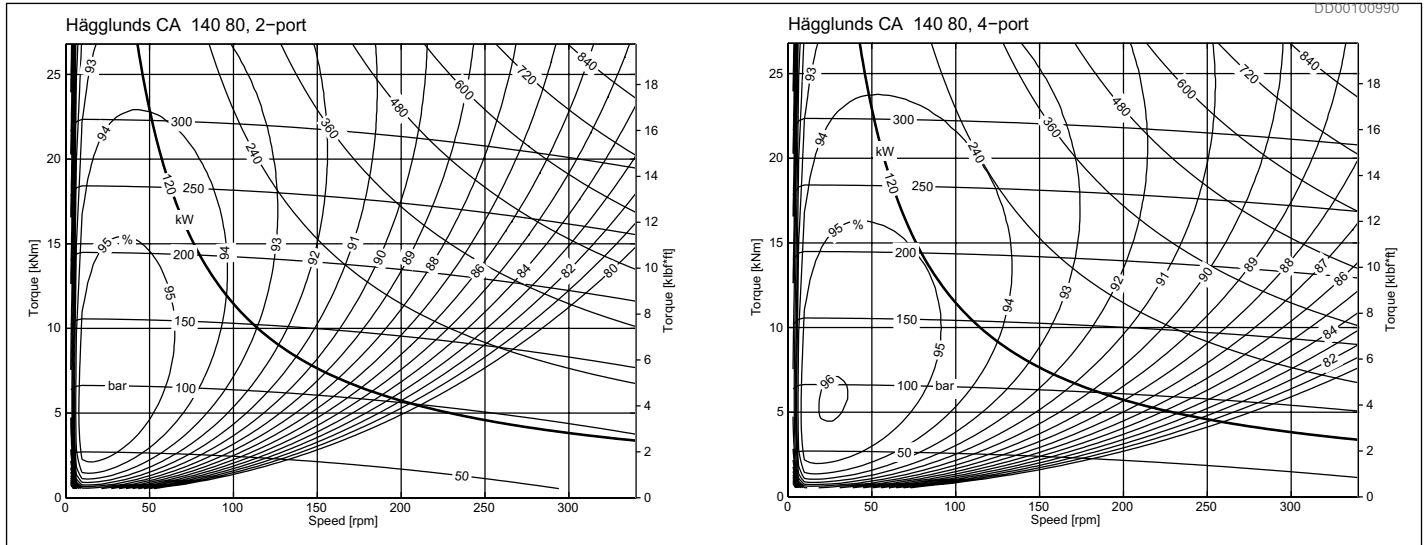


Fig. 22: CA 140 80

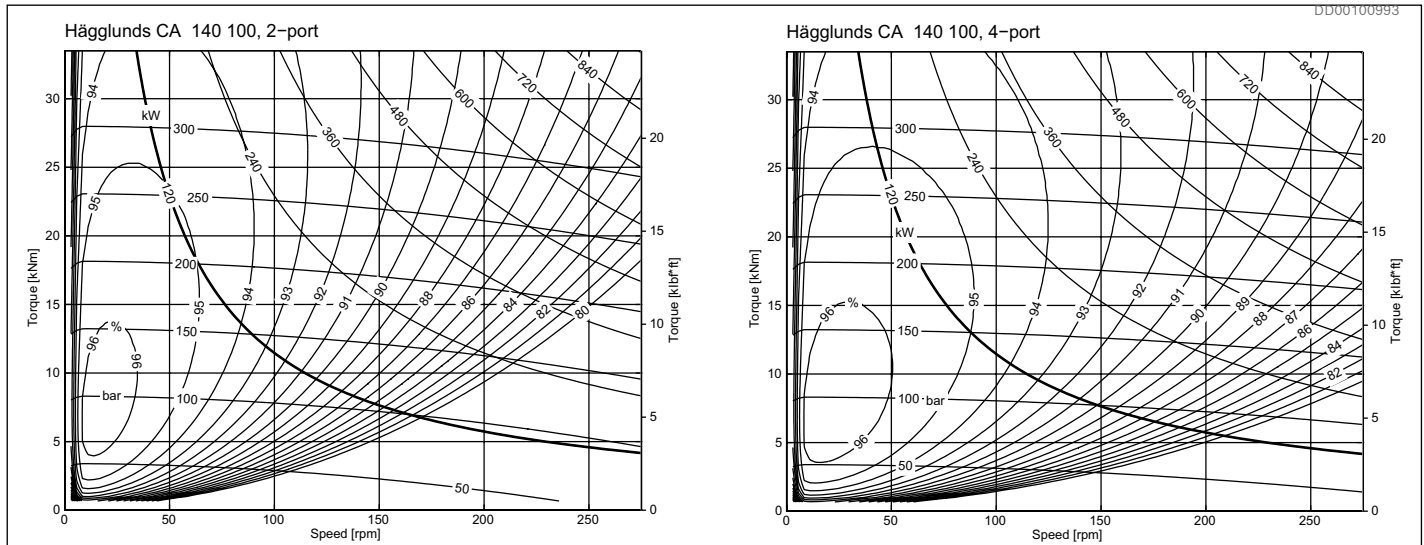


Fig. 23: CA 140 100

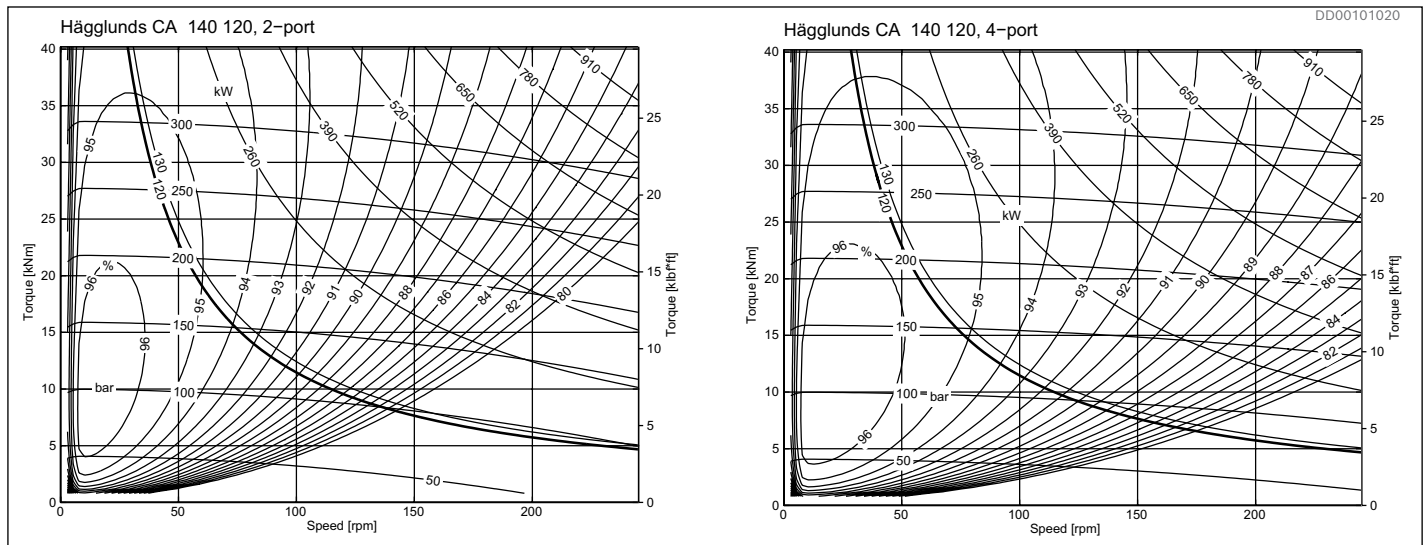


Fig. 24: CA 140 120

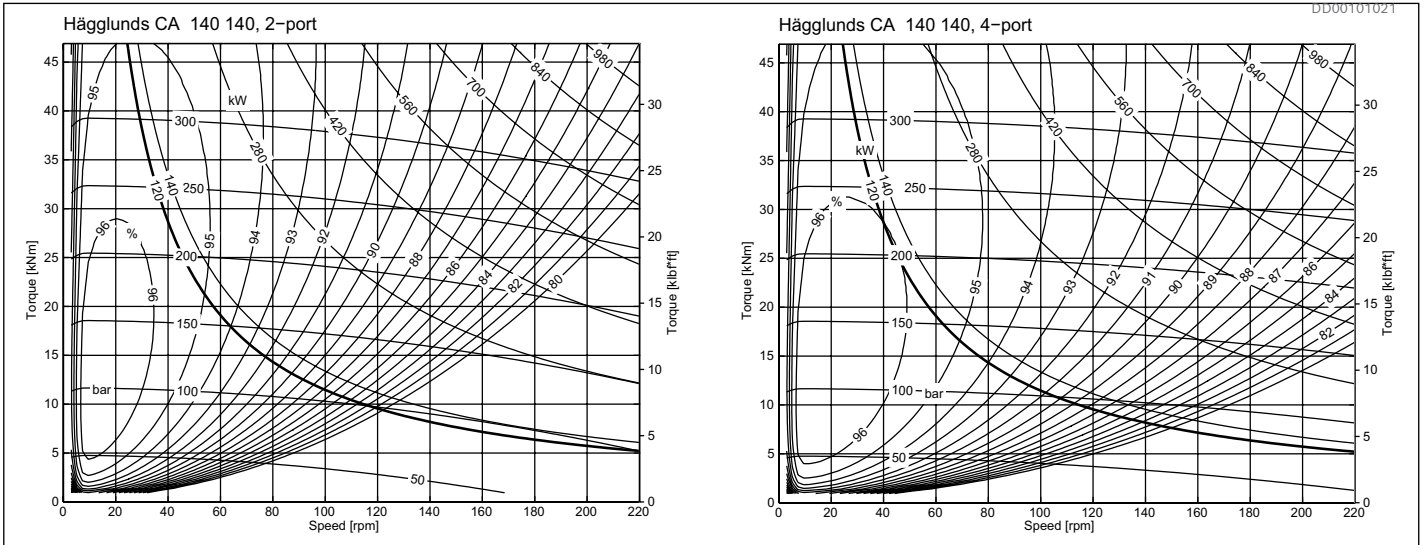


Fig. 25: CA 140 140

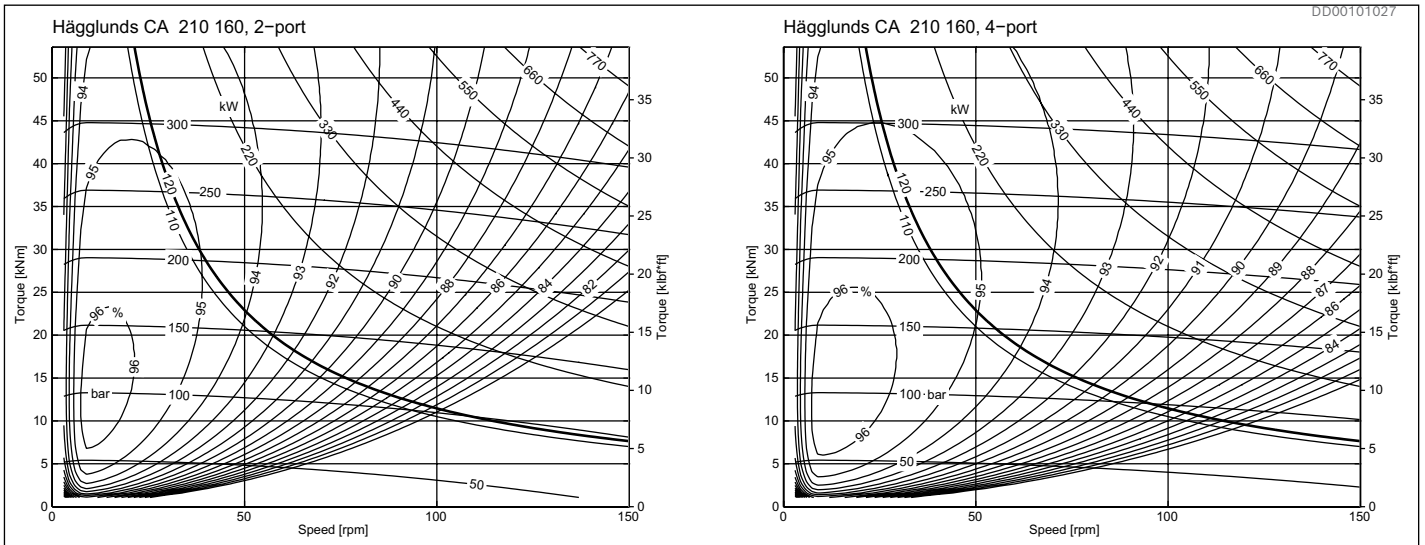


Fig. 26: CA 210 160

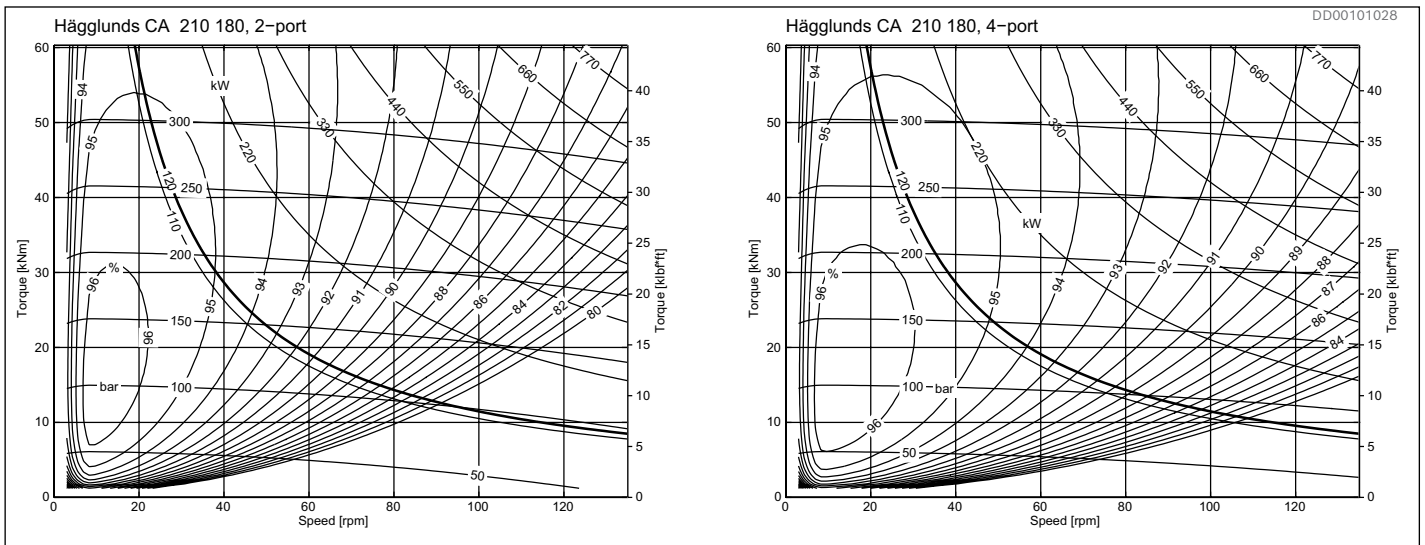


Fig. 27: CA 210 180

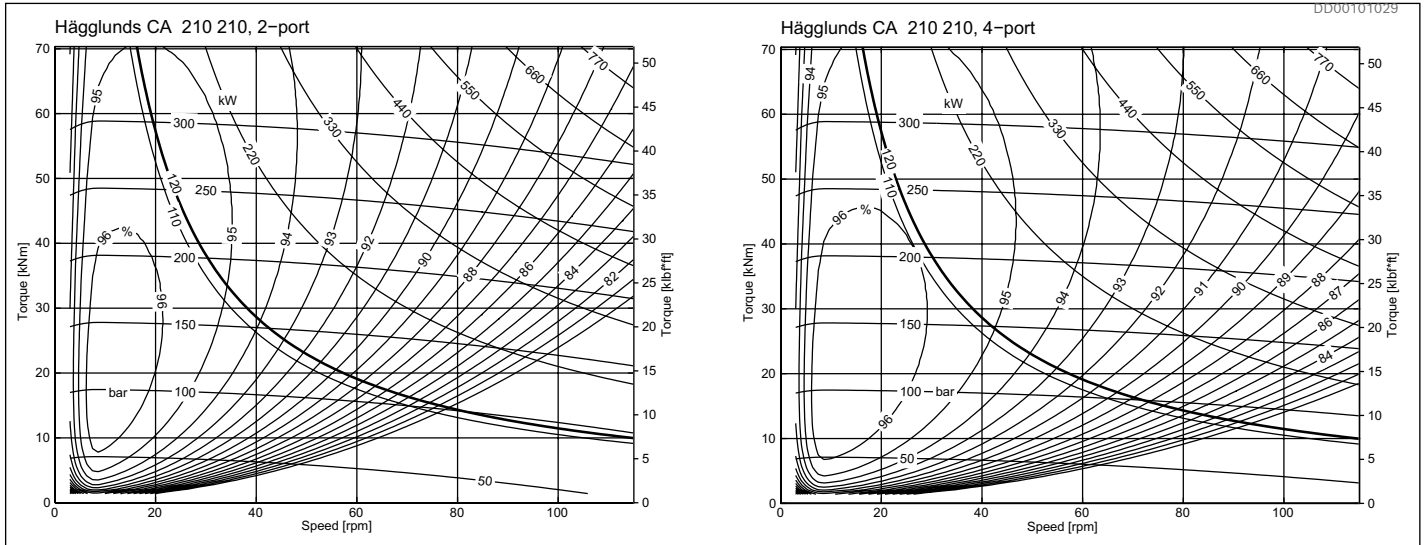


Fig. 28: CA 210 210

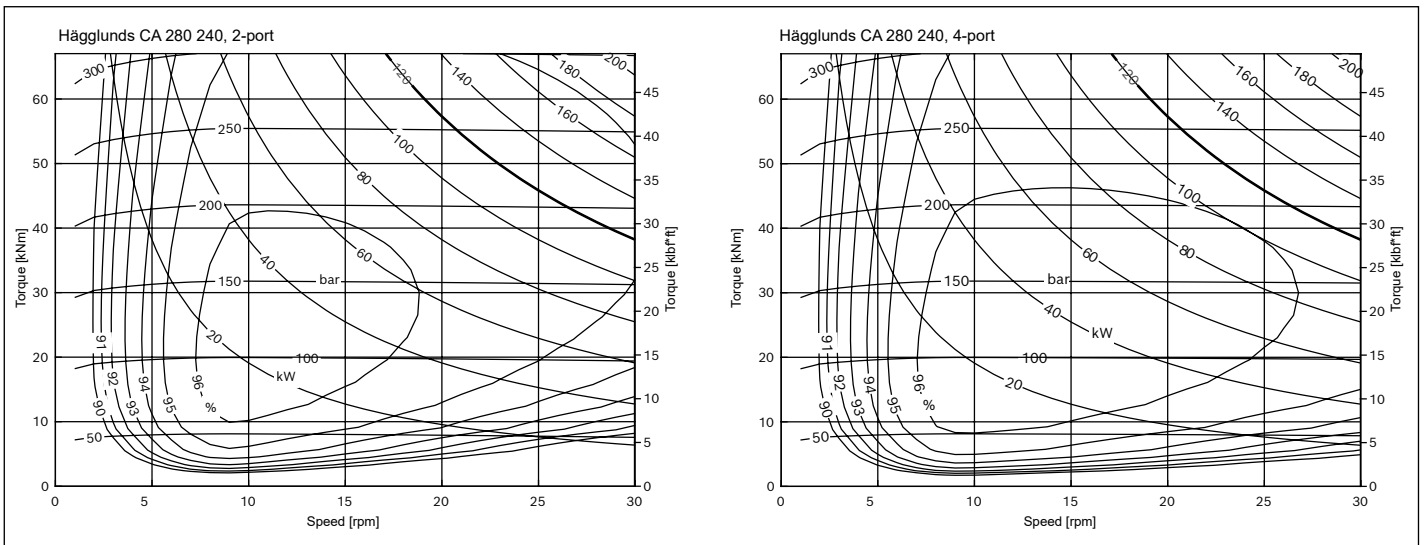


Fig. 29: CA 280 240

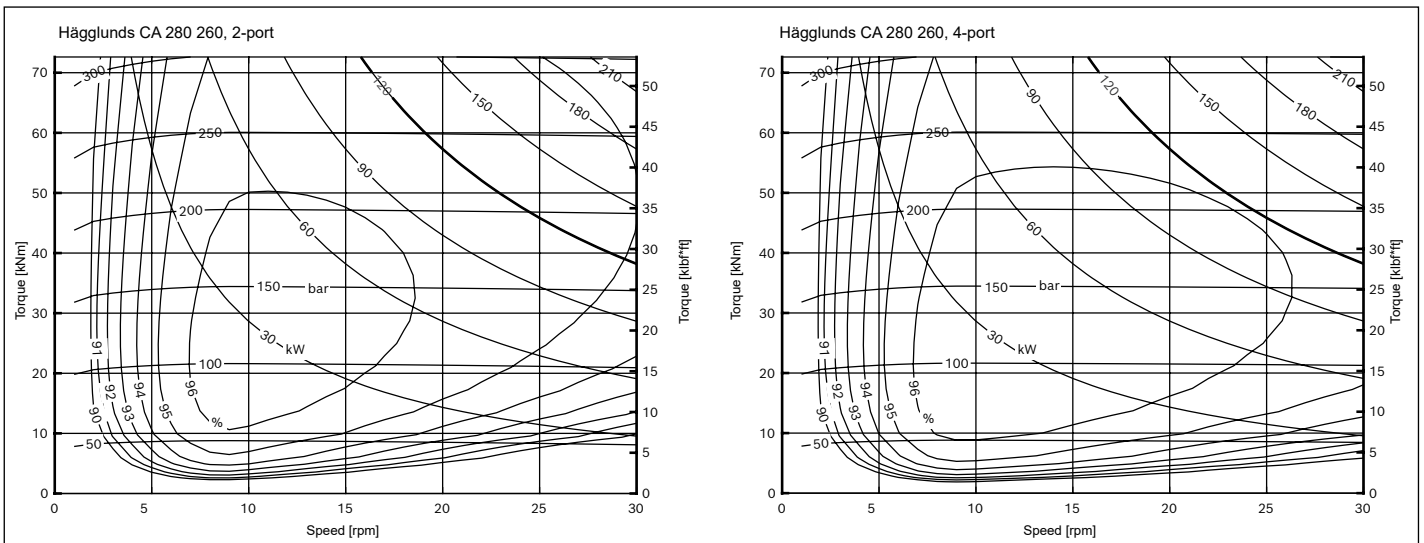


Fig. 30: CA 280 260

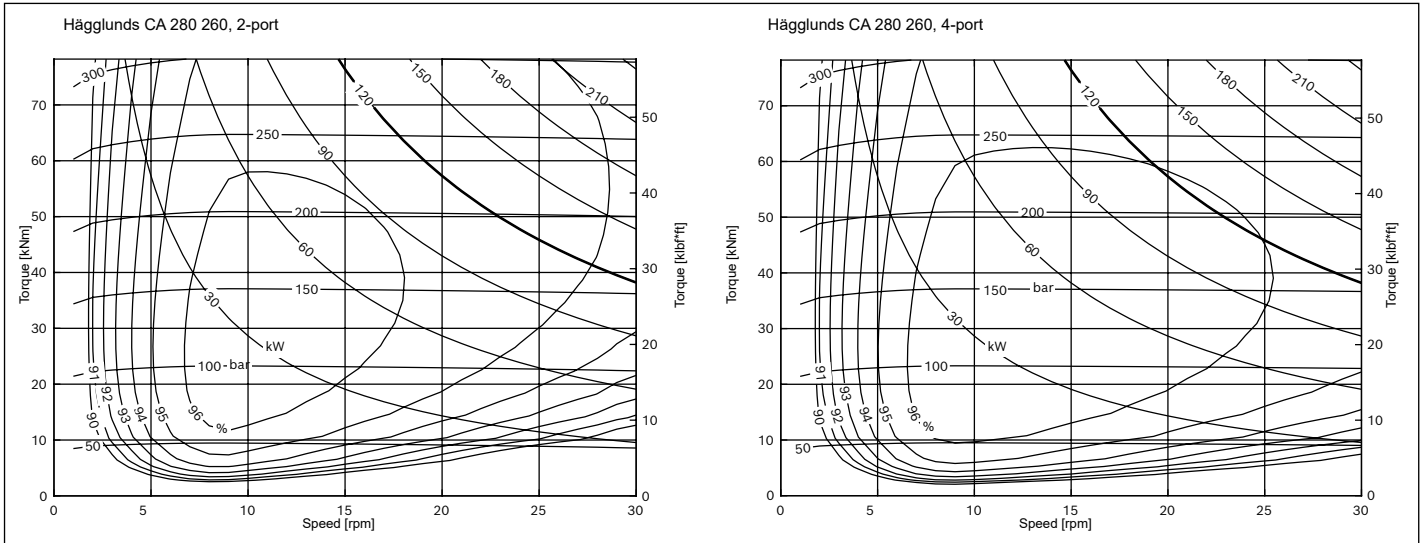


Fig. 31: CA 280 280

4.7 Pressure loss diagrams

Oil viscosity 40 cSt

$$\text{Actual pressure difference} = \frac{\text{output torque}}{\text{specific torque} \cdot \text{mechanical efficiency}} + \text{pressure loss}$$

$$\Delta p = \frac{T}{T_s \cdot \eta_m} + \Delta p_l$$

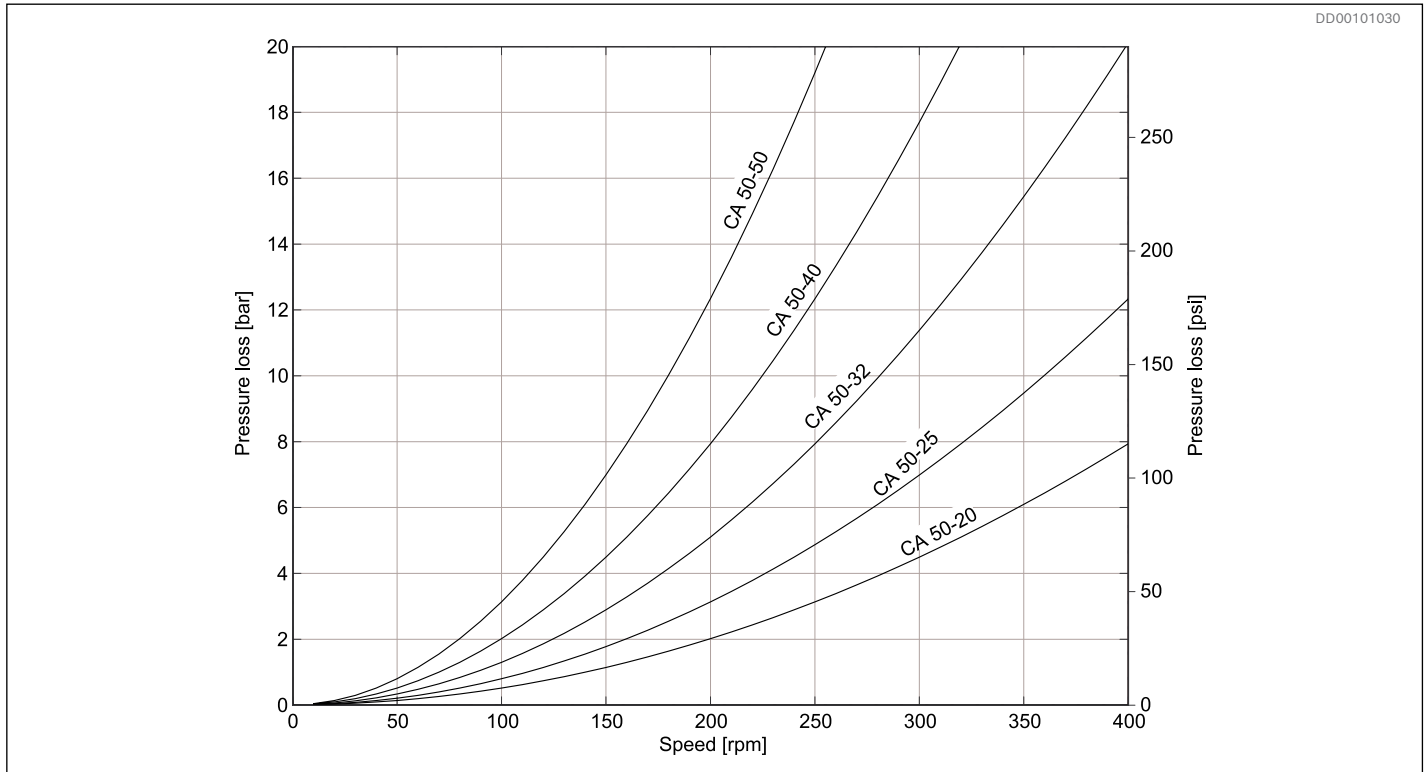


Fig. 32: CA 50 pressure loss, 2 port

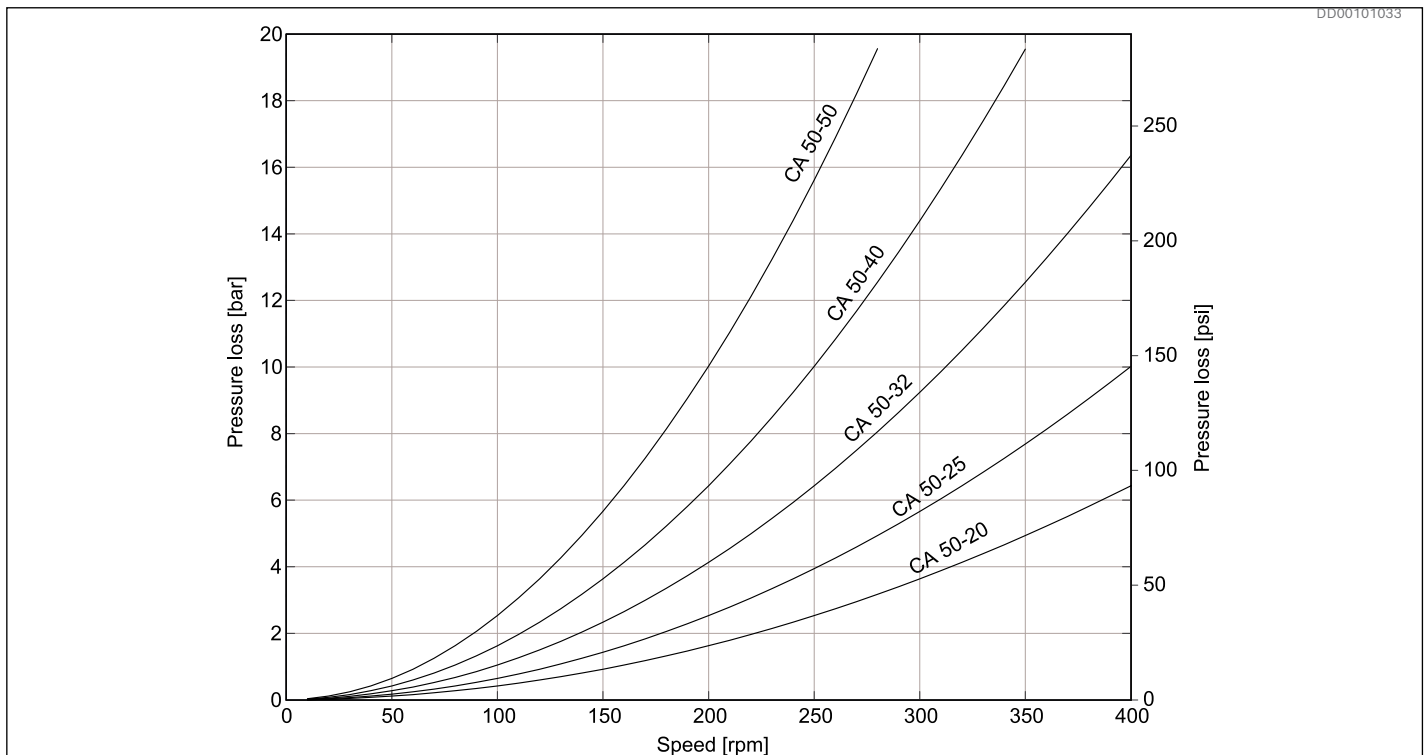


Fig. 33: CA 50 pressure loss, 4 port

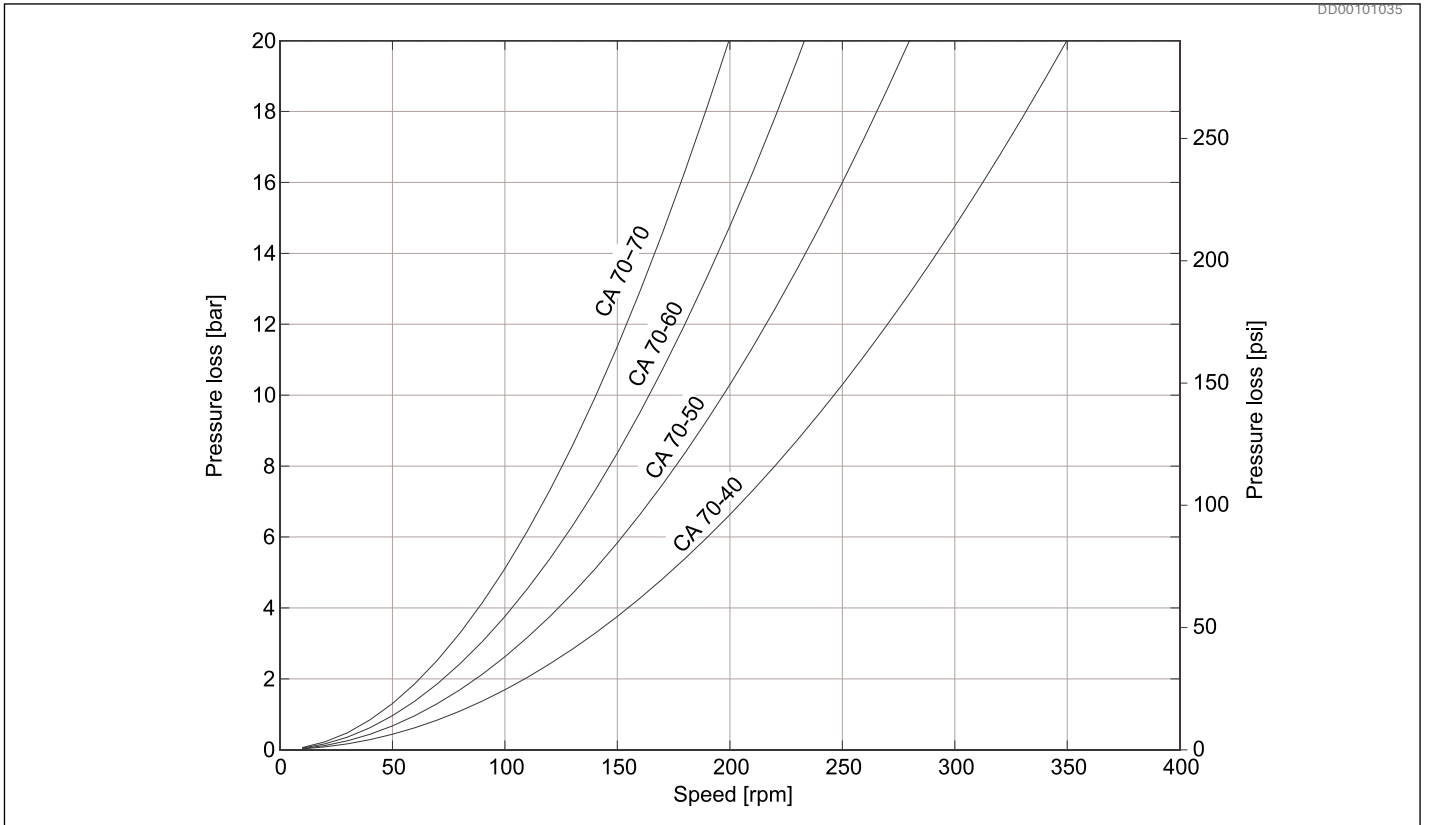


Fig. 34: CA 70 pressure loss, 2 port

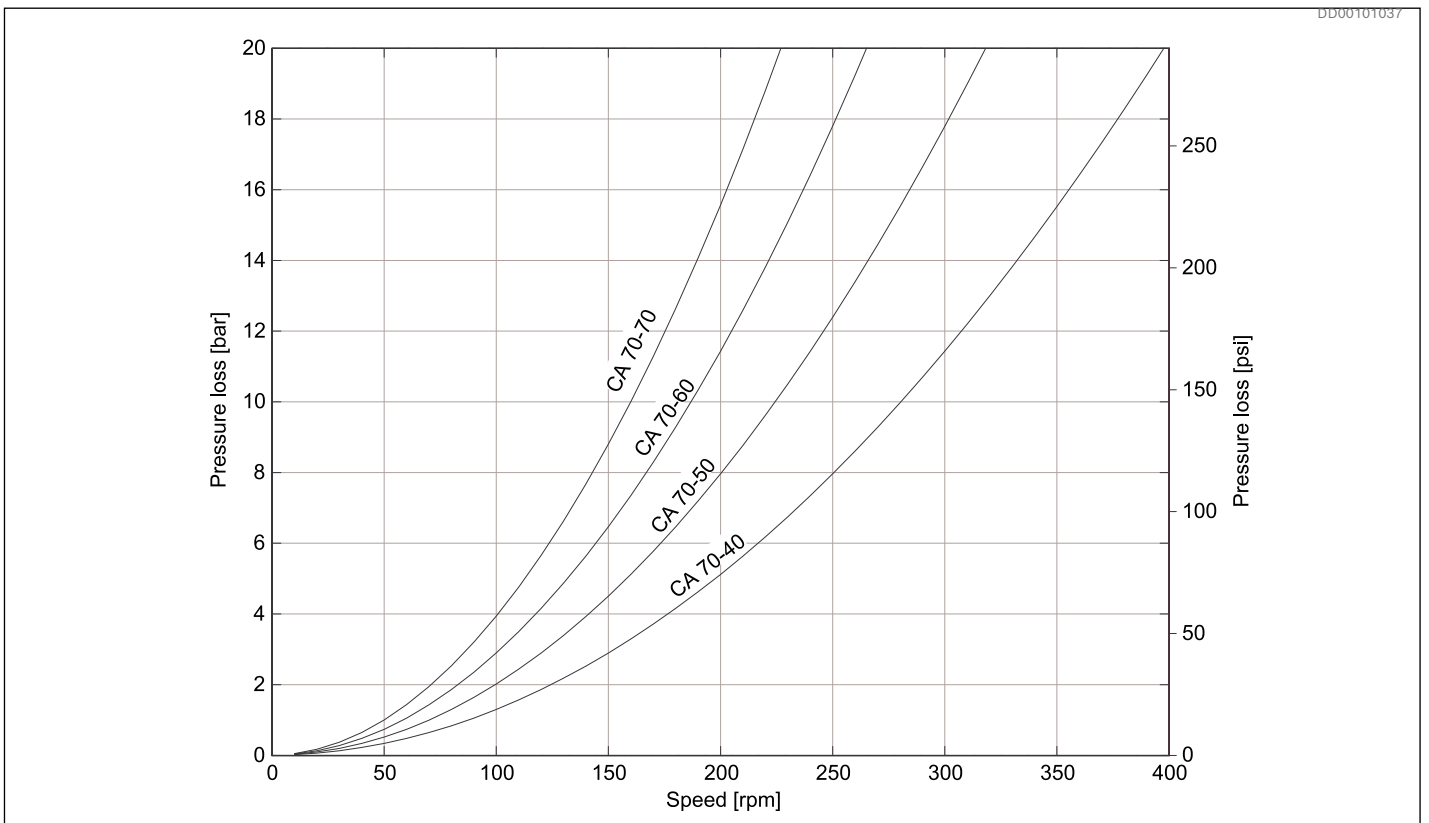


Fig. 35: CA 70 pressure loss, 4 port

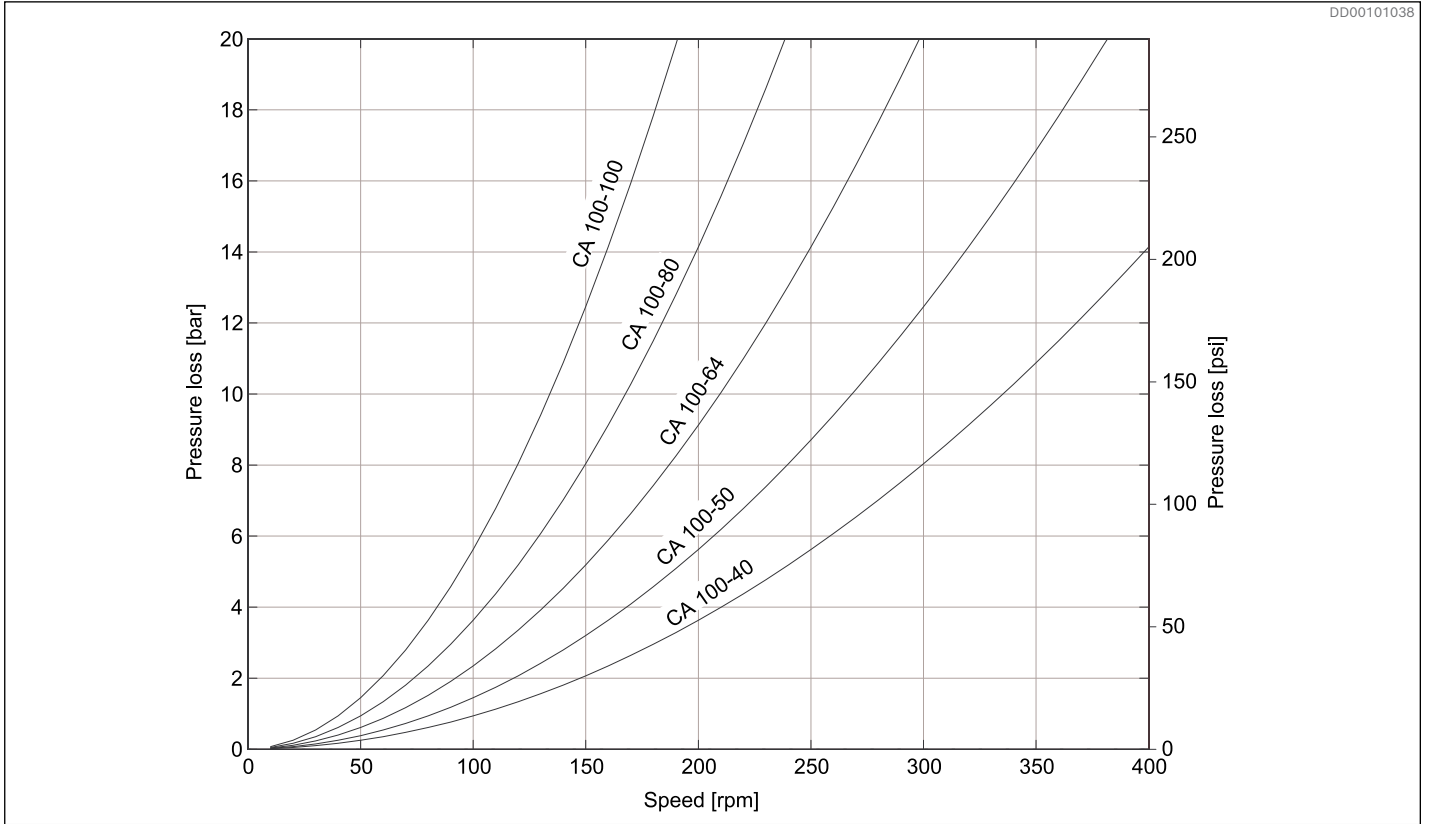


Fig. 36: CA 100 pressure loss, 2 port

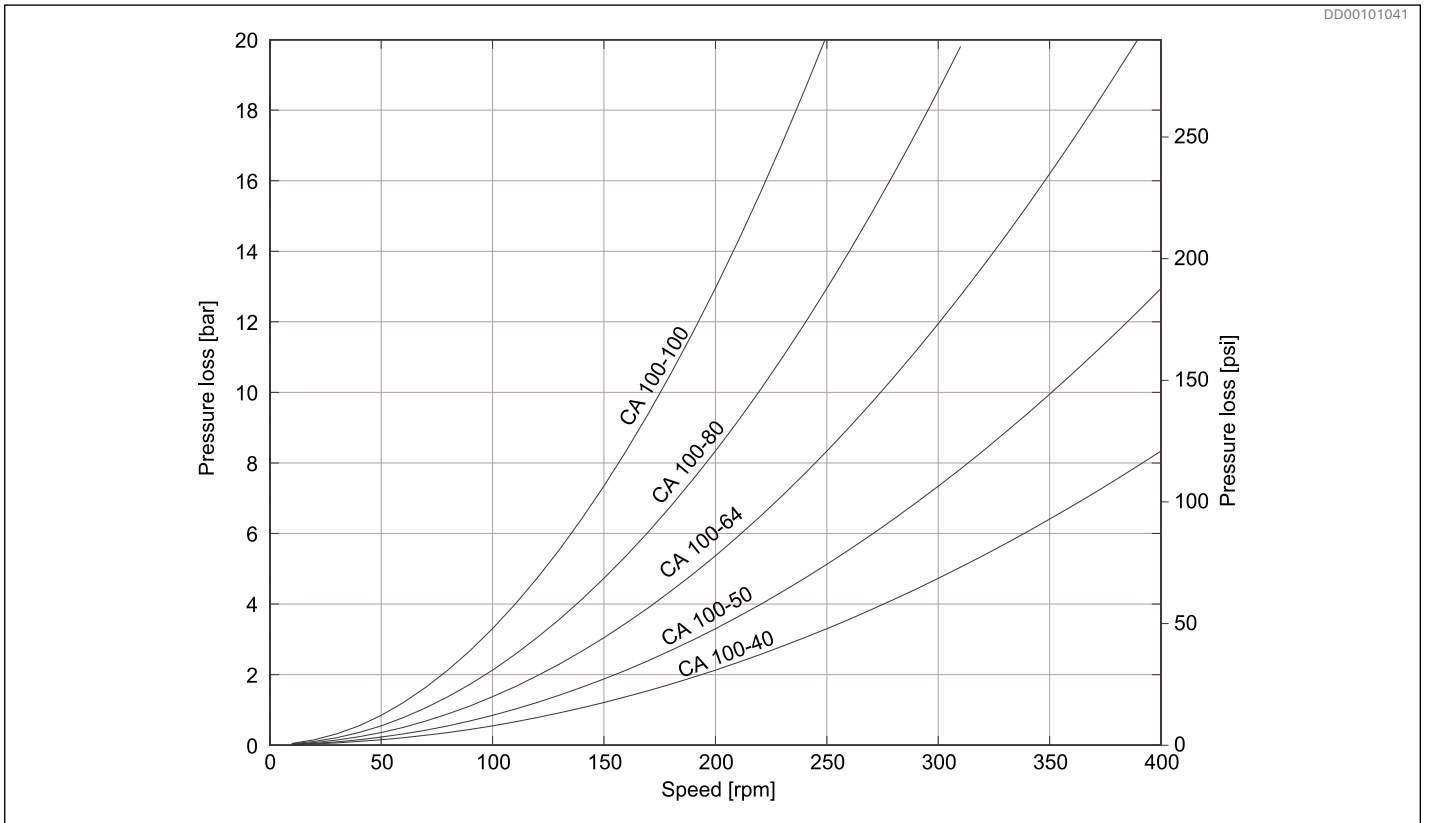


Fig. 37: CA 100 pressure loss, 4 port

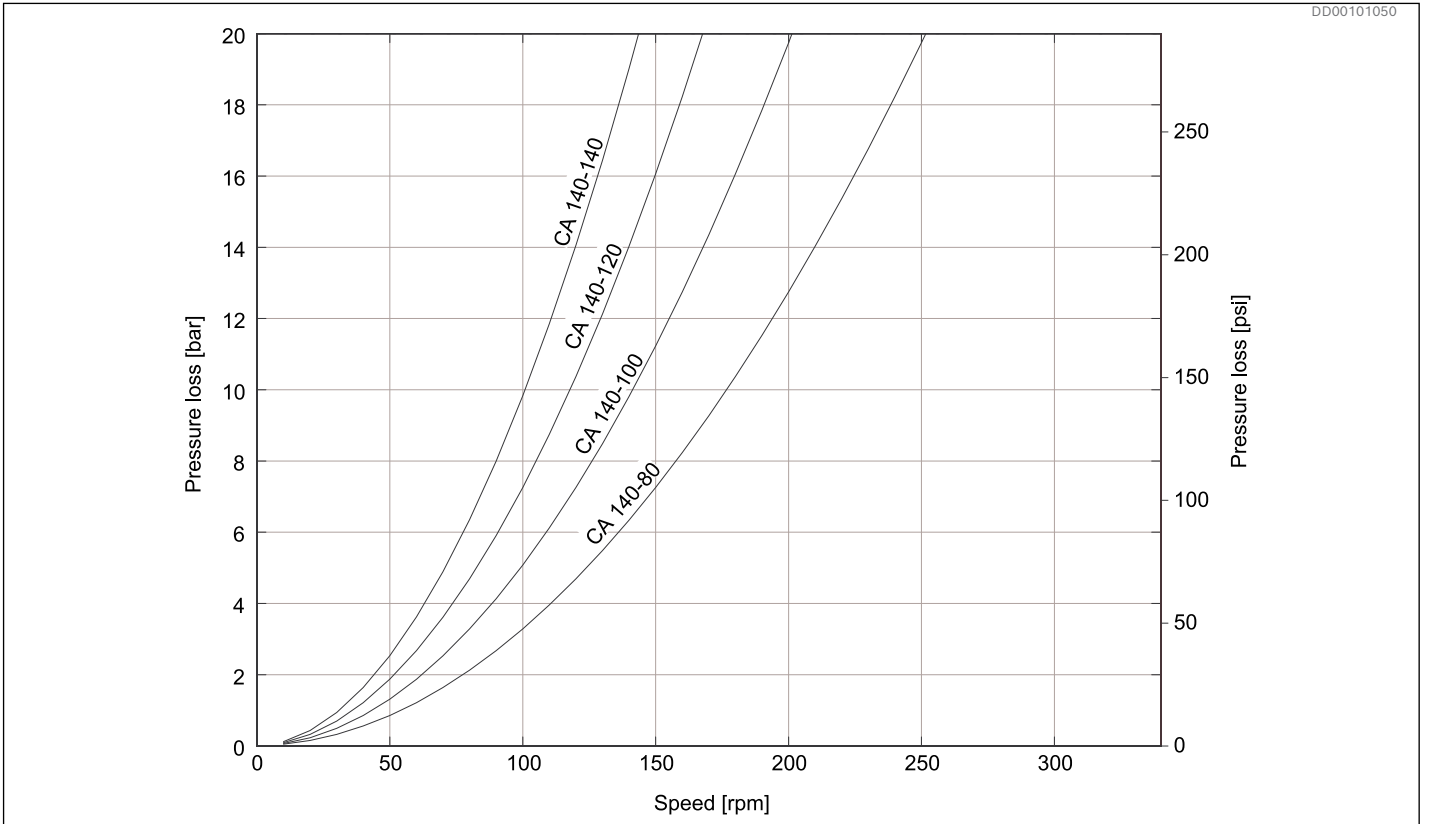


Fig. 38: CA 140 pressure loss, 2 port

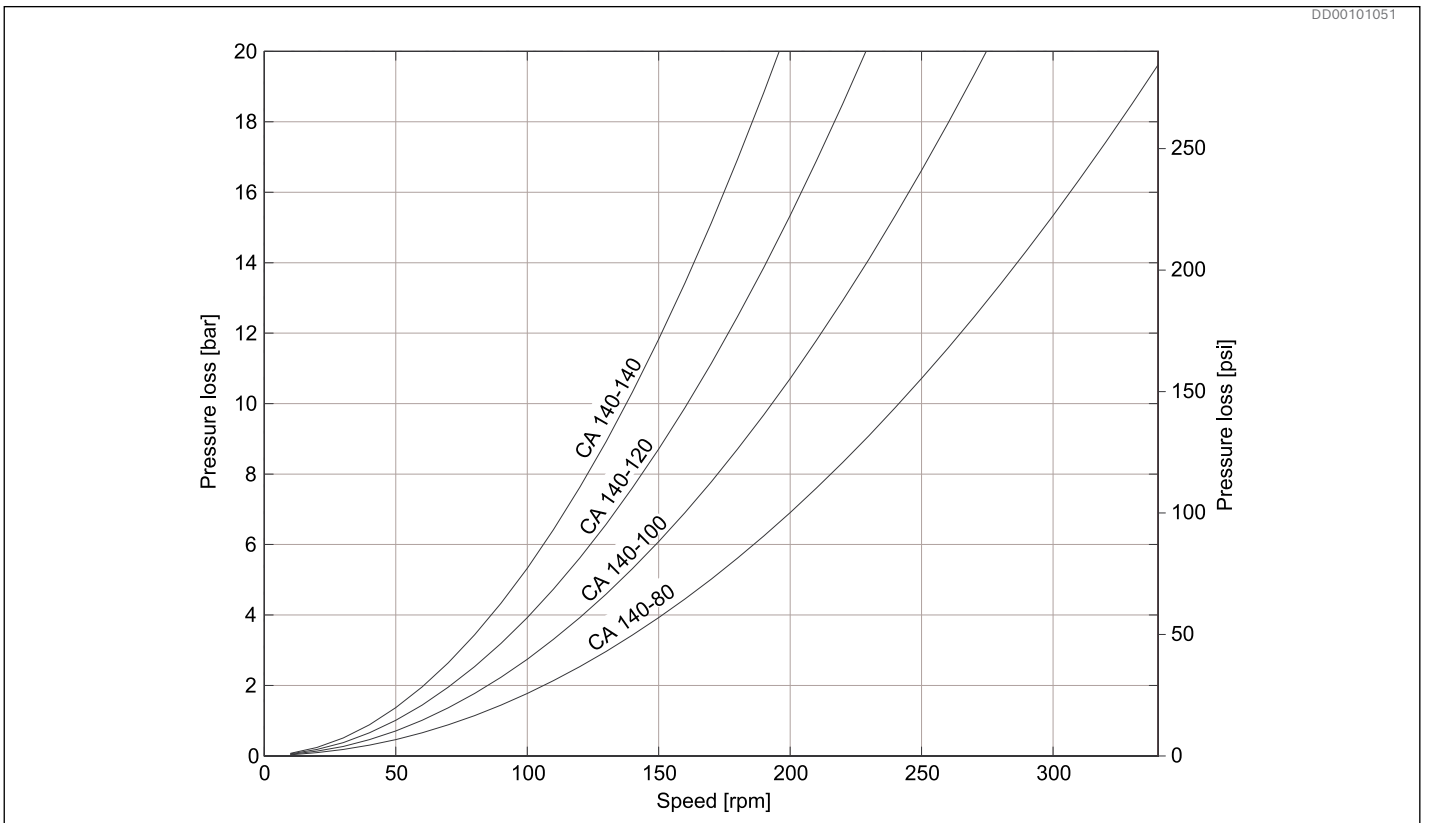


Fig. 39: CA 140 pressure loss, 4 port

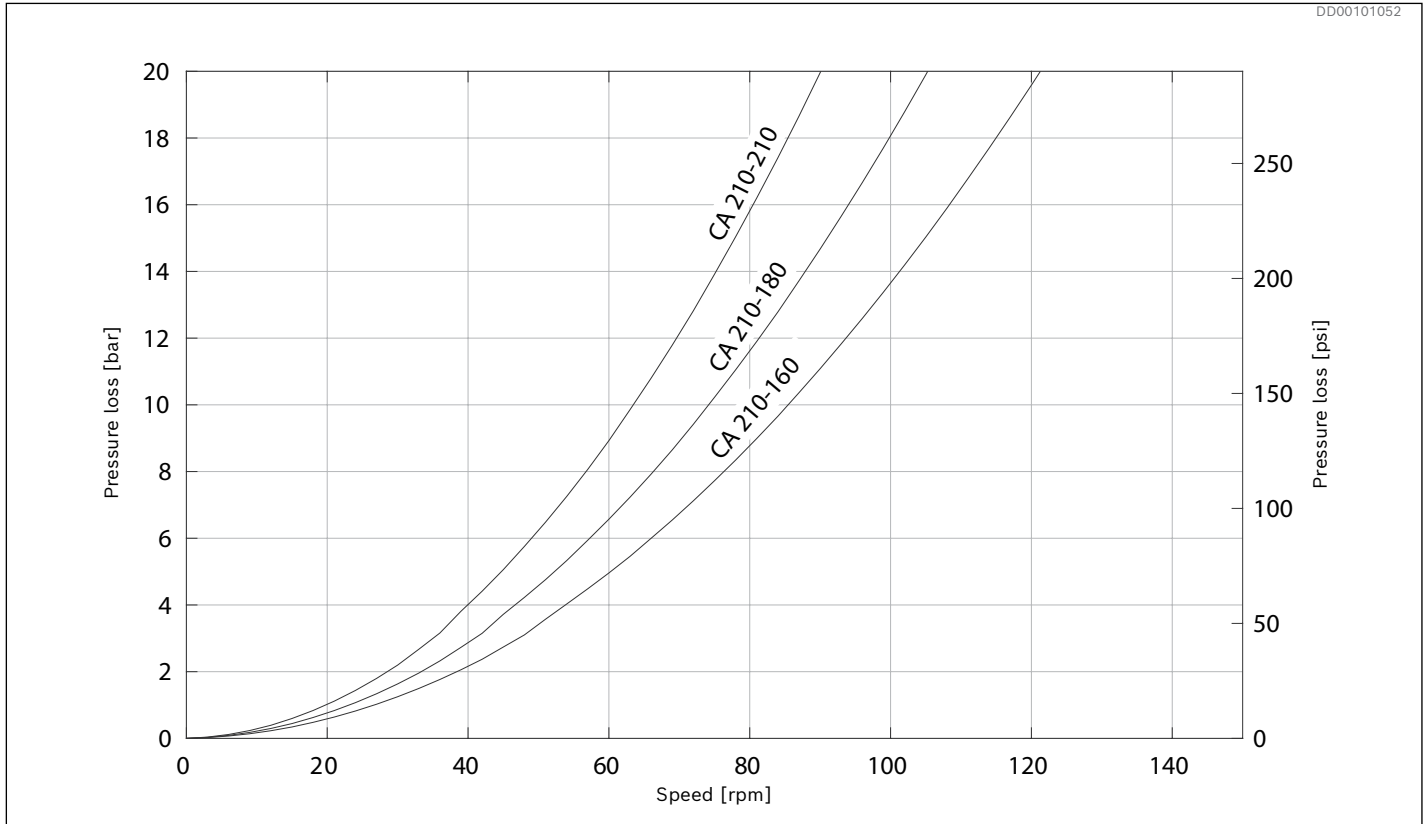


Fig. 40: CA 210 pressure loss, 2 port

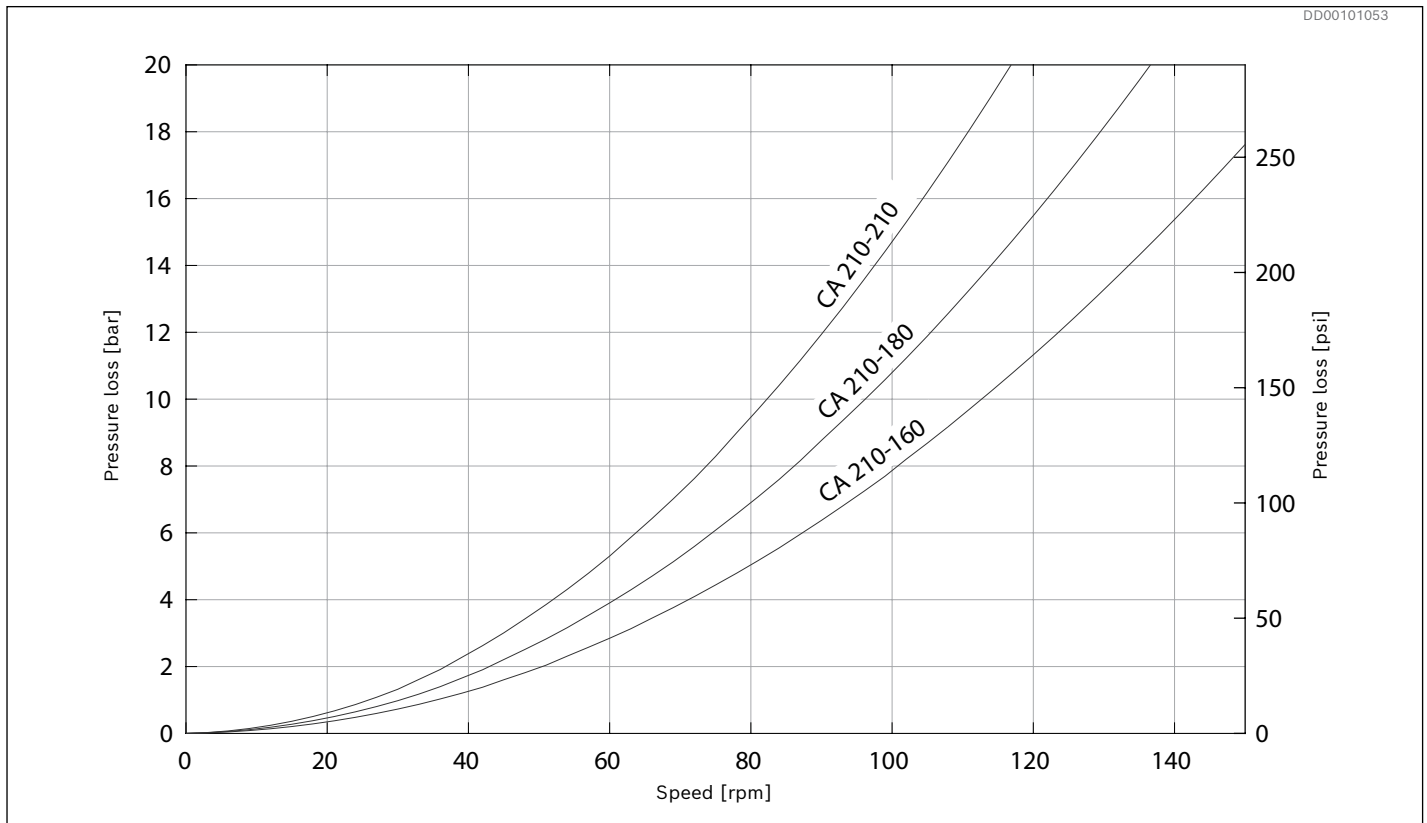


Fig. 41: CA 210 pressure loss, 4 port

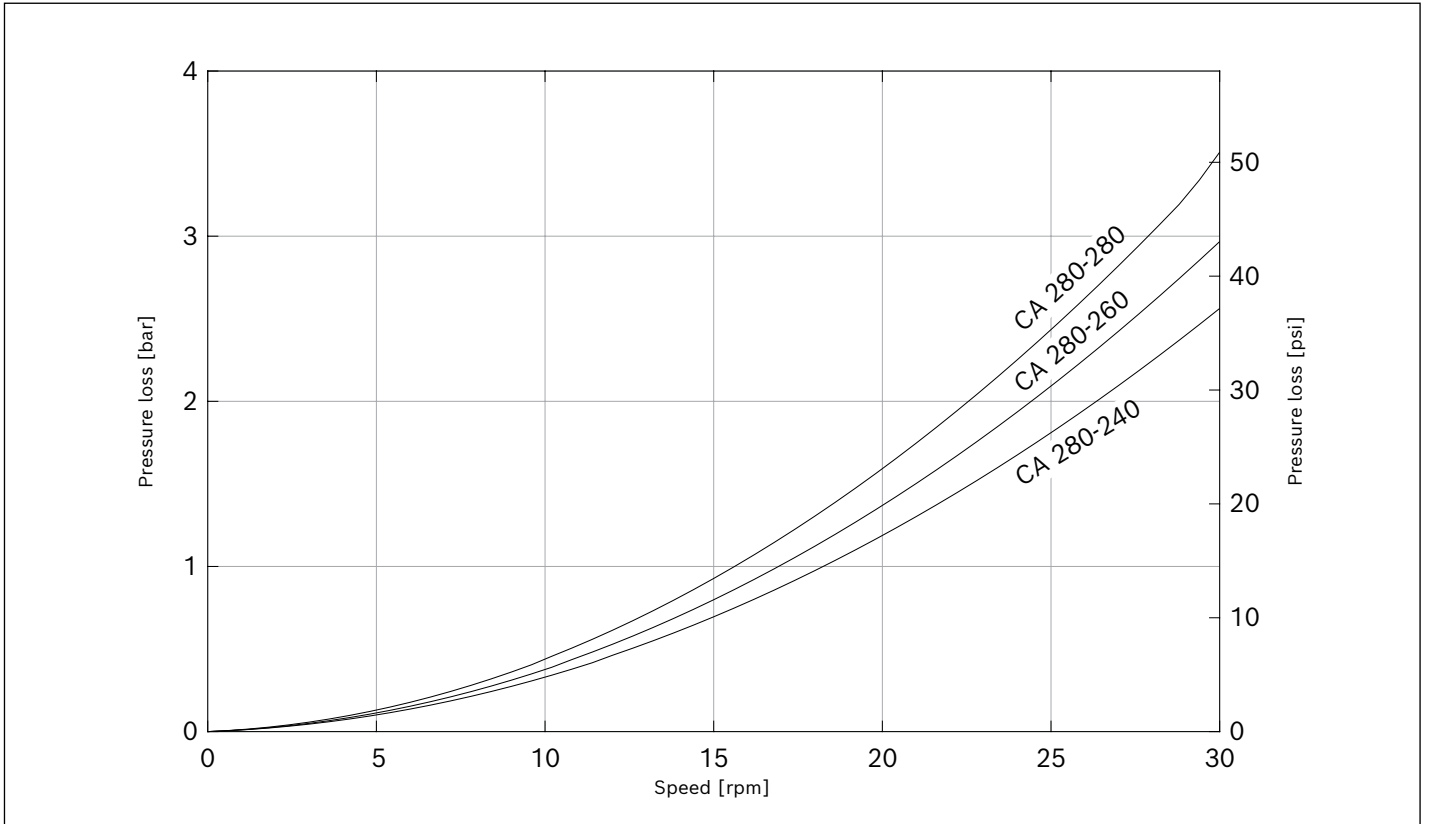


Fig. 42: CA 280 pressure loss, 2 port

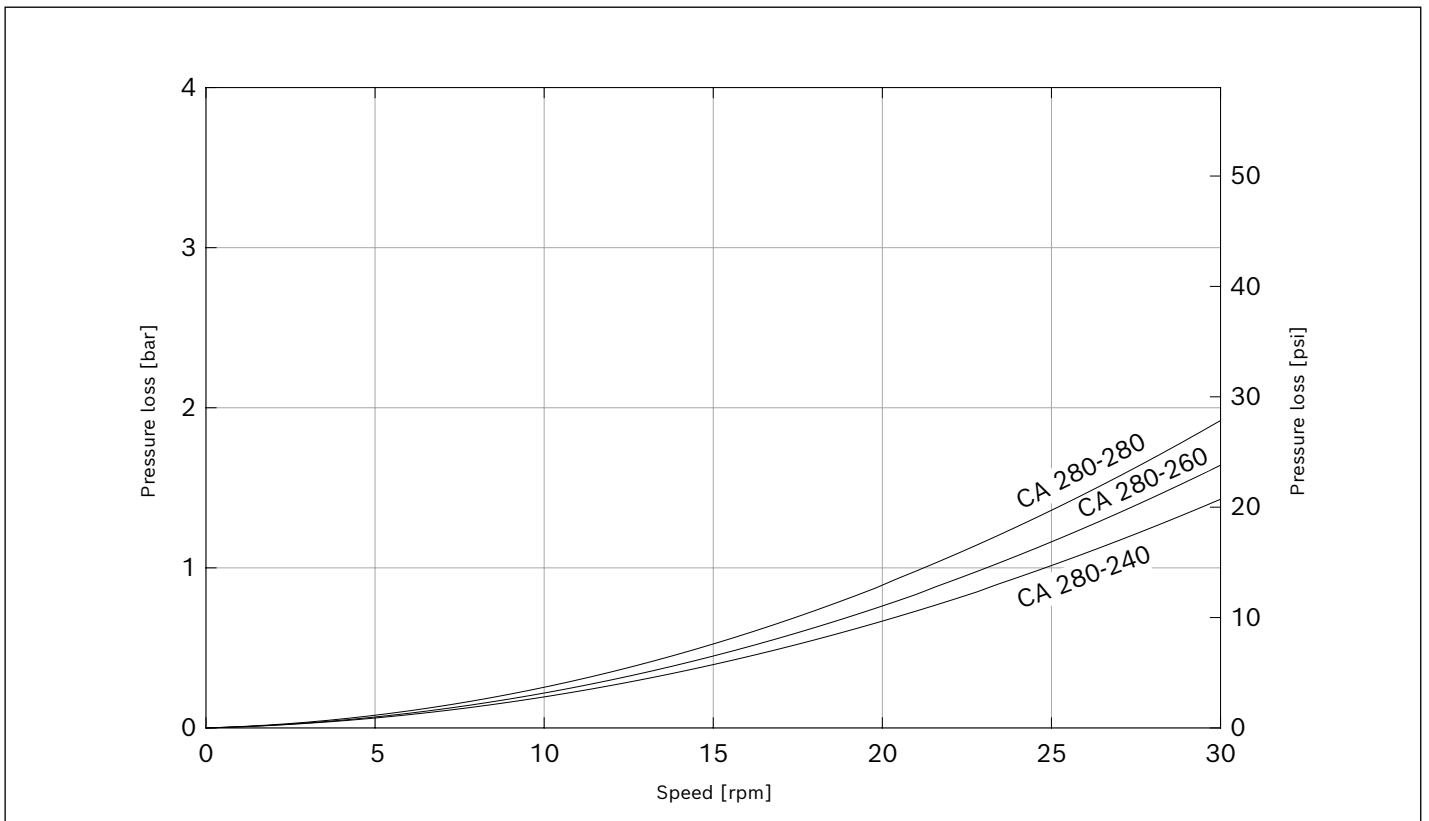


Fig. 43: CA 280 pressure loss, 4 port

4.8 Quick selection diagram

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

The diagrams below represents the torque and speed, corresponding to a modified rating life $L_{10mh} = 20\ 000\ h$ and $40\ 000\ h$ respectively.

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).

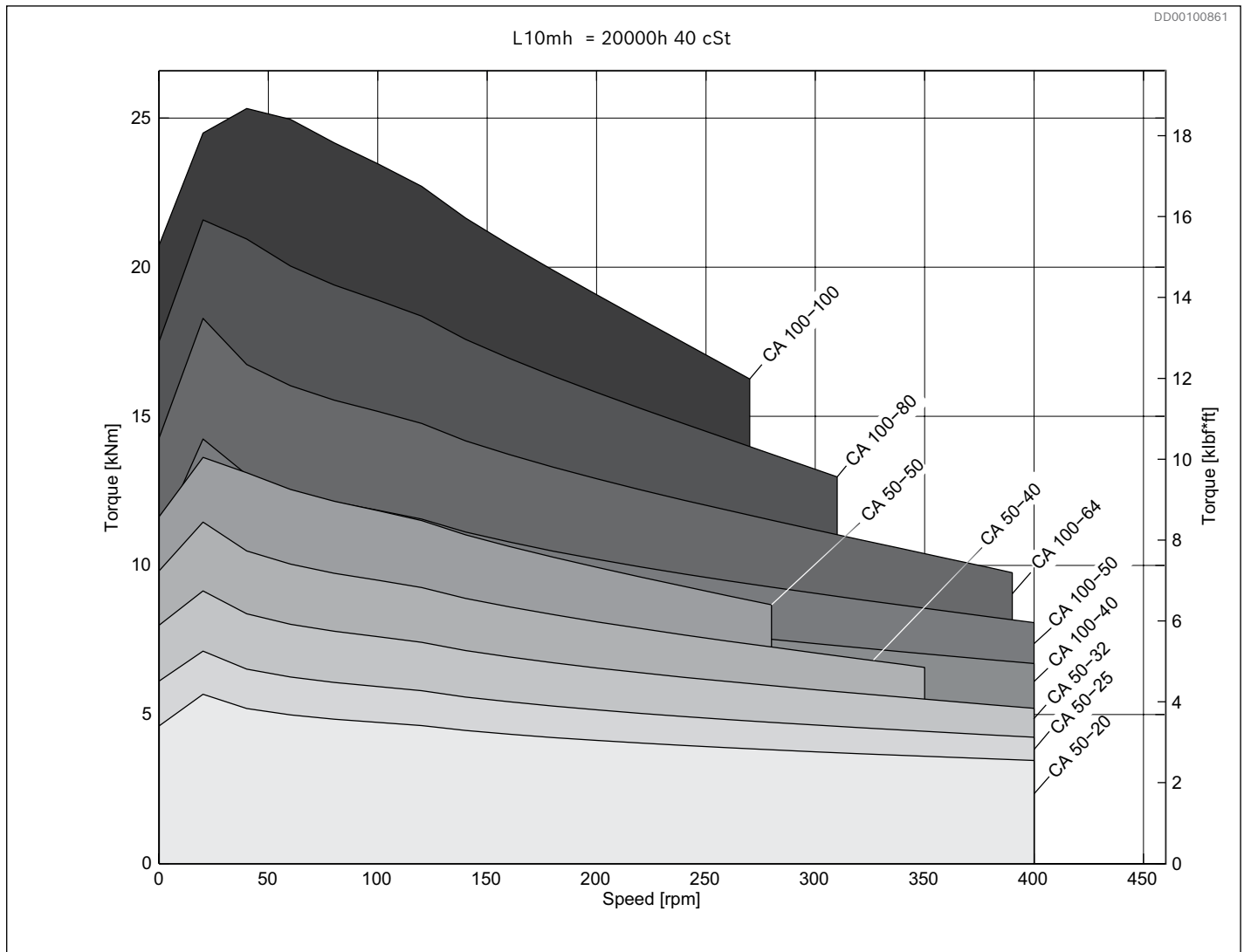


Fig. 44: Quick selection diagram CA 50, CA 100, L10mh = 20000h 40 cSt

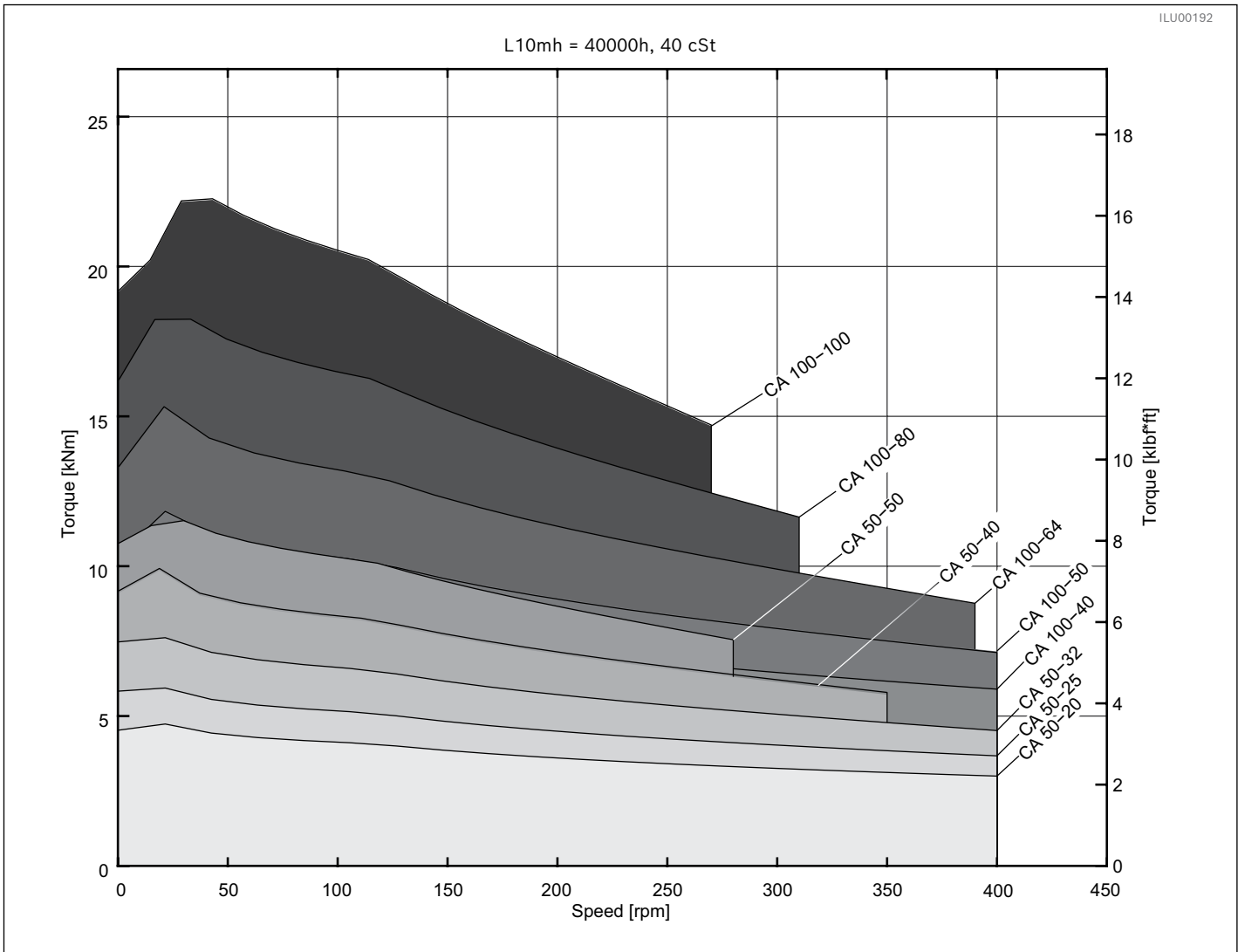


Fig. 45: Quick selection diagram CA 50, CA 100, L10mh = 40000h 40 cSt

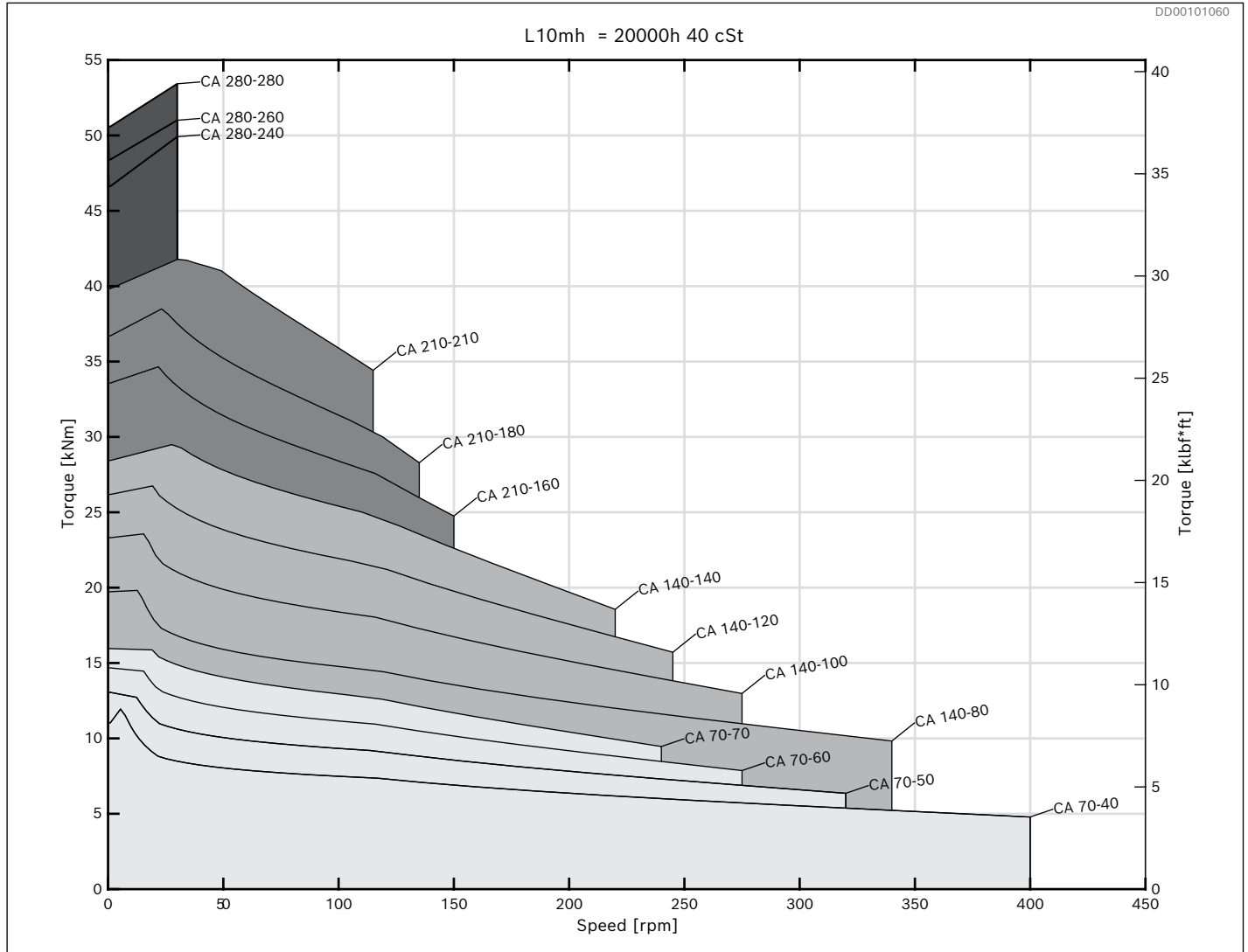


Fig. 46: Quick selection diagram CA 70, CA 140, CA 210 and CA 280, L10mh = 20000h 40 cSt

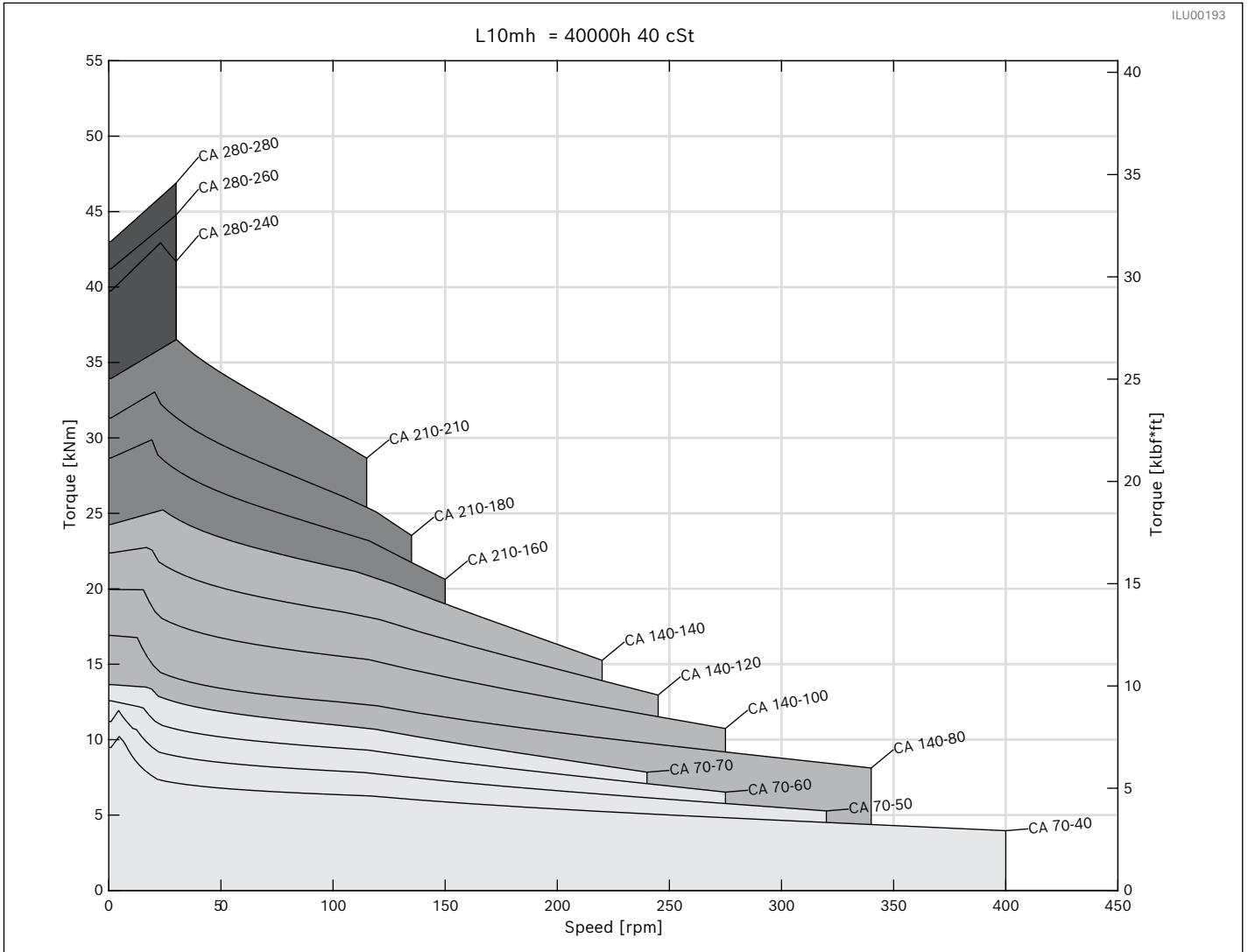


Fig. 47: Quick selection diagram CA 70, CA 140, CA 210 and CA 280, L10mh = 40000h 40 cSt

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

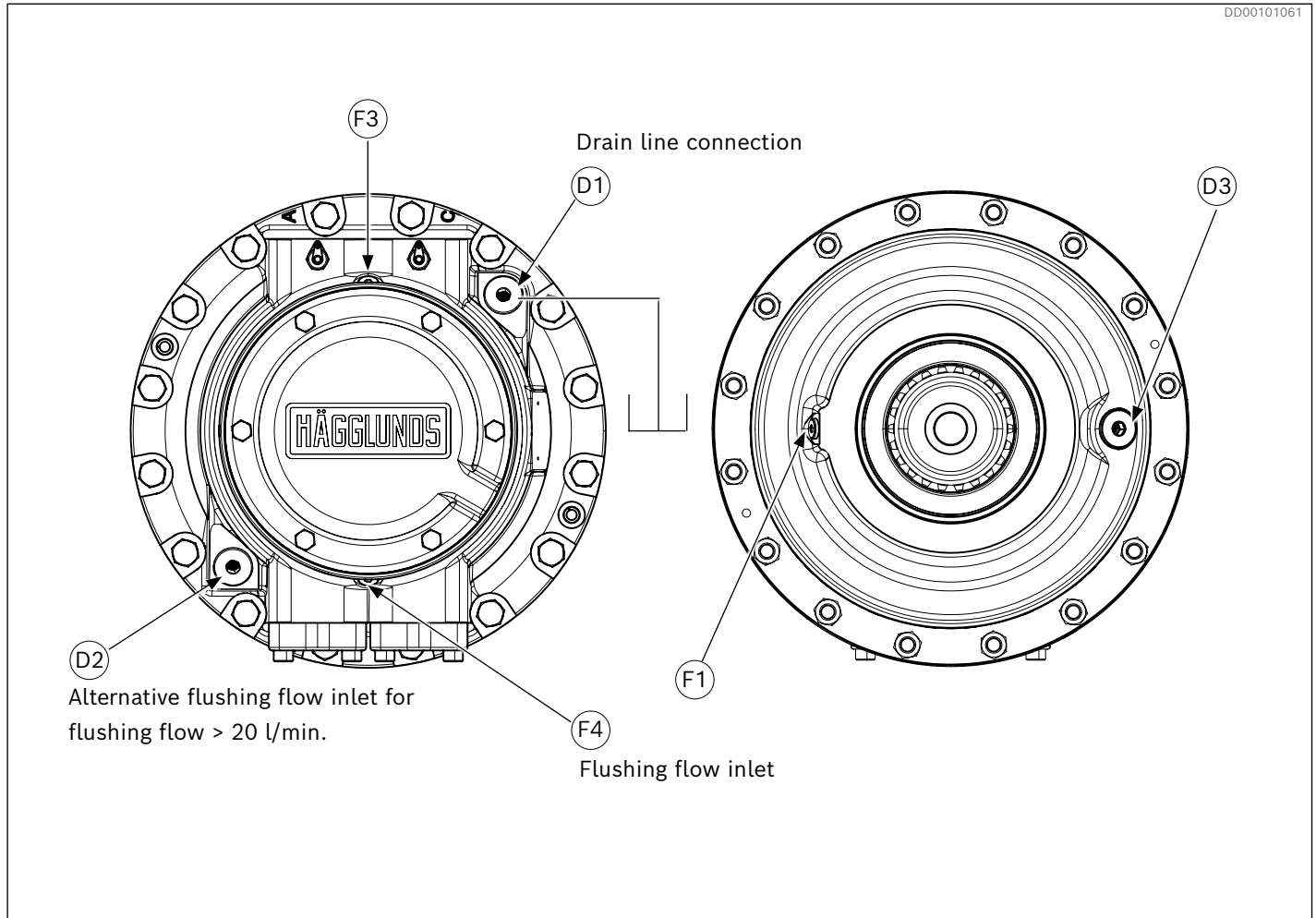


Fig. 48: Horizontal mounting

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. 48).

Drain line must be connected to the tank with a minimum of restrictions, to ensure that the maximum case pressure is not exceeded.

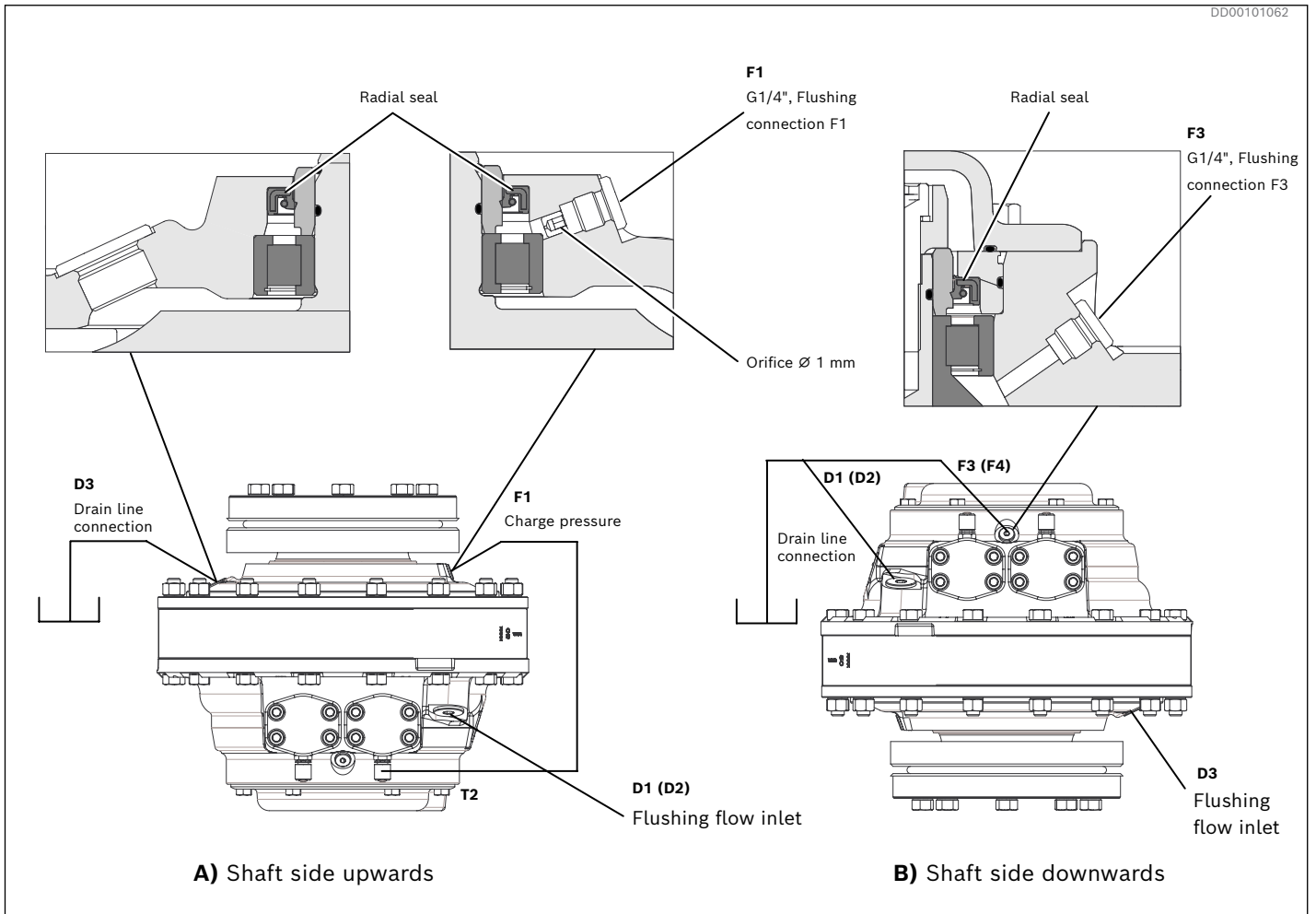


Fig. 49: Vertical mounting

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. 49, 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. 49 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. 48* and *Fig. 49*. 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 / CA 280	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 = $c \cdot$ 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 / CA 280	0.6	0.80

Required flushing to keep motor case maximum 10°C (18°F) warmer than flushing oil:

q flushing = $3.4 \cdot (E_1 + E_2 - \text{Heat transmitted to air})$ l/min.

q flushing_{US} = $0.67 \cdot (E_{1US} + E_{2US} - \text{Heat transmitted to air})$ gpm.

Viscosity in the motor case must be controlled according to diagram, *Fig. 7*.

Example:

Häggulunds CA 100 100 working at 250 bar and $n = 50$ rpm.

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

$$E_1 = 0.01 \cdot 130.8 = 1.3 \text{ kW (1.8 hp)}$$

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

$$q \text{ flushing} = 3.4 \cdot (E_1 + E_2 - \text{Heat transmitted to air}) = 3.4 \cdot (1.3 + 0.8 - 0.6) = 5.1 \text{ l/min}$$

$$q \text{ flushing}_{\text{US}} = 0.67 \cdot (E_{1US} + E_{2US} - \text{Heat transmitted to air}) = 0.67 \cdot (1.8 + 1.0 - 0.8) = 1.3 \text{ gpm}$$

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

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

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

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

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. 50*)

$c = 0,01$

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**.

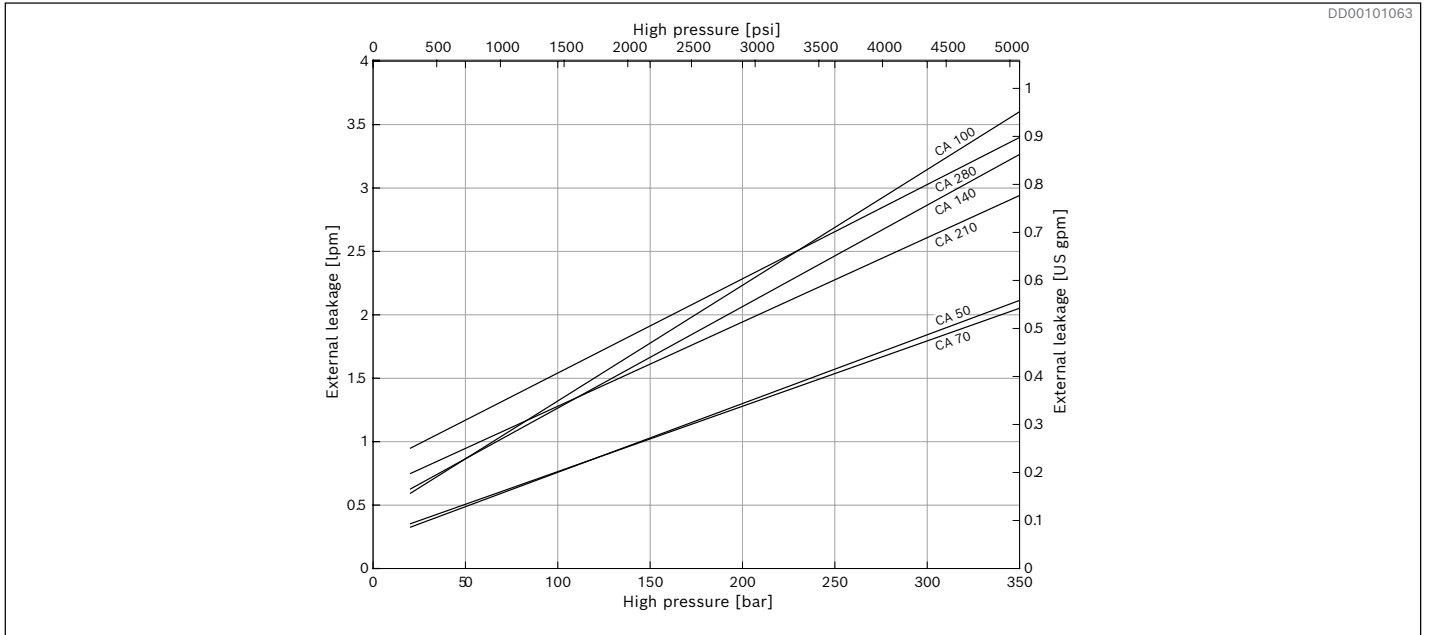


Fig. 50: External leakage

4.12 Viscosity factor K

The diagram shows the average values.

Actual flow rate = speed · displacement + external leakage

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

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.

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

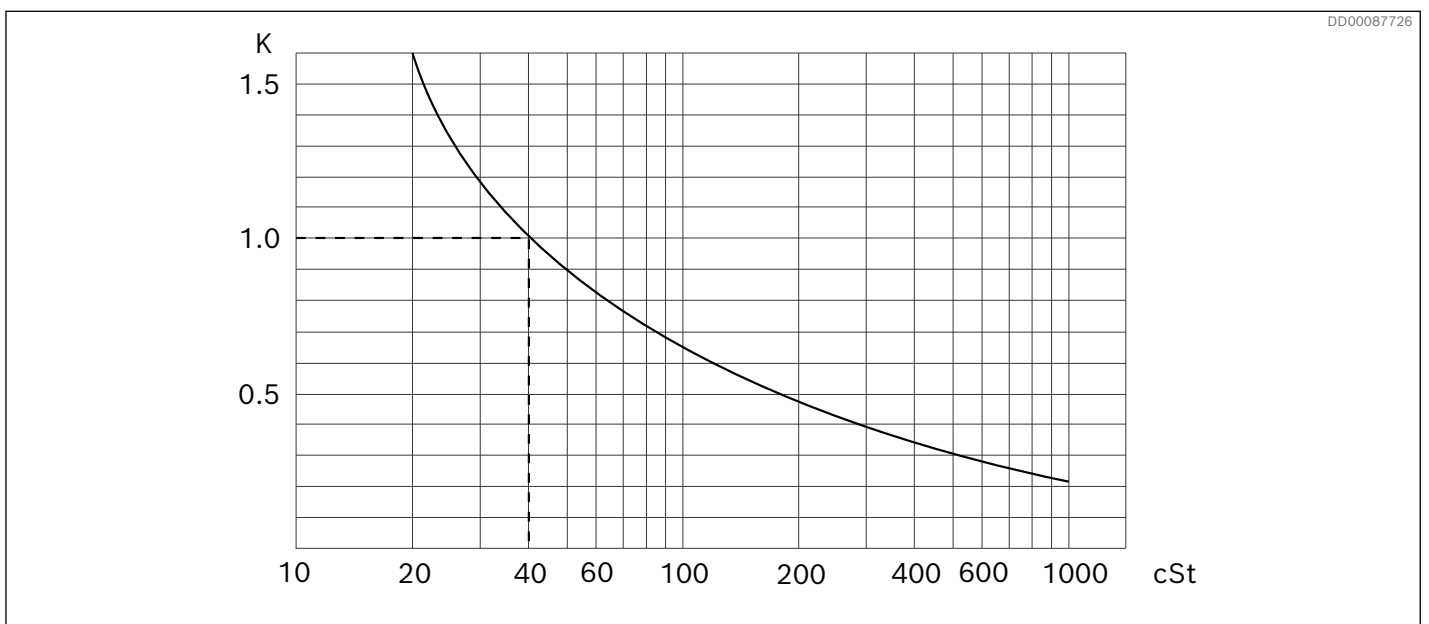


Fig. 51: Viscosity factor K

4.13 Freewheeling

4.13.1 The function of freewheeling

Hägglands 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, Hägglands 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. 54) while main ports A and C are without restriction drained directly to the fluid reservoir. See Fig. 53. 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. 52.

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. 54 (required case pressure).

Freewheeling valve function, see section 13.6.5.

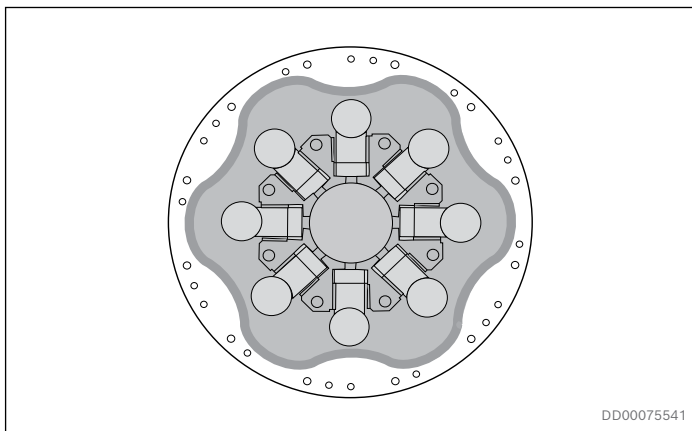


Fig. 52: Freewheeling

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.

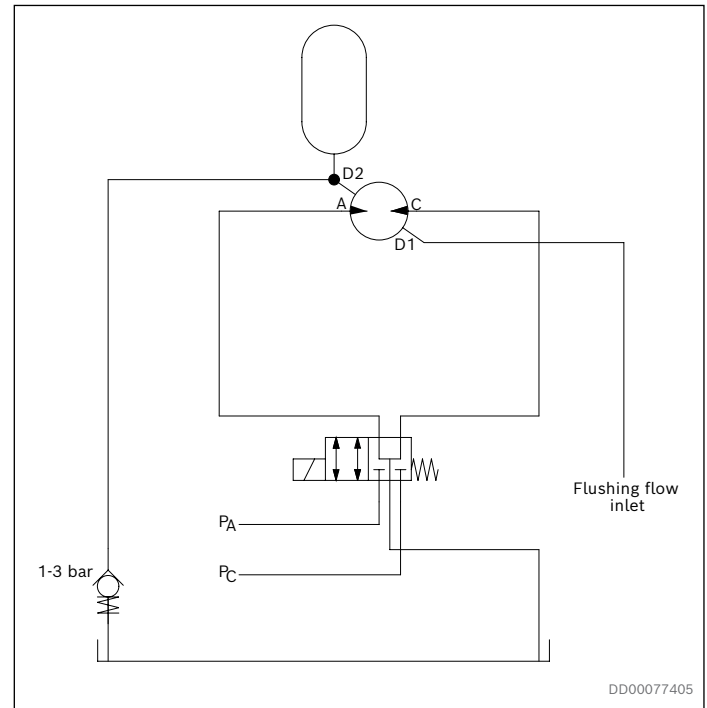


Fig. 53: Schematic principle freewheeling.

Freewheeling valve function, see section 13.6.5.

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 in CA 70, CA 140, CA 210 and CA 280)
	N_L = 8 (No of lobes for one camring in CA 50 and CA 100)

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. 54*.
- The motor case must be flushed all the time when the motor is in freewheeling mode, see *Fig. 54*.

An accumulator can be added into the circuit to shorten the time to retract all the pistons completely, see *Fig. 53*.

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. 53*.

4.13.4 Freewheeling restrictions

Freewheeling in vertical position is restricted for multi camring motors

Note!

Freewheeling in vertical position > 70 rpm may increase the risk of wear in multi cam ring motors (CA 100/140/210/280).

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. 54.

Case flushing is required to prevent overheating, see diagram Fig. 54

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. 54 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.

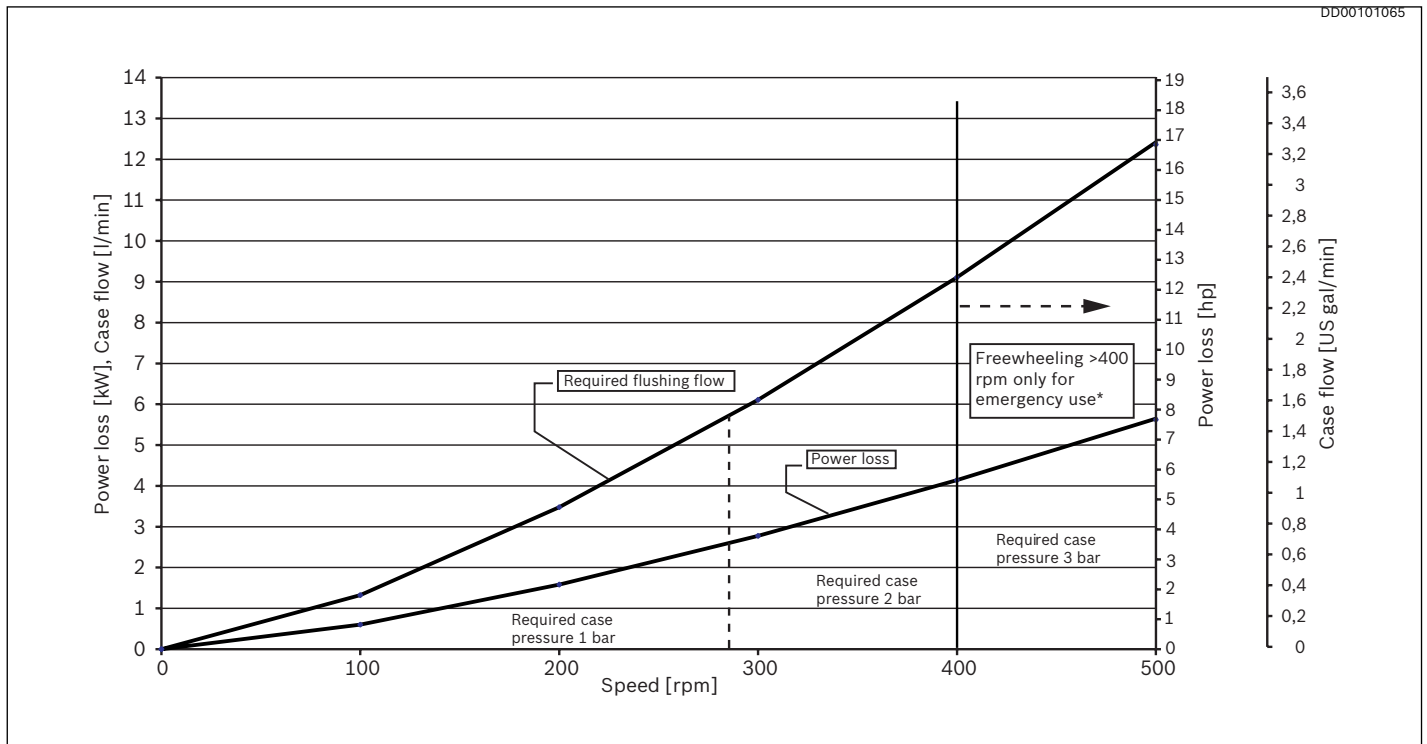


Fig. 54: Power loss freewheeling, oil viscosity 40 cSt (187 SSU)

*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

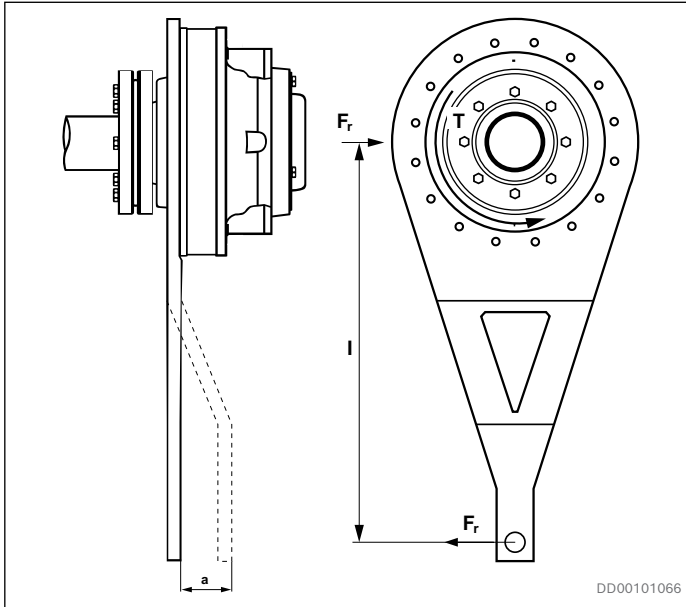


Fig. 55: Shaft mounted motor with torque arm

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

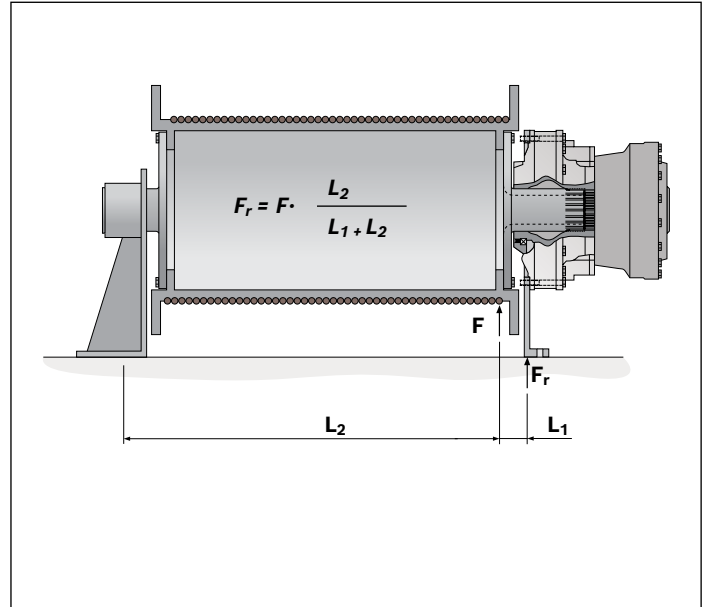


Fig. 56: Bracket mounted motor in winch - reaction forces

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

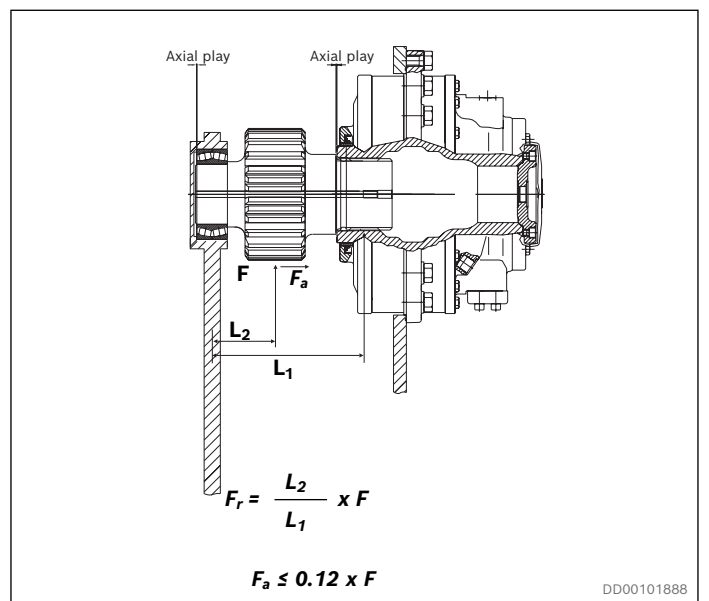


Fig. 57: Example of motor mounted with pinion drive - preferred design

4.14.1 Permissible external dynamic loads

Permissible external dynamic loads Hägglunds CA 50, CA 70

Viscosity 40 cSt/187 SSU.

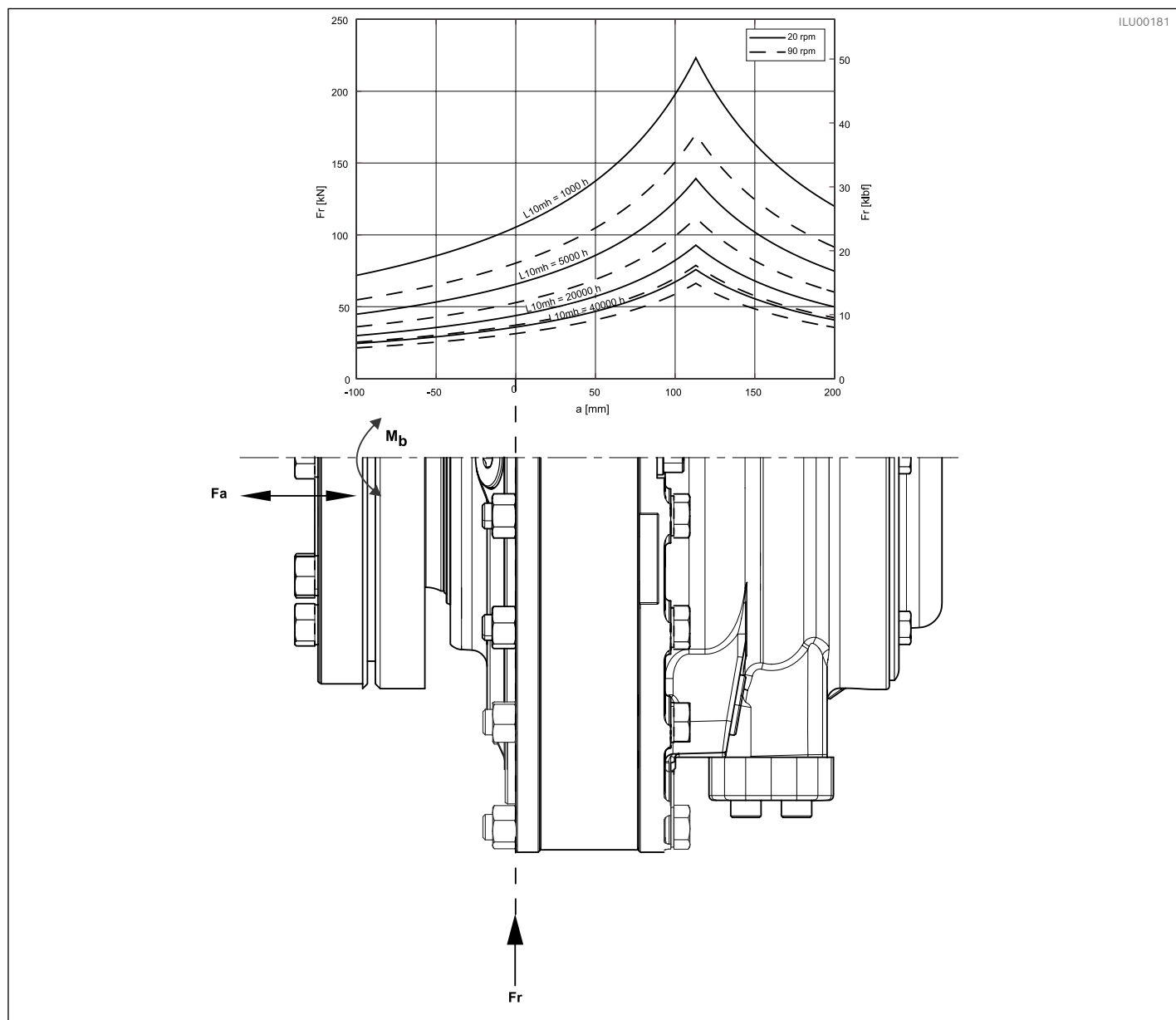


Fig. 58: Permissible external dynamic loads Hägglunds CA 50, CA 70

Axial loads: Permissible axial load for intermittent duty
 $F_a = 30\,000\text{ N}$ (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 $15\,000\text{ Nm}$ (11 060 lbf-ft).

Permissible external dynamic loads Hägglunds CA 100, CA 140

Viscosity 40 cSt/187 SSU.

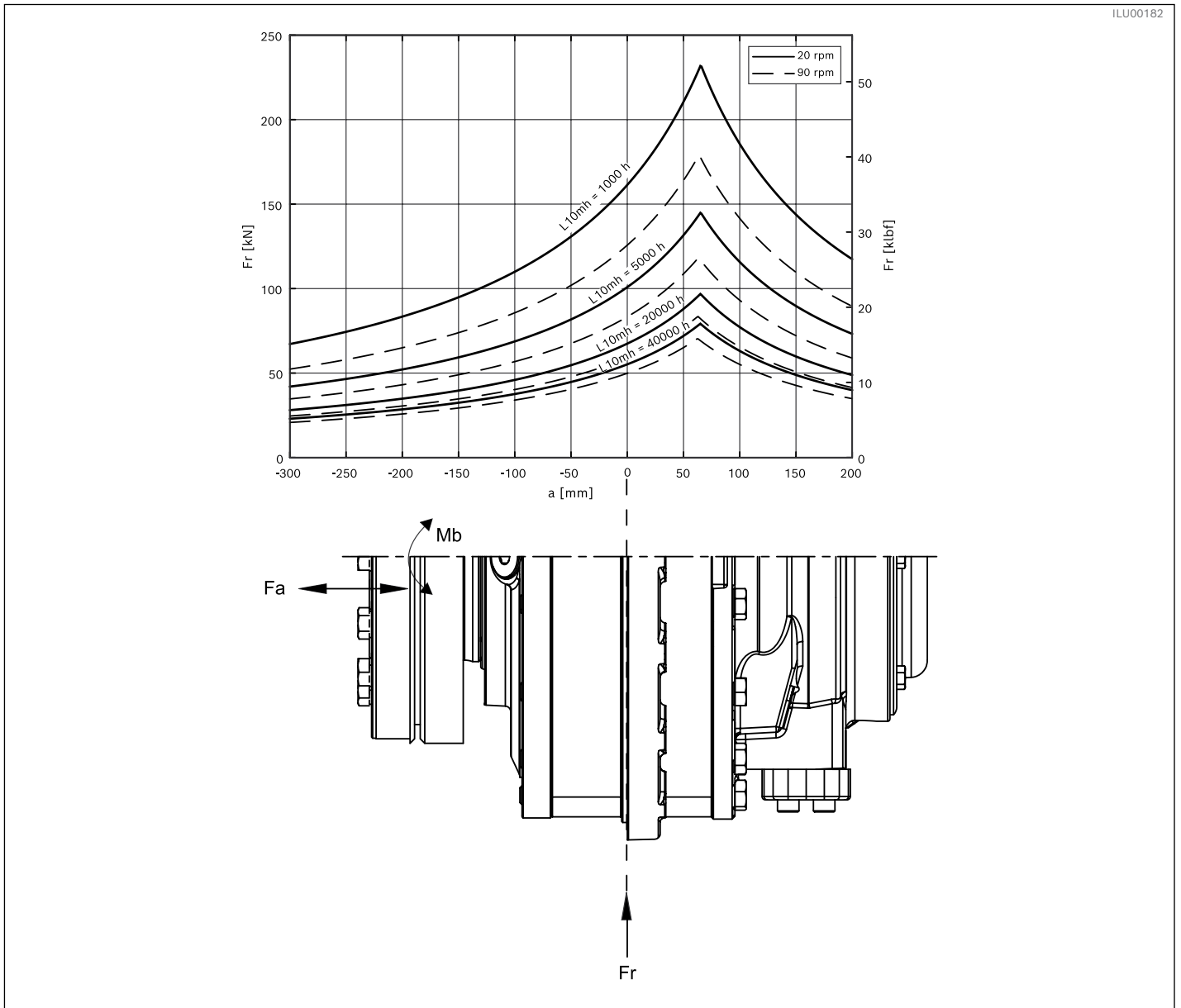


Fig. 59: Permissible external dynamic loads Hägglunds CA 100, CA 140

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.

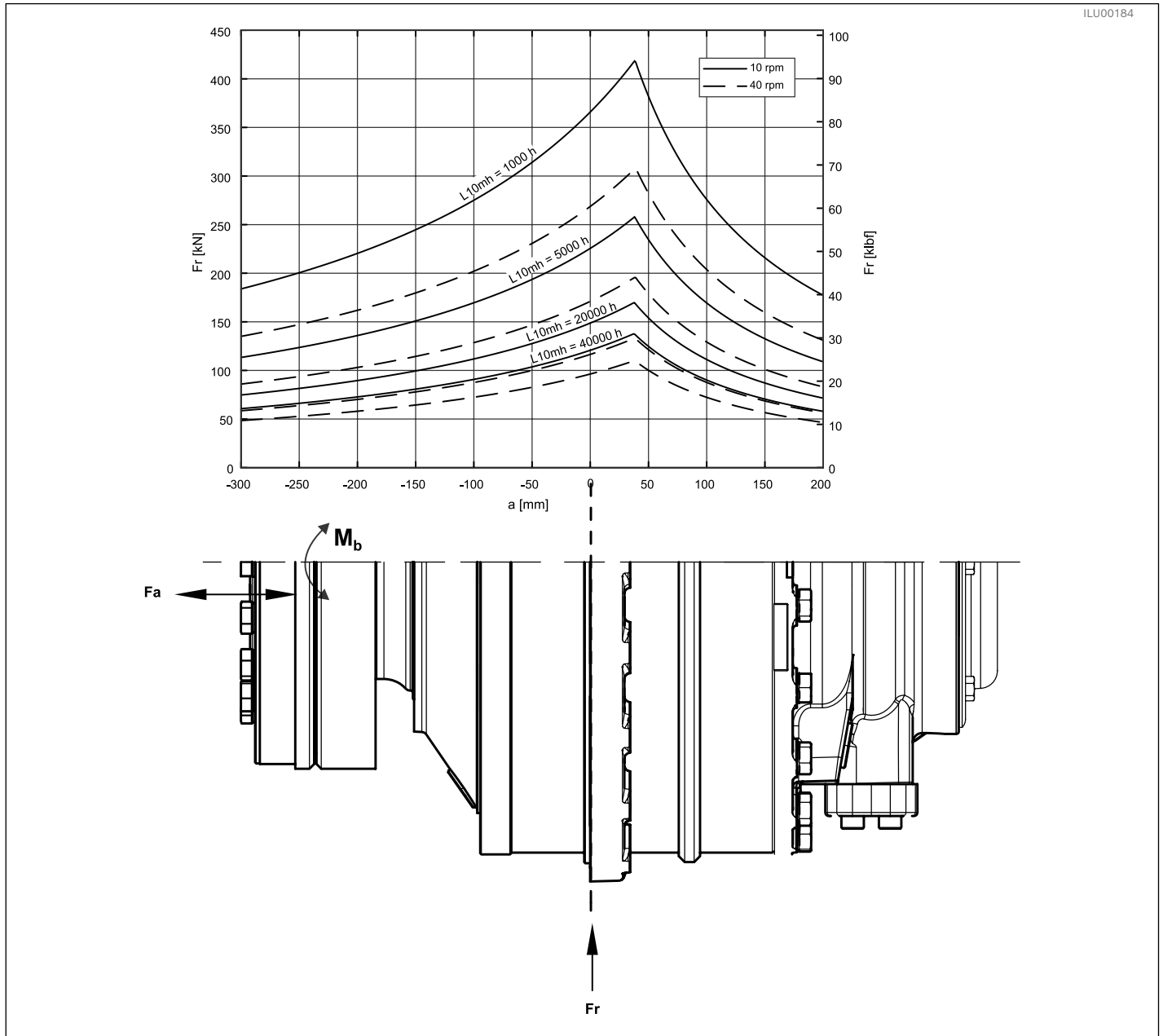


Fig. 60: Permissible external dynamic loads Hägglunds CA 210

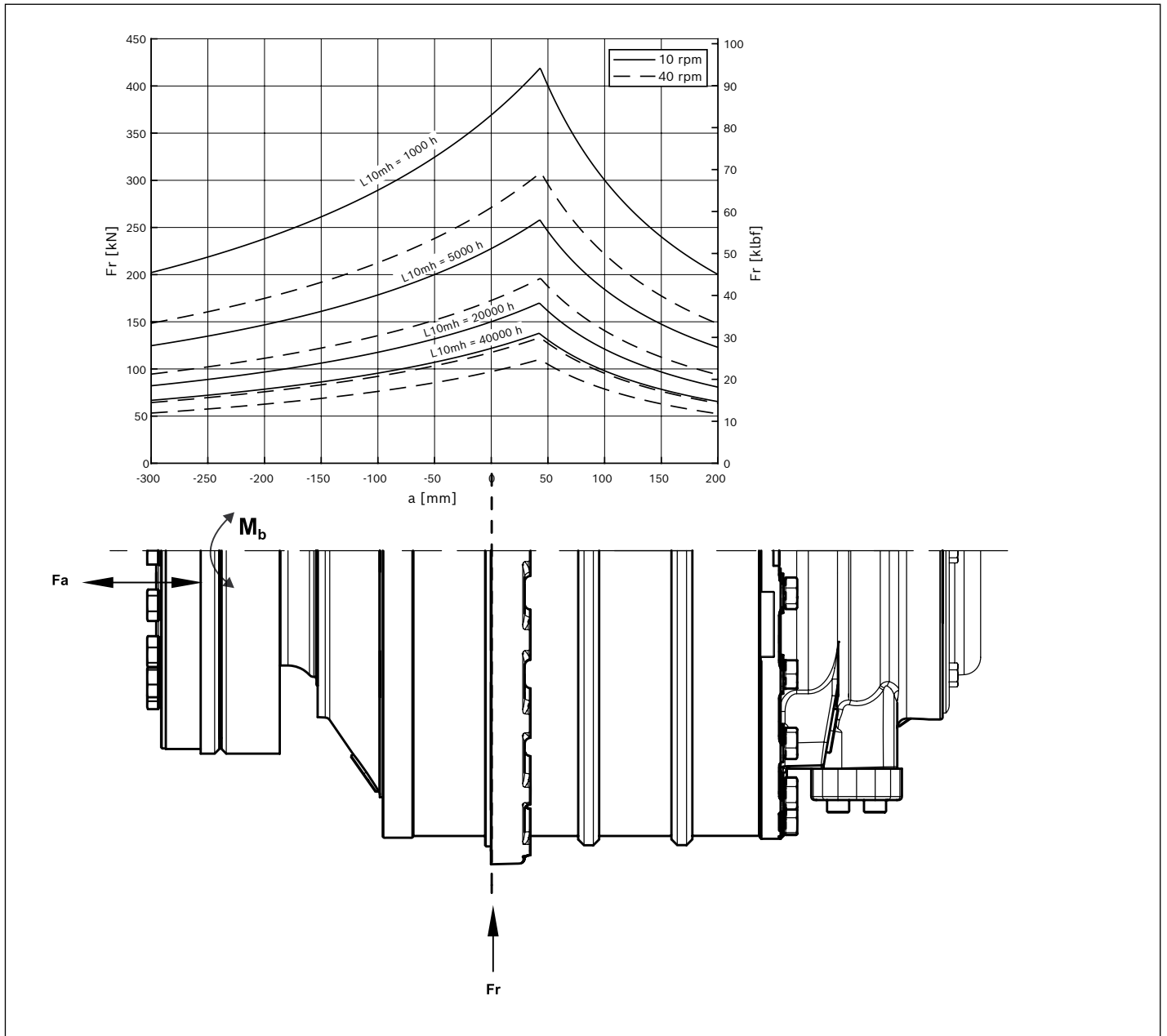
Axial loads: Permissible axial load for intermittent duty
 $F_a = 30\,000\text{ N}$ (6 740 lbf).

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 $30\,000\text{ Nm}$ (22 130 lbf-ft).

Permissible external dynamic loads CA 280

Viscosity 40 cSt/187 SSU.

**Fig. 61: Permissible external dynamic loads Hägglunds CA 280**

Axial loads: Permissible axial load for intermittent duty
 $F_a = 30\,000\text{ N}$ (6 740 lbf).

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

4.15 Low speed performance

Fig. 62 to Fig. 66 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.

$$A = n_{av} \cdot i \text{ (rpm)}$$

$$n_{max} = n_{av} + A \text{ (rpm)}$$

$$n_{min} = n_{av} - A \text{ (rpm)}$$

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. 62) and

$$A = 0,9 \cdot 0,059 = 0,053 \text{ rpm.}$$

Obtained amplitude value shall be reduced to two decimals.

$$n_{max} = 0,9 + 0,053 = 0,95$$

$$n_{min} = 0,9 - 0,053 = 0,85$$

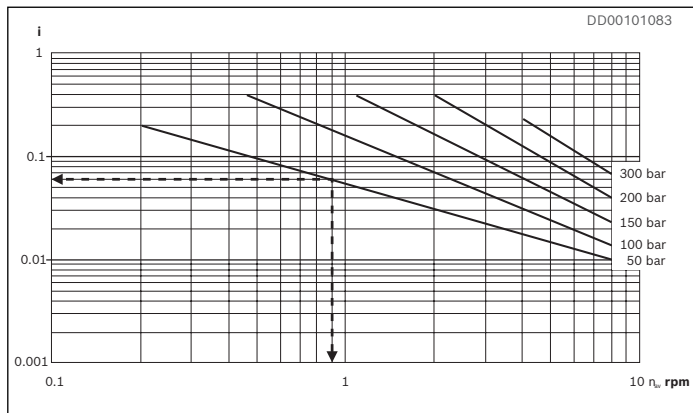


Fig. 62: Speed deviation CA 50, moment of inertia 2,8 kgm² (66 lb·ft²)

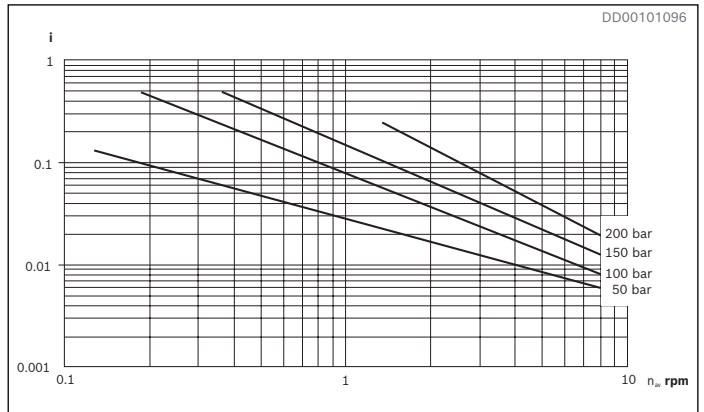


Fig. 64: Speed deviation CA 100, moment of inertia 5,0 kgm² (120 lb·ft²)

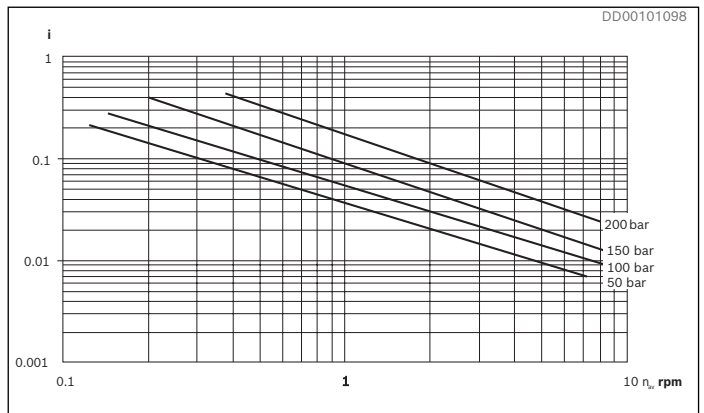


Fig. 65: Speed deviation CA 140, moment of inertia 6,8 kgm² (160 lb·ft²)

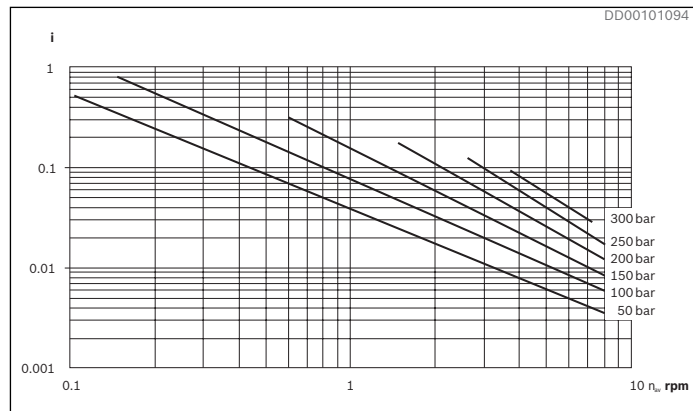


Fig. 63: Speed deviation CA 70, moment of inertia 3,6 kgm² (85 lb·ft²)

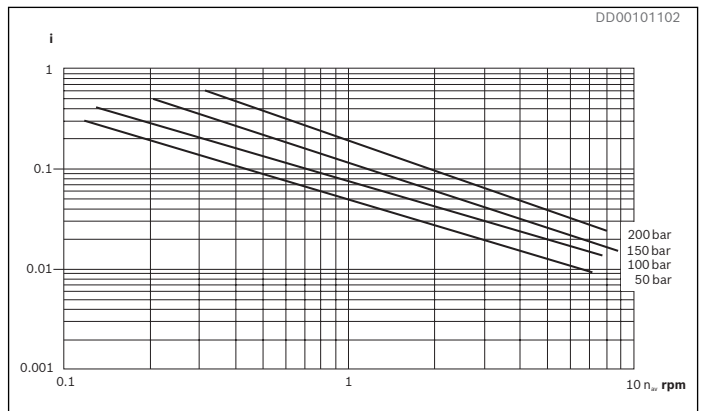


Fig. 66: Speed deviation CA 210 moment of inertia 8,8 kgm² (210 lb·ft²) and CA 280 moment of inertia 10,8kgm² (260 lb·ft²).

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. Recommendation 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 available in three 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
- C5 - Corrosivity category Very High - which is recommended for coastal environment with high salinity or aggressive industrial atmosphere
- CX - Corrosivity category Extreme - which is recommended for extreme industrial areas, offshore environment with high salinity or extreme humidity

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)

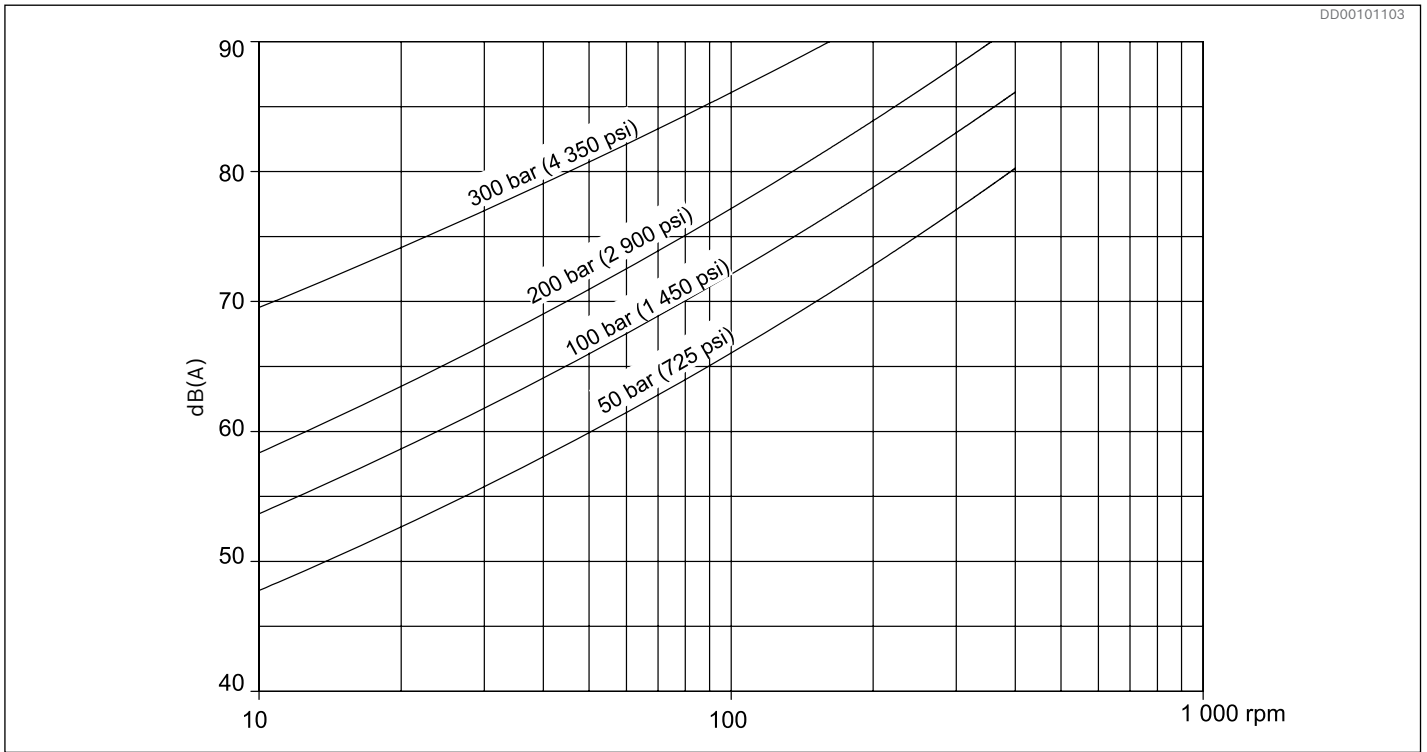


Fig. 67: A-weighted sound pressure level emission, LPA, of CA 50 to 70

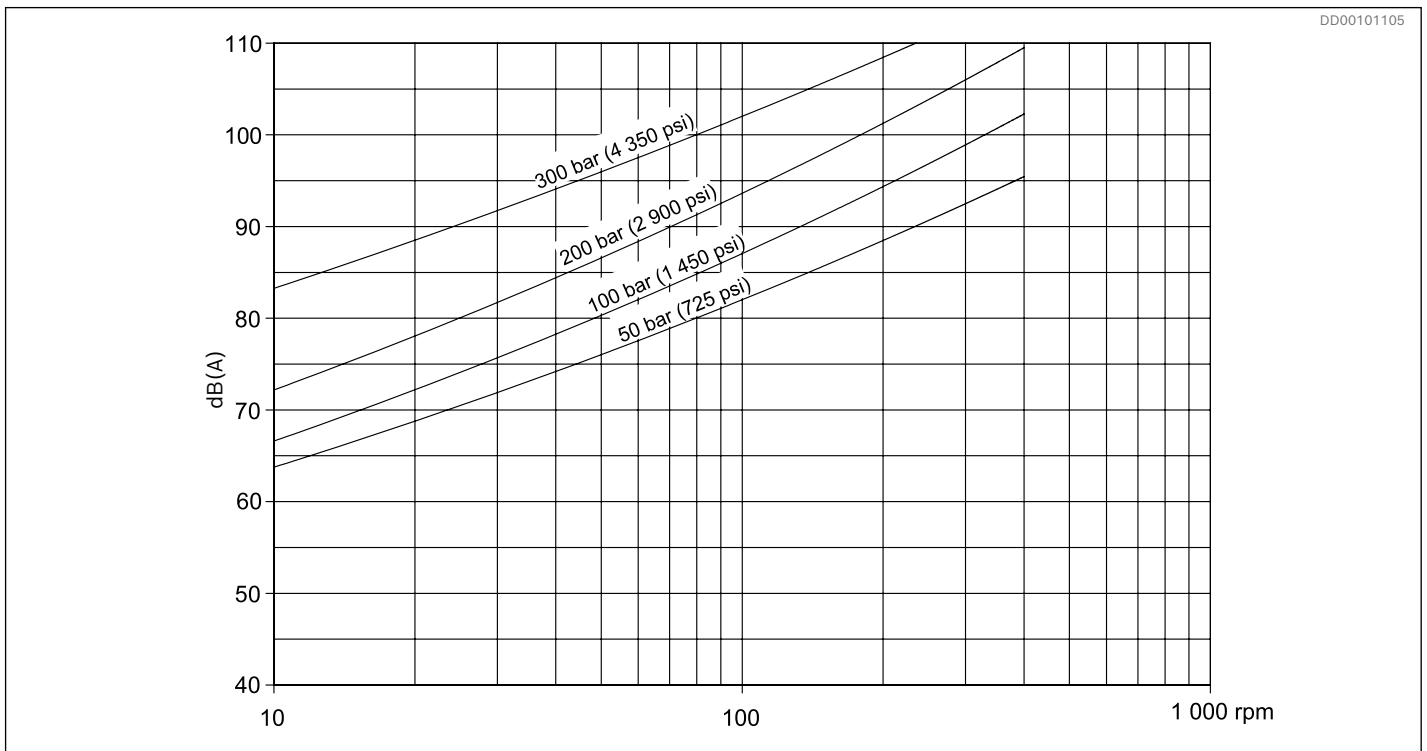


Fig. 68: A-weighted sound power level emission, LWA, of CA 50 to 70

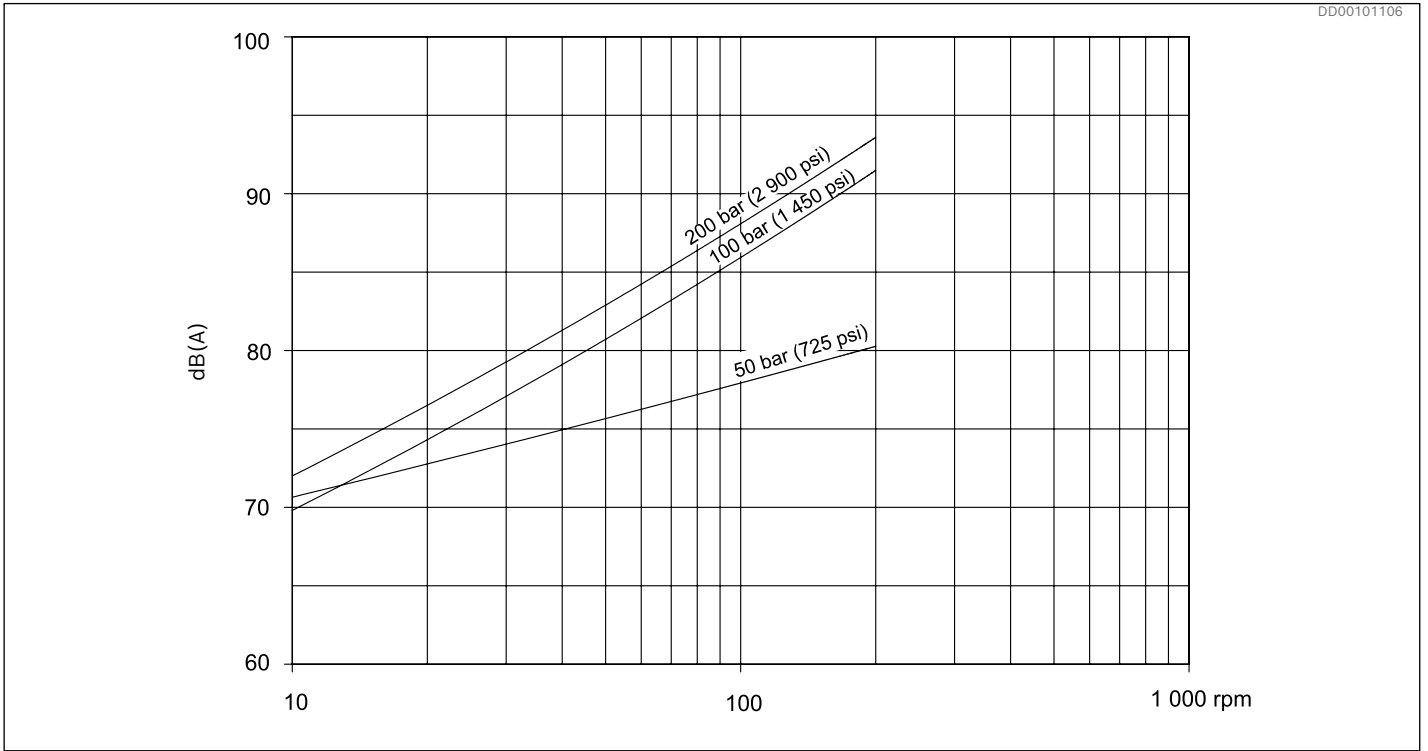


Fig. 69: A-weighted sound pressure level emission, LPA, of CA 100 to 280

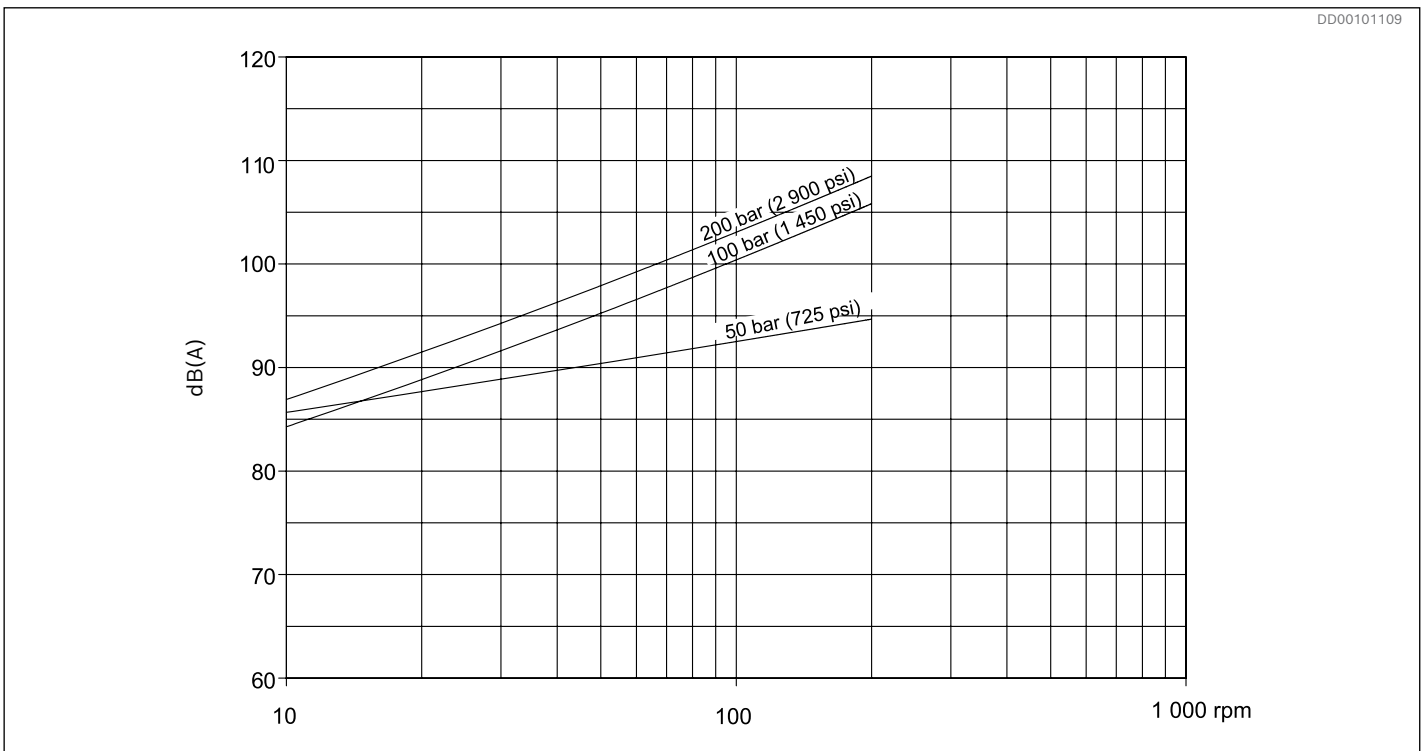


Fig. 70: A-weighted sound power level emission, LWA, of CA 100 to 280

5 Displacement shift

Hägglands CA¹⁾ 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*: .

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*

1) Not valid for CA 280

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 15: Related documents

Table 10: Dimensions Hägglunds CA with through hole kit

Motor	L1			
	Splines		Shrink disc	
	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
CA 280	572	22.52	-	-

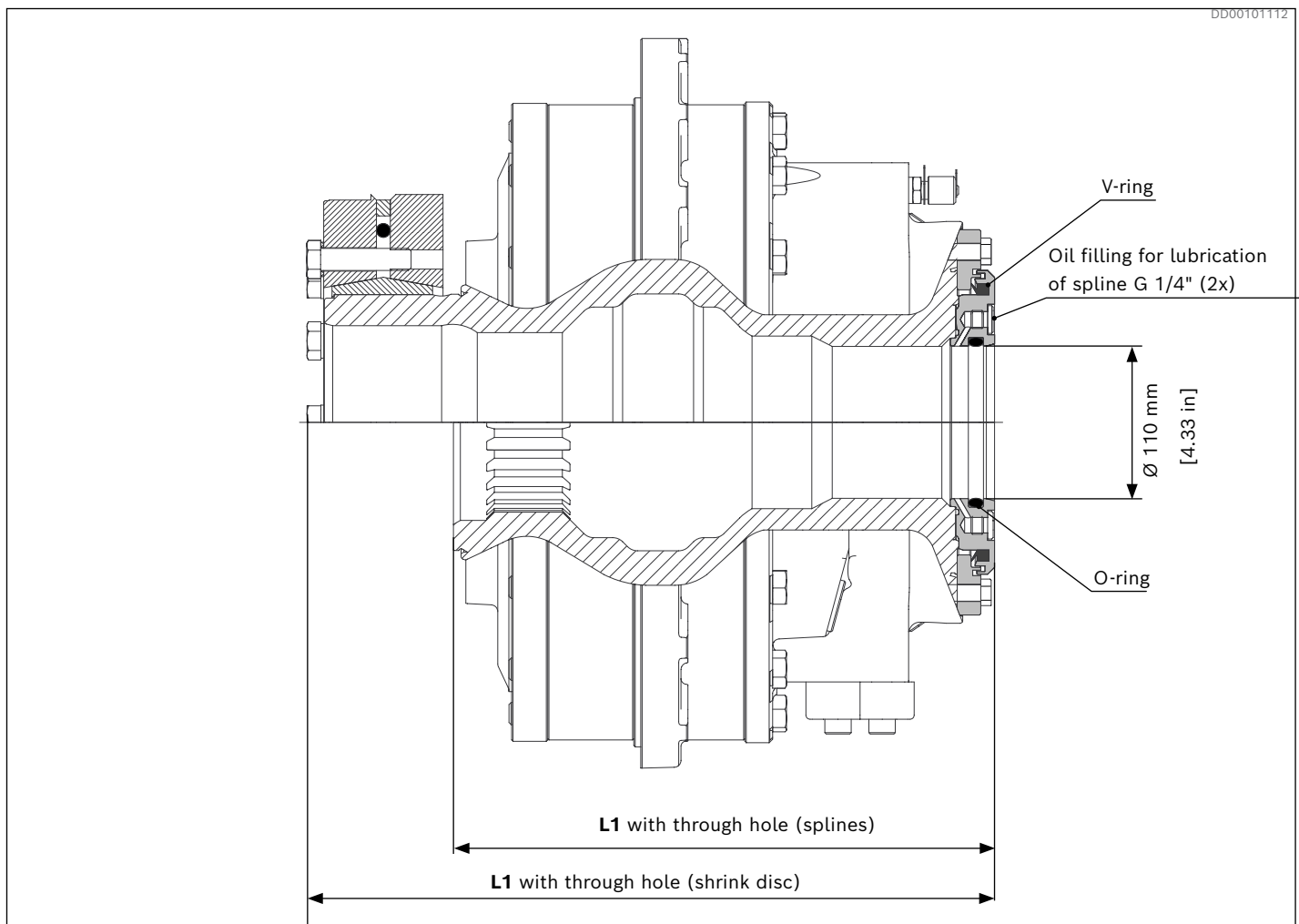


Fig. 71: Example: Hägglunds CA 140 with through hole kit

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 ≤ 5 rpm
- 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 Hägglands 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 efficiency is of high importance, e.g. in winches.

For industrial use with continuous 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 except 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*.

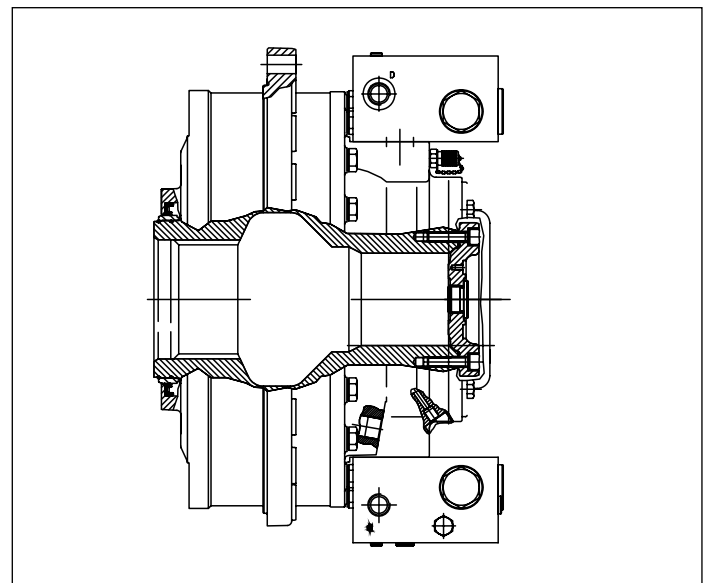


Fig. 72: CA motor with S-index 06 and 2pcs VTCA valves

9.2 Special index 11:

Motor for submerged applications

- Available for CA 50/70/100/140/210/280.
- 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. 73. For dimension drawing for design of flange, see section 15 *Related documents*.

To be ordered separately

- O-rings, see Table 11
- Suitable painting must be ordered separately. Corrosivity category CX or C5 is recommended for submerged usage, see 4.16 *Painting system*.

Table 11: Material ID O-ring

Motor type	Material ID
CA 50	R913021837
CA 70	R939051432
CA 100	R913021837
	R939005821
CA 140/ CA 210/ CA 280	R913018886
	R939051432

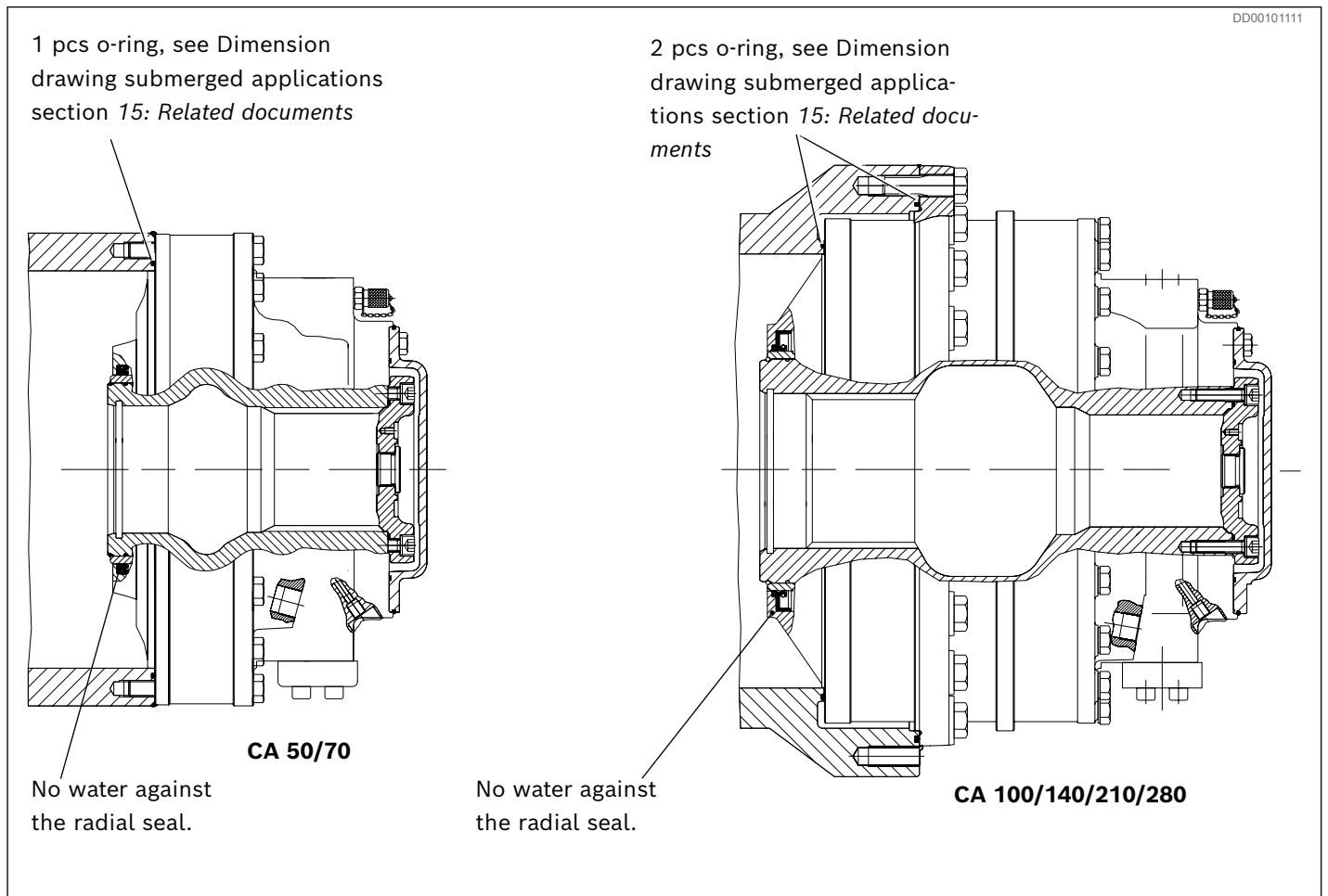


Fig. 73: CA motor for submerged application

9.3 Special index 13:

Motor with reduced noise level

- Available for CA 50/70/100/140/210/280
- 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 15 Related documents

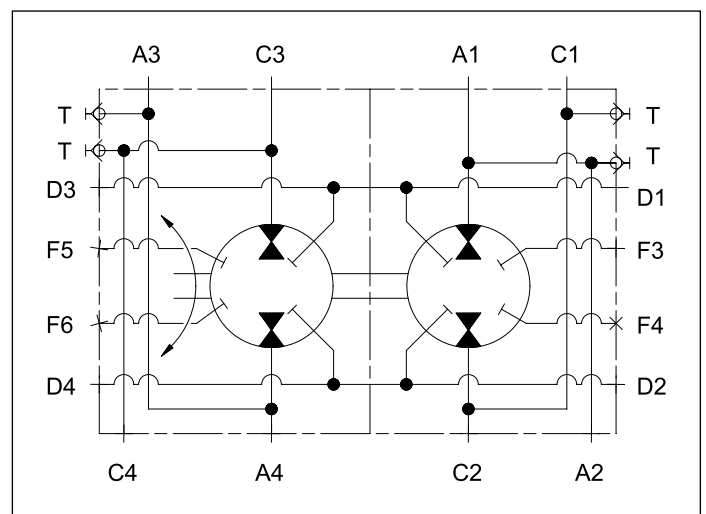


Fig. 74: Hydraulic symbol special index motors 15 and 42

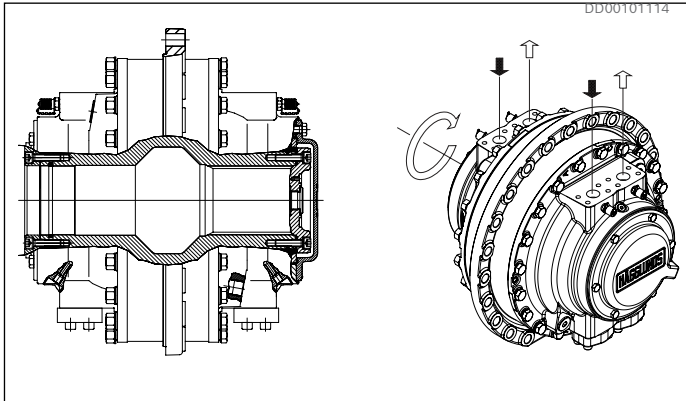


Fig. 75: Center flange mounted CA special index 15

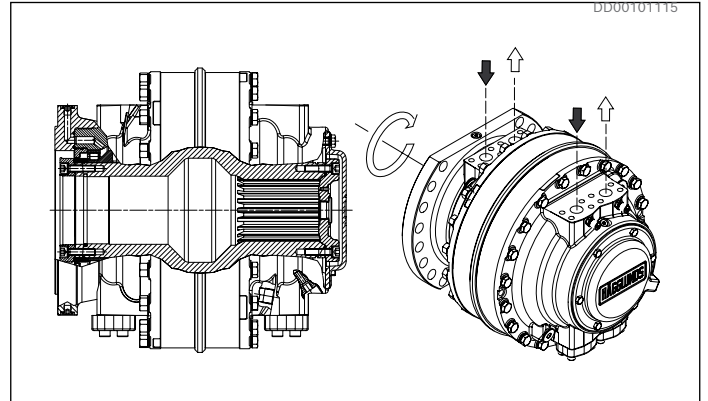


Fig. 76: Front flange mounted CA special index 42

Table 13: Motor data full displacement

Motor type	Displacement		Specific torque		Max. speed
	$\frac{\text{cm}^3}{\text{rev}}$	$\frac{\text{in}^3}{\text{rev}}$	$\frac{\text{Nm}}{\text{bar}}$	$\frac{\text{lbf}\cdot\text{ft}}{1000 \text{ psi}}$	rpm
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
	$\frac{\text{cm}^3}{\text{rev}}$	$\frac{\text{in}^3}{\text{rev}}$	rpm	$\frac{\text{cm}^3}{\text{rev}}$	$\frac{\text{in}^3}{\text{rev}}$	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.

Peak pressure 420 bar/ 6091 psi maximum, allowed to occur at a single operating period of max. 1 second.

Total amount of single operation periods = 1 000 000 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 15 Related documents.

Example:

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

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

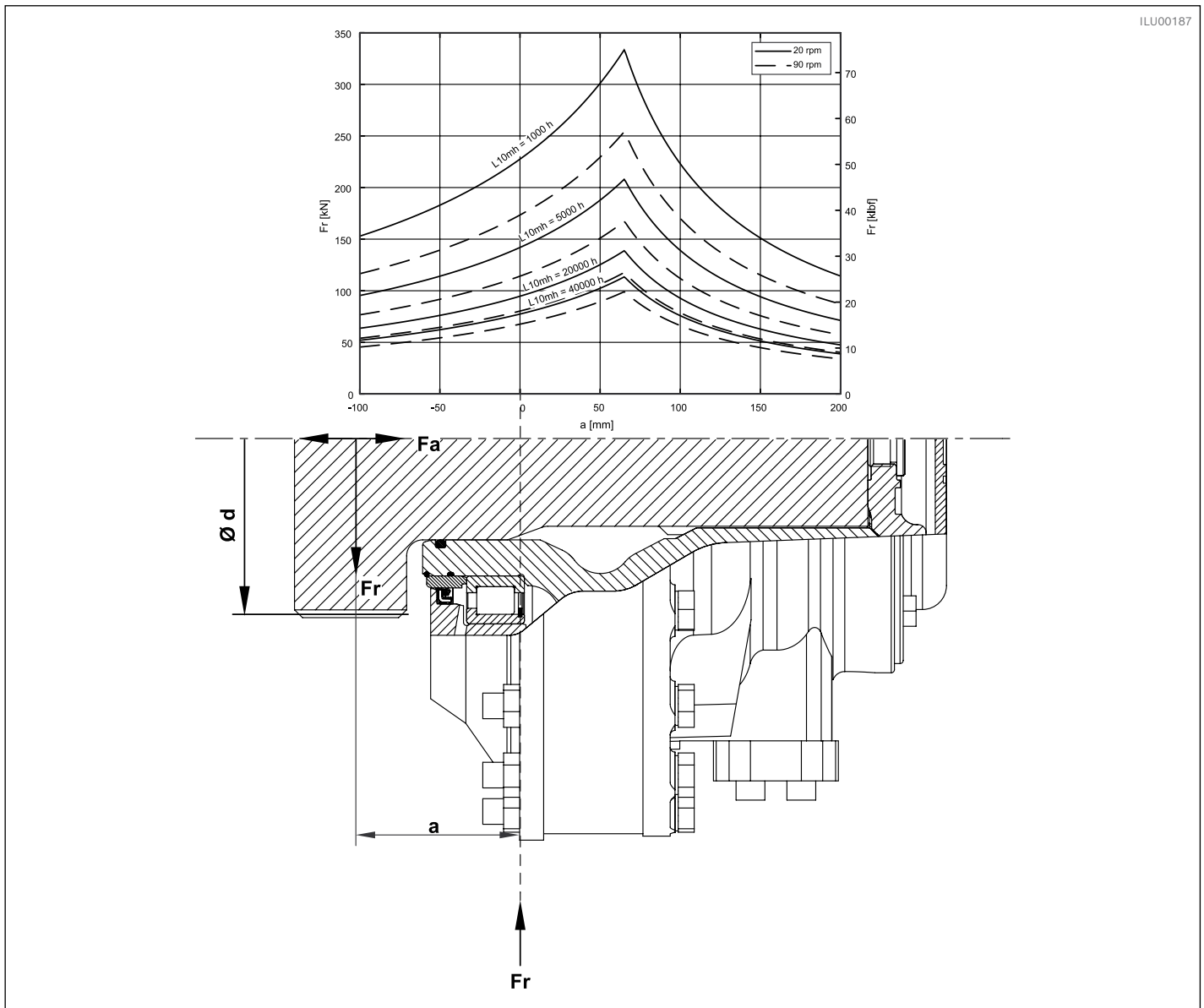


Fig. 77: Permissible external dynamic loads for CA 70 S-index 28

Axial loads: Permissible axial load for intermittent duty $F_a = 30\,000\text{ N (6\,740\ lbf)}$.

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.

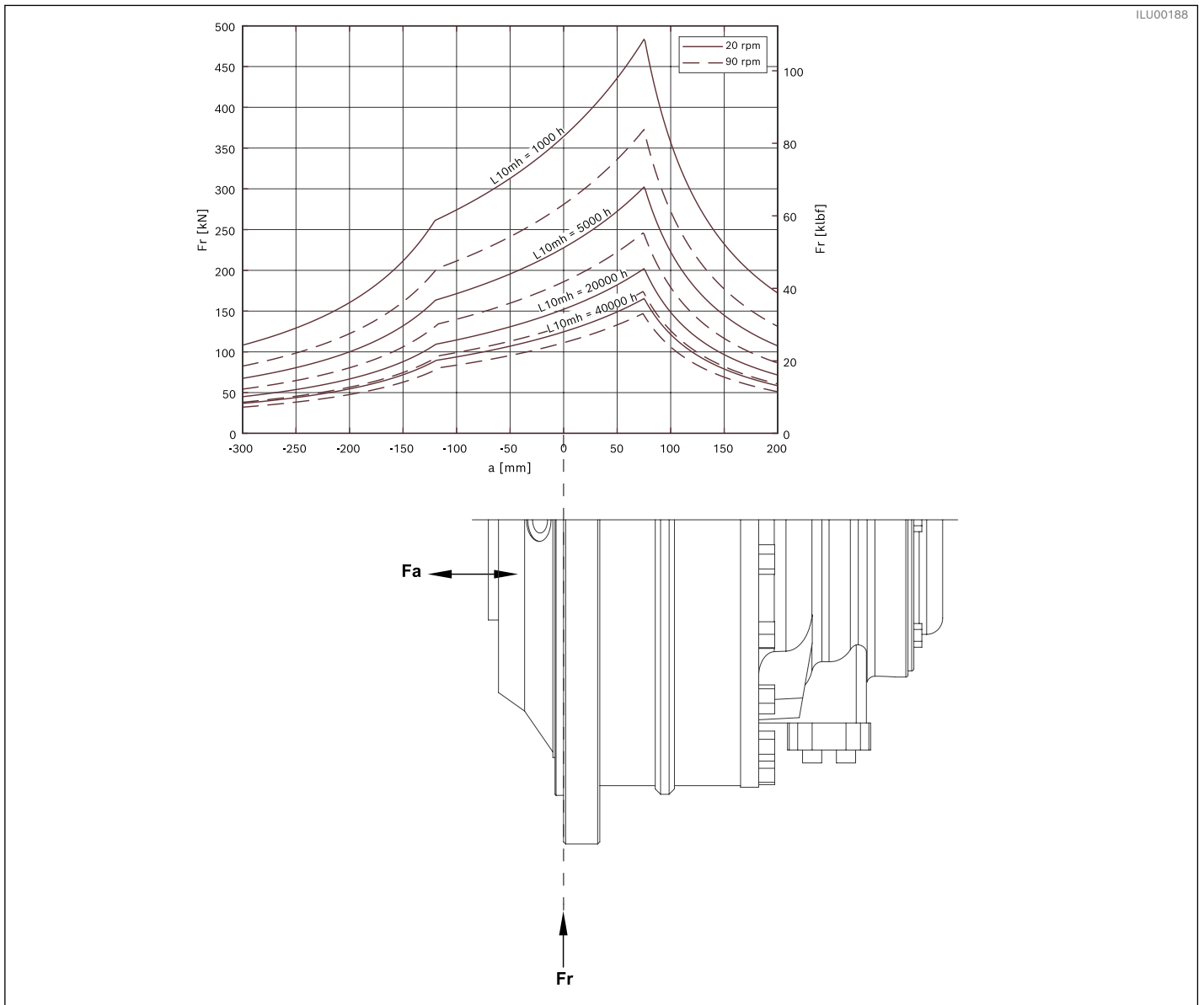


Fig. 78: Permissible external dynamic loads for CA 140 S-index 28

Axial loads: Permissible axial load for intermittent duty
 $F_a = 30\,000\text{ N (6\,740\ lbf)}$.

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.

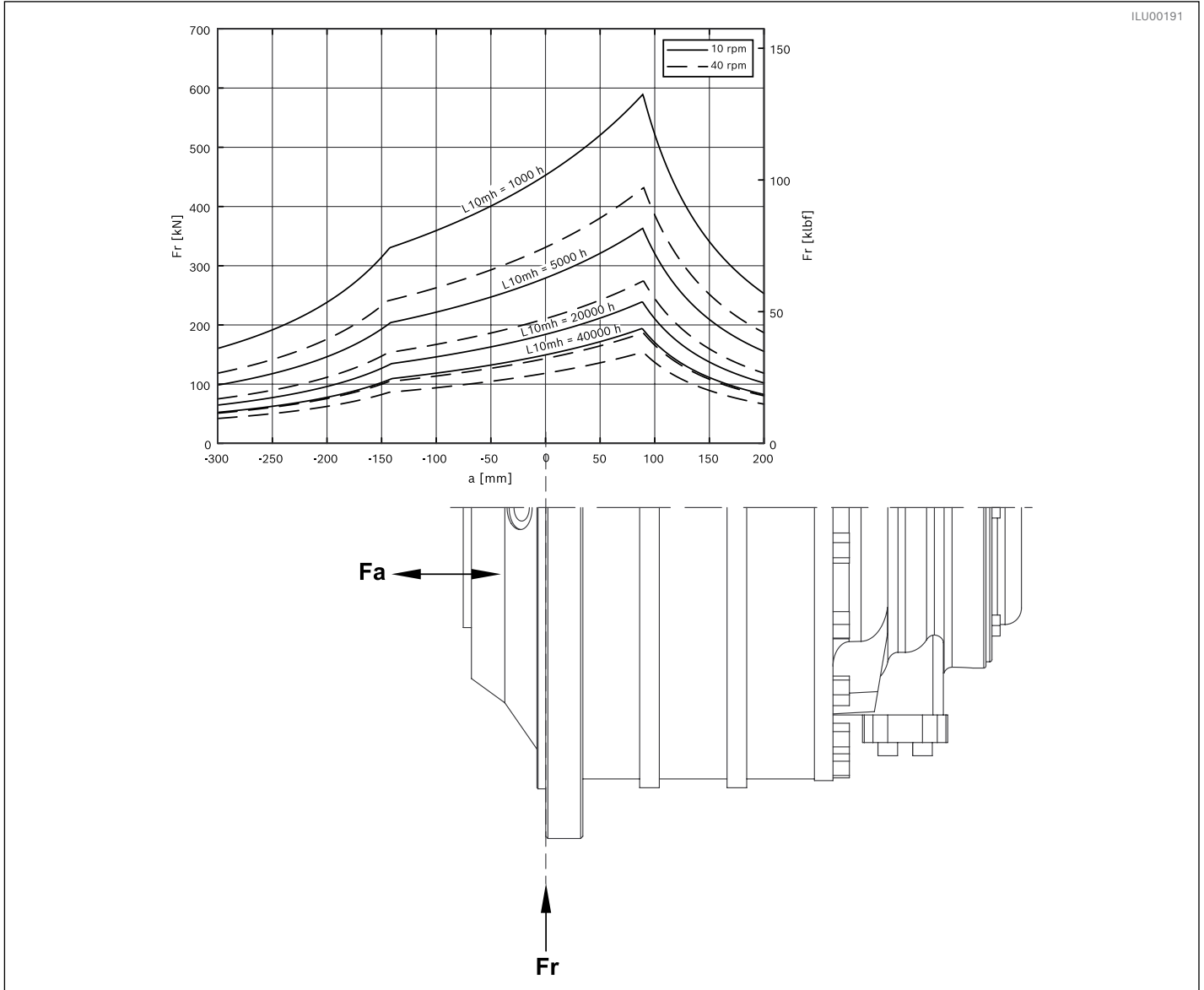


Fig. 79: Permissible external dynamic loads for CA 210 special index 28

Axial loads: Permissible axial load for intermittent duty

$F_a = 30\,000\text{ N (6\,740 lbf)}$.

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

9.6 Special index 33:**Motor for marine environment**

- Available for CA 50/70/100/140/210/280
- Motor equipped with shaft side wear ring of stainless steel
- Motor equipped with test connections of stainless steel

To be ordered separately

- Suitable painting must be ordered separately. Corrosivity category CX or C5 is recommended for marine environment.

9.7 Special index 101: Front flange mounted motor

- Available for flange mounted spline CA 100/140
- Reduced outer diameter see *Table 22* for CA 100 and *Table 23* for CA 140.

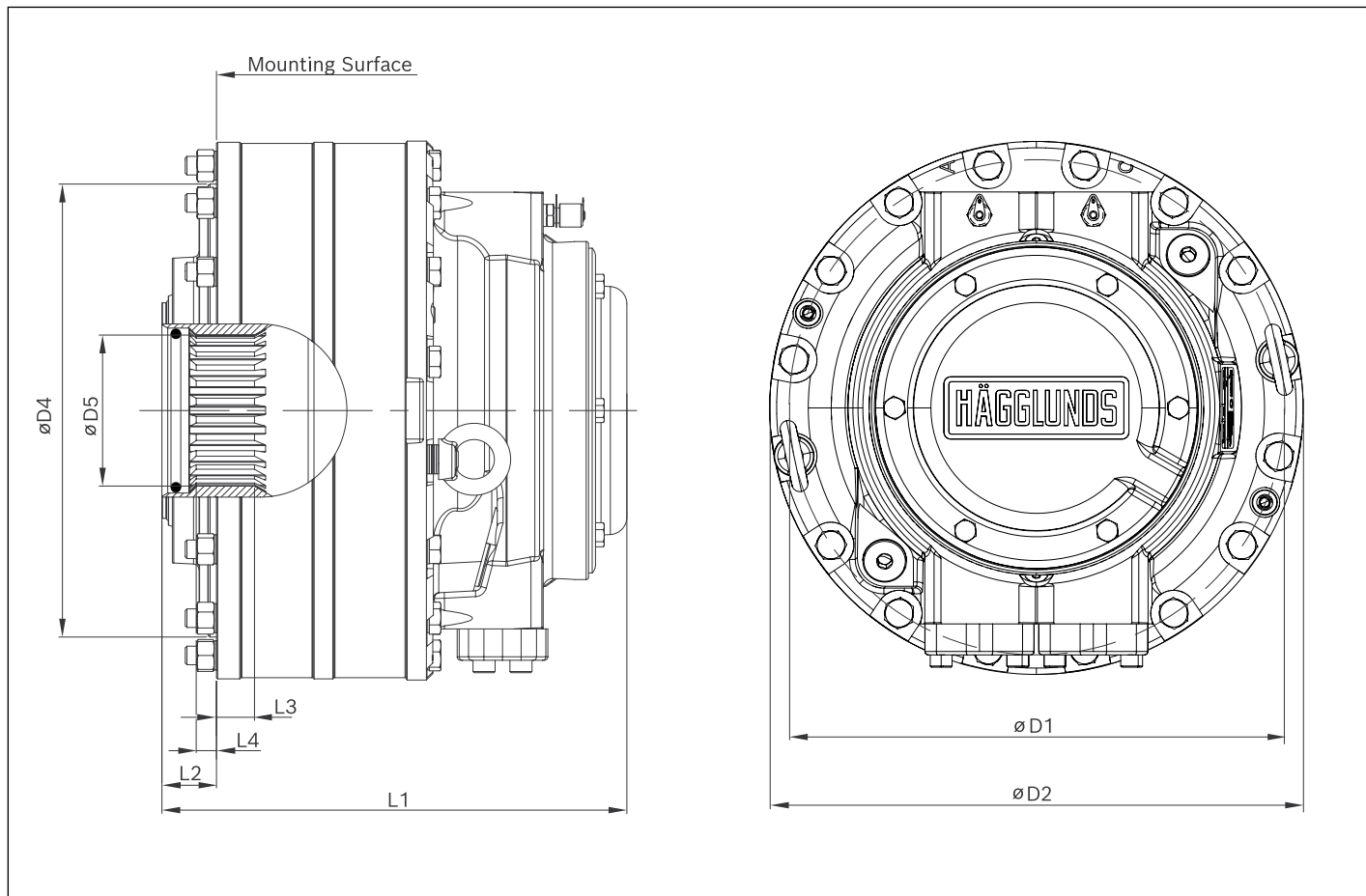


Fig. 80: CA 100 S101, CA 140 S101

Table 15: Dimensions CA 100 S101, CA 140 S101

		Dimensions				
		CA 100 S101		CA 140 S101		
		mm	in	mm	in	
D1	Pitch diameter	430	16.93	470	18.50	
D2	Outer diameter	464	18.27	508	20.00	
D4	Guide diameter	390	15.35	435	17.13	
D5	Spline size	DIN 5480	N140 x 5 x 30 x 26 x 9H	N140 x 5 x 30 x 26 x 9H		
L1	Total length	<i>Without through hole</i>	400	15.75	400	15.75
L2	Length to hollow shaft		47	1.83	47	1.83
L3	Length to spline end		32.7	1.29	52.9	2.08
L4	Length to spline		17.4	0.69	17.4	0.69
L5	Producing length of screws		27	1.06	27	1.06

10 Explosive environment

Note! Important to also consult additional ATEX related documentation [RE 15424-X-B2](#) and [RE 15417-X-B1](#)

Hägglunds CA¹⁾ can be adapted to work in potentially explosive environments according to the specifications in *Table 16*.

Table 16: Explosion protection information ATEX

Explosion protection marking	II 2G Ex h IIB/IIC T4-T1 Gb X
	II 2D Ex h IIC T135-T450 °C Db X
	I M2 Ex h I Mb X
In compliance with standards	EN ISO 80079-36:2016
	EN ISO 80079-37:2016
	EN ISO/IEC 80079-38:2016
Ambient temperature range	-35...+60 °C (-31...+140 °F)

10.1 How to order

When placing order for a Hägglunds CA motor with ATEX configuration, it is important to clearly state this in the order process and also verify that ATEX is included in the order confirmation. Information about requested gas group is required (ATEX IIB or ATEX IIC, see below).

ATEX IIB

Approval for ATEX gas group IIB, dust atmospheres and category M2 is included in this option. ATEXB in order confirmation.

ATEX IIC

In addition to the above, this option also includes approval for ATEX gas group IIC. To meet the most strict requirements for electrostatic charges (gas group IIC), a conductive (dissipative) coating is used to ensure that no hazardous energy levels can occur on the motor surface. ATEXC in order confirmation.

Note!

- When ATEX IIC is required, ensure that all painted accessories also are ordered with correct coating.
- With ATEX IIC, the colour of the motor (and the painted accessories) will be gray (RAL 7035).

To be ordered separately

Depending on ATEX conditions (see 10.3), additional equipment can be needed and must be ordered separately.

Table 17: Add-on kit (to be ordered separately)

Material number	Description
See 13.4.2	Temperature sensor kit, Pt100 4 wire
R939081618	Flushing set CA ATEX V1

Available configurations and accessories

All standard motor configurations, available in 1 *Ordering code*, can be used in explosive environment. Also a limited amount of special index motors and accessories are allowed in explosive environment, see below:

Available special index

- S06: Motor for high speed at half displacement
Only allowed in ATEX equipment category 3G/3D (zone 2/22)
- S11: Motor for submerged applications
- S13: Motor with reduced noise level
- S28: Motor with reinforced main bearing
- S33: Motor for marine environment

Available accessories

- Temperature sensor kit
- Torque arm TCA
- Speed sensor SPDB 2 ²⁾
- Brake BICA ³⁾
- Brake MDA 14 and 21 (mounted with tandem kit) ²⁾
- Tandem kit TA
- Early warning kit ²⁾ (see also 13.2)
- Two speed valve VTCA 600. Max allowed pressure drop in half displacement 20 bar. See data sheet [RE 15389](#)

Note! For ATEX requests on all other configurations and accessories, e.g MDA 5/7/10, please contact your Bosch Rexroth representative.

10.2 Dimensioning

Motor bearings in 2G/2D and M2

All motors for ATEX equipment category 2G/2D (zone 1/21) and M2 must be dimensioned for minimum 20 000 h rated life according to Quick selection diagram in 4.8 and maximum external dynamic load diagrams in 4.14.1.

Selection of rated life will affect interval for bearing replacement in ATEX equipment category 2G/2D and M2.

1) Not valid for CA 280

2) Approved for gas and dust (not mining)

3) Approved for gas environment (not dust and mining)

10.3 Limitations & Requirements

Speed limitation for CA 210

Max allowed speed in temperature class T4: 115 rpm

Free-wheeling limitation

Free-wheeling of motor is not allowed above max allowed operating speed.

Emergency free-wheeling is not allowed.

Voltage equalization

All ATEX motors are delivered with a terminal lug for connection of a grounding cable.

Temperature monitoring

Temperature monitoring in the drain line is required in ATEX equipment category 2G/2D (zone 1/21) and M2. It is also recommended when flushing of radial seals is used. For ATEX environment, a special temperature sensor kit is available, see *Table 17*.

Flushing of radial seals

Flushing of the radial seals and bearings is in some circumstances a precondition to fulfill the ATEX requirements, see *Table 18* and *Table 19*. For ATEX environment, a special flushing set is recommended, see *Table 17*. This flushing set is designed to distribute the flushing flow 50/50 to the both F ports. See also [RE 15424-X-B2](#).

Horizontal installations:

Depending on specific ATEX conditions (zone, temperature class), ATEX flushing of seals and bearings may be required for horizontally mounted motors. See *Table 18* for circumstances when ATEX flushing of seals is required.

Table 18: Conditions for ATEX flushing (horizontal installation)

Temperature class	ATEX equipment category	
	2G/2D (zone 1/21) and M2	3G/3D (zone 2/22)
T4/135°C	Yes	>150 rpm: Yes <150 rpm: No
T3/200°C	Yes	No
T2-T1/300-450°C	Yes	No

Vertical installations:

Independent of ATEX zone, ATEX flushing should be used for all vertical installations.

Table 19: Conditions for ATEX flushing (vertical installation)

Temperature class	ATEX equipment category	
	2G/2D (zone 1/21) and M2	3G/3D (zone 2/22)
All classes	Yes	Yes

Addition for shaft downwards installations

For CA with shaft pointing downwards, the motor should be drained through D1 (D2) and F3 (F4) to ensure lubrication of the bearing, see *Fig. 82*. (For installation with shaft pointing upwards, flushing according to *Fig. 81*. but drain from port D3, is sufficient).

Note! Flow control valve is not included in the flushing set.

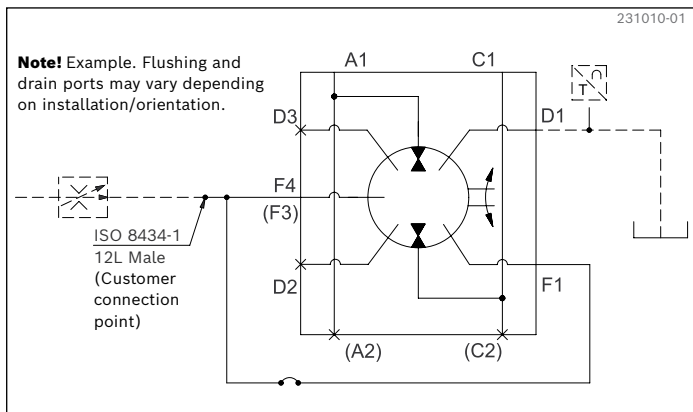


Fig. 81: ATEX flushing of radial seals CA general

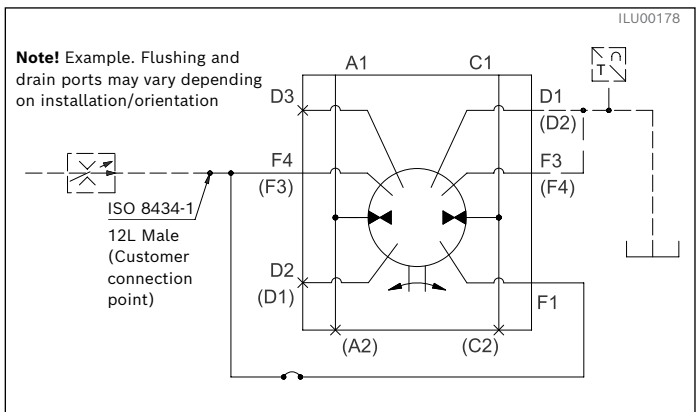


Fig. 82: Special case ATEX flushing of radial seals CA shaft pointing downwards

11 Dimensions / Interface

11.1 Dimensions

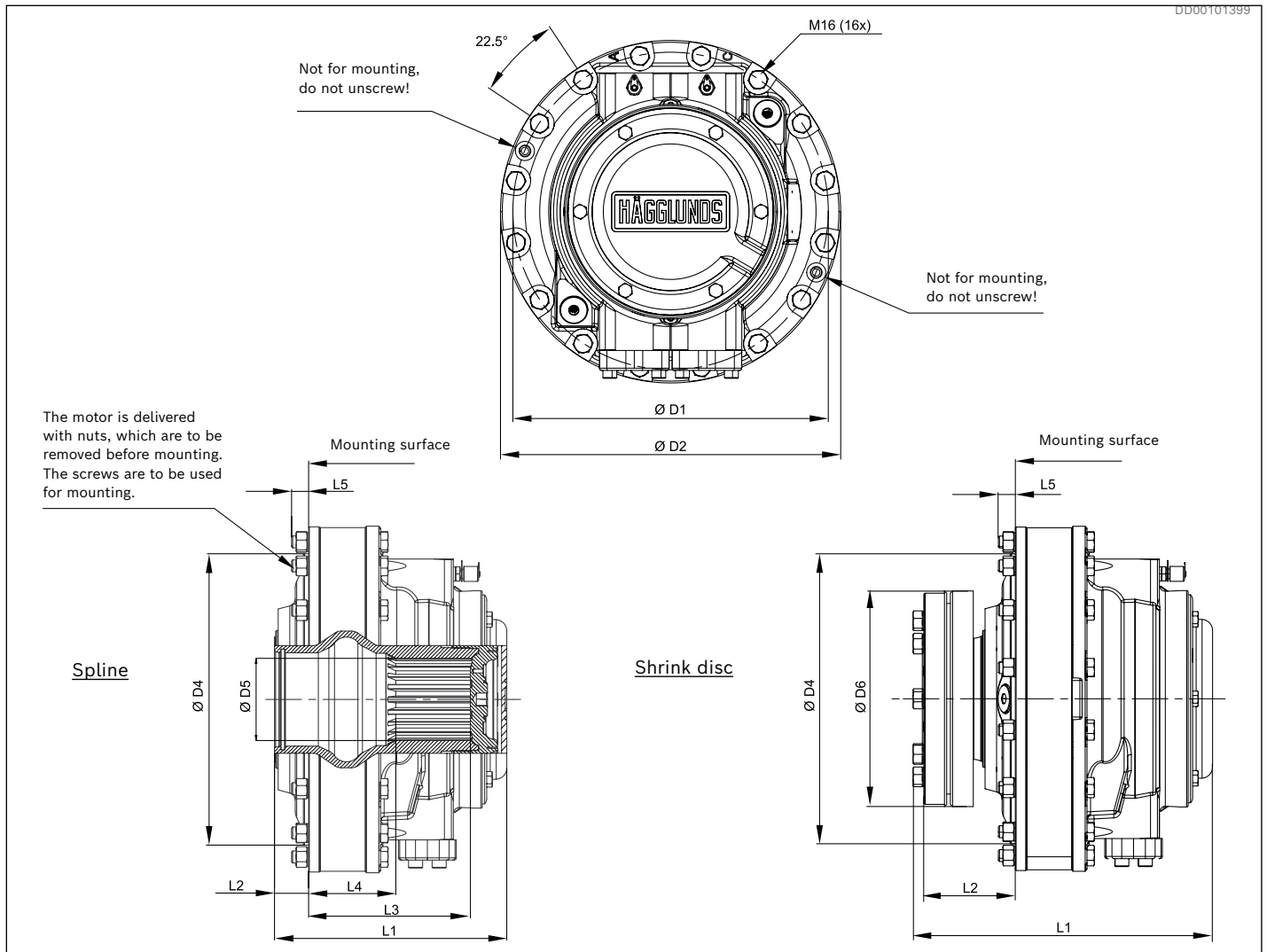


Fig. 83: CA 50

Table 20: 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 <i>Without through hole</i>	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 15: *Related documents*

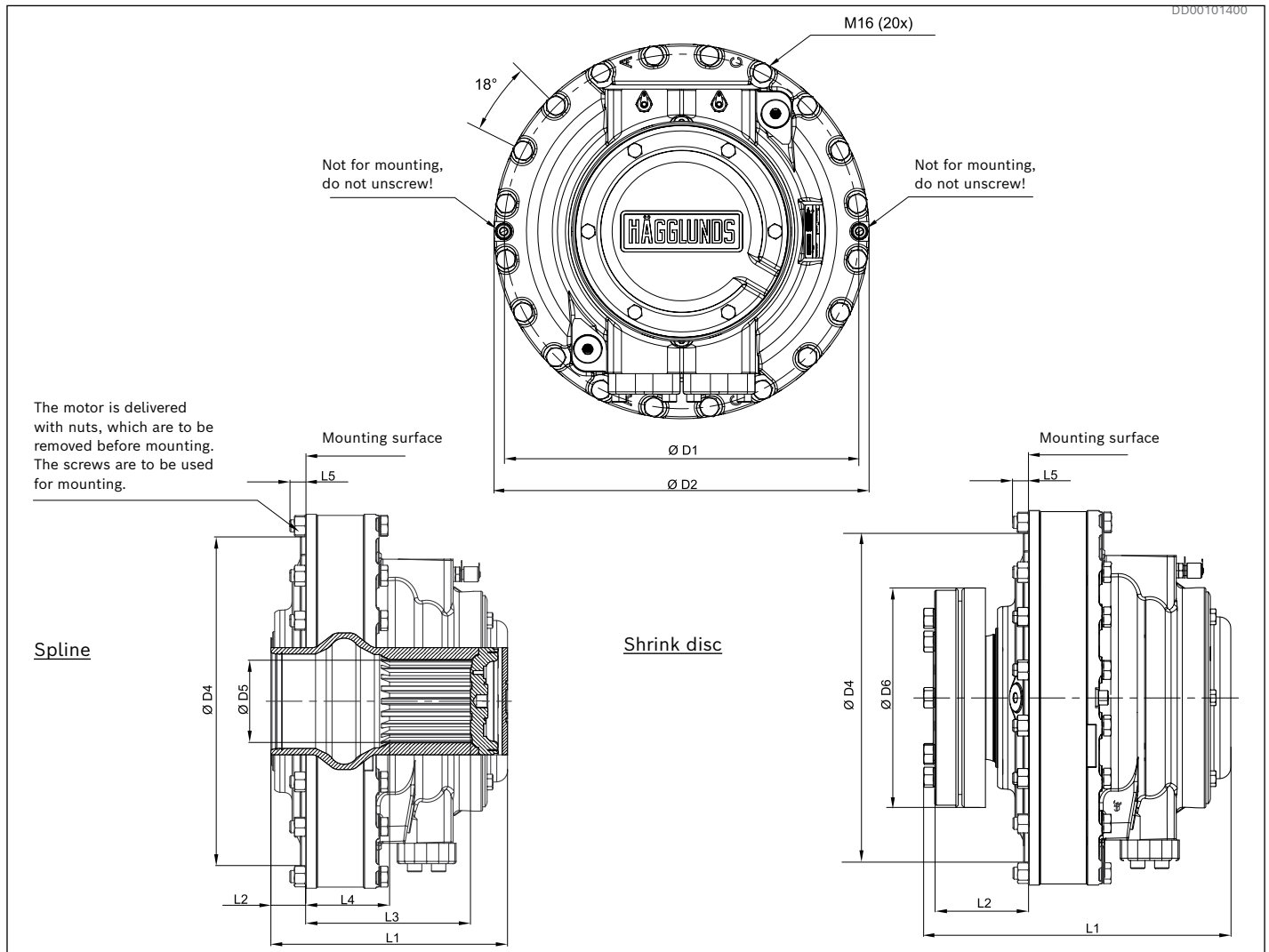


Fig. 84: CA 70

Table 21: 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	<i>Without through hole</i>	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	Producing length of screws		23	0.91	23	0.91

For dimension drawings CA 70, see section 15: Related documents

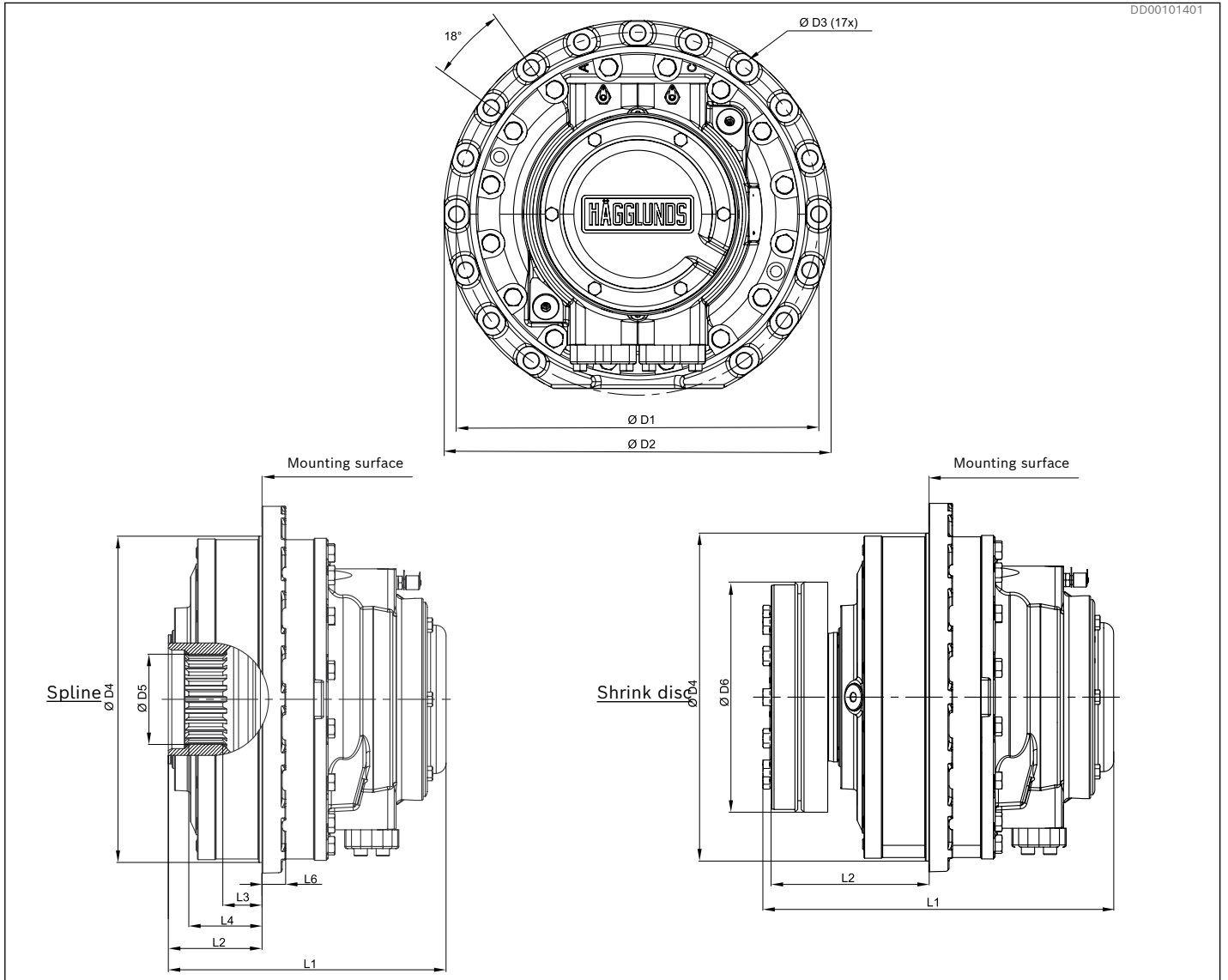


Fig. 85: CA 100

Table 22: 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	
	Center flange Front flange (See 9.7)	464	18.27	464	18.27	
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	<i>Without through hole</i>	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 15: Related documents

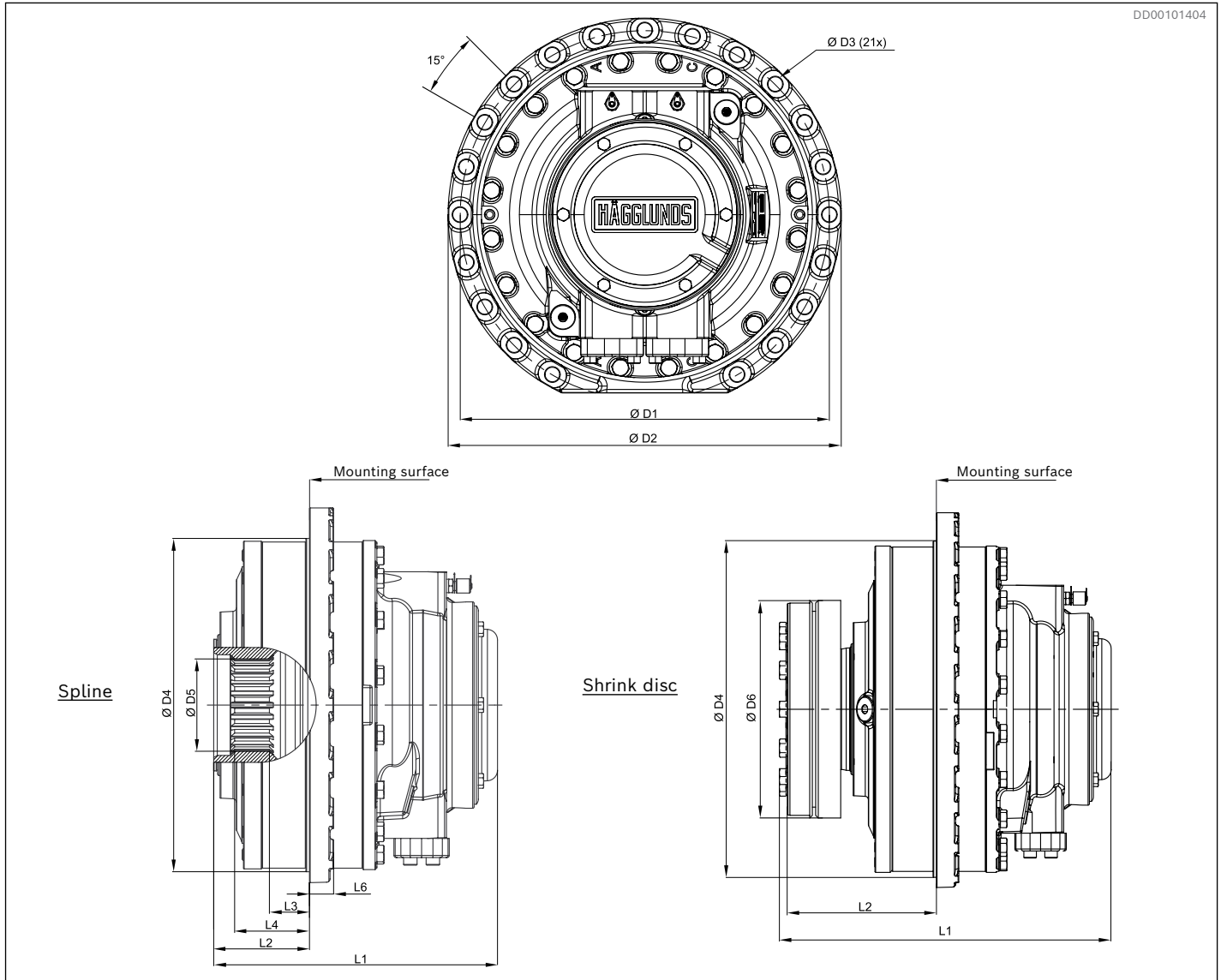


Fig. 86: CA 140

Table 23: 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	
	Center flange					
	Front flange (See 9.7)	508	20.00	508	20.00	
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	<i>Without through hole</i>	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 15: Related documents

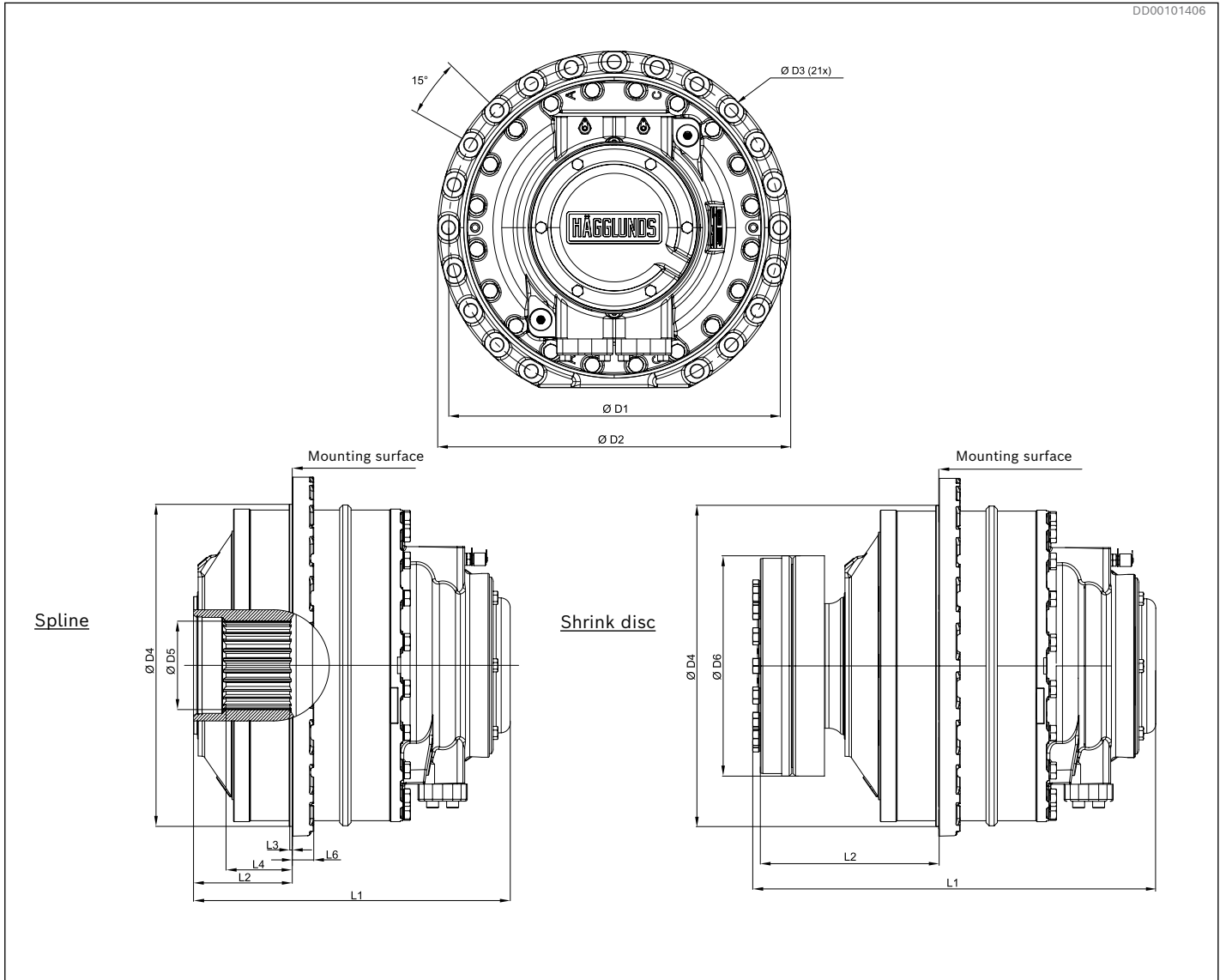


Fig. 87: CA 210

Table 24: 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 <i>Without through hole</i>	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 15: Related documents

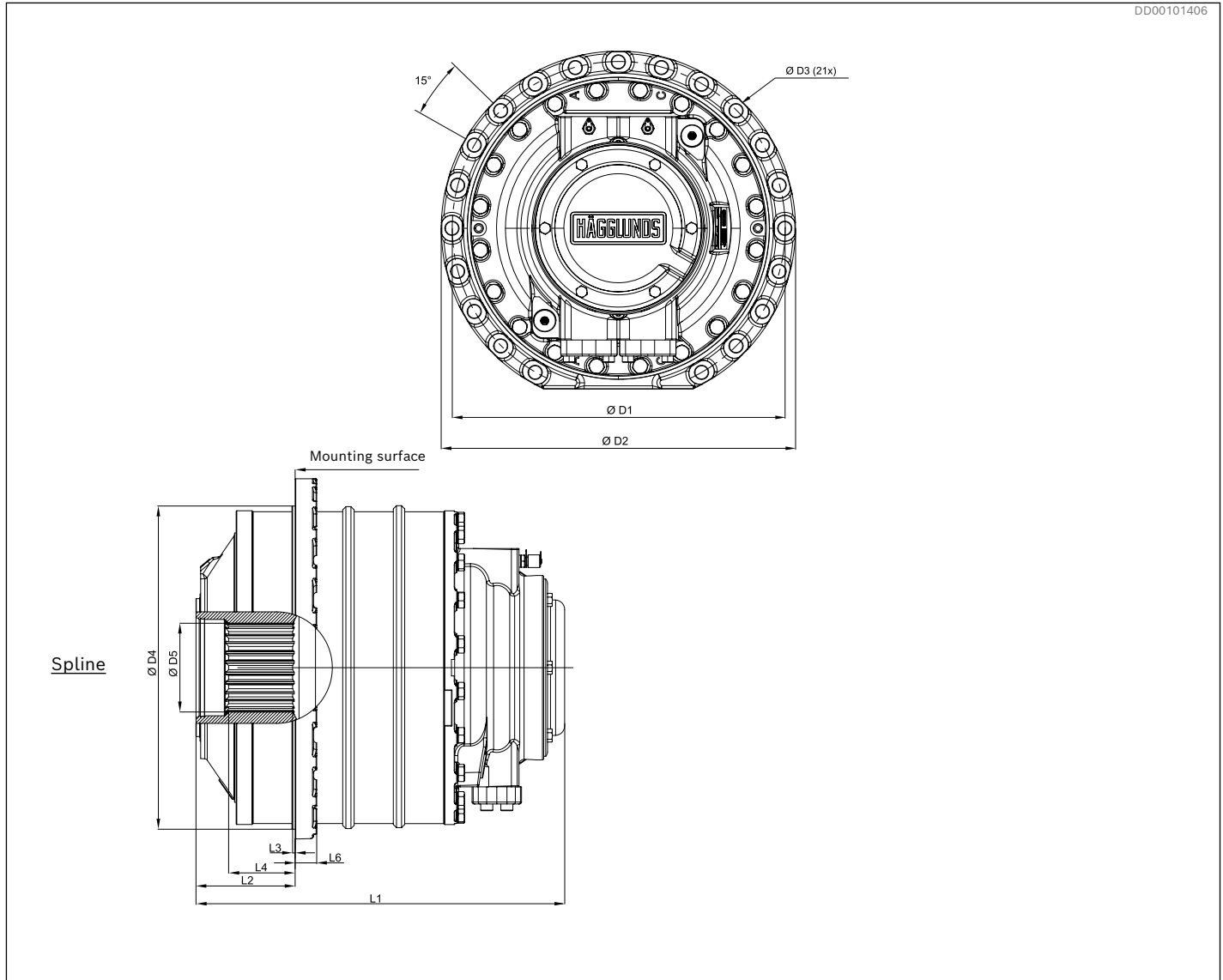


Fig. 88: CA 280

Table 25: Dimensions CA 280

		Dimensions		
		Splines		
		mm	in	
D1	Pitch diameter	560	22.05	
D2	Outer diameter	600	23.62	
D3	Screw hole	22	0.87	
D4	Guide diameter	510	20.08	
D5	Spline size	DIN 5480	N170 x 5 x 30 x 32 x 9H	
L1	Total length	<i>Without through hole</i>	581	22.87
L2	Length to hollow shaft		156.5	6.16
L3	Length to spline end		2	0.08
L4	Length to spline		105	4.13
L6	Thickness of mounting ring		34	1.34

For dimension drawings CA 280, see section 15: *Related documents*

12 Mounting alternatives

12.1 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. 89 For requirements of spline shaft, see section 15: *Related documents*

12.1.1 Flange mounting with splines

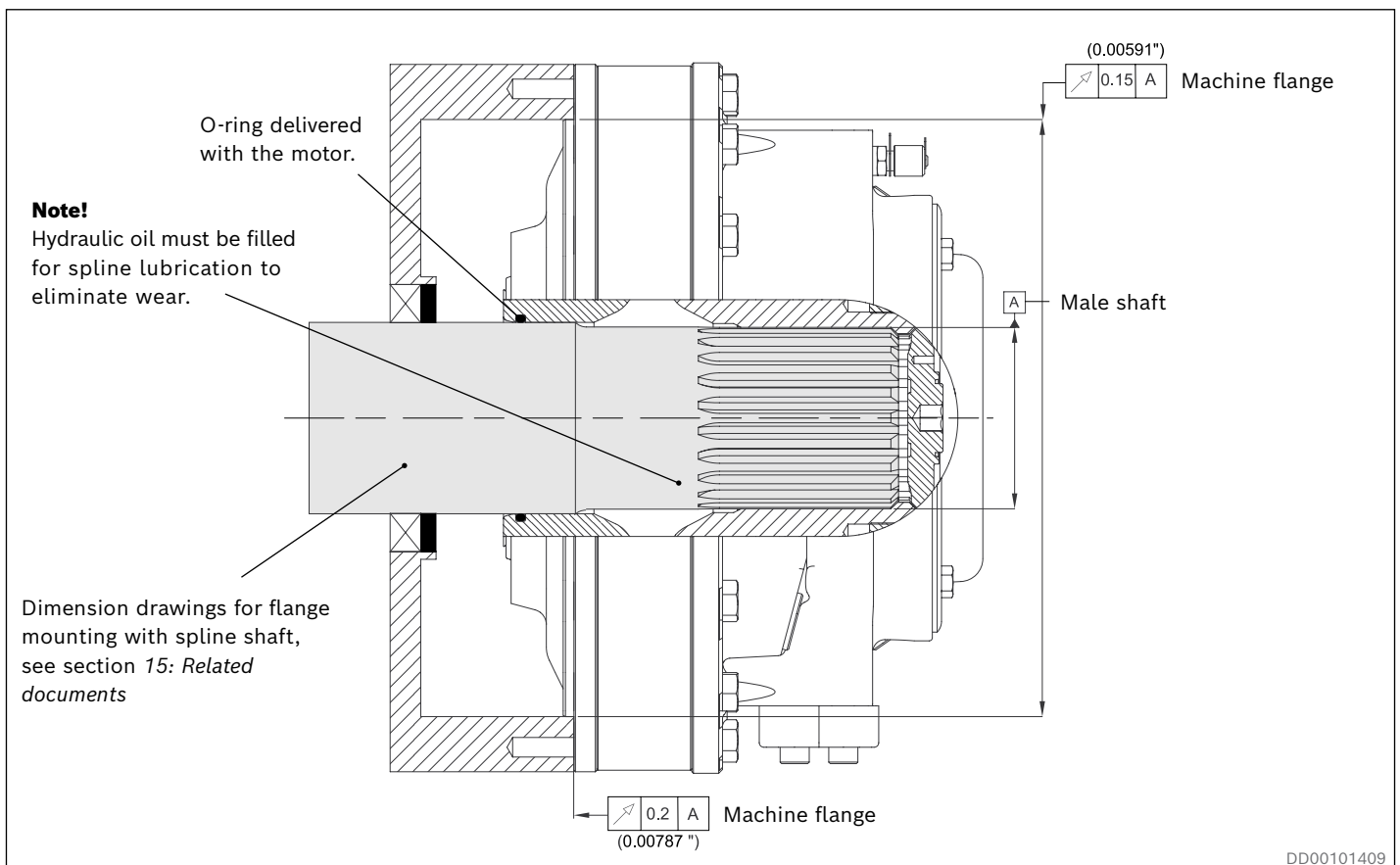


Fig. 89: Example: Flange mounting of CA 50 with splines

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.

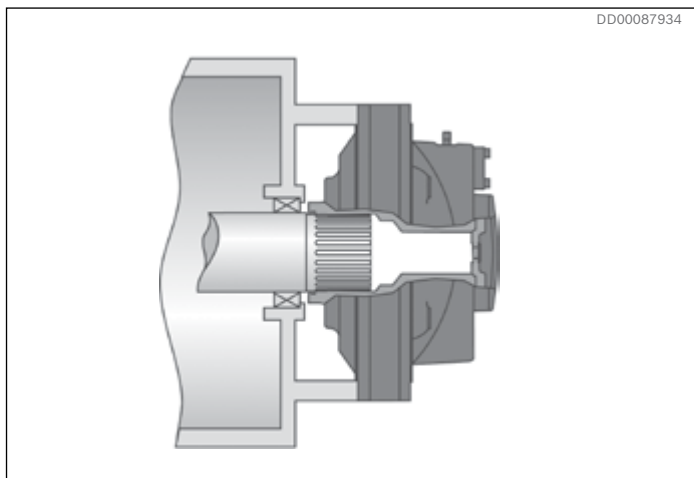


Fig. 90: Example: Flange mounted motor with spline and low radial load from driven shaft.

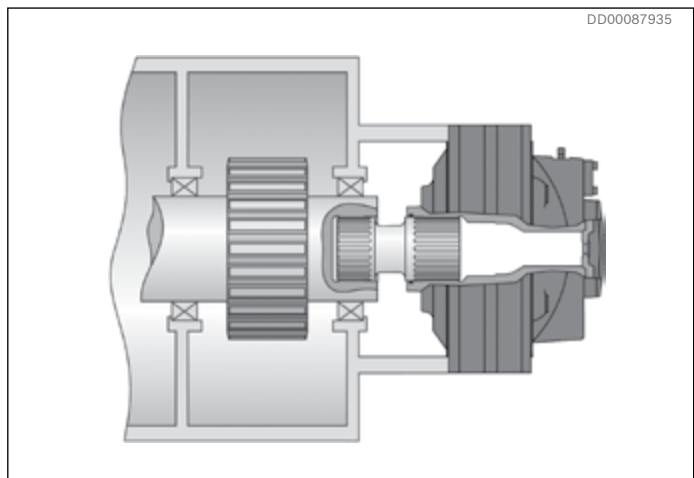


Fig. 91: Example: Flange mounted motor with spline to avoid high radial load from driven shaft.

Design of spline shaft

Table 26: Spline designation shaft

Frame size	Spline			
	CA 50, CA 70	CA 100, CA 140	CA 210	CA 280
Designation: Standard DIN 5480	W120x5x30x22x8f	W140x5x30x26x8f	W150x5x30x28x8f	W170x5x30x32x8f

Table 27: Recommended material in the spline shaft

Drive	Steel with yield strenght
Unidirectional drive	$Rel_{min} = 450 \text{ N/mm}^2 \text{ (65 000 lb/ft}^2\text{)}$
Bidirectional drive	$Rel_{min} = 700 \text{ N/mm}^2 \text{ (101800 lb/ft}^2\text{)}$

For shaft dimension drawings see section 15: *Related documents*

12.1.2 Torque arm mounting with splines

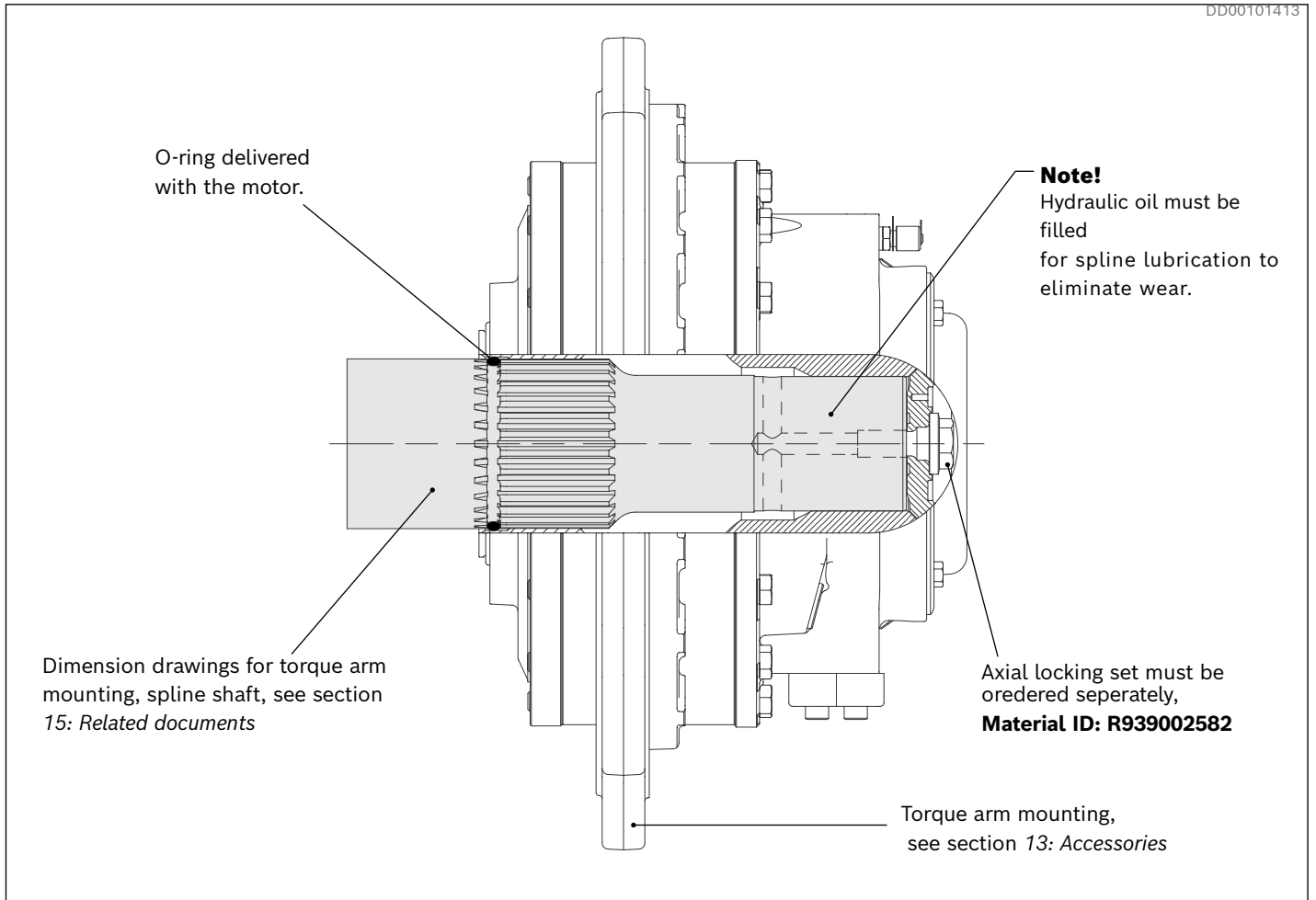


Fig. 92: Example: Torque arm mounting of CA 100 with splines

Recommended material in the shaft, see *Table 27*.

Spline designation shaft, see *Table 26*.

12.1.3 Torque arm mounting on plain shaft

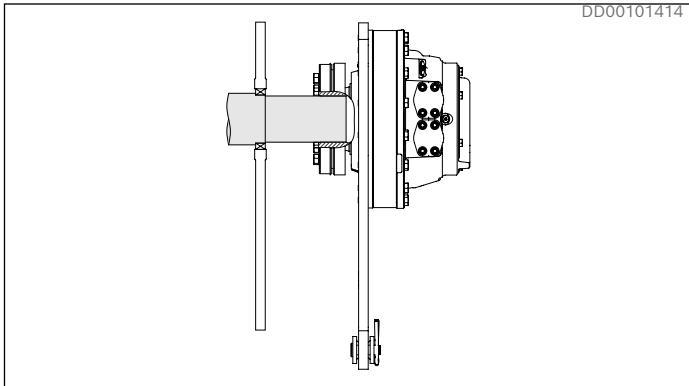


Fig. 93: Example: Torque arm mounted motor with shrink disc

Design of plain shaft

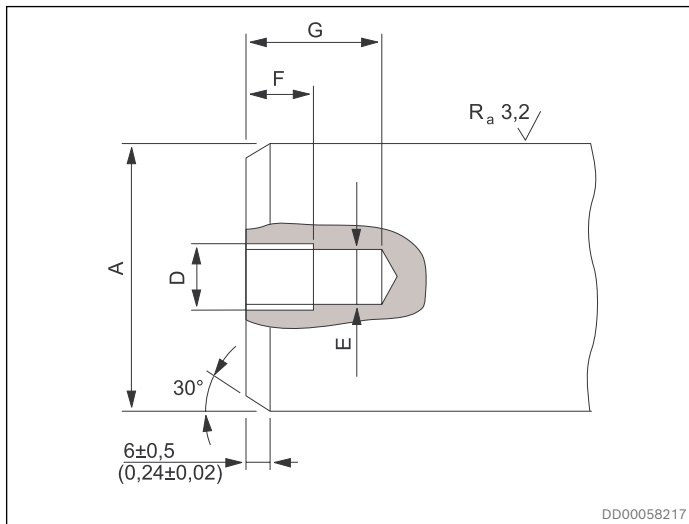


Fig. 94: Shaft end, normally loaded

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.

Table 28: Shaft recommendations

Dim	CA 50/CA 70	CA 100/CA 140	CA 210
A	mm \varnothing 120	\varnothing 140	\varnothing 160
	in \varnothing 4,7244	\varnothing 5,5118	\varnothing 6,2992
B	mm 71,5	84,5	105
	in 2,81	3,33	4,13
C	mm \varnothing 116	\varnothing 133	\varnothing 153
	in \varnothing 4,57	\varnothing 5,24	\varnothing 6,02

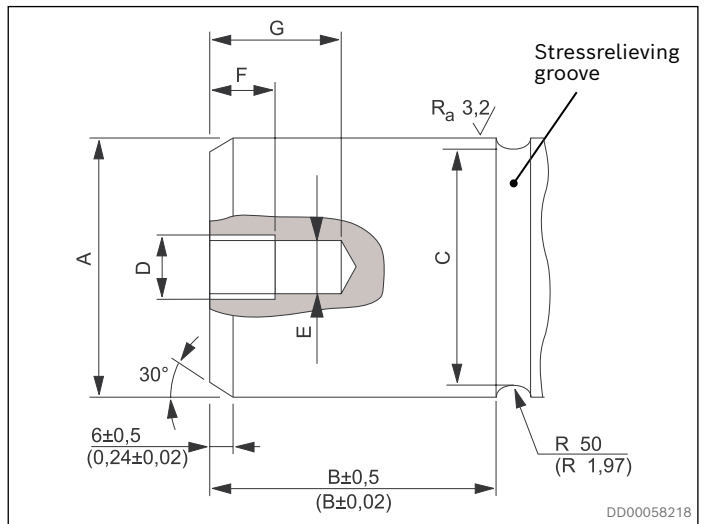


Fig. 95: Shaft end, heavily loaded

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 29: Thread dimensions for assembly tool in plain shaft

Measures	Dimensions, threads for assembly tool			
D	M20		UNC 5/8"	
E	$\varnothing > 17$ mm	\varnothing 0,67 in	$\varnothing > 13,5$ mm	\varnothing 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 30: Recommended material in the plain shaft

Drive	Steel with yield strenght
Unidirectional drive	$Rel_{min} = 300$ N/mm ²
Bidirectional drives	$Rel_{min} = 450$ N/mm ²

13 Accessories

13.1 Torque arms

Mounting alternatives

Dimensions, technical data, order code and material ID for torque arms, see separate data sheet: [RE 15355](#)

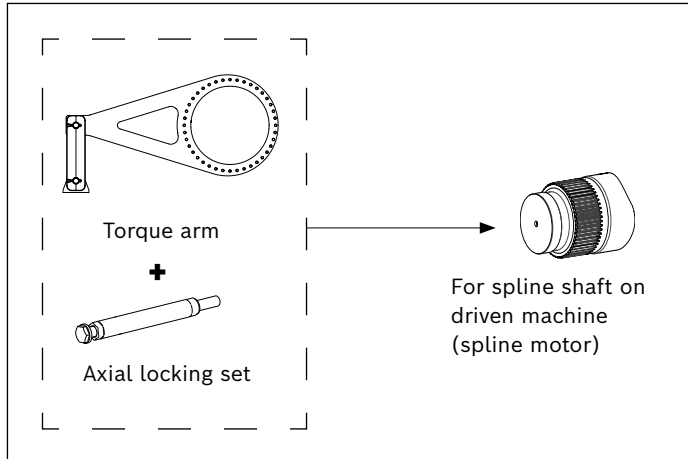


Fig. 96: Single ended torque arm mounting for spline shaft

Features

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

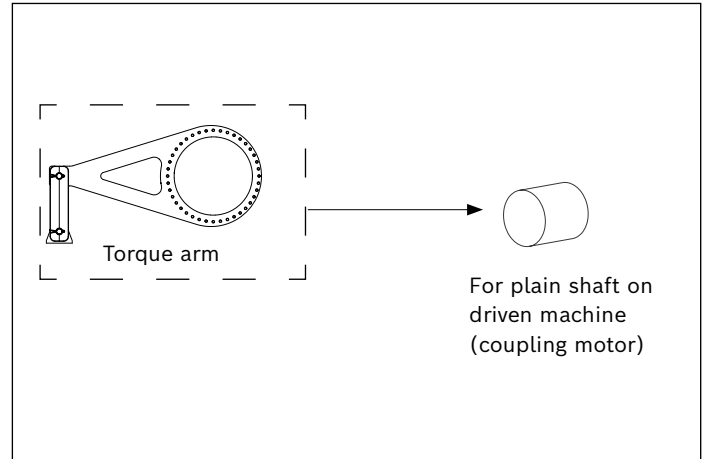


Fig. 97: Single ended torque arm mounting for plain shaft

Features

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

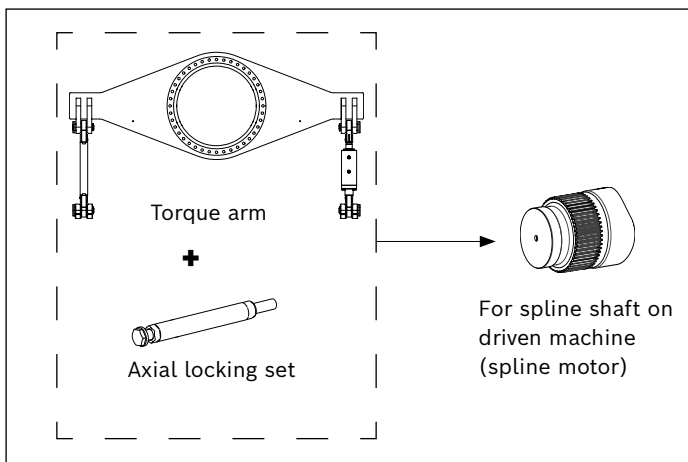


Fig. 98: Double ended torque arm mounting for spline shaft

Features

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

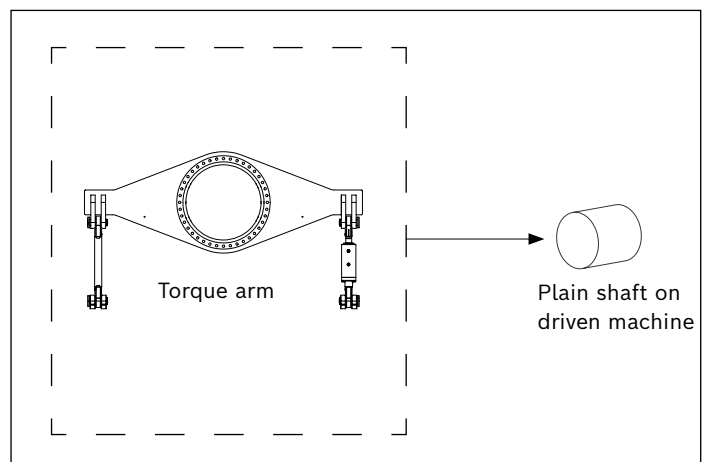


Fig. 99: Double ended torque arm mounting with plain shaft

Features

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

13.2 Flushing set and Early warning kit

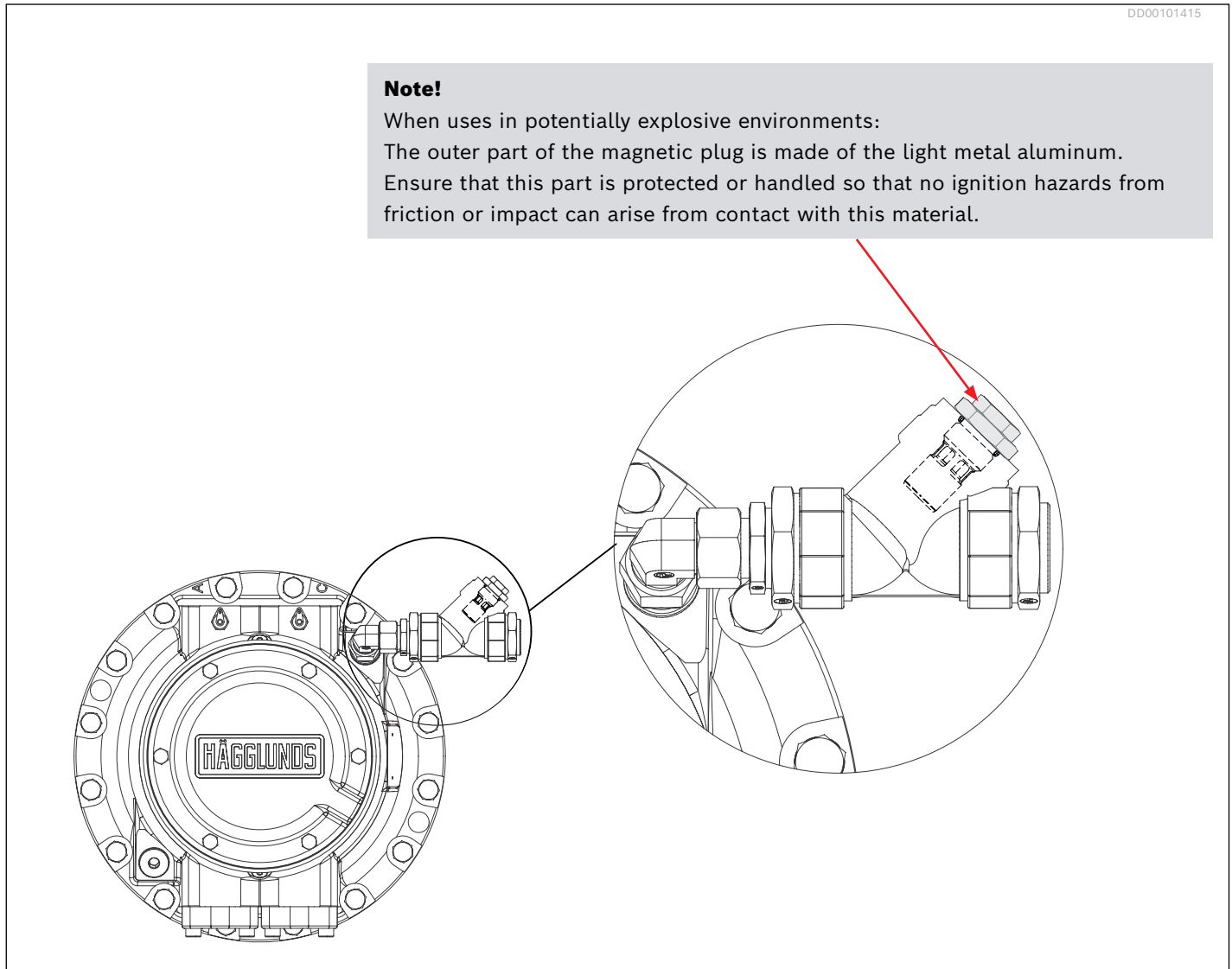


Fig. 100: Flushing set and Early warning kit including magnetic plug mounted on CA

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 280.

13.3 Tandem kit

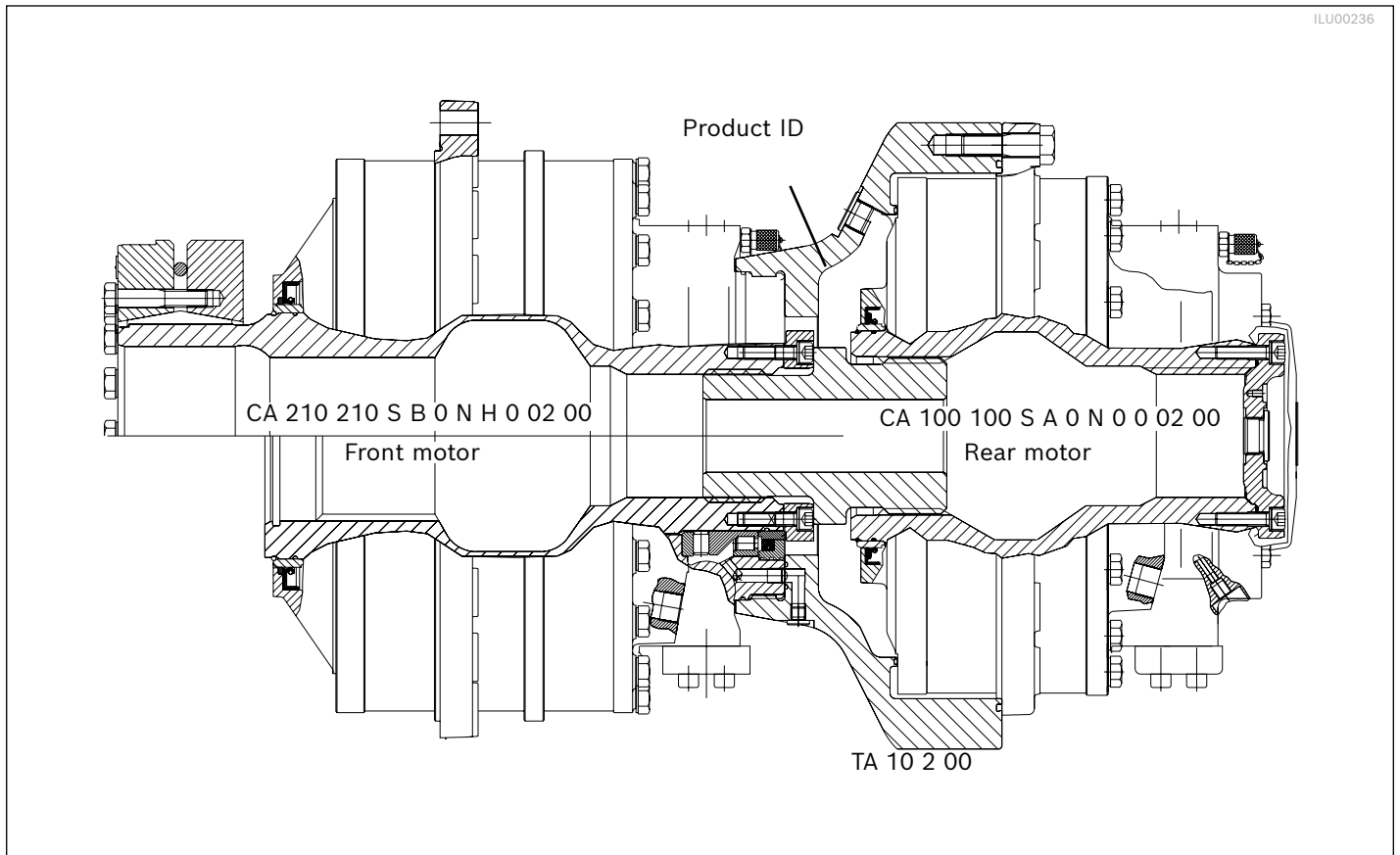


Fig. 101: Example: CA 210 210 S B 0 N H 0 02 00 + TA 10 2 00 + CA 100 100 S A 0 N 0 0 02 00

For technical data, see document: [RE 15356](#)

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 CA¹⁾ 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.

1) Not valid for CA 280

13.4 Temperature sensors

13.4.1 Pt100/4-20 mA sensor

Function

The temperature sensor is mounted in port D2, see *Fig. 103* and measure 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, Pt100/4-20 mA sensor

Material ID: R939054551
(Adapter G3/4 to G1/4 included)

Table 31: Technical data, Pt100/4-20 mA sensor

	Pt100/4-20 mA sensor
Sensor length l	30 mm (1.18 in)
Process connection	G 1/4" 100
Degree of protection	IP65
Ambient temperature	- 40...+85 °C (-40...+185 °F)
Type of sensor element	Pt100
Output	4-20 mA / 0..100 °C (32...212 °F)
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)

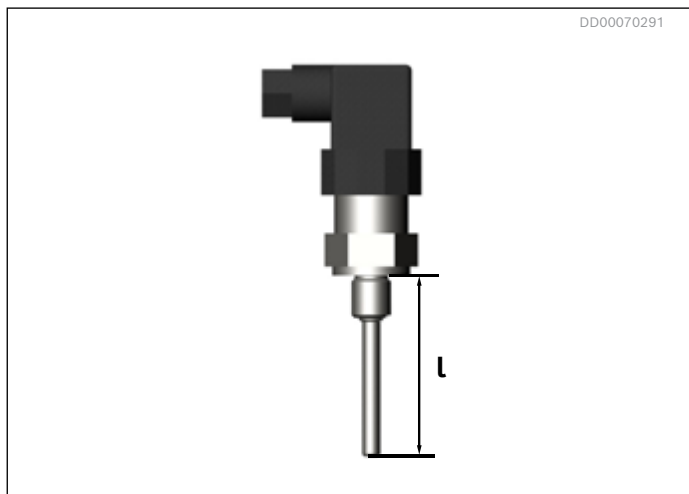


Fig. 102: Temperature sensor

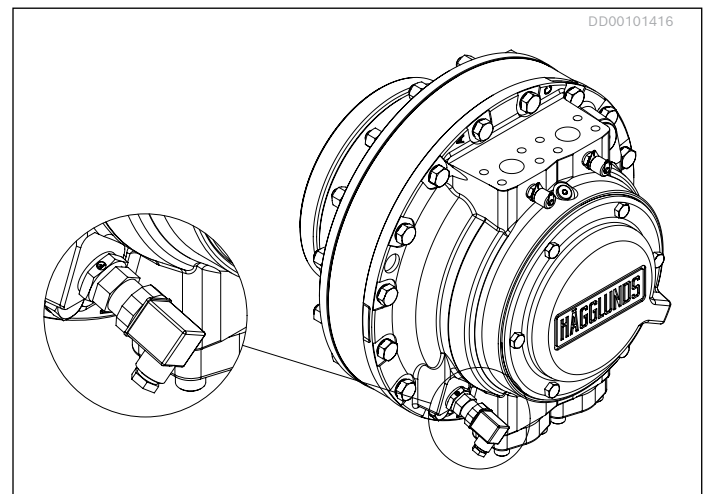


Fig. 103: Temperature sensor mounted on CA motor

13.4.2 Sensor for explosive environment

Function

The temperature sensor is mounted in an adapter tube connected to the drain output of the motor, see Fig. 104, and measures the fluid temperature in the motor case drain. The sensor element is a Pt100 resistance sensor, which change resistance in relation to the fluid temperature in the motor case. (For explosive environments, it is not allowed to use the D ports on the

CA motors for temperature measurements since a sensor would not reach in to the actual motor case, but would only measure in the port cavity, which could result in too slow reaction times to detect a temperature increase in case of a malfunction.)

Table 32: Technical data, explosion proof sensor

	Sensor for gas and dust	Sensor for mining
Sensor length l	30 mm (1.18 in)	30 mm (1.18 in)
Process connection	G 1/4"	G 1/2"
Ambient temperature	- 40...+85 °C (-40...+185 °F)	- 40...+80 °C (-40...+176 °F)
Type of sensor element	Pt100 4-wire	Pt100 4-wire
Electrical connection	M12 x 1 (4-pin)	M12 x 1 (4-pin)
ATEX and IECEx approval (Approvals for other regions may be available on request)	II 1G Ex ia IIC T1...T6 Ga II 1D Ex ia IIIC T135 °C Da	I M2 Ex ia I Mb
Material ID temperature sensor kit (adapter tube included)	R939080752	R939082529

The temperature sensors are of intrinsically safe type ('Ex i') and must be operated via an intrinsically safe amplifier to limit the energy to the explosive zone. Safety-related maximum values for electrical parameters (Ui, li, Pi) depends on temperature class and atmosphere in question. For electrical parameters, see separate documentation from sensor supplier.

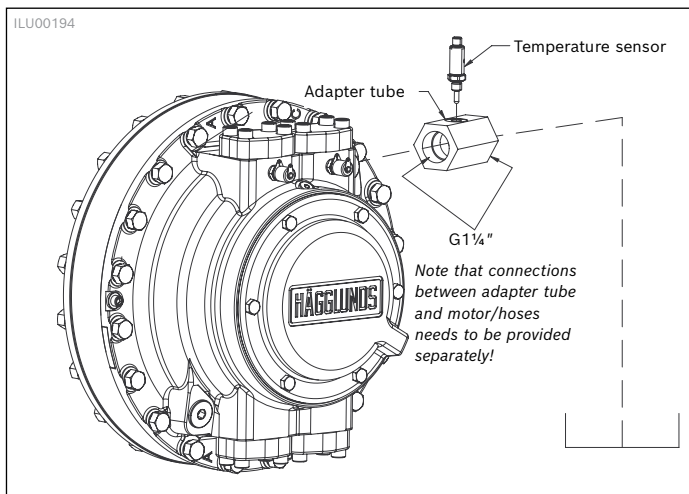


Fig. 104: Example of temperature sensor in CA motor drain line

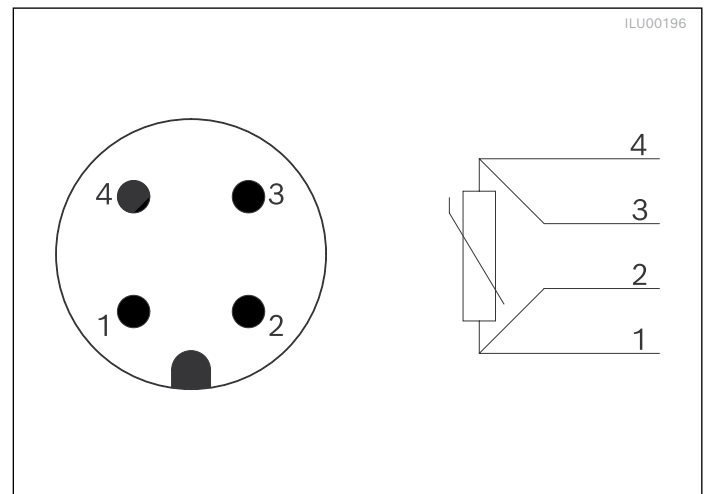


Fig. 105: M12 x 1 circular connector, Pt100 4-wire

13.5 Speed sensor

13.5.1 Hägglunds CA with SPDC

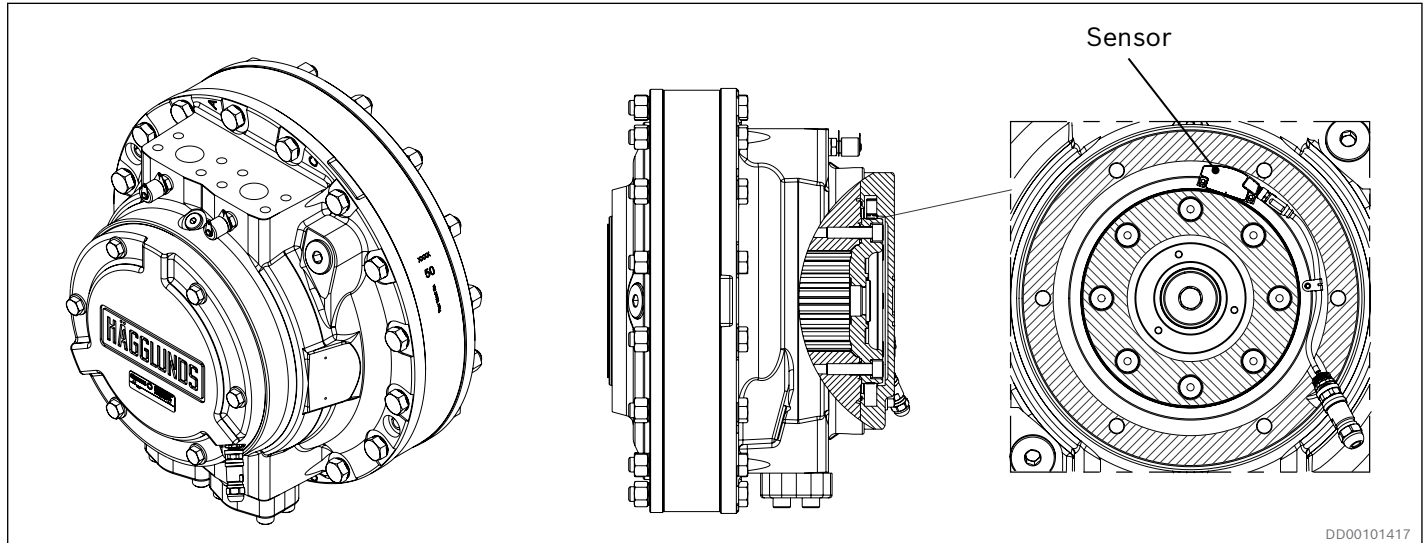


Fig. 106: CA motor with SPDC

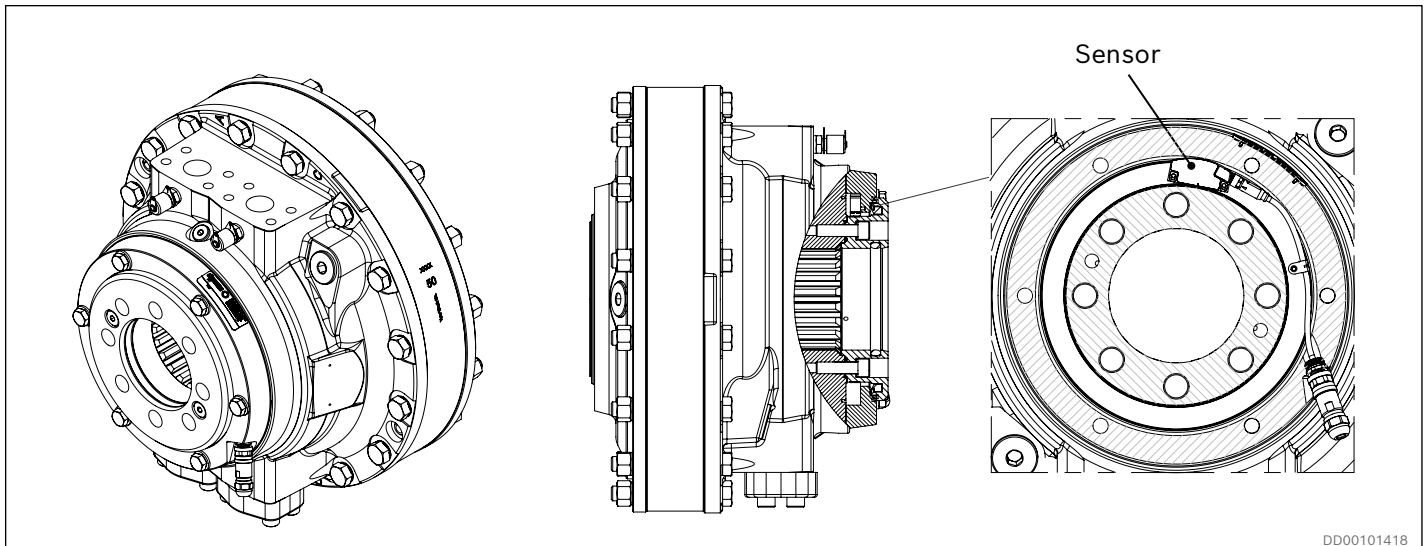


Fig. 107: CA motor with through hole and SPDC

For technical data, see document: [RE 15350](#)

Features

- ▶ Slim design fully integrated in motors
- ▶ Non-contact, wear free sensing system
- ▶ 1856 pulses per revolution for good speed control
- ▶ Possibility for redundant speed sensor functionality
- ▶ Protection class IP67

Description

The Hägglunds SPDC is an incremental encoder system used for speed measurement. The sensing principle is non-contact magnetic.

The encoder provides incremental square-wave output signals A+ and B+ with a 90° phase shift, enabling direction and speed detection.

The encoder supports two output modes, digital pulse output (HTL/TTL) or IO-link.

13.5.2 Speed sensor SPDB 2

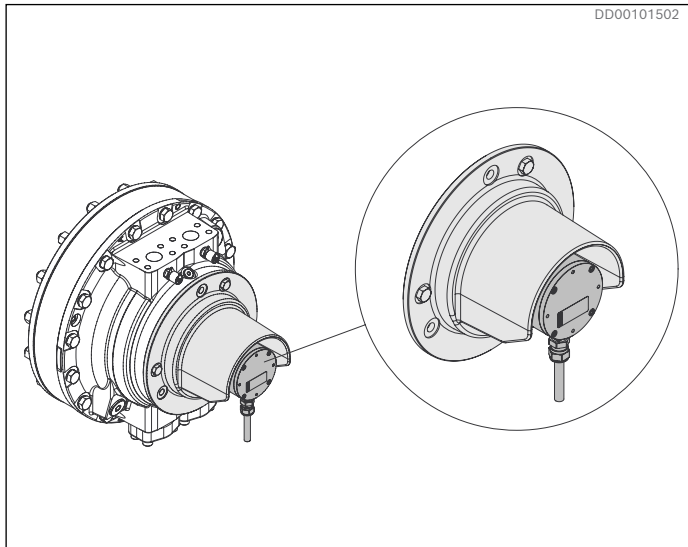


Fig. 108: SPDB 2

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.

Recommendations:

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

13.5.3 Absolute Rotary Encoder, ABRA

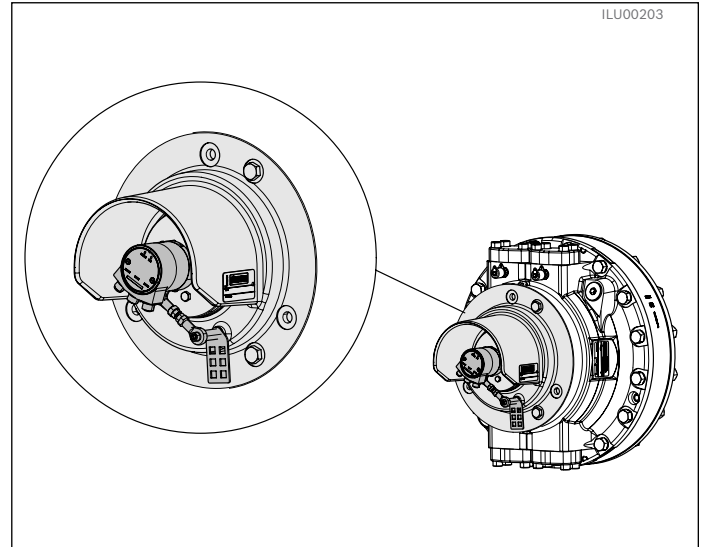


Fig. 109: Absolute Rotary Encoder, ABRA

For technical data, see document nr: [RE 15367](#)

Features

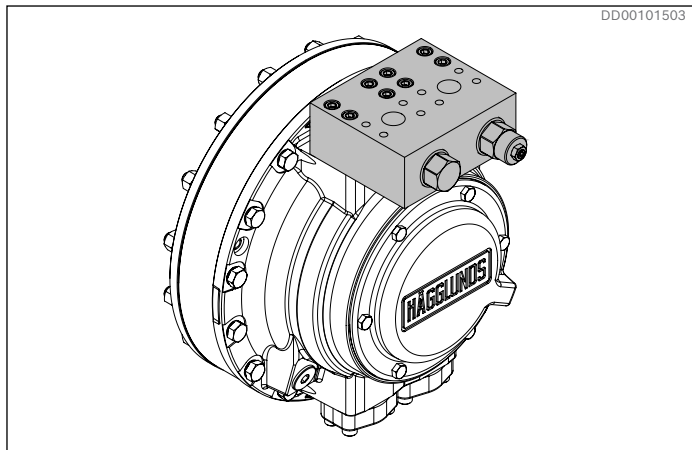
- ▶ Robust with inductive sensing principle
- ▶ 8192 steps per revolution for good positioning capabilities
- ▶ Singleturn or multiturn
- ▶ Many communication interfaces available to facilitate system integration
- ▶ Encoder protection class IP67 / IP66

Description

The advantage of absolute rotary encoders is that they, unlike incremental encoders, directly outputs the exact position of the shaft as soon as they are switched on. Every point of rotation has a unique position value and it can keep the position information even if power temporarily is lost, which means that there is no need to turn the shaft to a reference point to determine the position.

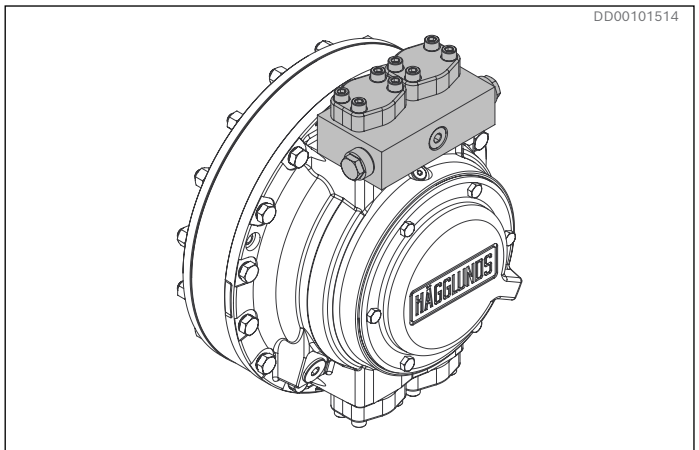
13.6 Valves

13.6.1 Counter balance valve, VCBCA 480



For technical data, see document: [RE 15378](#)

13.6.2 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
- ▶ Counter balance function with low pilot pressure
- ▶ Pilot pressure independent of load pressure

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

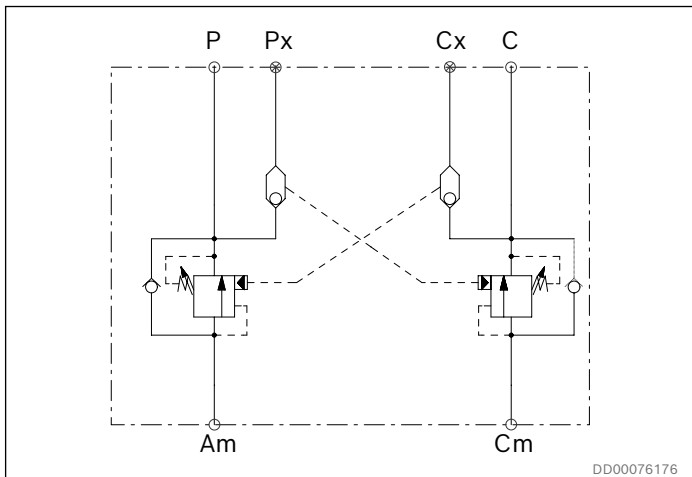


Fig. 110: Hydraulic circuit VCBCA 480 00 00 A

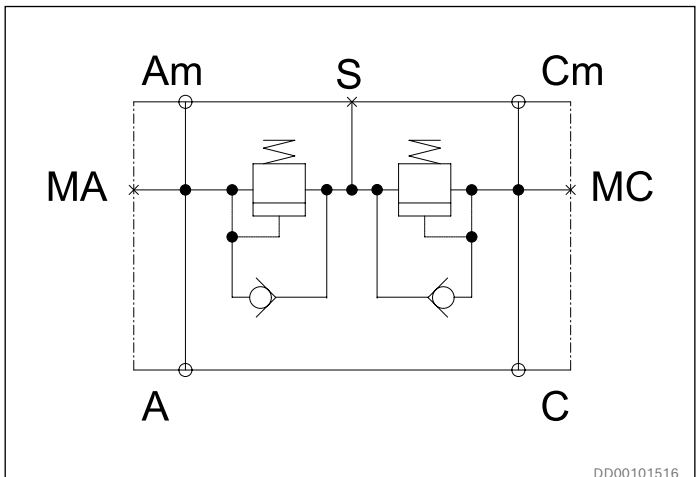
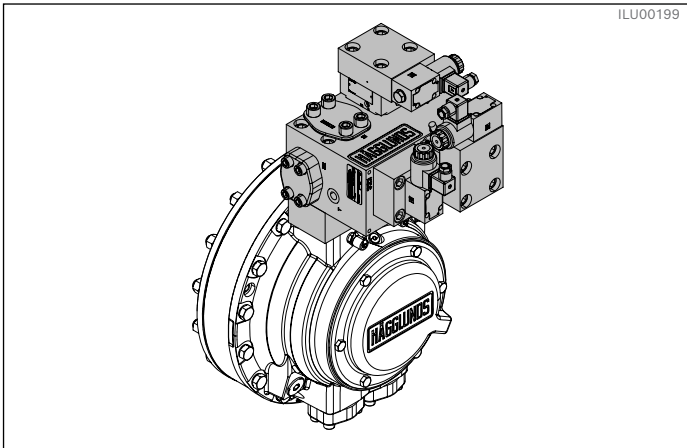


Fig. 111: Hydraulic circuit COCA 300

13.6.4 Hydraulic quick stop valve, VQCC 800



For technical data, see document: [RE 15374](#)

Features

- ▶ Compact and robust design
- ▶ Mounted directly on Hägglunds motors
- ▶ Fulfills performance level D category 3 according to EN ISO 13849
- ▶ Low pressure loss

The hydraulic quick stop valve VQCC 800 is designed to stop a roll mill without stopping the electric motor and without any need of a mechanical brake. The quick stop valve VQCC 800 is equipped with two active stop cartridge valves to achieve performance level D and category 3 according to EN ISO 13849 and to fulfill DIN EN 1417. The stop is done by blocking the oil flow from the Hägglunds hydraulic motor. A very short braking time is possible due to the small moment of inertia and very quick response from the hydraulic valve.

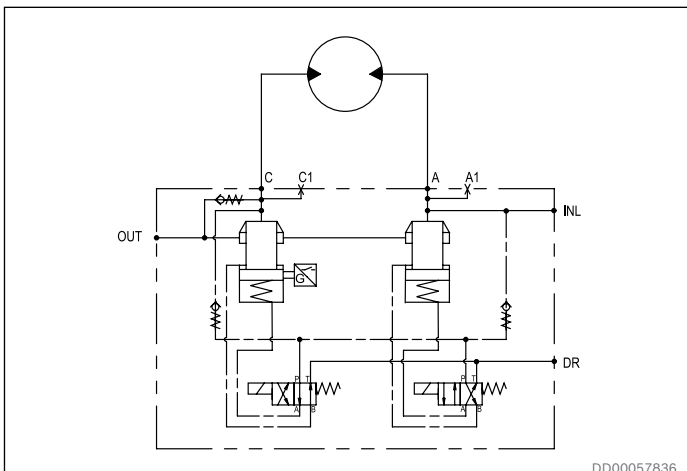
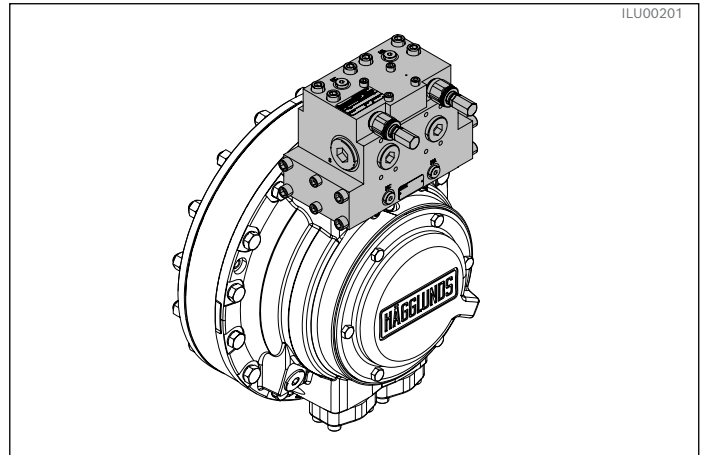


Fig. 113: Hydraulic circuit VQCB 800

13.6.3 Cross-over valve, COCC 1200



For technical data, see document: [RE 15392](#)

Features

- ▶ Compact and robust design
- ▶ Mounted directly on Hägglunds motors
- ▶ Protects the motor from high pressure peaks
- ▶ Provides cavitation protection
- ▶ Oil exchange system for closed loop as option

The valve COCC 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).

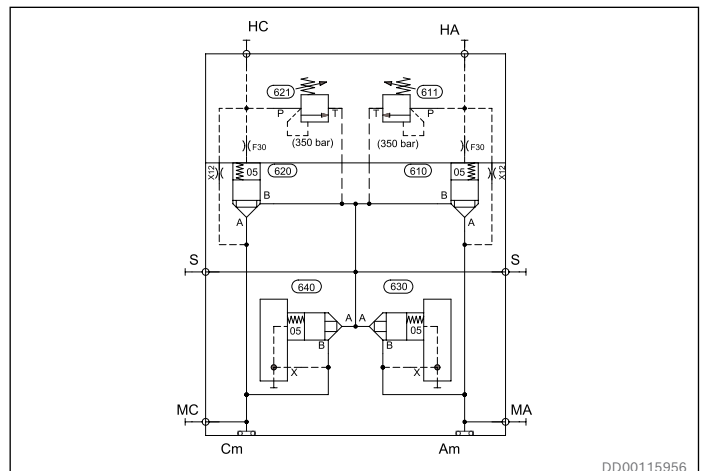
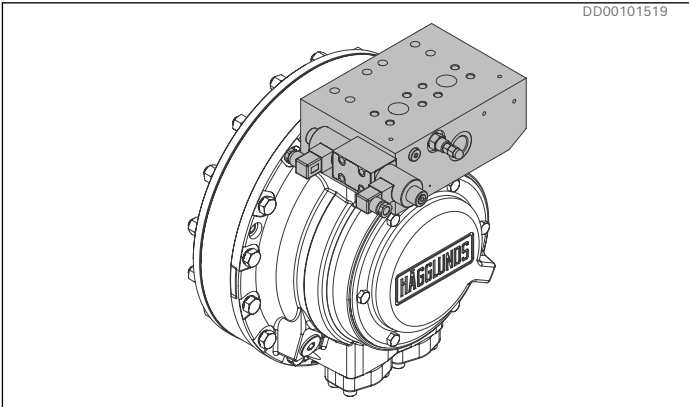


Fig. 112: Hydraulic circuit COCC 1200 1

13.6.5 Freewheeling valve, VFWCB 600



DD00101519

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

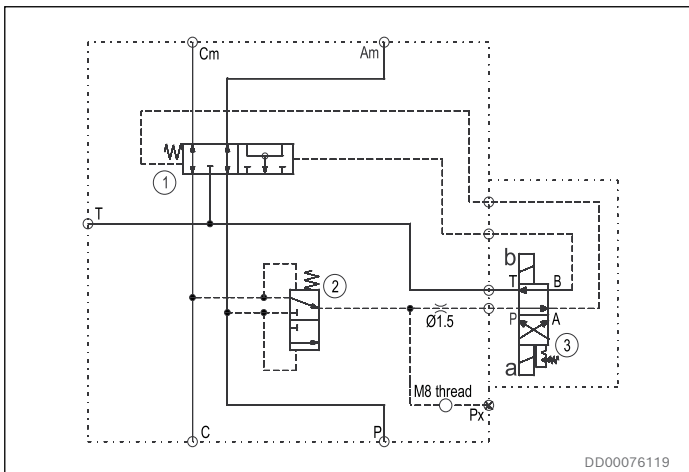
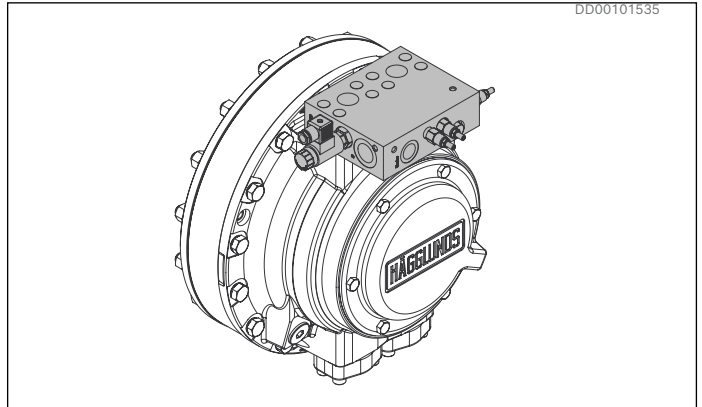


Fig. 114: Hydraulic circuit VFWCB 600 E

13.6.6 Brake opening valve, VBO



DD00101535

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.

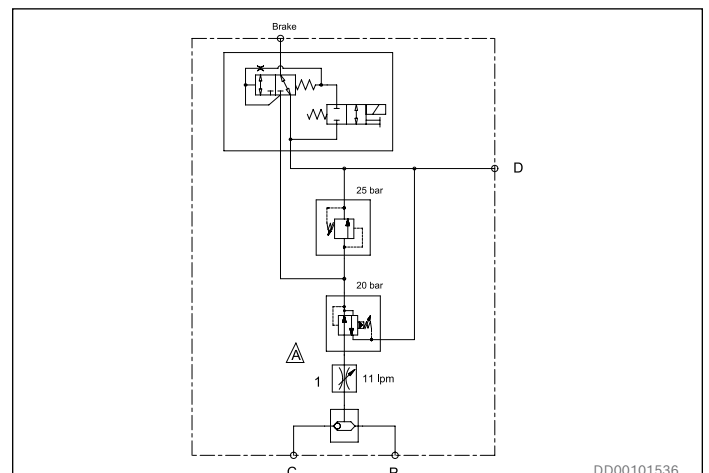
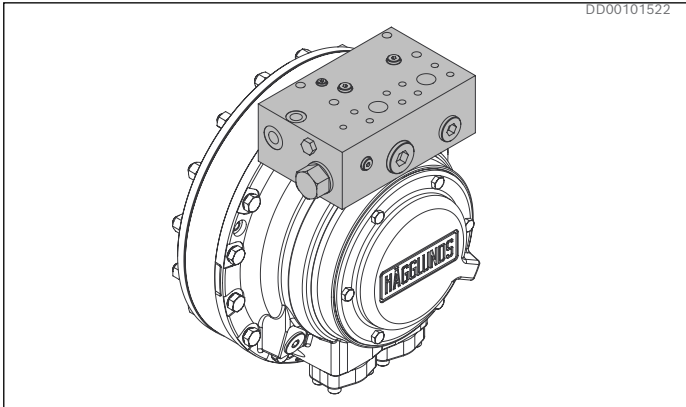


Fig. 115: Hydraulic circuit VBO E

13.6.7 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 CA 50 to CA 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.

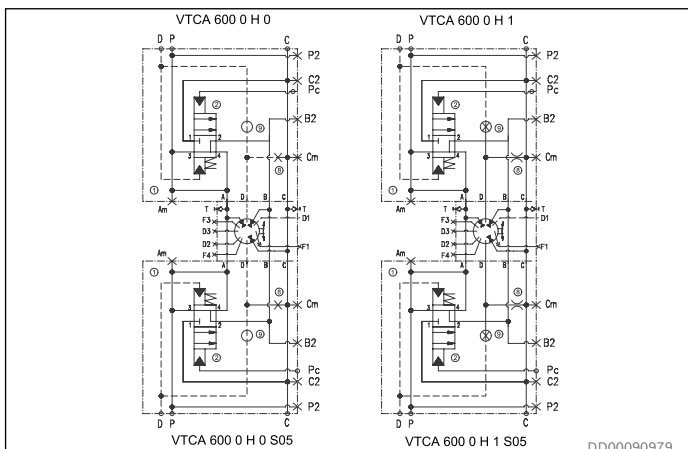


Fig. 116: Hydraulic circuit with S-index 06 motor + VTCA 600 std + VTCA 600 S-index 05

13.7 Brakes

13.7.1 Hägglunds BICA

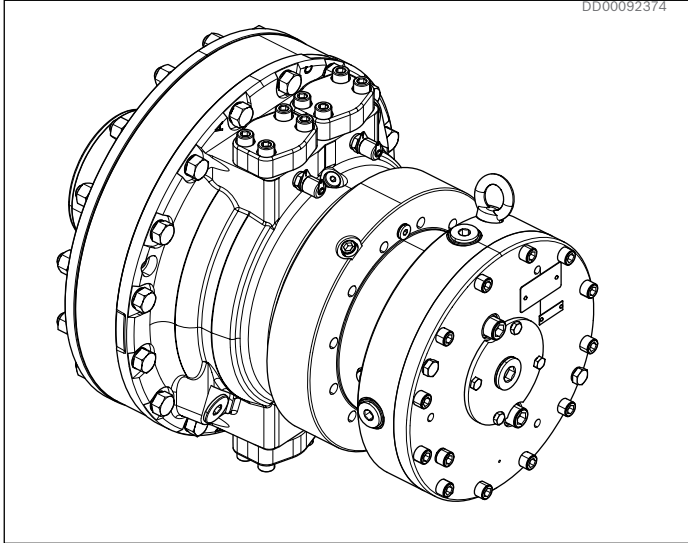


Fig. 117: CA motor with BICA brake

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 motors¹⁾ prepared for brake (option B). The brake is designed to be used as parking brake only.

13.7.2 Hägglunds MDA

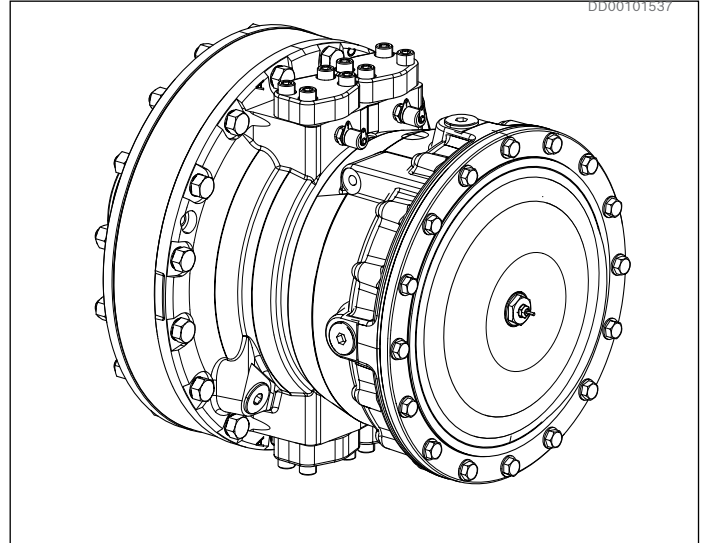


Fig. 118: CA motor with MDA brake

For technical data, see document: [RE 15358](#)

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 motors¹⁾. 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.

Note!

If direct-mounted brake MDA 5-10 is used, service life of the motor will be reduced and a Bosch Rexroth representative must be contacted!

1) Not valid for CA 280

13.8 Kit for harsh and marine environment

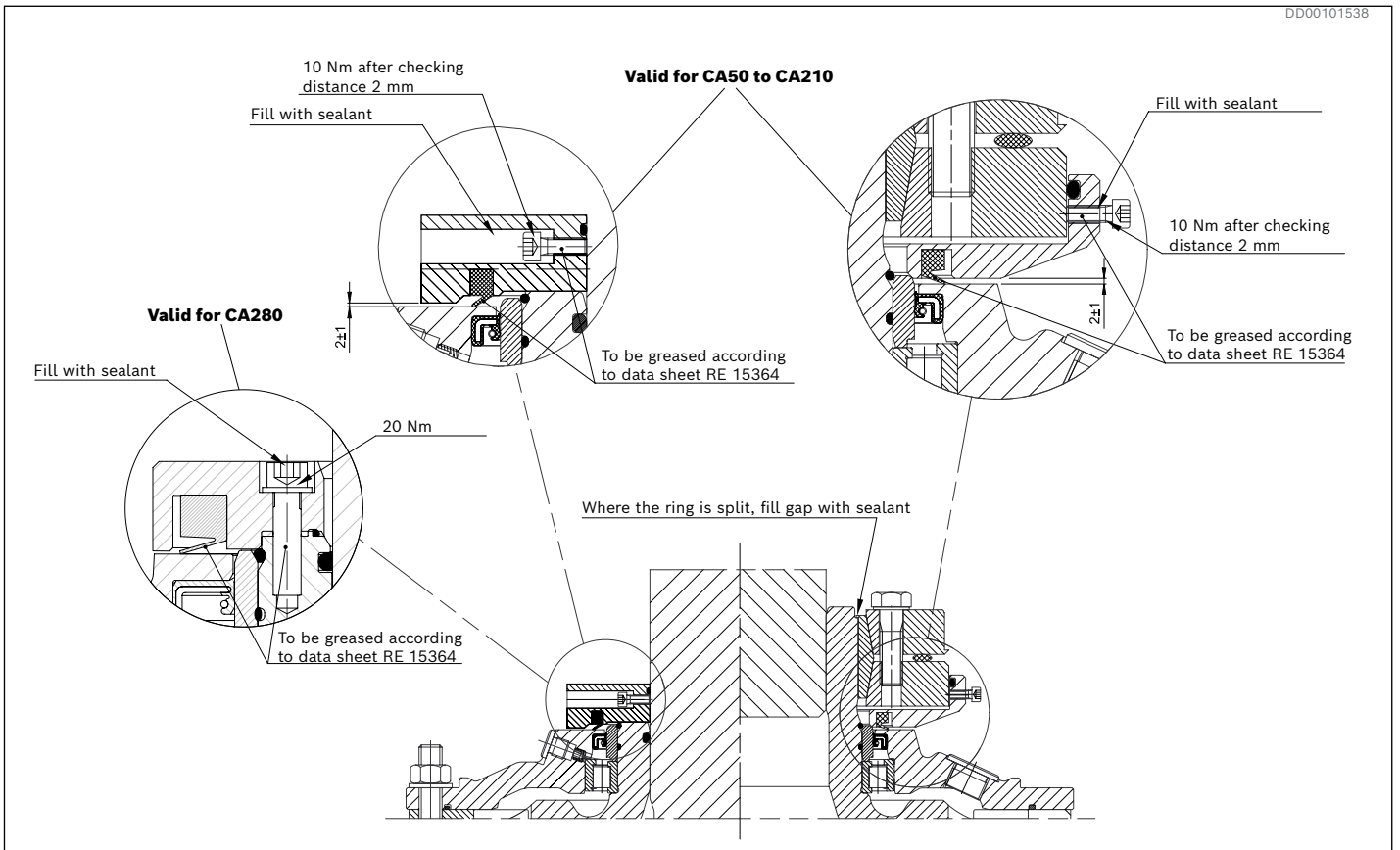


Fig. 119: Kit for harsh and marine environment

For technical data, see document: [RE 15364](#)

Features

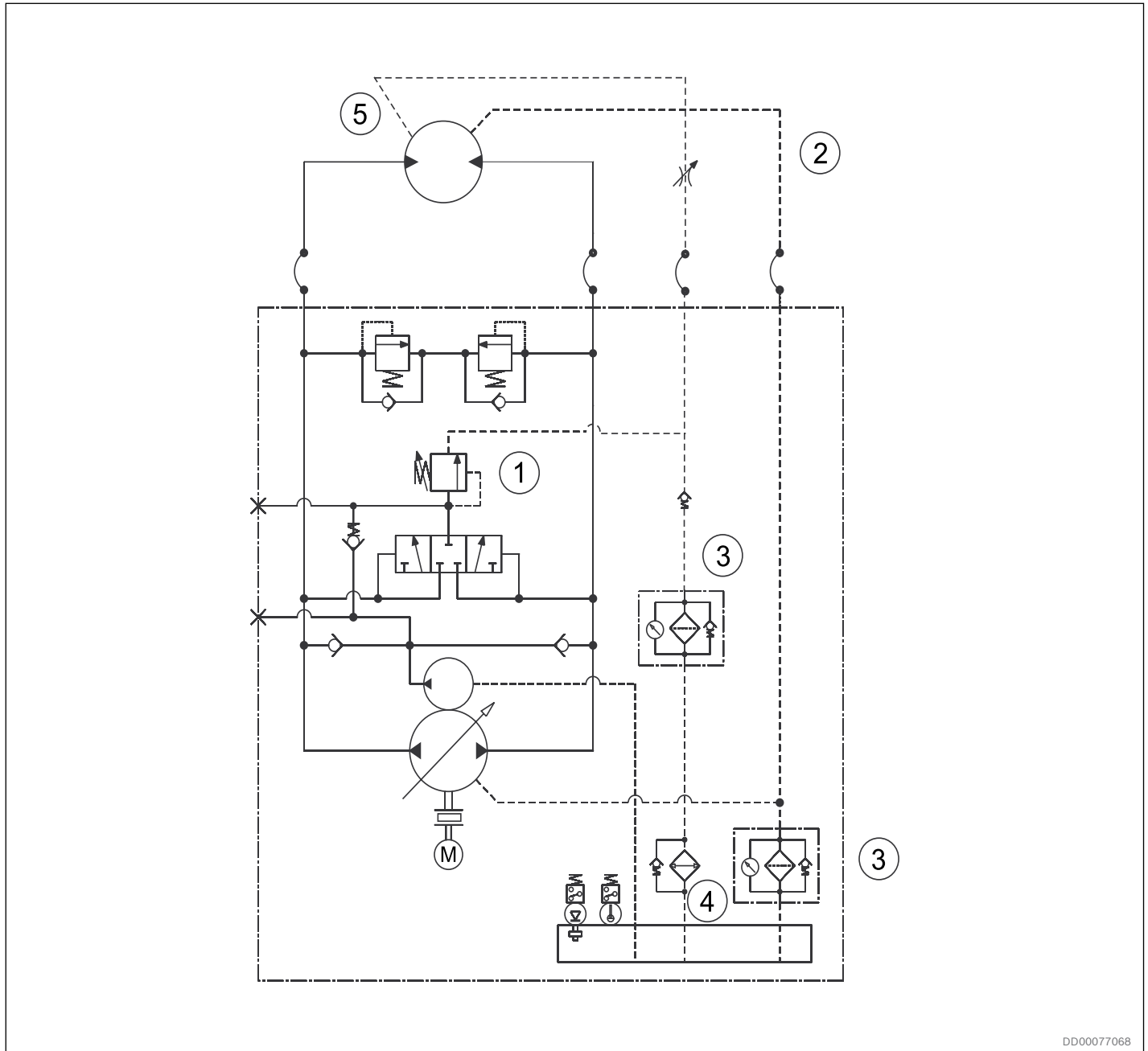
- ▶ Protects the motor main seal
- ▶ Designed for harsh and marine environments
- ▶ Extends the life time of the main sealings

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.

14 Circuit design

14.1 Closed circuit



DD00077068



























Fig. 120: Example closed circuit

Things to consider:

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

15 Related documents

Title	Document no	Document type
 Häggulunds CA	RE 15305-WA	Installation & maintenance manual
 Häggulunds Atom, CA, CBp 140	RE 15424-X-B2	ATEX Appendix - Installation & maintenance manual
 Häggulunds products for explosive environments	RE 15417-X-B1	General Information ATEX units
 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 280 S	RA30085162	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
 CA 100 S101	RA30082307	Dimension drawing
 CA 140 S101	RA30082919	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 280 splines, flange mounted	RA30087095	Dimension drawing
 Shaft CA 280 splines, external load and torque arm	RA30082601	Dimension drawing
 Shaft CA 140 S15 with splines, flange mounted	278 2302	Dimension drawing

 Title	Document no	Document type
 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	RA30087044	Dimension drawing
 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 VQCC 800	RE 15374	Data Sheet
 Cross-over valve, Hägglunds COCC 1200	RE 15392	Data Sheet
 Counter balance valve Hägglunds VCBCA 480	RE 15378	Data Sheet
 Freewheeling valve, Hägglunds VFWCB 600	RE 15380	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

For dimension drawings please contact your Bosch Rexroth representative.



HÄGGLUNDS

Bosch Rexroth AB

SE-895 80 Mellansel

tel: +46 (0)660 870 00

www.hagglunds.com

Häggglunds is a brand of Rexroth, a leading global supplier of drive and control technologies. Häggglunds solutions enrich a comprehensive Rexroth portfolio.

The data specified above only serve to describe the product. As our products are constantly being further developed, no statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.