

ENGINEERING
TOMORROW



Technical Information

THORX Motors

CLM C



Revision history

Table of revisions

Date	Changed	Rev
November 2025	Shaft load curve added	0102
July 2025	First edition	0101

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Introduction

Our THORX Cam Lobe Motor product line delivers improved performance and higher efficiency to match the evolving customer demands in mobile transmissions. The **CLM C** has been developed in close collaboration with our customers and are based on a well-proven radial piston motor design, also known as a Cam Lobe motor, which is commonly used in closed-circuit medium power propel applications. THORX motors are designed to be combined with other products in systems to transfer and control hydraulic power.

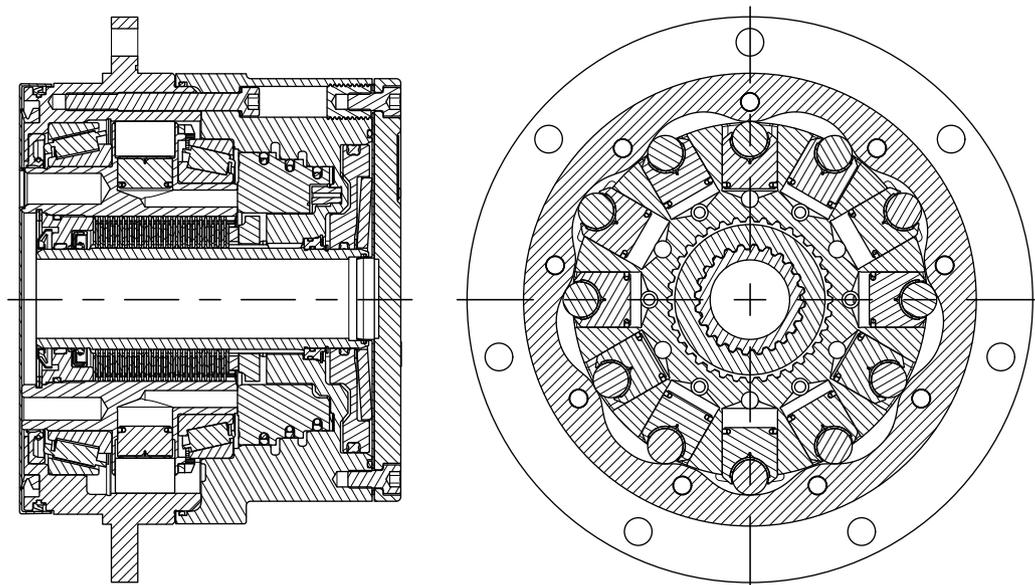
Danfoss has designed the CLM C to fit perfectly for compaction equipment, such as Tandem Rollers. It is optimized for these applications with focus on physical size, longer lifetime, performance, and total installed cost.

The **THORX Motor** family provides a range of products during the next years to cover other applications and new markets. We engineer a better future.

Customer benefits

Designed for compact drives, our THORX Motors are engineered with our customers in mind. Tapered roller bearings allow for high radial loads, while the novel design of the rotating group provides a market leading high efficiency. Combined with an integrated multi-disc parking brake the CLM C motors delivers a longer lifetime than previously made possible.

Functional Description



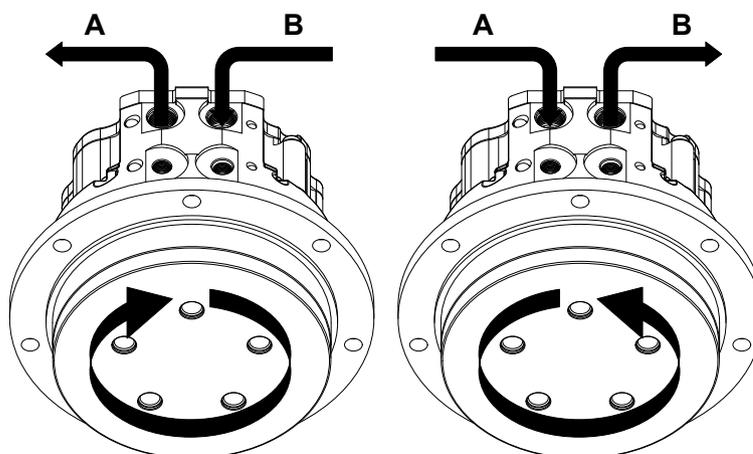
Sectional drawing of CLM 5 C

The Cam Lobe principle

A Cam Lobe Motor is a type of radial piston motor which is a Low Speed High Torque hydraulic motor. It differs from other radial piston motor designs by utilizing a cam ring with multiple lobes and pistons. The pistons move against the cam profile and thereby rotate the motor, either clockwise or counterclockwise. The design of the motors can have either stationary housing and rotating shaft, or a stationary shaft and rotating house. The Cam Lobe motor are in particular known for its high starting efficiency and high efficiency in general.

The Cam Lobe technology is not a new technology, it has been around for more than 60 years, however Danfoss have now refined the technology to design a whole new line of hydraulic motors for mobile off-highway machinery, known as THORX Motors. Cam Lobe motors are typically applied in direct drive solutions because of its ability to provide full torque without the need for a gearbox, opposed to high-speed motors such as axial piston type.

Bidirectional design



Functional Description

The THORX motors are based on a bidirectional design which provides the same performance in clockwise rotation as counterclockwise rotation. This provides a clear benefit in drivetrain solutions where the motor needs to reverse and don't go down in performance.

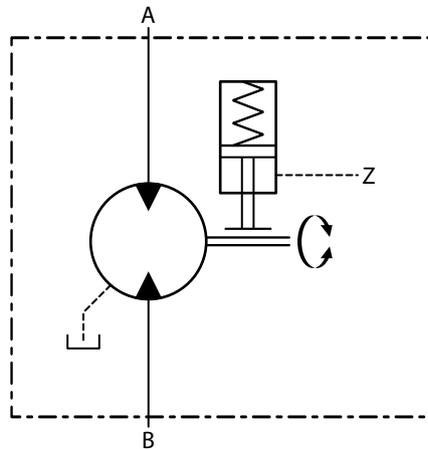
Rotation direction	Inlet port
Clockwise	B port
Counter-clockwise	A port

Tapered roller bearings

For enhanced durability and load-handling capability, CLM C motors are fitted with dual tapered roller bearings. These bearings are specifically designed to support substantial axial and radial forces, ensuring optimal performance under demanding operating conditions, throughout the motors lifetime.

Integrated parking brake

The integrated parking brake is a 3,170 Nm [28,325 lbf·in] multi-disc static friction brake. The brake discs are compressed by the disc spring and released by the application of brake pressure. To release the brake is required a release pressure of 20 bar [290 psi] via the Z port. This type of brake is commonly referred to as SAHR, or Spring Applied Hydraulic Release.



Motor with parking brake

⚠ Warning

Never apply more than max. 40 bar pressure to the Z port.

⚠ Warning

While the parking brake is designed for 100 emergency dynamic stops during its lifetime, it is intended solely for static use and should not be applied while the motor is in use. Applying the brake while driving can damage the brake.

Shaft seal

The CLM C features a NBR shaft seal as standard options. This shaft seal is characterized by its ability to handle high temperature operation.

Functional Description

Shaft Seal			CLM C
Max. pressure, case drain	bar [psi]	Continuous	1 [15]
		Intermittent ¹	3 [44]
		Peak ²	10 [145]

¹ Intermittent operation: the permissible value may occur for less than 1 min per incident and not exceeding 2 % of duty cycle

² Peak load: the permissible value may occur for max. 1 % of every minute

Operating parameters

System pressure

System pressure is the differential pressure between high pressure system ports (A and B ports). It is the dominant operating variable affecting hydraulic unit life. High system pressure, which results from high load, reduces expected life. Hydraulic unit life depends on the speed and normal operating, or weighted average, pressure that can only be determined from a duty cycle analysis.

Application pressure is the high pressure relief or pressure limiter setting normally defined within the order code of the pump. This is the applied system pressure at which the driveline generates the maximum calculated pull or torque in the application.

Maximum working pressure is the highest recommended application pressure. Maximum working pressure is not intended to be a continuous pressure. Propel systems with application pressures at, or below, this pressure should yield satisfactory unit life given proper component sizing.

Maximum pressure is the highest allowable application pressure under any circumstance. Application pressures above Maximum Working Pressure will only be considered with duty cycle analysis and factory approval. Pressure spikes are normal and must be considered when reviewing maximum working pressure.

Case pressure

Under normal operating conditions, the rated case pressure must not be exceeded. During cold start case pressure must be kept below **maximum intermittent case pressure**. Size drain plumbing accordingly.

Caution

Possible component damage or leakage

Operation with case pressure in excess of stated limits may damage seals, gaskets, and/or housings, causing external leakage. Performance may also be affected since charge and system pressure are additive to case pressure.

Temperature

The high temperature limits apply at the hottest point in the motor, which is normally the motor case drain. The **CLM C** motors should generally be run at or below the rated temperature.

The **maximum intermittent temperature** is based on material properties and should never be exceeded.

Cold oil will generally not affect the durability of the transmission components, but it may affect the ability of oil to flow and transmit power. Therefore, temperatures should remain 16°C [30°F] above the pour point of the hydraulic fluid.

The **minimum temperature** relates to the physical properties of component materials. Size heat exchangers to keep the fluid within these limits. Danfoss recommends testing to verify that these temperature limits are not exceeded.

Operating parameters

Viscosity

For maximum efficiency and bearing life, ensure the fluid viscosity remains within the recommended range.

The **minimum viscosity** should be encountered only during brief occasions of maximum ambient temperature and severe duty cycle operation.

The **maximum viscosity** should be encountered only at cold starts.



Attention

Monitor oil cleanliness at regular intervals.

Hydraulic fluid specifications

Features		Units	CLM C
Viscosity	Intermittent ¹⁾	mm ² /sec [SUS]	5 [42]
	Minimum		7 [49]
	Recommended range		12 - 80 [66 - 370]
	Maximum (cold start) ²⁾		2,000 [9,375]
Temperature range ³⁾	Minimum (cold start)	°C [°F]	-40 [-40]
	Maximum continuous		85 [185]
	Maximum intermittent		115 [240]
Cleanliness per ISO 4406			22/18/13
Hydraulic fluid class			ISO VG 46

¹⁾ The permissible value may occur for less than 1 min per incident and not exceeding 2 % of duty cycle

²⁾ Cold start is defined as less than 3 minutes and with pressure not exceeding 50 bar [725 psi]

³⁾ At the hottest temperature point, normally case drain port

CLM 5 C motor

On the following pages you will find technical specifications of the CLM 5 C.



CLM 5 C motor

Technical Data

Specifications

CLM C			Frame size 5					
Nominal size			270	340	410	455	500	545
Geometric displacement	cm ³ [in ³]		272 [16.6]	340 [20.7]	408 [24.9]	456 [27.8]	502 [30.6]	545 [33.3]
Maximum speed	min ⁻¹ [rpm]		120	110	100	90	82	75
Maximum torque	Nm [lbf·in]	Continuous	1,080 [9,575]	1,350 [11,965]	1,625 [14,375]	1,815 [16,055]	1,995 [17,675]	2,170 [19,190]
		Peak ¹⁾	1,730 [15,325]	2,165 [19,155]	2,595 [22,990]	2,900 [25,695]	3,195 [28,285]	3,470 [30,710]
Maximum power	kW [hp]	Continuous	18 [24]					
System pressure	bar [psi]	Nominal pressure ²⁾	250 [3,625]					
		Max. working pressure (peak ¹⁾)	380 [5,510]					
		Max. pressure (peak ¹⁾)	400 [5,800]					
		Max. pressure in Inlet port (peak ¹⁾)	430 [6,235]					
Minimum starting torque	Nm [lbf·in]	at max. press. drop cont.	810 [7,185]	1,015 [8,975]	1,220 [10,780]	1,360 [12,035]	1,500 [13,360]	1,625 [14,390]
		at max. press. drop peak ¹⁾	1,385 [12,255]	1,730 [15,320]	2,075 [18,390]	2,320 [20,550]	2,555 [22,620]	2,775 [24,560]
Weight ³⁾	kg [lbs]		32 [70.5]					

¹⁾ Peak operation: the permissible values may occur for max. 1% of every minute

²⁾ Nominal values are guide values for max. continuous operation

³⁾ Depending on product configuration

Caution

Do not exceed Δ pressure rating.

Warning

The motor should not be run unloaded at above 100 rpm during the running in period.

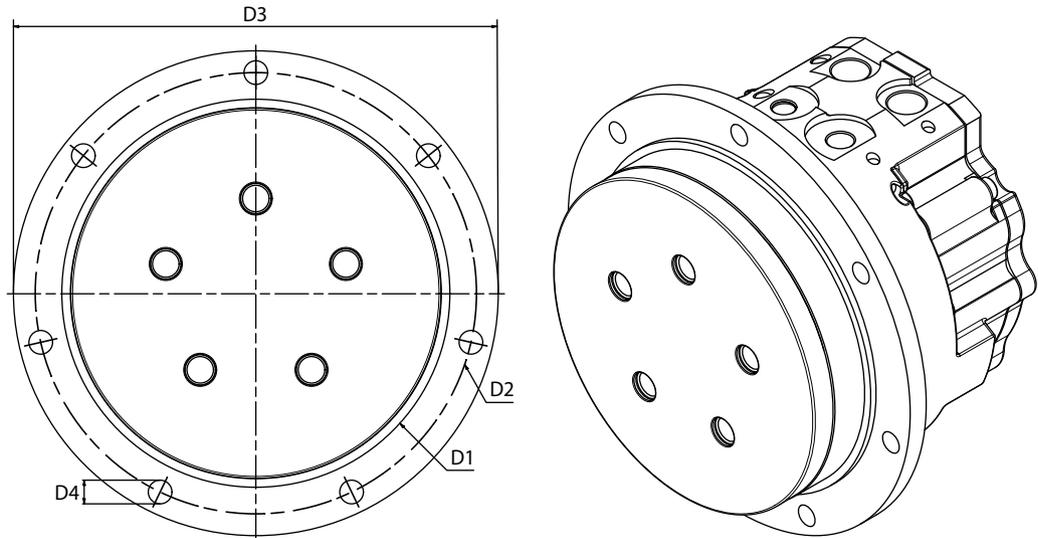
For operation in series with return pressure higher than 40 bar please consult your local sales contact.

For long term operation with speeds under 5 rpm please consult your local sales contact.

CLM 5 C motor

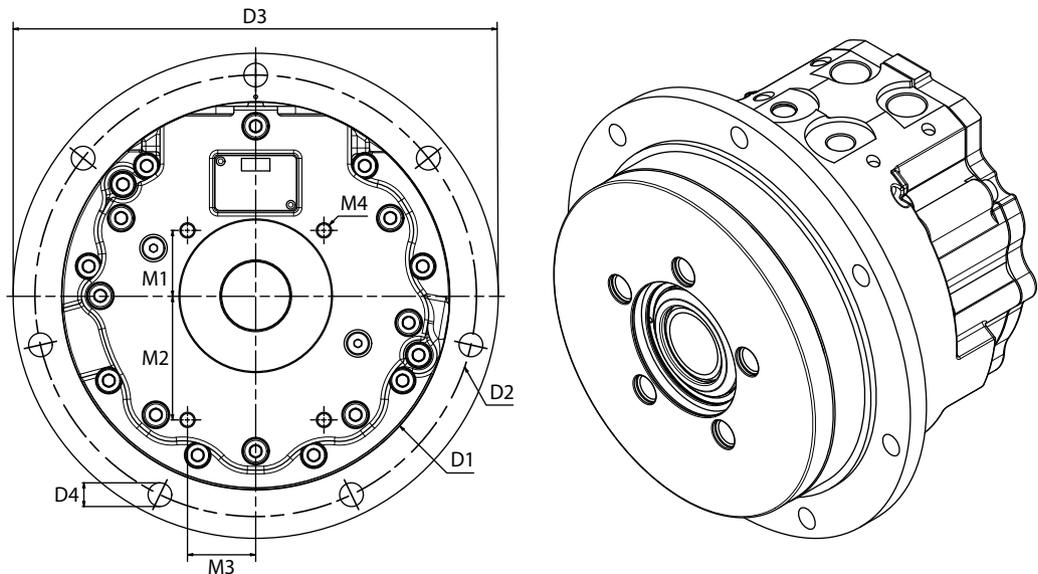
Housings

C4A: 7-hole circular mounting flange



Motor		D1	D2	D3	D4
CLM 5 C	mm	Ø204.9	Ø233	Ø256	7 x Ø12.5

C4B: 7-hole circular mounting flange with rear mount



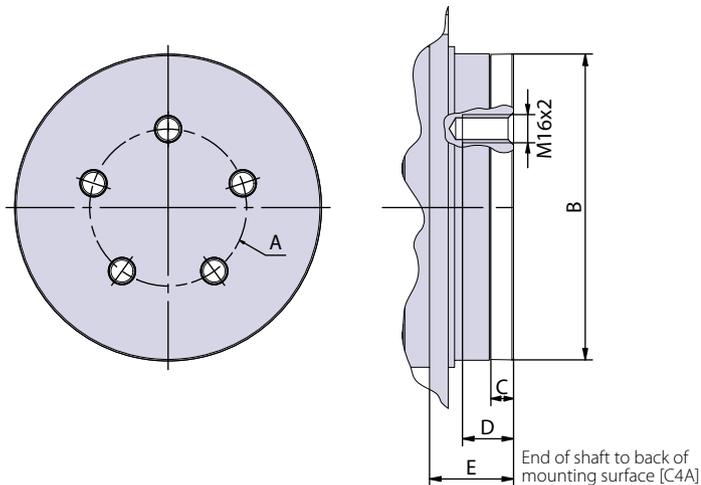
Motor		D1	D2	D3	D4
CLM 5 C	mm	Ø204.9	Ø233	Ø256	7 x Ø12.5

Motor		M1	M2	M3	M4
CLM 5 C	mm	34.5	65.5	36.0	4 x M8x1.25

CLM 5 C motor

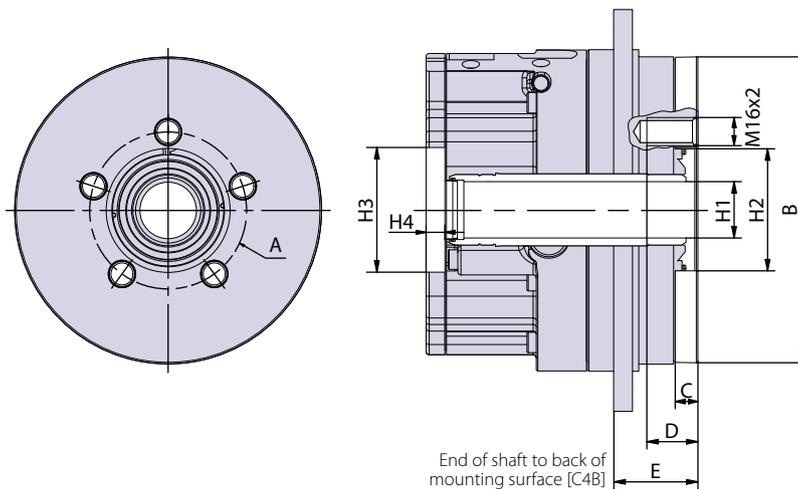
Shafts

C01: Ø196 thread hole flange with 5 x M16 – BC100 mm



Shaft		A	B	C	D	E
Ø196 thread hole flange	mm	100	196	14.5	30.5	53.7

CH1: Ø36 Hollow shaft with 5 x M16 – BC100 mm



Shaft		A	B	C	D	E
Ø36 Hollow shaft	mm	100	196	14.5	30.5	53.7

Shaft		H1	H2	H3	H4
Ø36 Hollow shaft	mm	Ø36	Ø78	Ø80	12.0

CLM 5 C motor

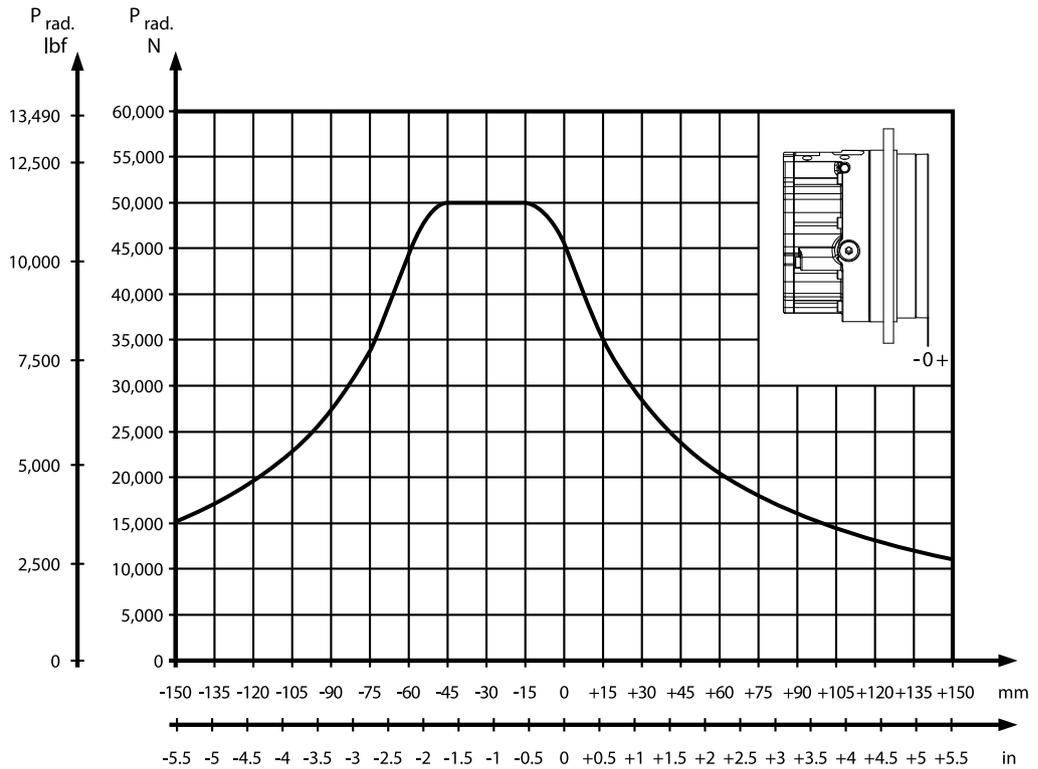
Radial load capacity

The permissible radial load on the shaft is shown for an axial load of 0 N as a function of the distance from the front of the shaft to the point of load application, applicable for the shown shaft.

The output shaft runs in tapered roller bearings that permit high axial and radial forces.

The curve is based on B10 bearing life (2000 hours or 12 000 000 shaft revolutions at 100 rpm and 250 bar pressure) at rated output torque, when mineral-based hydraulic oil with a sufficient content of anti-wear additives, is used.

C01: Ø196 thread hole flange with 5 x M16 – BC100 mm

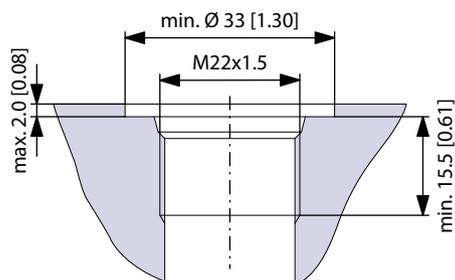


[To understand maximum permissible radial load for other available shaft options please contact Danfoss for a bearing life review.](#)

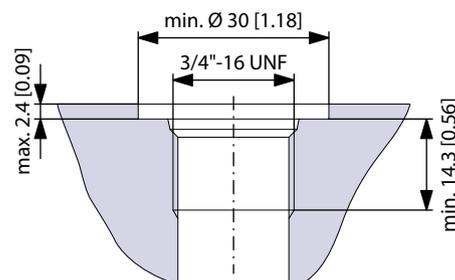
CLM 5 C motor

Port thread options

Inlet ports

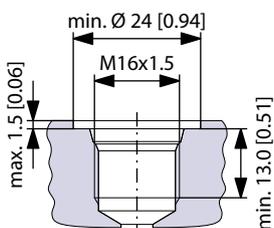


1B M22 x 1.5 ISO 9974-1

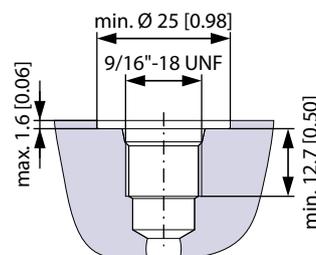


3A UNF 3/4" – 16 (ISO 11926-1)

Case drain port

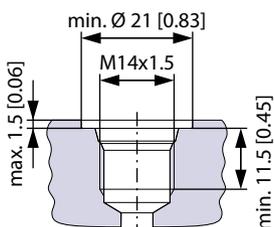


B M16 x 1.5 ISO 9974-1

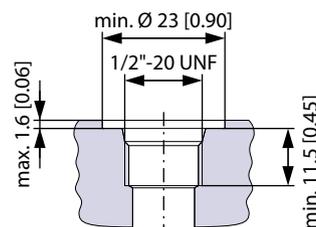


K UNF 9/16" – 18 (ISO 11926-1)

Brake release port



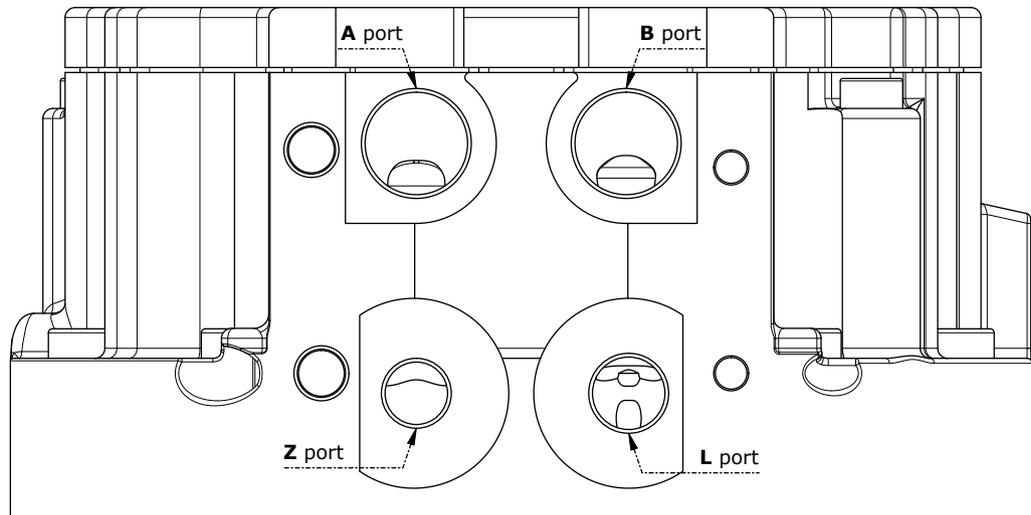
A M14 x 1.5 ISO 9974-1



K UNF 1/2" – 20 (ISO 11926-1)

CLM 5 C motor

Manifold layout

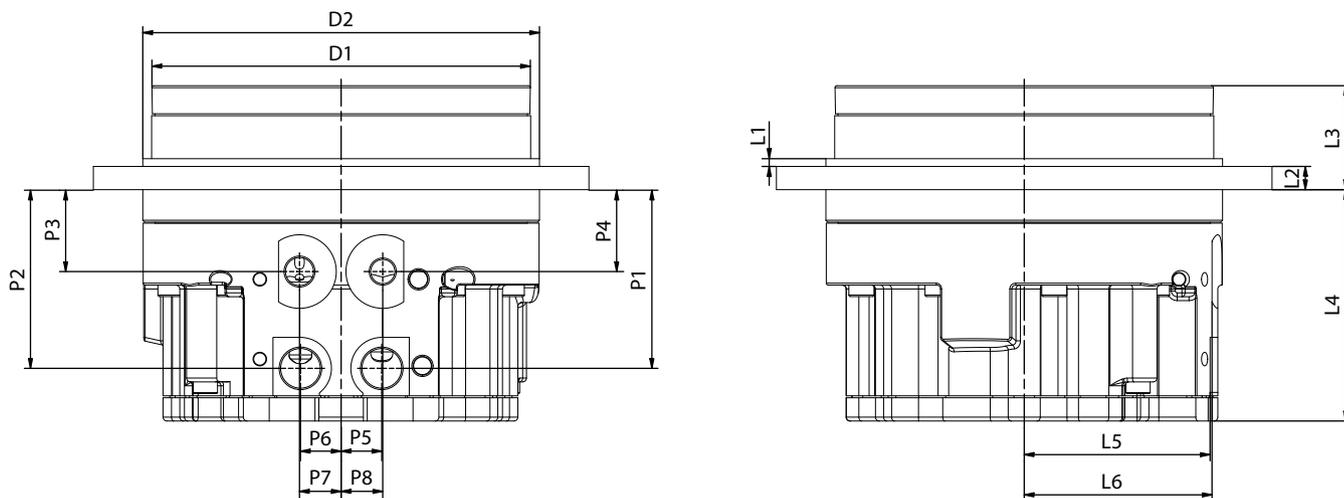


Thread type	Inlet ports (A+B)	Case drain port (L)	Brake release port (Z)
Metric (ISO 9974-1)	M22 x 1.5	M16 x 1.5	M14 x 1.5
UNF (ISO 11926-1)	3/4 " - 16 UNF	9/16 " - 18 UNF	1/2 " - 20 UNF

CLM 5 C motor

Dimensions

C4x: 7-hole circular mounting flange Ø233



Motor		D1	D2
CLM 5 C	mm	Ø196	Ø204.9

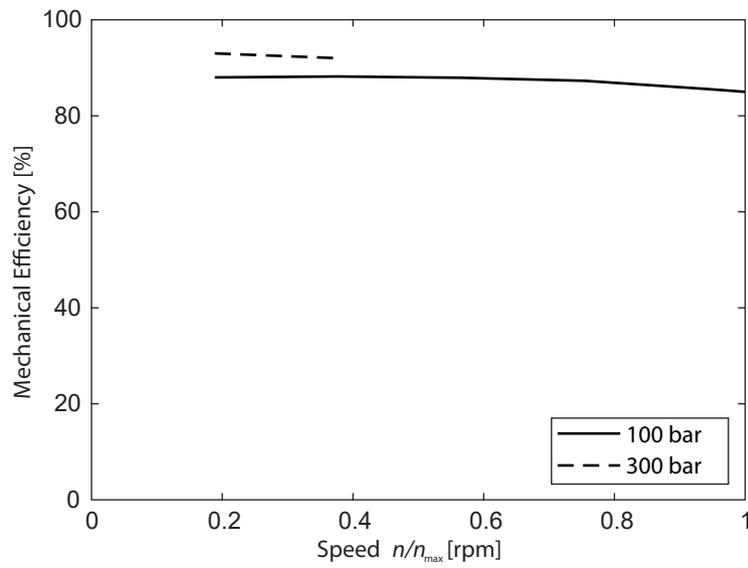
Motor		P1	P2	P3	P4	P5	P6	P7	P8
CLM 5 C	mm	92.3	92.3	42.3	42.3	21.0	21.0	21.5	21.5

Motor		L1	L2	L3	L4	L5	L6
CLM 5 C	mm	4.0	12.0	53.7	119.5	96.2	97.2

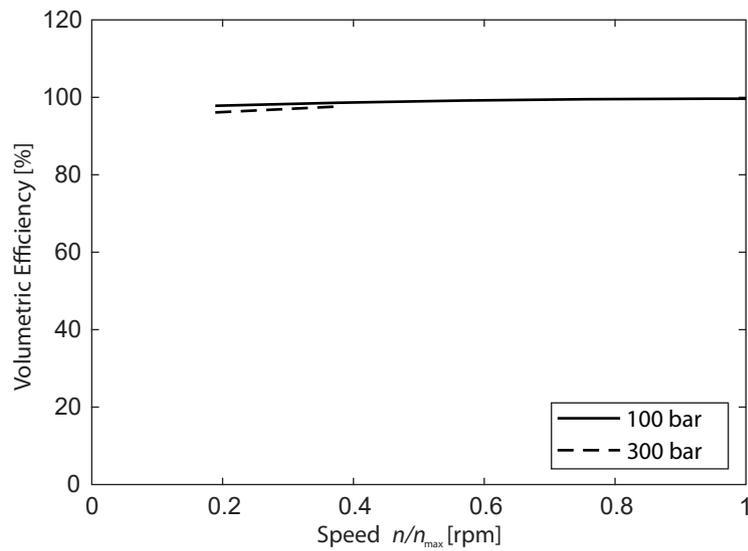
CLM 5 C motor

Efficiency curves

Mechanical efficiency



Volumetric efficiency



Ordering Information

Model Code (A-B-C-D-E-F-G)

A	B	C	D	E	F	G	H	I	J ₁	J ₂	J ₃	K	L	M ₁	M ₂	N	O	P ₁	P ₂	P ₃													
C	L	M	0	5	C				1	N				C	A	N							S	P	D	D	N	N	N	N	N	N	N

A – Product type

Code	Description
CLM	THORX motor

B – Frame size

Code	Description
05	Frame size

C – Housing type

Code	Description
C	Front case mounting flange

D – Nominal size

Code	Description
0270	272 cc/rev
0340	340 cc/rev
0410	408 cc/rev
0455	456 cc/rev
0500	502 cc/rev
0545	545 cc/rev

E – Single/Two-speed operation

Code	Type	Description
1AN	Single speed	Clockwise rotation (pressure to port B)
1BN		Counter-clockwise rotation (pressure to port B)

F – Mounting flange

Code	Type	Description
C4A	Circular flange	7-hole (Ø12.5) circular mounting flange Ø233
C4B		7-hole (Ø12.5) circular mounting flange Ø233 + High Speed motor mount on rear (M8x1.25)

G – Drive shaft

Code	Type	Description
C01	Thread hole flange	Ø196 thread hole flange with 5 x M16 – BC100 mm
CH1	Hollow shaft	Ø36 Hollow shaft

Ordering Information

Model Code (H-I-J-K-L)

A	B	C	D	E	F	G	H	I	J ₁	J ₂	J ₃	K	L	M ₁	M ₂	N	O	P ₁	P ₂	P ₃	
C	L	M	0	5	C								CA	N							

H – Brake options

Code	Description
CA	3.170 Nm spring applied hydraulic release multi-disc holding brake (ISO10265)

I – Sealing options

Code	Description
N	NBR – Standard sealing

J₁ – Porting options – Inlet ports

Code	Type	Description
1B	Metric threads	ISO Metric 9974-1, M22 x 1.5
3A	UNF threads	UNF (ISO 11926-1), 3/4 " - 16 UNF

J₂ – Porting options – Chase drain port

Code	Type	Description
B	Metric threads	ISO Metric 9974-1, M16 x 1.5
K	UNF threads	UNF (ISO 11926-1), 9/16 " - 18 UNF

J₃ – Porting options – Brake release port

Code	Type	Description
A	Metric threads	ISO Metric 9974-1, M14 x 1.5
K	UNF threads	UNF (ISO 11926-1), 1/2 " - 20 UNF

K – Speed sensor

Code	Description
N	Without speed sensor

L – Valve options

Code	Type	Description
NN	No flushing	No flushing

Ordering Information

Model Code (M-N-O-P)

A	B	C	D	E	F	G	H	I	J₁	J₂	J₃	K	L	M₁	M₂	N	O	P₁	P₂	P₃	
C	L	M	0	5	C				1	N				C	A	N					

M₁ – Paint options – Color

Code	Description
NN	No paint
SB	Standard black primer

M₂ – Paint options – Masking

Code	Type	Description
NN	No paint	No masking
10	Painted	Shaft and Mounting flange
1H	Painted	Shaft, Mounting flange and High Speed motor mount

N – Packaging

Code	Description
SP	Single pack

O – Name tag

Code	Description
DD	Danfoss name tag - with data matrix

P₁ – Special features – Internal

Code	Description
NN	None

P₂ – Special features – External

Code	Description
NN	None

P₃ – Special features – Other

Code	Description
NN	None

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