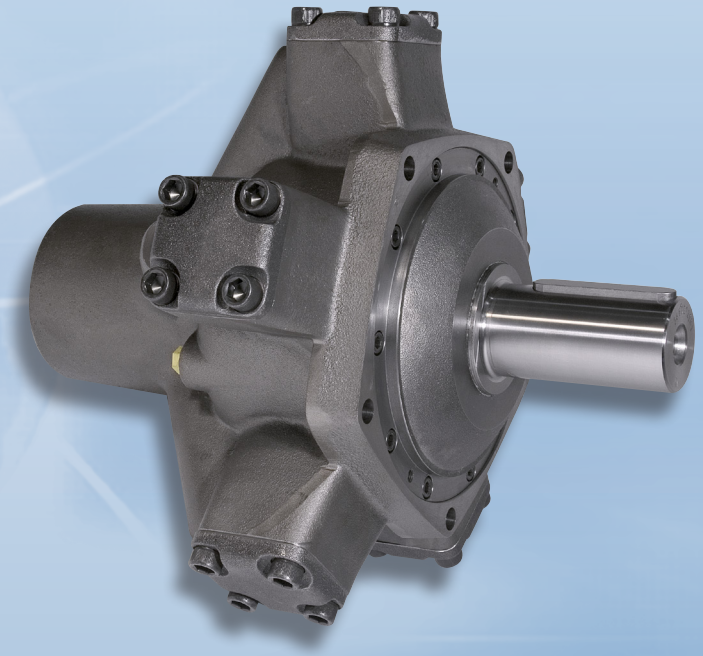
DÜSTERLOH Fluidtechnik

Hydraulic motors

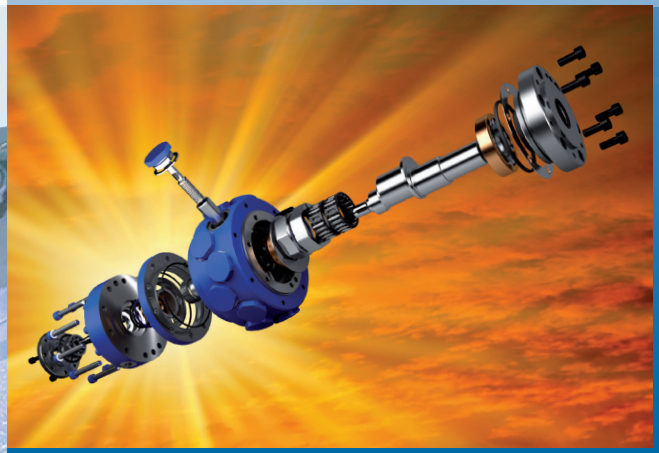


Radial piston motors

with fixed displacement

Series RM 250X - RM 900X

V_g = 250 ccm/rev - 900 ccm/rev



Doc.-No. HM1-015 EN

Features:

- many displacements for all applications
- very high starting torque
- high efficiencies, high constant power
- smooth running at all speeds
- high resistance to temperature shock
- reversible
- suitable for automatic control engineering
- suitable for inflammable and biologically degradable liquids
  special design - type "S18" with environmentally sealed, grease lubricated bearings, especially for operating with hardly combustible fluids containing water or glycol (HFA, HFB or HFC) available
- bearings for very long life
- quiet running properties
- design with:
  - instrument shaft
  - brake and / or gearbox..... (separate catalogue)
  - valve assembly..... (separate catalogue)

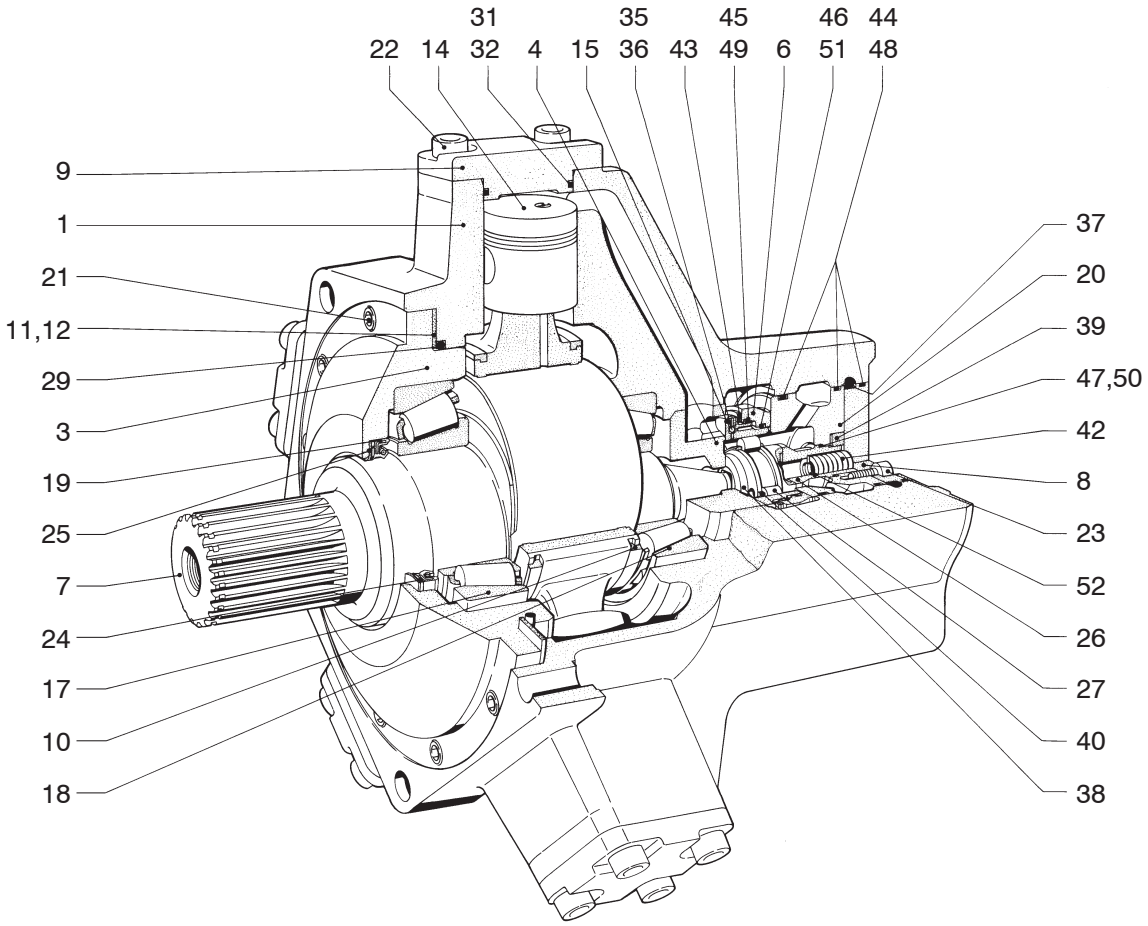
Contents

Designation **Page**

1. General Characteristics and Features

Design:
The radial piston hydraulic motor has been designed with a high load capacity.
It is efficient, has a low moment of inertia, and is capable of very low speeds and has excellent reversing properties. The concept features make it extremely quiet, being suitable for servo control systems with facility to work either as a motor or pump in booth directions.

2. Design and Operation



2.1 Drive Motor

Consists of a close grain, high strength, cast iron cylinder block. Eccentric crankshaft concept.

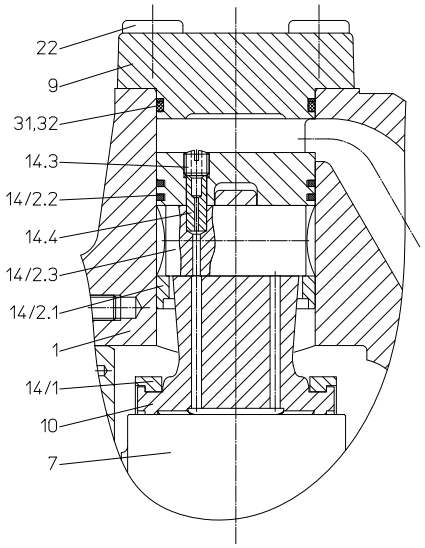
Operating characteristics:
Five radial piston/connecting rod assemblies (14) bear on the crankshaft (7) which is located by heavy duty tapered roller bearings.

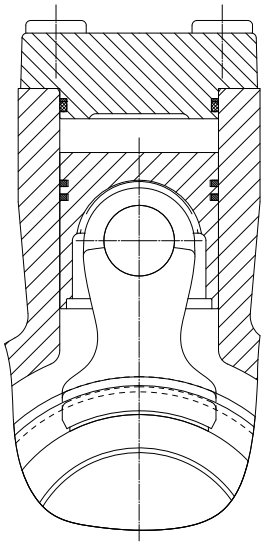
Crankshaft bearings (17 & 18):
Pre-loaded to take the thrust in booth axial directions, ensures silent running and allows heavy radial and axial loading on the output shaft (e.g. gear drives).

Connecting Rod (14.1):
The computer optimated design is hydrostatically balanced on the crankshaft with sufficient leakage to ensure lubrication and cooling. Friction losses are reduced to a minimum and, stick slip action is avoided at low speeds. High starting torque and running torque combined with high speeds are important features

of the design. Long service life is assured since con-rod slippers are uneffected by contamination and self-adjustable. Non-inflammable fluids have been used with success. Noise generation is also reduced by the cushioning effect of the hydrostatic bearing design.

The force is transmitted from the piston (14) to the connecting rod (14.1) via cylindrical, pressure-lubricated reciprocating bearing.
A special design feature is the bending stress relieved gudgeon pin.
This design is superior to a ball connection since friction losses are lower and all moving contact surfaces have a constant velocity.





2.2 Control

Design:
The oil flow to and from the cylinders is arranged through a flat faced distributor (4) which operates in the following manner:
Control rings (6 & 15) are mounted on eccentric (38) over roller bearings (27) and, together with the body (1) form two annular passages. When oil pressure is supplied to the motor, the crankshaft (7) and eccentric (38) rotate together, allowing the control rings (6 & 15) to open the inner and outer annular passages to the oil flow. Control rings (6 & 15) are axially loaded by means of wave springs (43) to maintain constant clearance across the face of the distributor block (4) under pressure. The eccentric (38) is also axially loaded by means of the hydraulic compensator (26) and spring (42). The design ensures low friction losses, self cleaning across the distributor face, immunity from the effects of contamination and a low leakage loss. The sinusoidal opening characteristics of the distributor results in smooth and quiet running at all speeds. A twoway shuttle valve (35 & 36) ensures that the inner and outer annular spaces between control rings (6 & 15) are always at the higher pressure applied to the motor.

3. Available Options:

The range is comprehensive, and the following features can be provided:

1. Choice of shafts
2. Double shaft extension
3. Motor and brake combinations
4. Geared motors; gear motor and brake combinations
5. Tachometer and other measuring attachments
6. Couplings, flanges
7. Viton seals
8. Special models for HFB and HFC non-flammable fluids
9. Direct valve assembly possible
10. Connection SAE J 518 High pressure (Typ: A1)

We are prepared to consider special designs.

Radial Piston Motor

RM		X		A1			

Displacement nominal size

255 cm³/rev =	250
360 cm³/rev =	355
442 cm³/rev =	450
491 cm³/rev =	500
704 cm³/rev =	710
904 cm³/rev =	900

Series type - motor
Actual series type = **X**

Drive shaft
Cylindrical with key acc. DIN 6885 = **Z**
Male involute splined shaft acc. DIN 5480 = **K**
Female involute splined shaft acc. DIN 5480 = **H**

Hydraulic ports
Flange connection radial
SAE J518C 1" - 6000 PSI for nominal size 250 - 500 = **A1**
SAE J518C 1¼" - 6000 PSI for nominal size 710 - 900 = **A1**

Sealing material
NBR, suitable for:
HLP - mineral oils to DIN 51524 part 2 = *****
FPM / FKM, suitable for:
phosphoric acid-ester and high temperatures = **V**

2nd shaft end
Without 2nd shaft end = *****
Cylindrical instrument shaft $ø10_{h6}$ for measuring device = **M**

Additional data
Brakes / gearboxes/ decoder/
special installation situations / higher leakage pressures, etc. = **detailed description**

* = no indication in type key

Example for ordering:

RM 900 X K A1 □ M □

- Additional data
- Instrument shaft $ø10_{h6}$
- Sealing material: NBR
- Flange: SAE J518C 1¼" - 6000 PSI
- Drive shaft: male involute splined shaft acc. DIN 5480
- Series type: X
- Displacement: V_g = 904 cm³/rev
- Radial Piston Motor

All characteristic quantities at v = 36 mm²/s; Θ = 45°C; p_{outlet} = without pressure

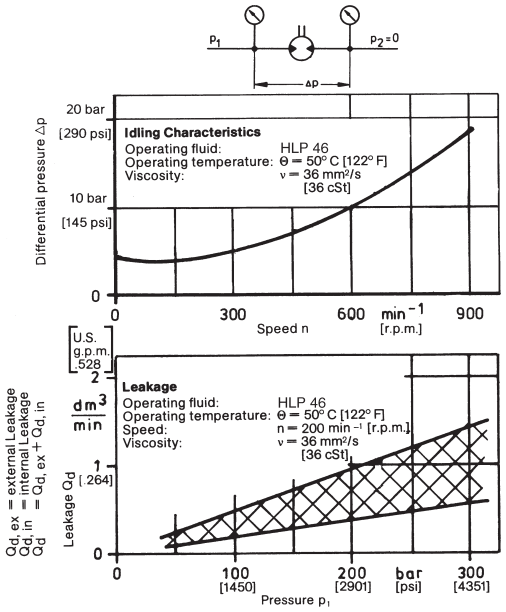
Nominal size			**NS**	**250**	**355**	**450**	**500**
Displacement		V_g	cm³/rev	255	360	442	491
Theoretically specific torque		$T_{spec.\ theor.}$	Nm/bar	4,1	5,7	7,0	7,8
Average specific torque		$T_{spec.\ mittl.}$	Nm/bar	3,7	5,3	6,5	7,2
Min. starting torque / theoretically torque		%		89,5	90,0	90,5	91,0
Inlet pressure	max. continuous	$p_{cont.}$	bar	250			
	intermittent	$p_{intermit.}$	bar	315			
	peak	p_{peak}	bar	400			
Total pressure, max. in port A + B		p_{total}	bar	400			
Leakage pressure, max.		p_{Leak}	bar	1,5			
Operating speed range		n	rpm	5 - 600	5 - 550	5 - 500	5 - 450
Continuous power, max.		$P_{cont.}$	kW	28	39	40	40
Intermittent power, max.		$P_{intermit.}$	kW	35	45	50	50
Moment of inertia		J	kg m²	0,0082	0,0089	0,0096	0,0101
Weight		m	kg	75	75	75	75
Temperature range of pressure medium		Θ	°C	-30 bis +80			
Viscosity range		ν	mm²/s	18 bis 1000, recommended: 30 bis 50			

Nominal size			**NS**	**710**	**900**		
Displacement		V_g	cm³/rev	704	904		
Theoretically specific torque		$T_{spec.\ theor.}$	Nm/bar	11,3	14,4		
Average specific torque		$T_{spec.\ mittl.}$	Nm/bar	10,4	13,2		
Min. starting torque / theoretically torque		%		89,5	91,0		
Inlet pressure	max. continuous	$p_{cont.}$	bar	250			
	intermittent	$p_{intermit.}$	bar	315			
	peak	p_{peak}	bar	400			
Total pressure, max. in port A + B		p_{total}	bar	400			
Leakage pressure, max.		p_{Leak}	bar	1,5			
Operating speed range		n	rpm	5 - 500	5 - 450		
Continuous power, max.		$P_{cont.}$	kW	63	63		
Intermittent power, max.		$P_{intermit.}$	kW	80	80		
Moment of inertia		J	kg m²	0,0273	0,0298		
Weight		m	kg	132	132		
Temperature range of pressure medium		Θ	°C	-30 bis +80			
Viscosity range		ν	mm²/s	18 bis 1000, recommended: 30 bis 50			

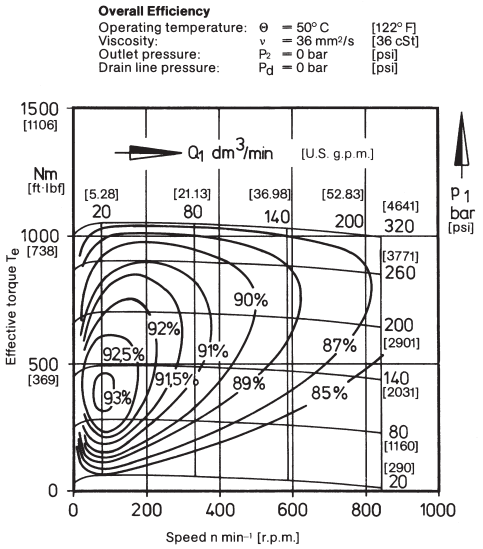
p_{cont} = admissible continuous pressure at limitation to P_{cont}.
p_{max} = maximal admissible operating pressure at limitation $P_{intermit.}$ and max. 10% duty cycle / hour
p_{peak} = peak pressure, where the components remain safe in function.
P_{cont} = Continuous power (at maximal 10 bar outlet pressure).
Motor flushing must be carried out above P_{cont}.
$P_{intermit.}$ = Power, which may be demanded temporarily (max. 10% duty cycle / hour).

Power, speed and bearing life may be increased when flushing with 3-6 liters flushing oil (see page 22).

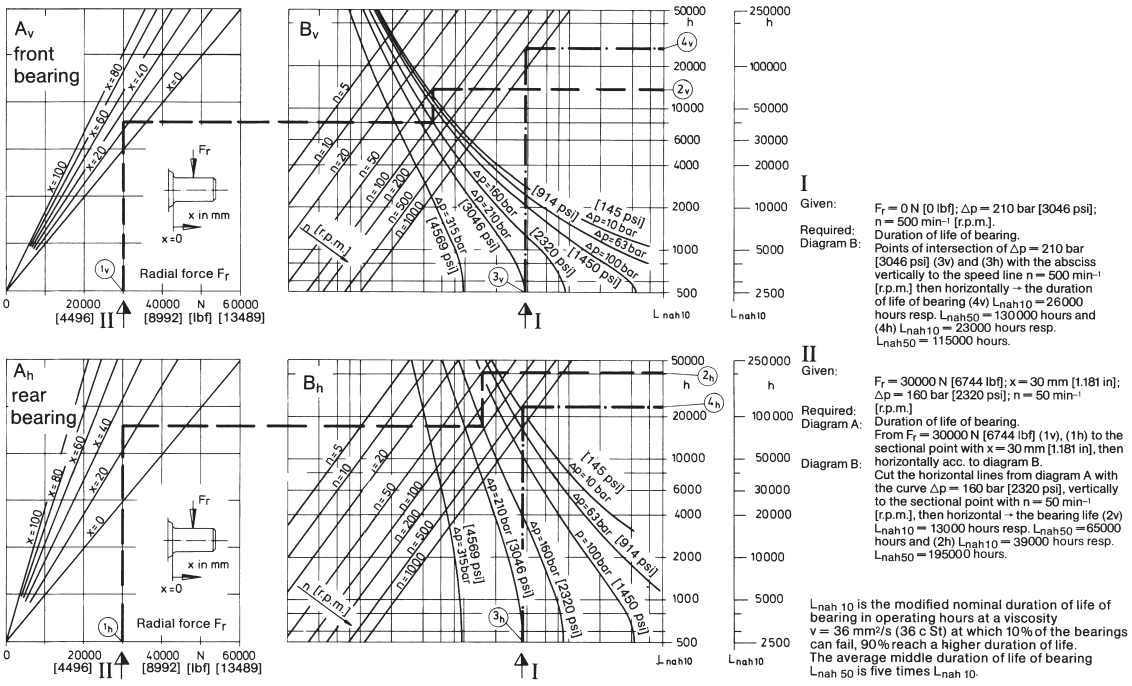
Characteristics



Performance



Determination of Bearing Life



I

Given: F_r = 0 N [0 lbf]; Δp = 210 bar [3046 psi]; n = 500 min⁻¹ [r.p.m.].

Required: Duration of life of bearing.

Diagram B: Points of intersection of Δp = 210 bar [3046 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 500 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 26000 hours resp. L_{nah50} = 130000 hours and (4h) L_{nah10} = 23000 hours resp. L_{nah50} = 115000 hours.

II

Given: F_r = 30000 N [6744 lbf]; x = 30 mm [1.181 in]; Δp = 160 bar [2320 psi]; n = 50 min⁻¹ [r.p.m.]

Required: Duration of life of bearing.

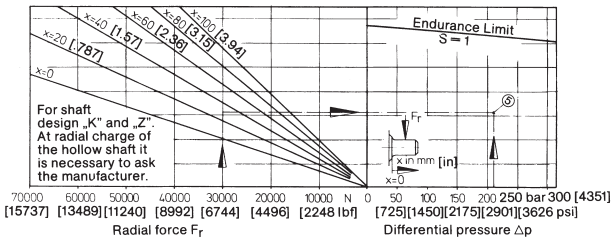
Diagram A: From F_r = 30000 N [6744 lbf] (1v), (1h) to the sectional point with x = 30 mm [1.181 in], then horizontally acc. to diagram B.

Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 160 bar [2320 psi], vertically to the sectional point with n = 50 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 13000 hours resp. L_{nah50} = 65000 hours and (2h) L_{nah10} = 39000 hours resp. L_{nah50} = 195000 hours.

$L_{nah\ 10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10% of the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing $L_{nah\ 50}$ is five times $L_{nah\ 10}$.

Shaft strength

Example:
Given values: F_r = 30000 N [6744 lbf] x = 30 mm [1.181 in] Δp = 210 bar [3046 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 30000 N [6744 lbf] to distance x = 30 mm [1.181 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 210 bar [3046 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



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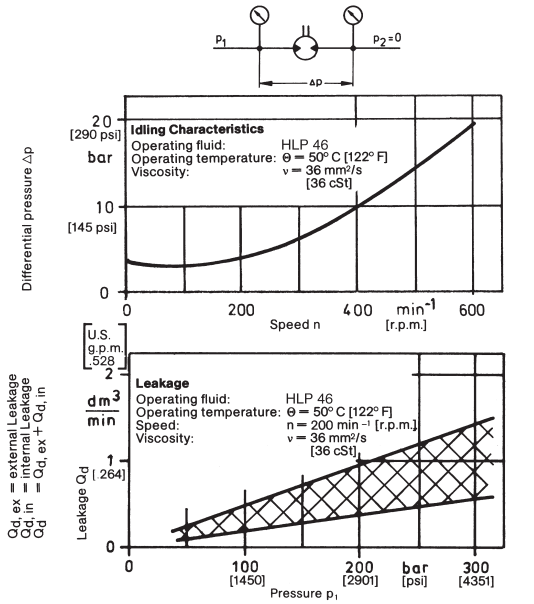

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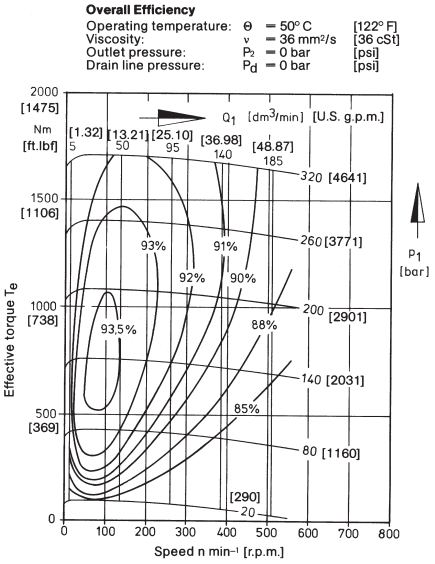

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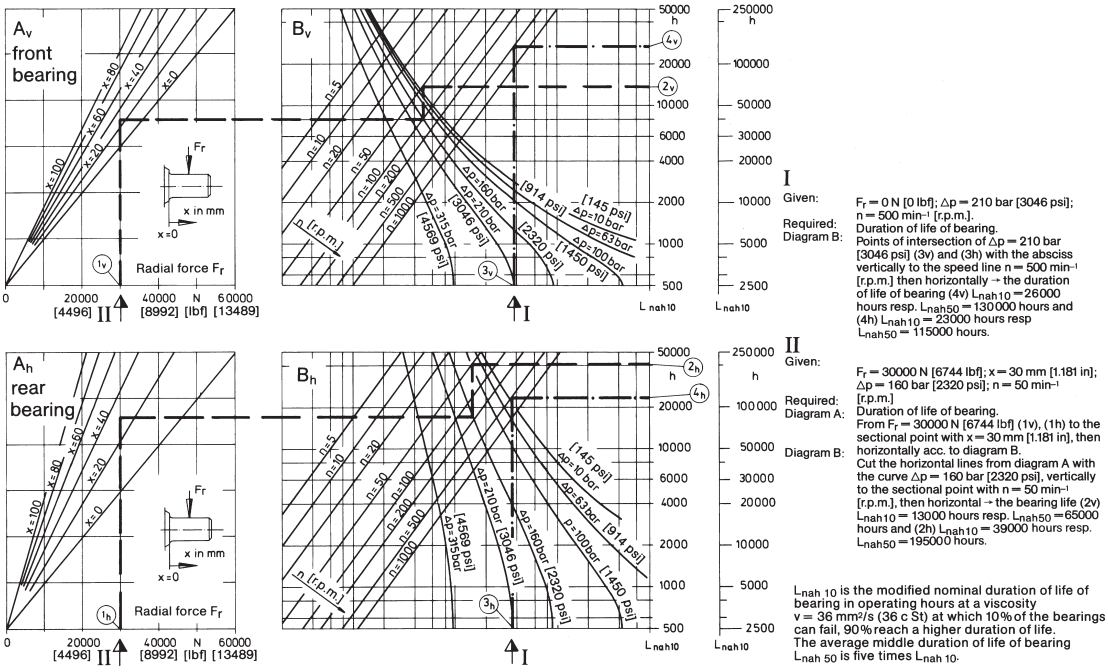

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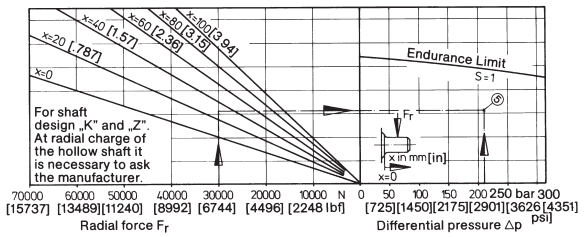

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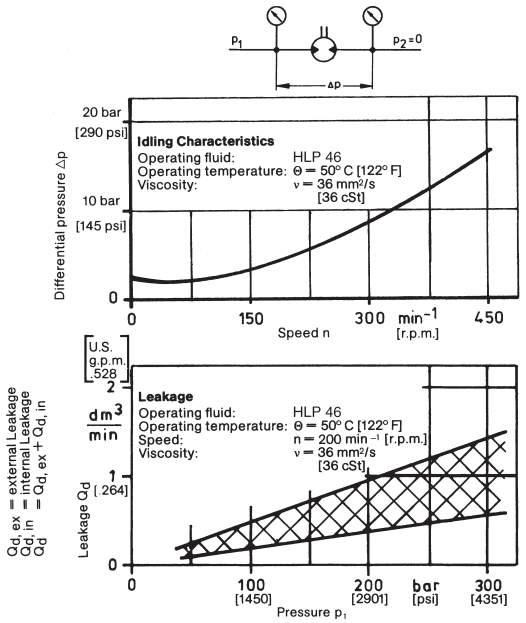

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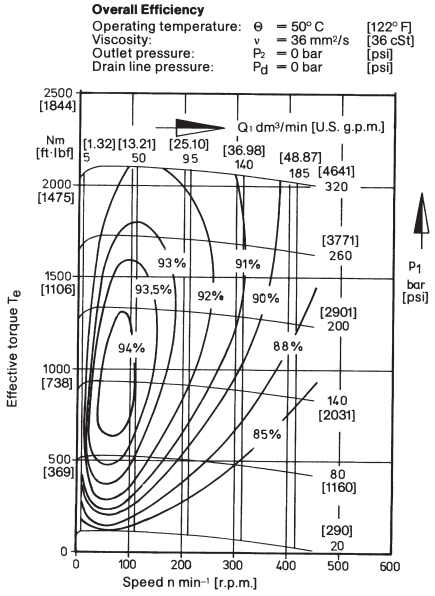
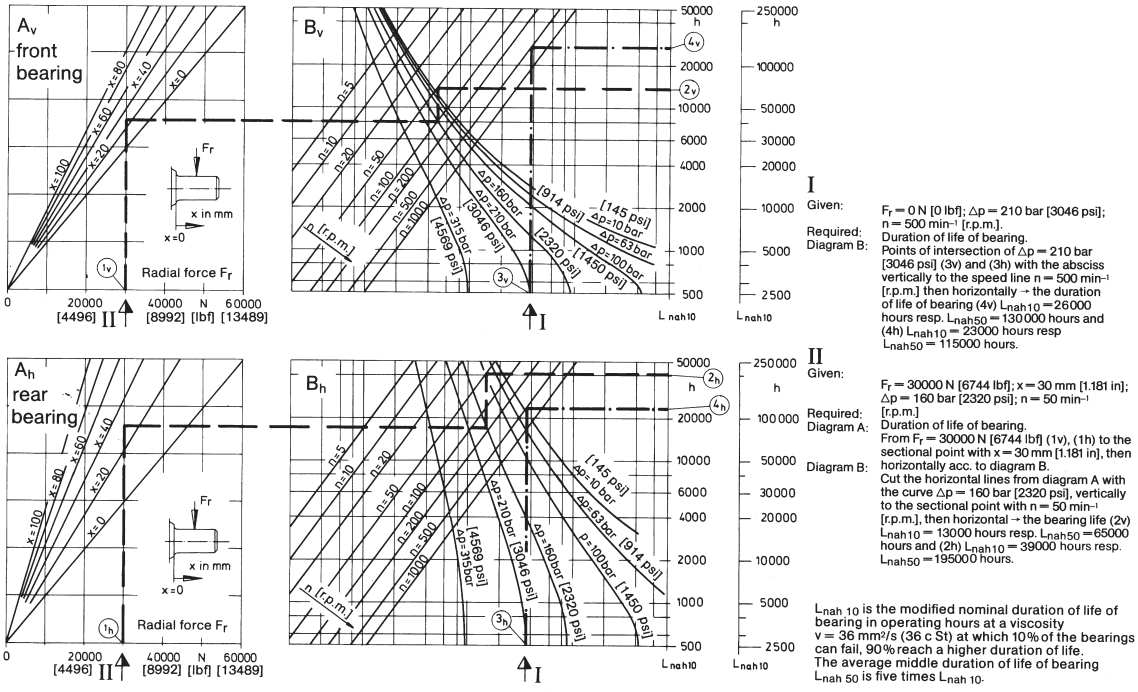


Determination of Bearing Life



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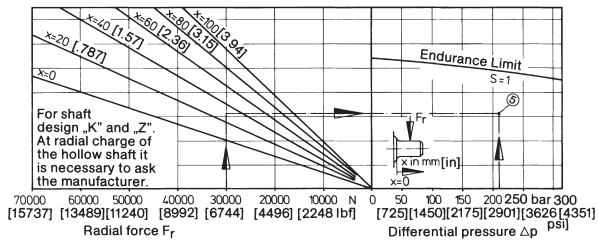
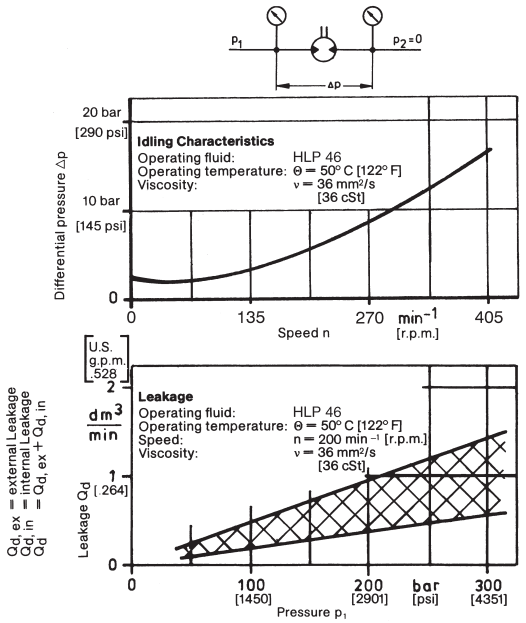


Characteristics



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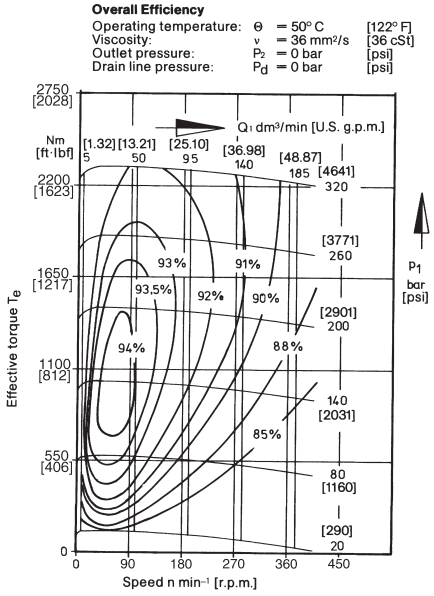
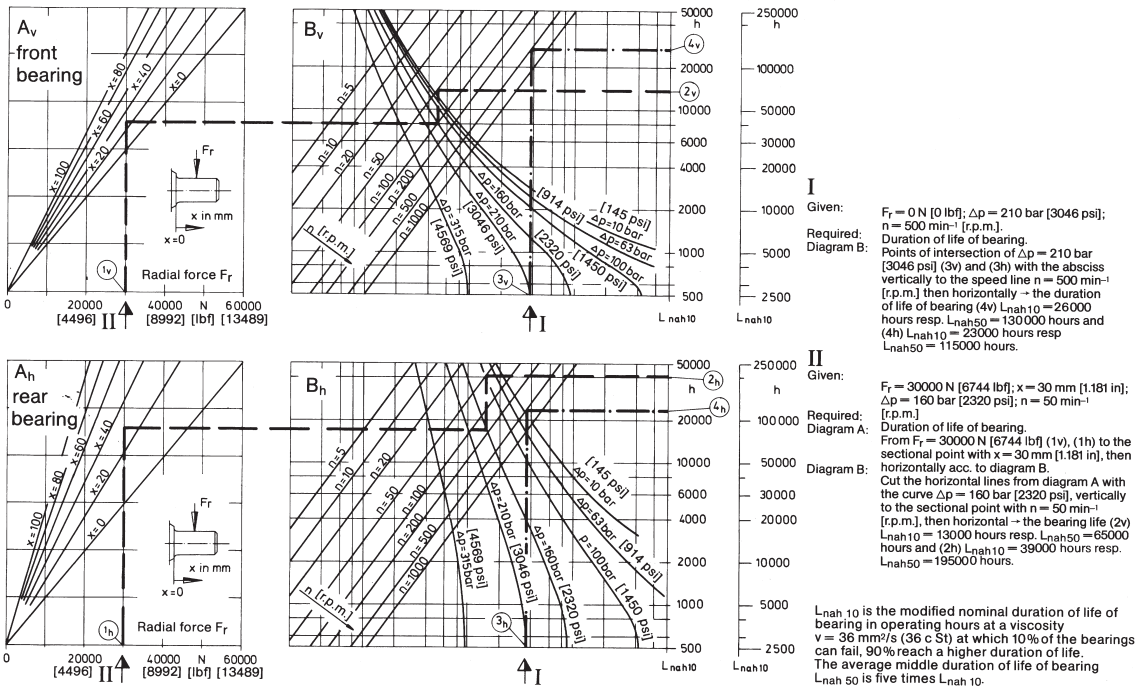


Determination of Bearing Life



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Given: F_r = 30000 N [6744 lbf]; x = 30 mm [1.181 in]; Δp = 160 bar [2320 psi]; n = 50 min⁻¹ [r.p.m.]
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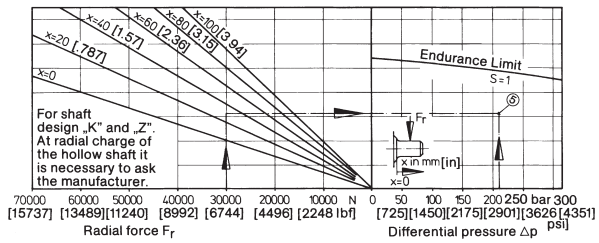
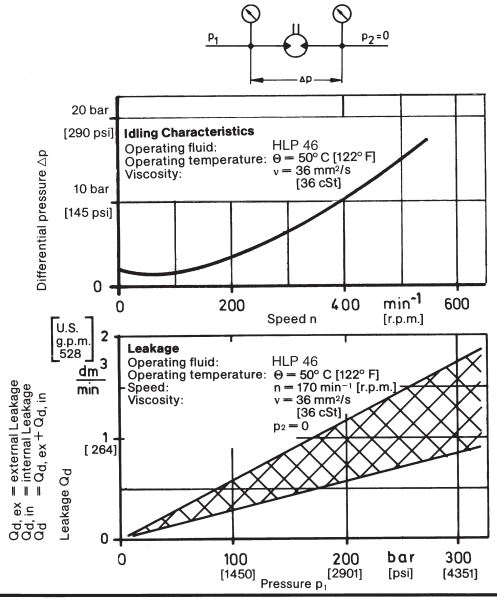
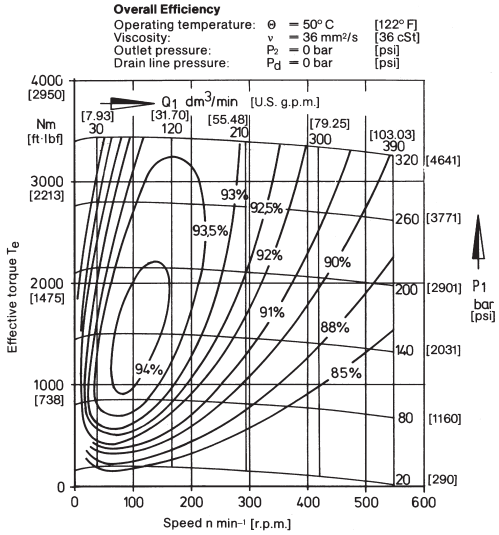


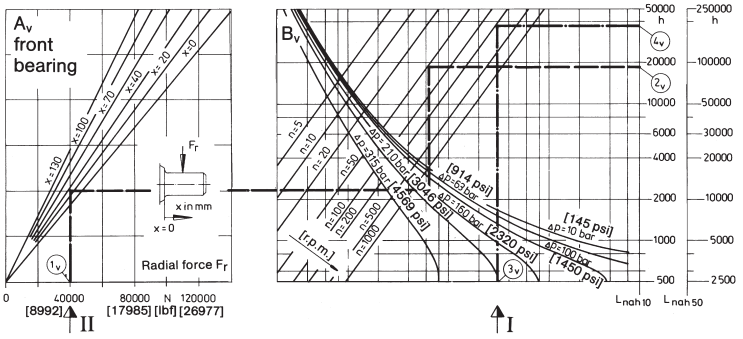
Characteristics



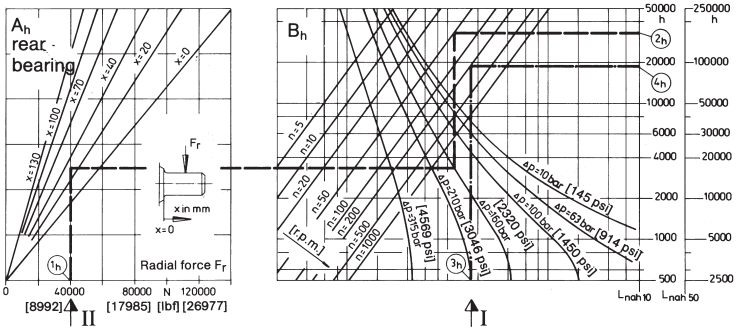
Performance



Determination of Bearing Life



I
Given: F_r = 0 N [0 lbf]; Δp = 210 bar [3046 psi]; n = 200 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 210 bar [3046 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 200 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 37000 hours resp. L_{nah50} = 185000 hours and (4h) L_{nah10} = 18000 hours resp. L_{nah50} = 90000 hours.

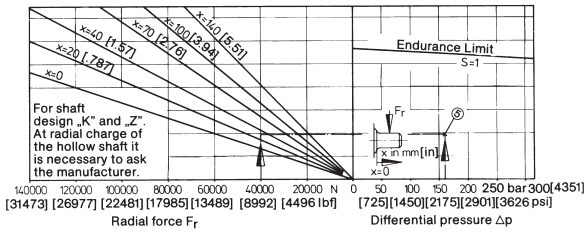


II
Given: F_r = 40000 N [8992 lbf]; x = 30 mm [1.181 in]; Δp = 160 bar [2320 psi]; n = 50 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 40000 N [8992 lbf] (1v), (1h) to the sectional point with x = 30 mm [1.181 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 160 bar [2320 psi], vertically to the sectional point with n = 50 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 18000 hours resp. L_{nah50} = 90000 hours and (2h) L_{nah10} = 31000 hours resp. L_{nah50} = 155000 hours.

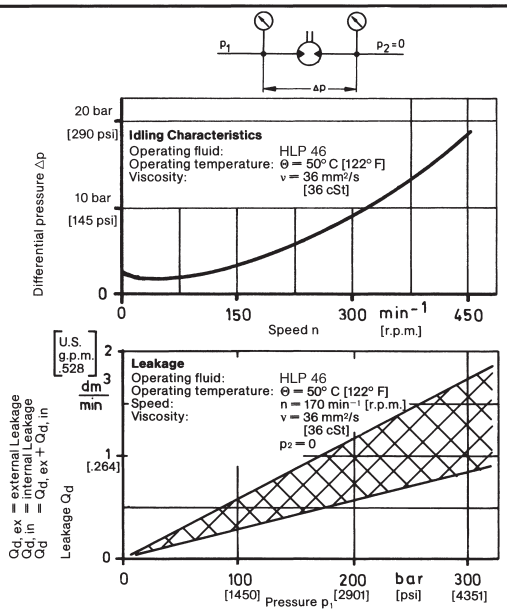
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10% of the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Shaft strength

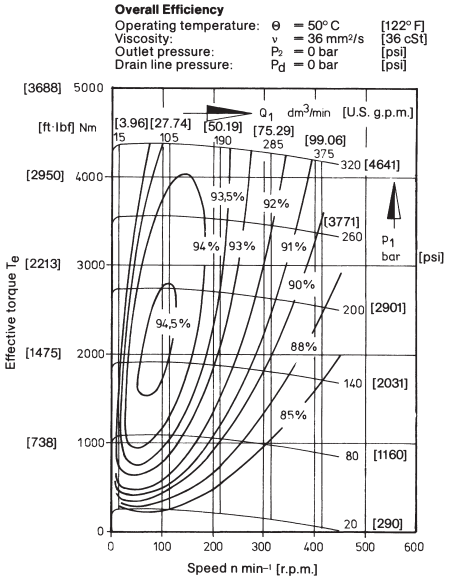
Example:
Given values: F_r = 40000 N [8992 lbf] x = 30 mm [1.181 in]
Δp = 160 bar [2321 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 40000 N [8992 lbf] to distance x = 30 mm [1.181 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 160 bar [2321 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



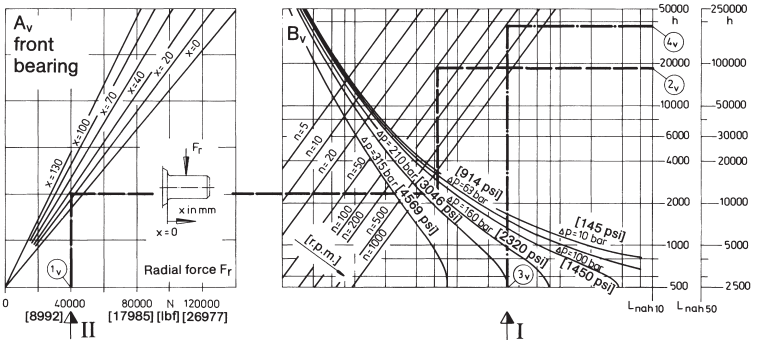
Characteristics

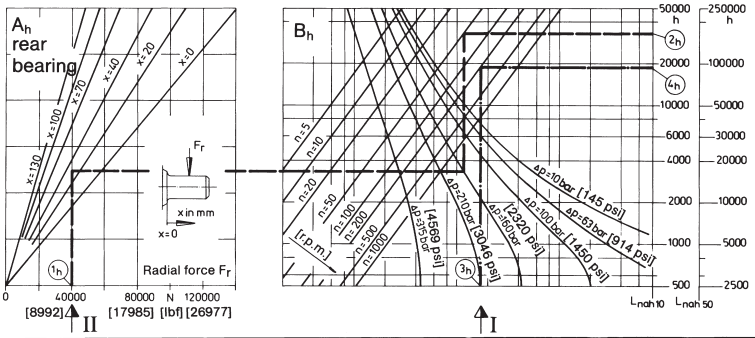


Performance



Determination of Bearing Life





I
Given: F_r = 0 N [0 lbf]; Δp = 210 bar [3046 psi]; n = 200 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 210 bar [3046 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 200 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 37000 hours resp. L_{nah50} = 185000 hours and (4h) L_{nah10} = 18000 hours resp. L_{nah50} = 90000 hours.

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Given: F_r = 40000 N [8992 lbf]; x = 30 mm [1.181 in]; Δp = 160 bar [2320 psi]; n = 50 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 40000 N [8992 lbf] (1v), (1h) to the sectional point with x = 30 mm [1.181 in], then horizontally acc. to diagram B.
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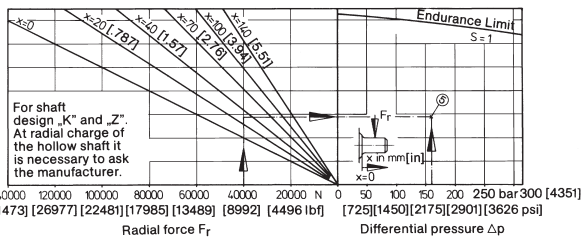
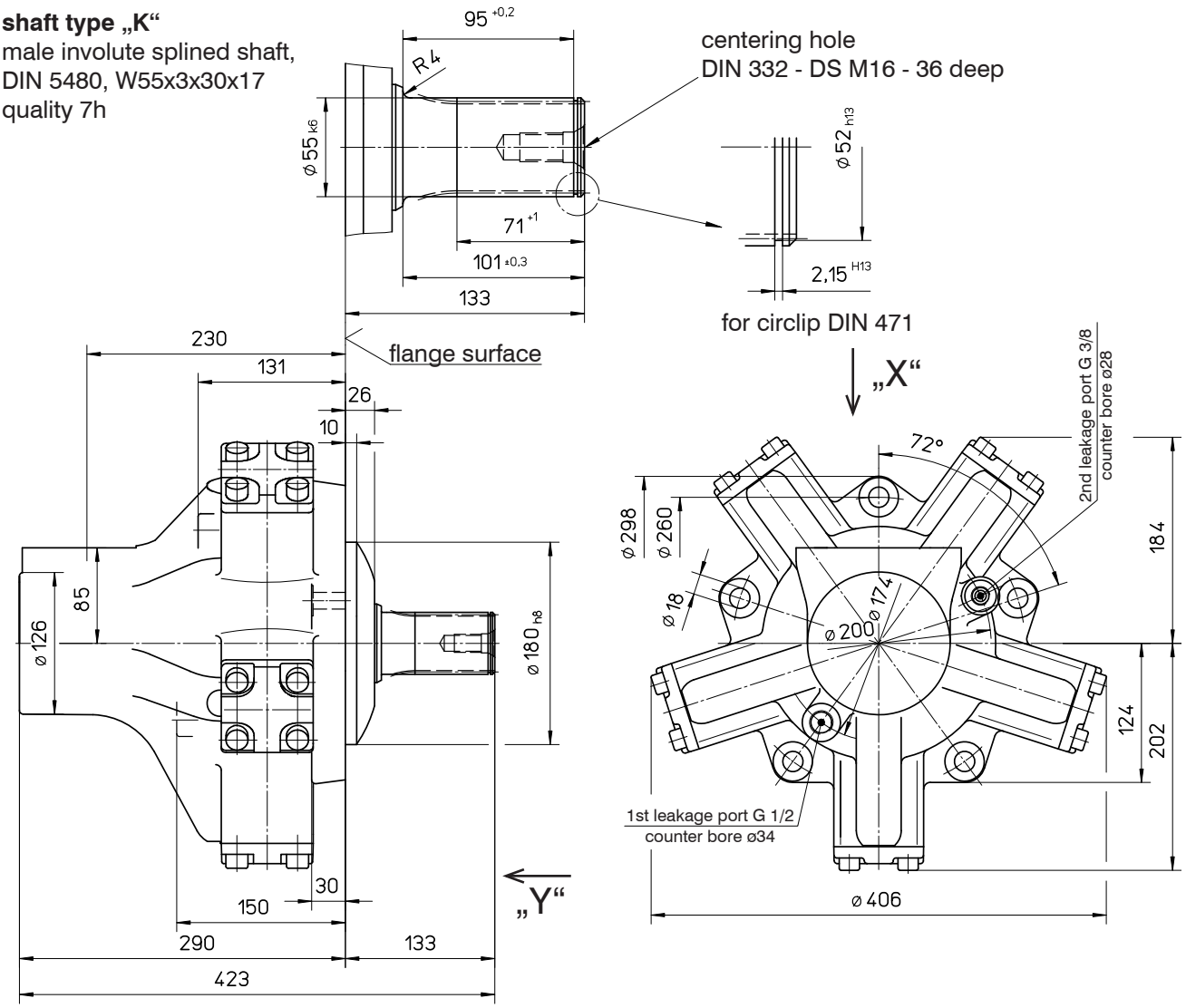
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10% of the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

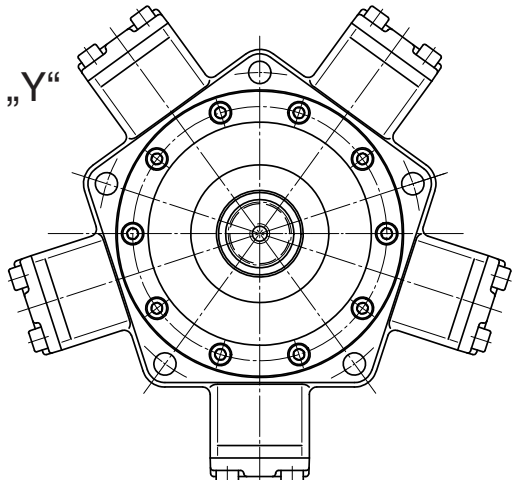
Shaft strength

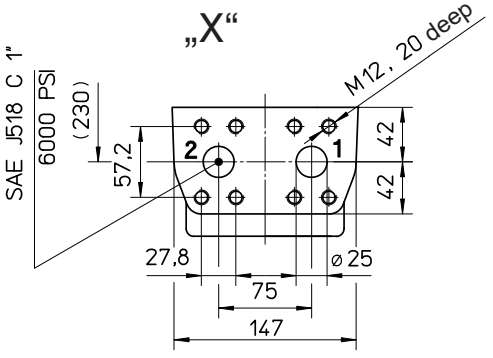
Example:
Given values: F_r = 40000 N [8992 lbf] x = 30 mm [1.181 in] Δp = 160 bar [2321 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 40000 N [8992 lbf] to distance x = 30 mm [1.181 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 160 bar [2321 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



shaft type „K“
male involute splined shaft,
DIN 5480, W55x3x30x17
quality 7h

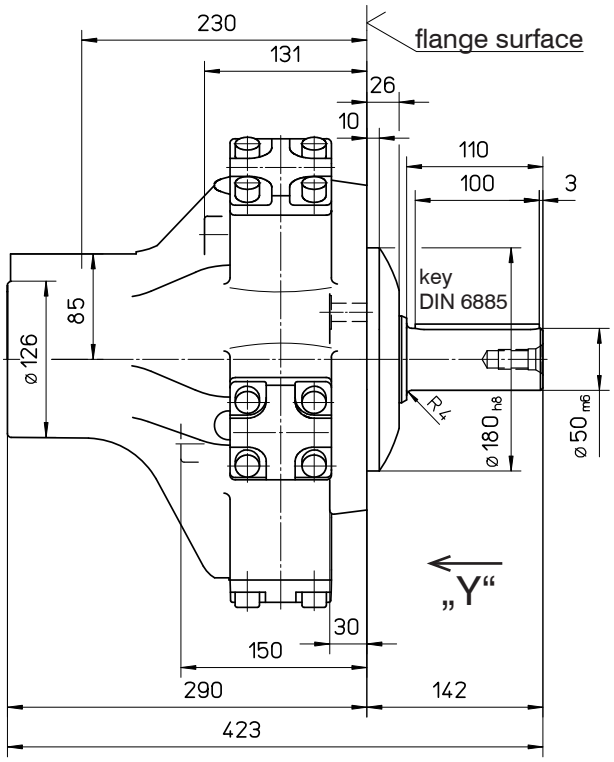


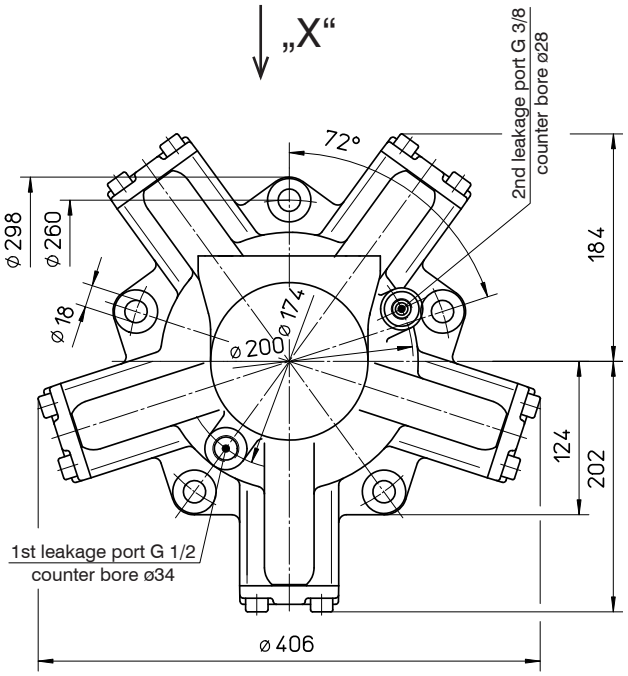


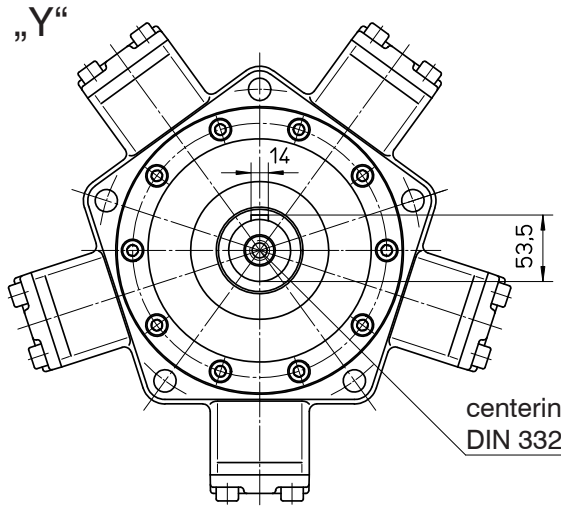


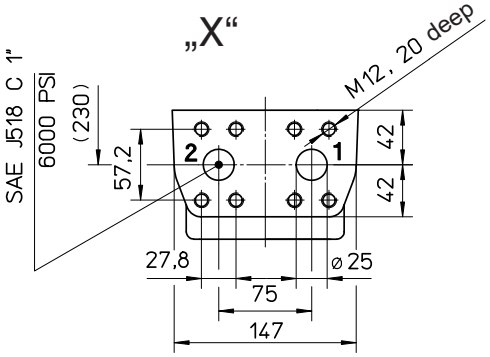
Sense of ratation viewed onto shaft front side:
clockwise: at flow from port 2 to port 1
anticlockwise: at flow from port 1 to port 2

Connection of the leakage lines: please observe assembly and initiation instructions on page 23.







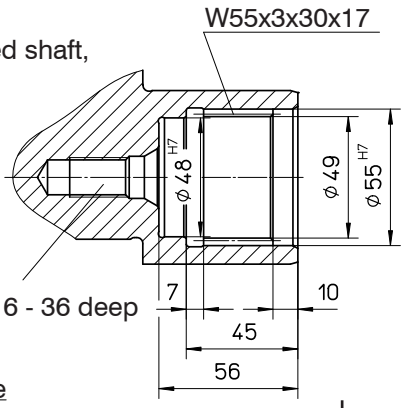


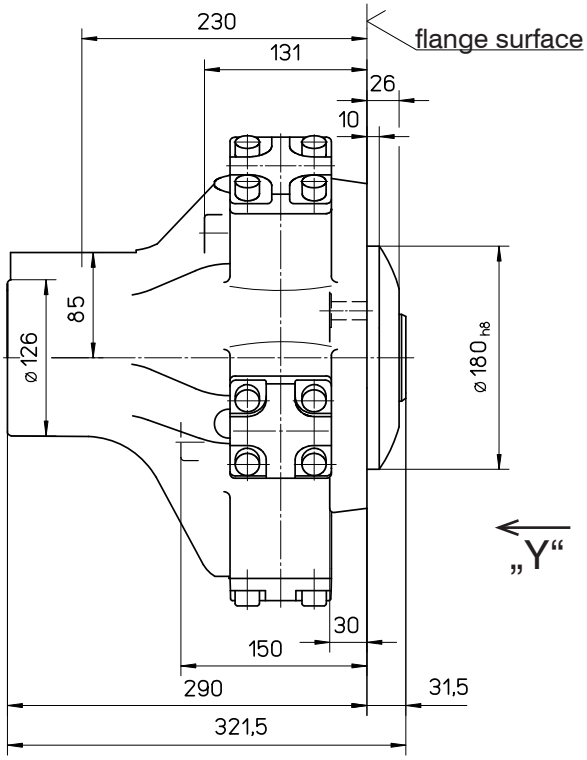
centering hole
DIN 332 - DS M16 - 36 deep

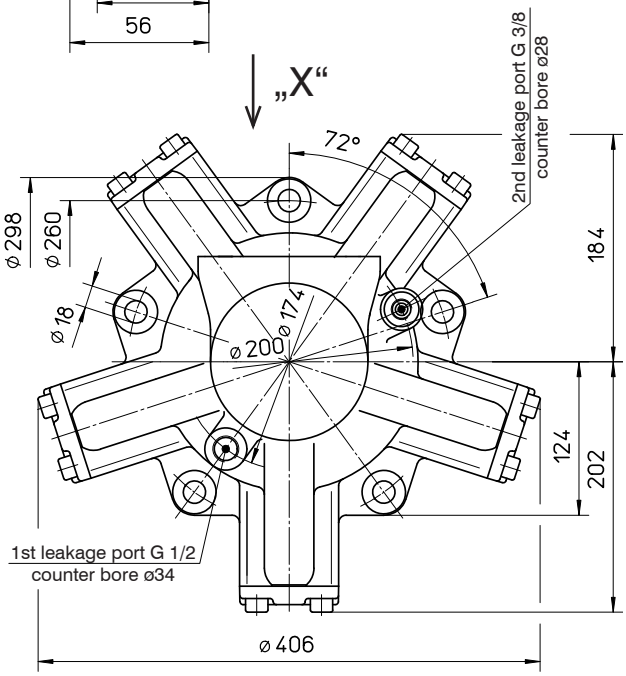
Sense of ratation viewed onto shaft front side:
clockwise: at flow from port 2 to port 1
anticlockwise: at flow from port 1 to port 2

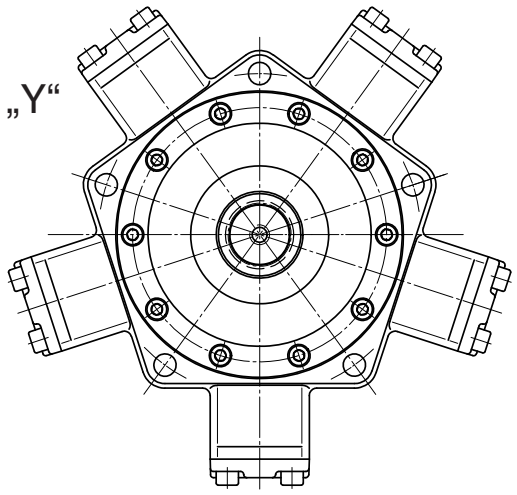
Connection of the leakage lines: please observe assembly and initiation instructions on page 23.

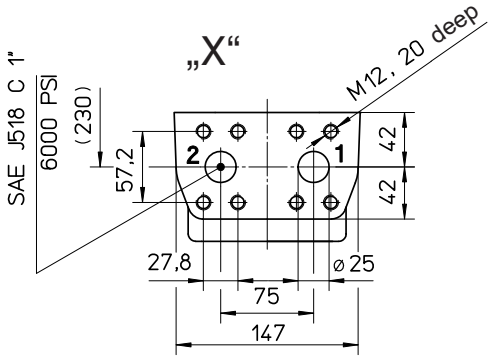
shaft type „H“
female involute splined shaft,
DIN 5480, quality 9H







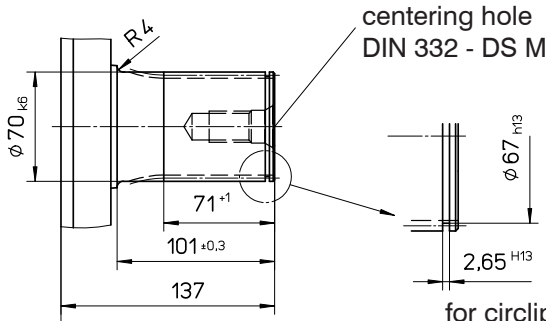


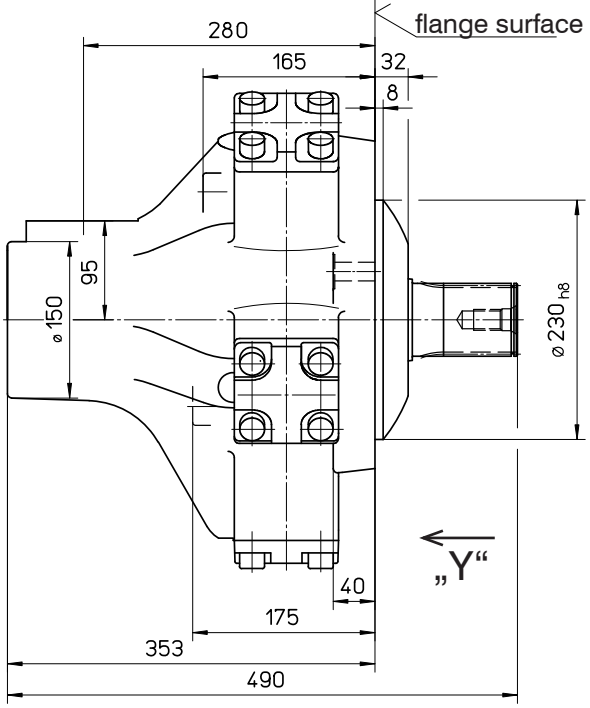


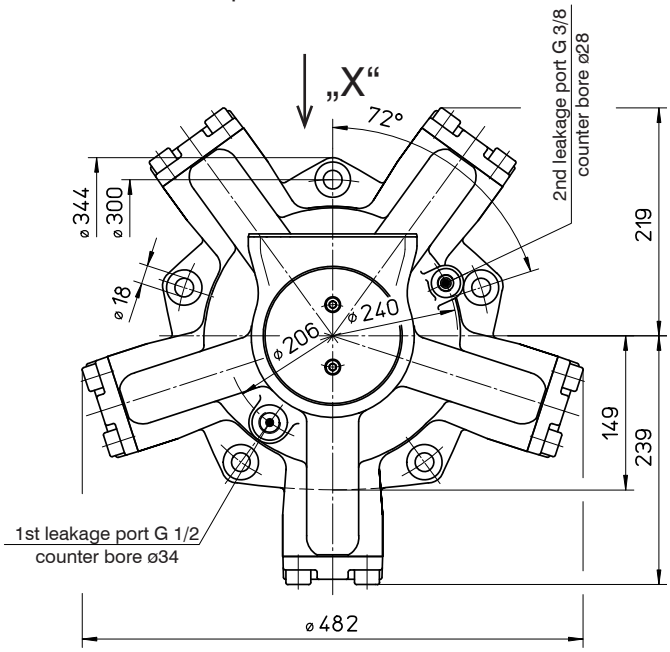
Sense of ratation viewed onto shaft front side:
clockwise: at flow from port 2 to port 1
anticlockwise: at flow from port 1 to port 2

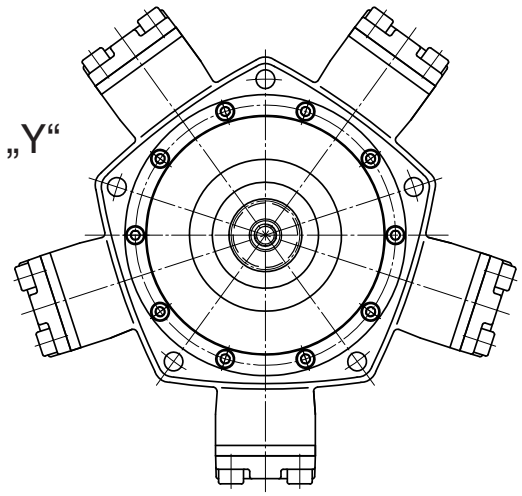
Connection of the leakage lines: please observe assembly and initiation instructions on page 23.

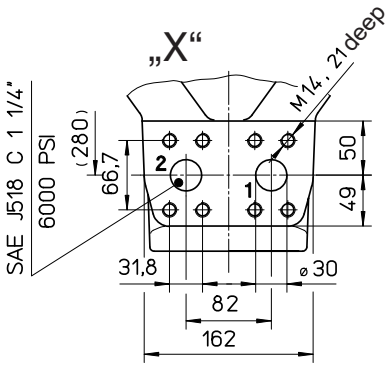
shaft type „K“
male involute splined shaft,
DIN 5480, W70x3x30x22
quality 7h





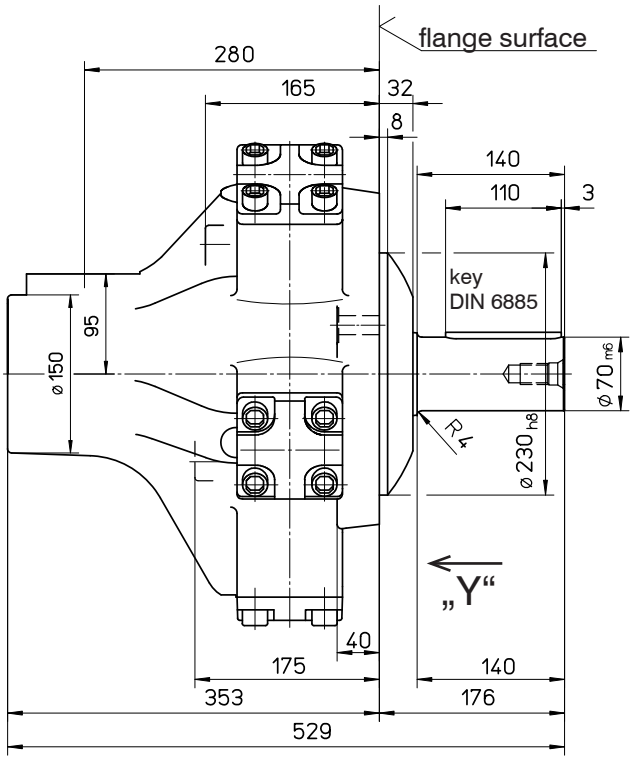


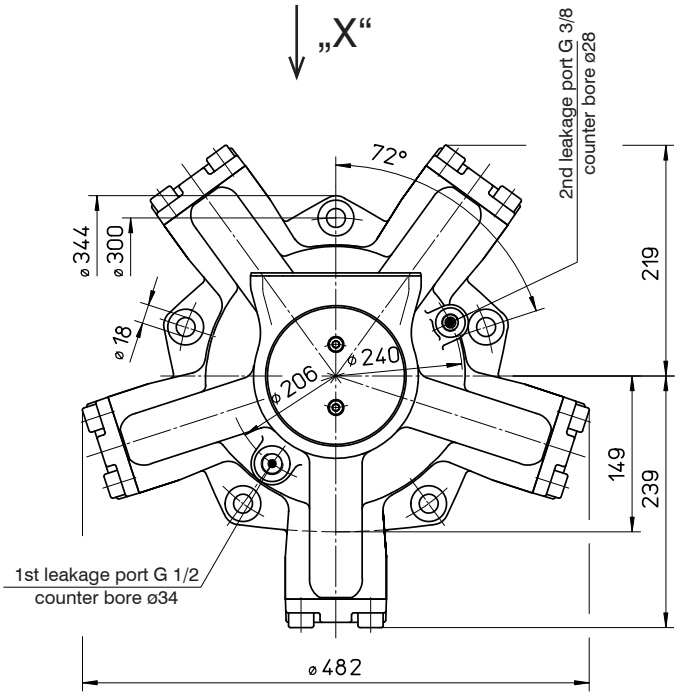


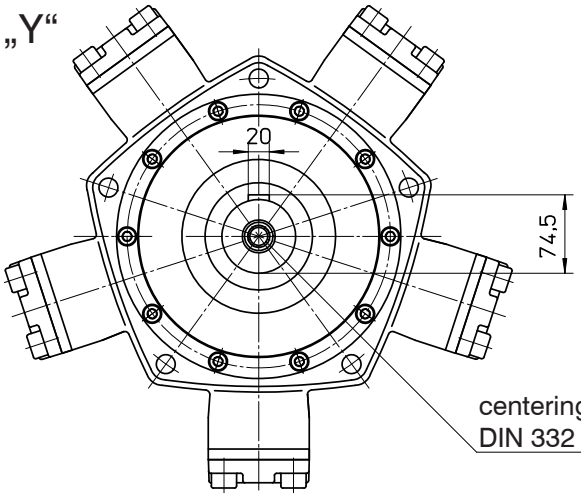


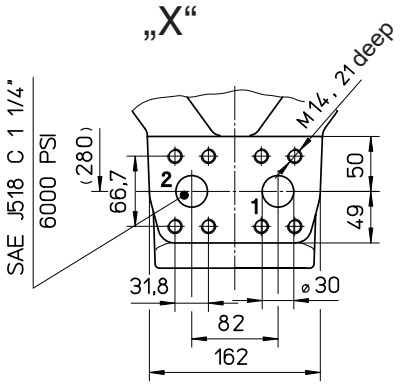
Sense of ratation viewed onto shaft front side:
clockwise: at flow from port 2 to port 1
anticlockwise: at flow from port 1 to port 2

Connection of the leakage lines: please observe assembly and initiation instructions on page 23.







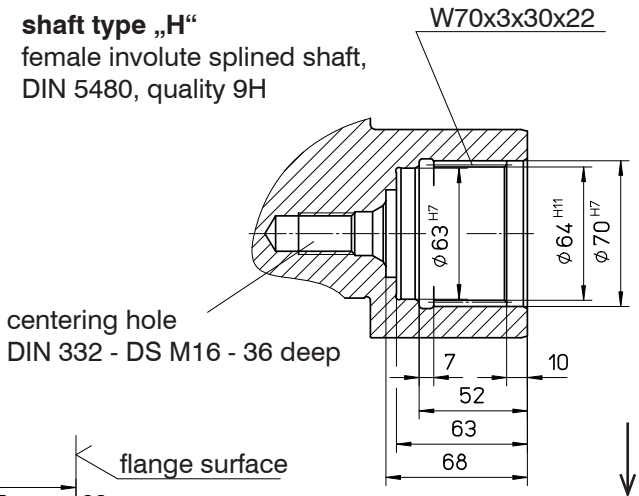


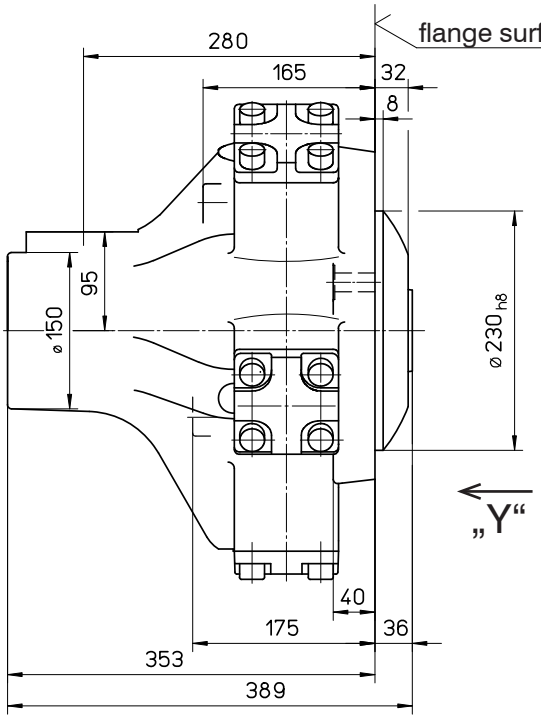
centering hole
DIN 332 - DS M20 - 42 deep

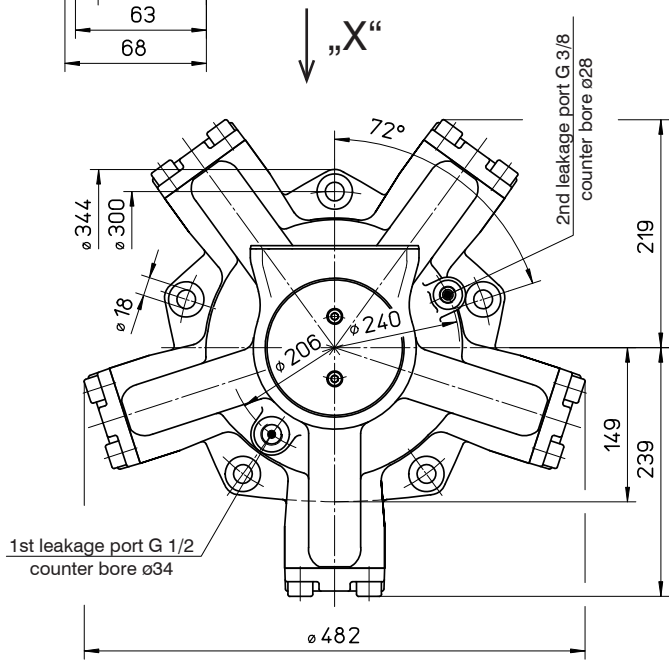
Sense of ratation viewed onto shaft front side:
clockwise: at flow from port 2 to port 1
anticlockwise: at flow from port 1 to port 2

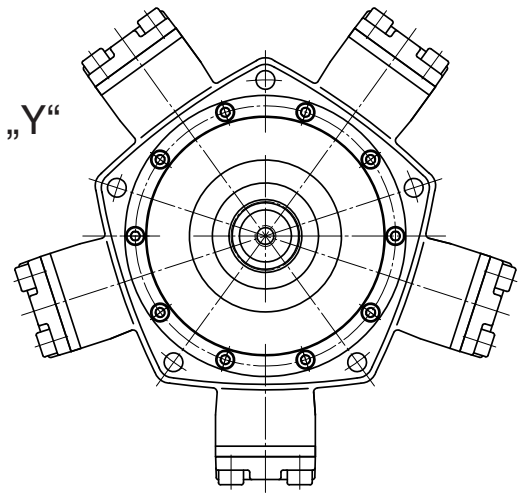
Connection of the leakage lines: please observe assembly and initiation instructions on page 23.

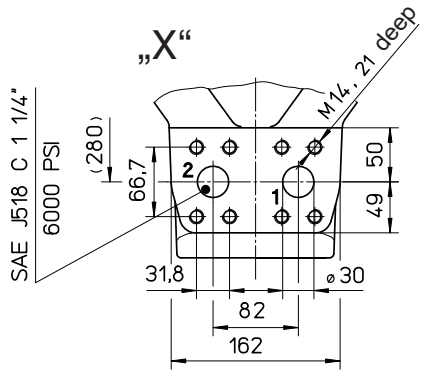
shaft type „H“
female involute splined shaft,
DIN 5480, quality 9H







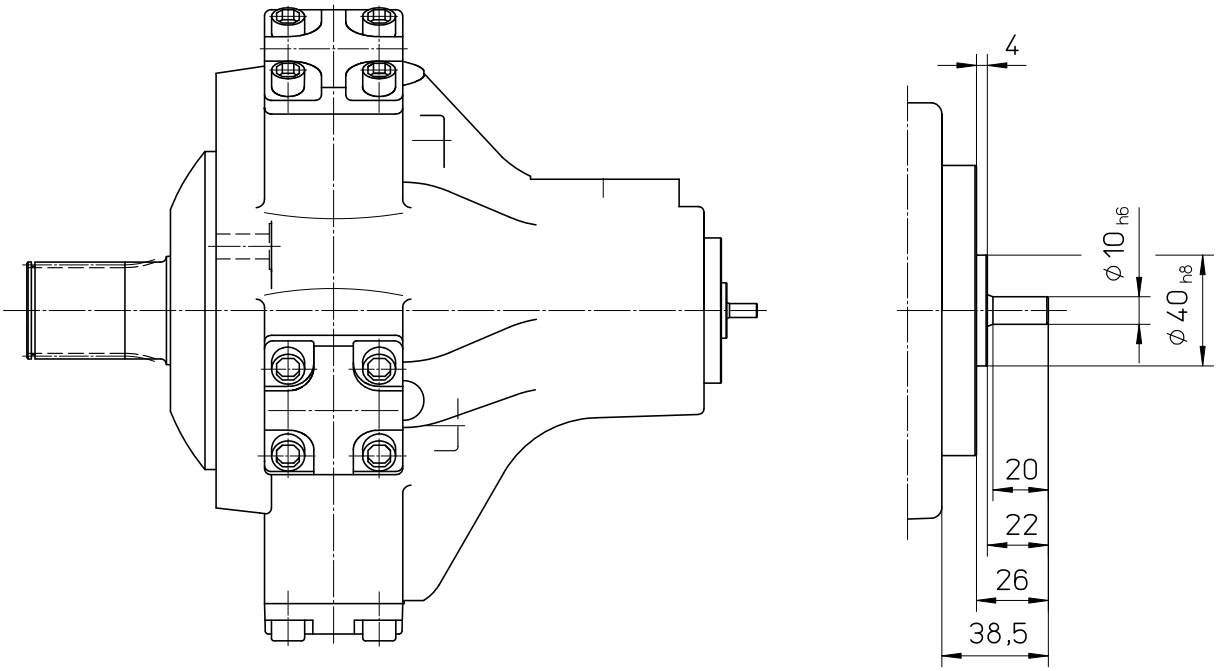


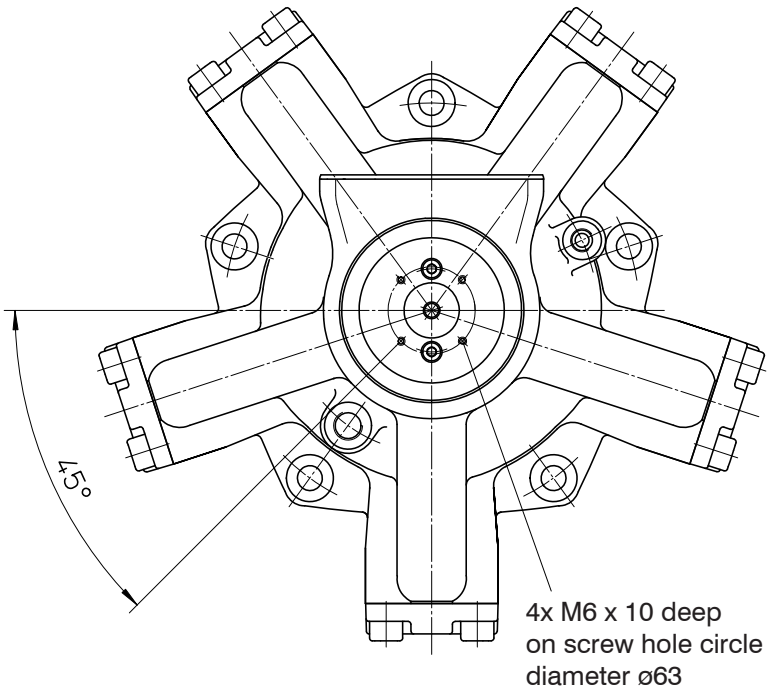


Sense of ratation viewed onto shaft front side:
clockwise: at flow from port 2 to port 1
anticlockwise: at flow from port 1 to port 2

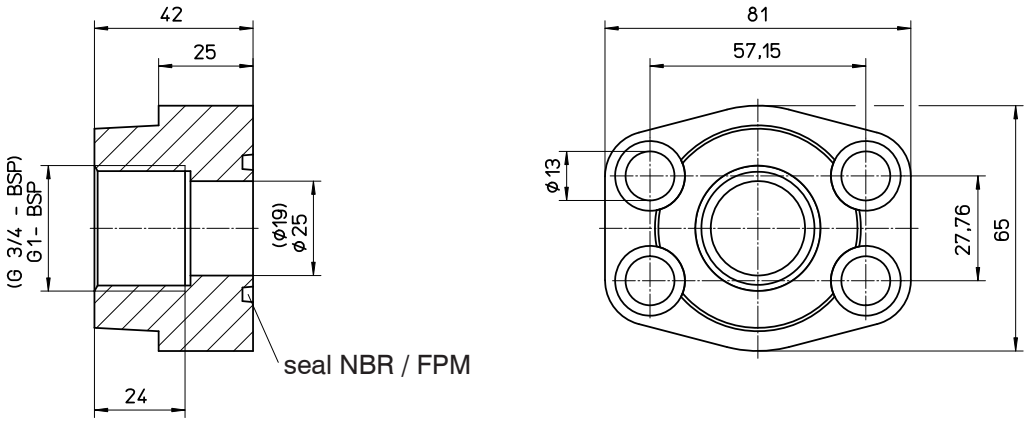
Connection of the leakage lines: please observe assembly and initiation instructions on page 23.

All radial piston motors with type mark „M“ are equipped with an instrument shaft.
The instrument shaft transmits a miximal torque of 5 Nm.
On request further documentation is available relating to installation of tacho-generators for registration of speed and incremental encoders for registration of turning angle up to 3600 impulses per revolution.



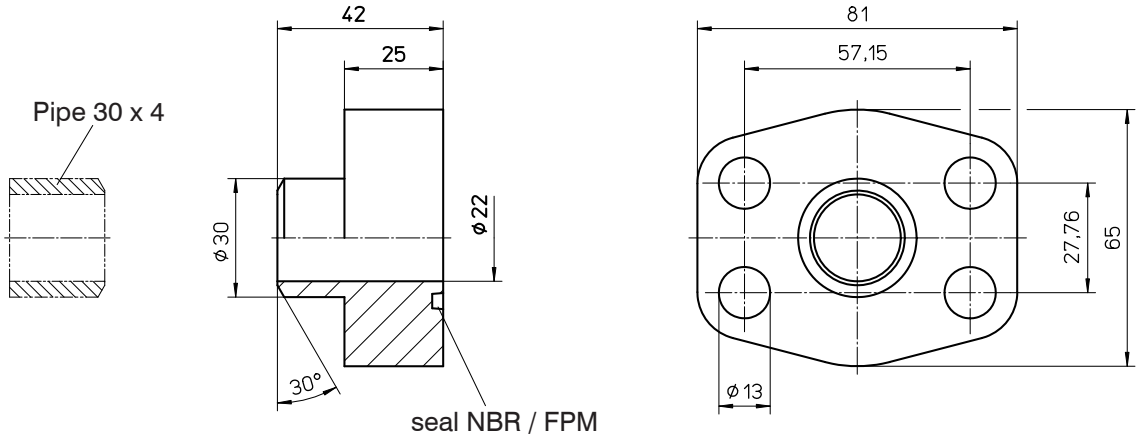


For each radial piston motor 2 flanges, 2 o-ring seals and 8 bolts are required.



(SAE1“ - BSP ¾“ screwed flange 6000 psi - AFS 403 G-034)
SAE1“ - BSP 1“ screwed flange 6000 psi - AFS 403 G **material: ST52.3**

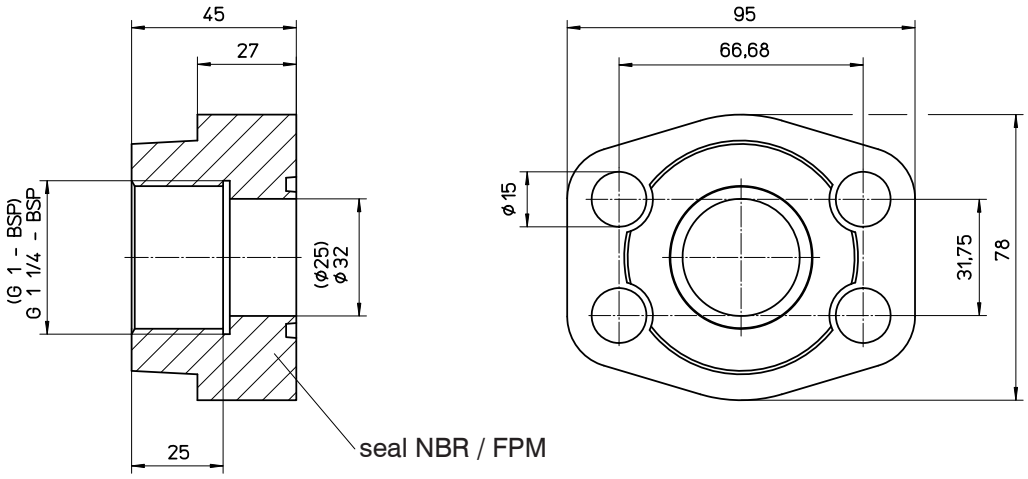
Designation	Seal material	Thread DIN ISO 228/1	Order - No.:
1 piece SAE 1“ - screwed flange complete, metric 6000 psi with BSP-thread, with 4 bolts M12 x 45 DIN 912 - 8.8 and 1 o-ring 32,92 x 3,53	NBR	G ¾	59.0000.31
	FPM	G ¾	59.0000.32
	NBR	G 1	59.0000.33
	FPM	G 1	59.0000.34



SAE- welding flange 6000 psi - metric **material: ST52.3**

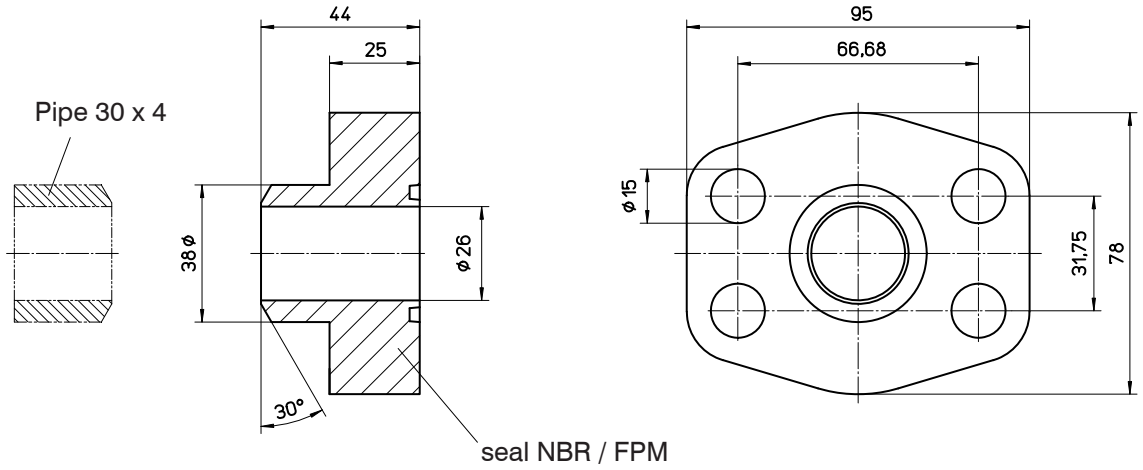
Designation	Seal material	Pipe	Order - No.:
1 piece SAE 1“- welding flange complete, metric 6000 PSI with 4 bolts M12 x 45 DIN 912 - 8.8 and 1 o-ring 32,92 x 3,53	NBR	30 x 4	59.0000.35
	FPM	30 x 4	59.0000.36

For each radial piston motor 2 flanges, 2 o-ring seals and 8 bolts are required.



(SAE 1¼“ - BSP 1“ screwed flange 6000 psi - AFS 404 G)
SAE 1¼“ - BSP 1¼“ screwed flange 6000 psi - AFS 404 G 100 **material: ST52.3**

Designation	Seal material	Thread DIN ISO 228/1	Order - No.:
1 piece SAE 1¼“ - screwed flange complete, metric 6000 psi with BSP-thread, with 4 bolts M14 x 45 DIN 912 - 8.8 and 1 o-ring 37,7 x 3,53	NBR	G 1	59.0000.21
	FPM	G 1	59.0000.22
	NBR	G 1¼	59.0000.23
	FPM	G 1¼	59.0000.24



SAE- welding flange 6000 psi - metric **material: ST52.3**

Designation	Seal material	Pipe	Order - No.:
1 piece SAE - welding flange complete, metric 6000 PSI with 4 bolts M14 x 45 DIN 912 - 8.8 and 1 o-ring 37,7 x 3,53 AFS 404 SRE 38	NBR	38 x 6	59.0000.25
	FPM	38 x 6	59.0000.26

You know your product, we know our radial piston motors!
Give us your conditions, we will calculate all important data for the suitable drive.

1. **Company*** _____ **For attention of*** _____
Street / P.O. Box _____ Department _____
Postal code / City _____ **Phone No.*** _____
Country _____ **E-Mail*** _____

2. **Operating data:** secondary drive

2.1 Machine type: _____ project: _____

2.2 Machine operating factor at gearboxes k = _____

2.3 Installation position: ☐ horizontal ☐ vertical
☐ drive shaft upwards ☐ drive shaft downwards

2.4 Forces onto drive shaft: ☐ pressure ☐ tension
Radial: _____N axial: _____N

2.5 Nominal torque T_N = _____Nm speed n = _____min^{-1} time = _____ min

2.6 **Continuous torque*** **T_{cont}* = _____Nm speed n* = _____min^{-1}** time = _____ min

2.7 Maximum torque T_{max} = _____Nm speed n = _____min^{-1} time = _____ min

2.8 Minimum torque T_{min} = _____Nm speed n = _____min^{-1} time = _____ min

2.9 Maximum speed n_{max} = _____min^{-1} time t = _____min

2.10 Minimum speed n_{min} = _____min^{-1} time t = _____min

2.11 Information about working cycle: _____

_____

2.12 ☐ Secondary drive with valve assembly on the motor

2.13 ☐ Control drive with proportional- / servo valve

2.14 Maximum power: P_{max} = _____kW **continuous power*: P_{cont}* =** _____ **kW**

2.15 ☐ one-shift-operation ☐ two-shift-operation ☐ three-shift-operation

2.16 Desired bearing life: L_{h10} = _____hours

2.17 Remarks: _____

_____

_____

3. **Operating data:** primary drive

Hydraulic fluid: _____

Operating temperature: Θ = _____°C

Delivery volume of pump Q_P = _____l/min

☐ opened circuit ☐ closed circuit

Feeding pressure p_{Sp} = _____bar

System pressure p_{Sys} = _____bar

Desired operating pressure at T_N p_N ~ _____bar

*** Minimum Required Fields are necessary for the first interpretation.**
(The more information we have received on the application conditions, the more effective we can assist you with your project.)

Pressure liquid:

HLP mineral oil to DIN 51524 Teil 2
Biologically degradable fluids (gaskets NBR / FPM to clarify with supplier of fluid).

HFC Reduce pressure to about 70%, re-calculate bearing life.

HFD Phosphoric acid-ester, FPM- / FKM- seals are necessary.

Filtering:

Max. admissible contamination degree of the fluid to NAS 1638 class 9,
filter recommendation with a minimum retaining value of $\beta_{10} \geq 100$

For a long life NAS 1638 class 8, filter recommendation with a minimum retaining value of $\beta_5 \geq 100$.

Assembly / attachment:

Installation position optional, leakage oil outlet see below.
Motor align exactly, fastening screws min. 10.9.
For frequent reversing, 2 fastening screws to be used as dowel screws.

Coupling:

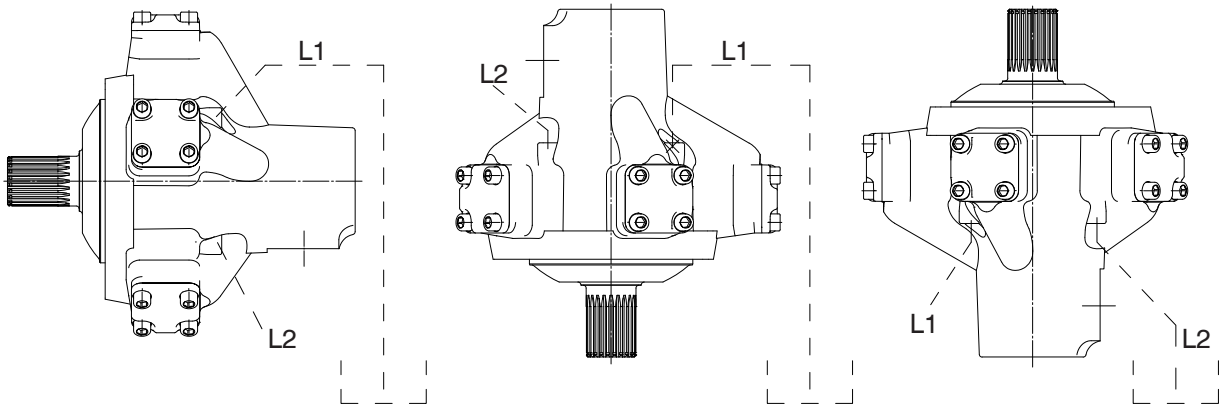
Install the coupling with a screw (not with a hammer).

Pipelines:

The motor has flange connections SAE J518C 1“ - 6000 PSI (RM 250X to RM 500X).
The motor has flange connections SAE J518C 1¼“ - 6000 PSI (RM 710X to RM 900X)
Use flange acc. to page 20 and 21.

Leakage line:

Before starting fill the motor with hydraulic fluid. Lay the leakage line in a way that the motor cannot drain off and no big air bubble builds up within the housing.



Flushing:

Connect the flushing line (with about 3 - 6 liters/minute, 1,5 bar maximum) in that way that the oil inlet enters at the lowest leakage connection L_1 / L_2.

DUESTERLOH has been developing fluid technology products for more than 100 years.
The drives, controls and hydraulic power units from Hattingen are appreciated throughout the world for their complete reliability; including under extreme conditions. The owner-managed company´s own development and construction department and the wide range of products cater for distinctive flexibility and customer-orientation.

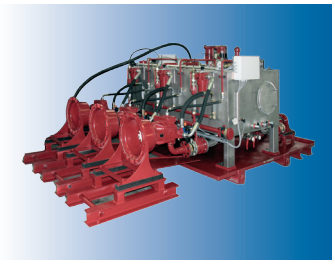
Products

- Hydraulic radial piston motors
- Hydraulic axial piston motors
- Hydraulic high precision motors
- Pneumatic motors
- Pneumatic starters
- Hydraulic and pneumatic controls
- Hydraulic power units

Designing controls and hydraulic power units specific to the customer is our company´s major strength. Vast product diversity is also available for standardized products.

Industrial areas of application

- Machine tools
- Smelting and rolling mill equipment
- Foundry machines
- Testing machines
- Shipbuilding (diesel engines)
- Offshore technology
- Printing and paper technology
- Vehicle construction
- Manipulators
- Environmental technology
- Mining equipment
- Materials handling equipment



Düsterloh Fluidtechnik GmbH
Im Vogelsang 105
D-45527 Hattingen

Tel.: +49 2324 709-0
Fax: +49 2324 709-110

DÜSTERLOH Fluidtechnik

e-mail: info@duesterloh.de
Internet: www.duesterloh.de

Certified acc. to ISO 9001