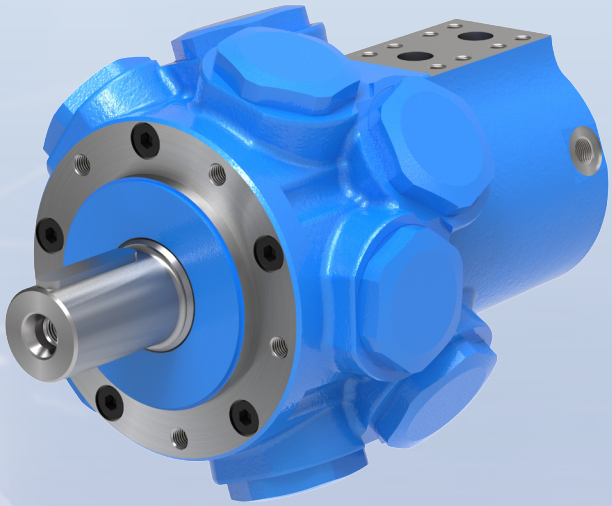
DÜSTERLOH Fluidtechnik

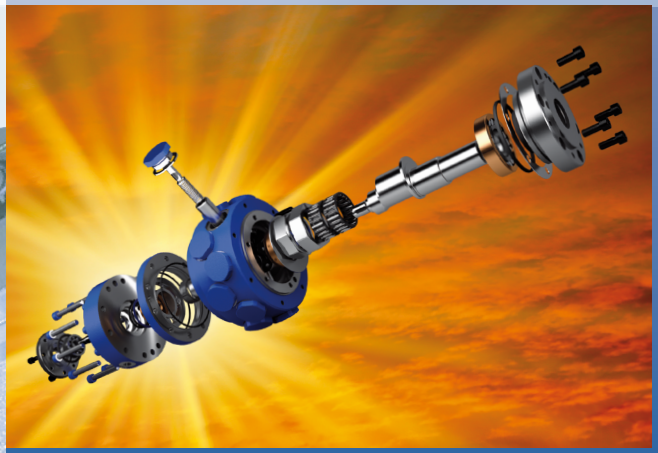
Hydraulic-Motors



Radial Piston Motors

with fixed displacement
Series RM 80N - RM 250N

Catalogue



HM1-022 EN Edition 2022.06 / 00

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Have a close look at our motors:

- long service life on account of mature design
- shaft end able to support large radial and axial forces
- small number of components in drive
- extremely low moment of inertia
- measuring shaft can be fitted as a standard option
- low leakage thanks to play self-adjustment design feature
- translationally operating control valve with play adjustment control
- resistant to temperature shocks
- suitable for use with liquids with low combustion properties
- maintenance free
- quiet running
- wide speed range
- 100 % torque throughout the entire speed range
- uniform running properties even at extremely low speed
- immediately reversible
- high starting torque
- no counterpressure required for motor operation
- can be used as pump if feed is available
- very suitable for applications as a control
- feed and discharge control possible
- may be operated in series
- total efficiency of up to 96%
- direct valve construction available as a standard option
- with SAE flange connections

Fixed displacement motor (constant hydraulic displacement)

Radial Piston Motor	Displace-ment	Torque		Speed range		Cont. pressure	Max. pressure	Peak pressure	Power	
Typ	V_g	T_{spec}	T_{max}	n_{min} *	n_{max}	p_{cont}	p_{max}	p_{peak}	P_{cont}	$P_{intermit.}$
RM	cm^3/rev	Nm/bar	Nm	min^{-1}	min^{-1}	bar	bar	bar	kW	kW
80 N	81	1,16	365	5	800	250	315	400	12,0	15,0
125 N	126	1,80	567	5	600	200	315	350	12,0	15,0
160 N	160	2,38	750	5	800	250	315	400	24,0	30,0
250 N	251	3,70	1165	5	600	200	315	350	24,0	30,0

* extremely low speeds of below 1 rpm can be reached using built-on servo-valves.

p_{cont} if limited to P_{cont}
p_{max} if limited to Pintermit. operating for a maximum duration of 10 % in every hour
p_{peak} highest pressure at which the components will remain functional
P_{cont} continuous output (at a return pressure of 10 bar);
if this output is constantly exceeded, the drive must be flushed
$P_{intermit.}$ output with which the motor can be run intermittently (for an operating time of max 10 % in every hour)

Peak pressure = Pressure curve that briefly exceeds the maximum operating pressure at which the motor is functional.

max. pressure = If the sum of inlet and outlet pressure (total pressure) is higher than the maximum pressure, the following must be asked for in the technology.

Leistungsgrenze $$P = \frac{T_{spec} * (p1-p2) * n}{9550}$$

Control

with play self-adjustment control **RM**
NG 80N, 125N, 160N, 250N

Displacement — **Rated Size NG**

81	cm³/rev	=	80N
126	cm³/rev	=	125N
161	cm³/rev	=	160N
251	cm³/rev	=	250N

Drive shaft — **Description**

Cylindrical with feather key	=	**Z**
Male involute splined shaft DIN 5480 / NG 80N to NG 250N	=	**K**
tooth hub profile shaft DIN 5480 / NG 80N to NG 250N	=	**H**

Hydraulic connections — **Description**

Threaded connections radial NG 80N, 125N, 160N, 250N G 1" DIN ISO 228-1	=	**A**
Flange connections radial NG 80N, 125N, 160N, 250N SAE J 518 ¾" standard 3000 PSI	=	**A1**

Sealing material

*	=	NBR - seals, suitable for HLP mineral oils according to DIN 51524 part 2
V	=	FPM - (FKM) seals, suitable for ester of phosphoric acid (HFD)

Additional information

S99	=	Flush connection
T	=	larger clearance for highest speeds and at very high temperatures

Flange dimensions

Description

Attachment to the face

*	=	NG 80N, 125N, 160N, 250N ISO 3019/3 S = ø125 K = ø160

Flange connections

F	=	NG 80N, 125N, 160N, 250N ISO 3019/2 S = ø140 K = ø200

(S = diameter of the centering ring)
(K = circle diameter for screw holes)

Second shaft end

Description

*	=	without second shaft end
M	=	cylindrical measuring shaft ø10h6 for sensor (incremental speed sensor etc)

***** No information given in the type key number..

1. General properies and features

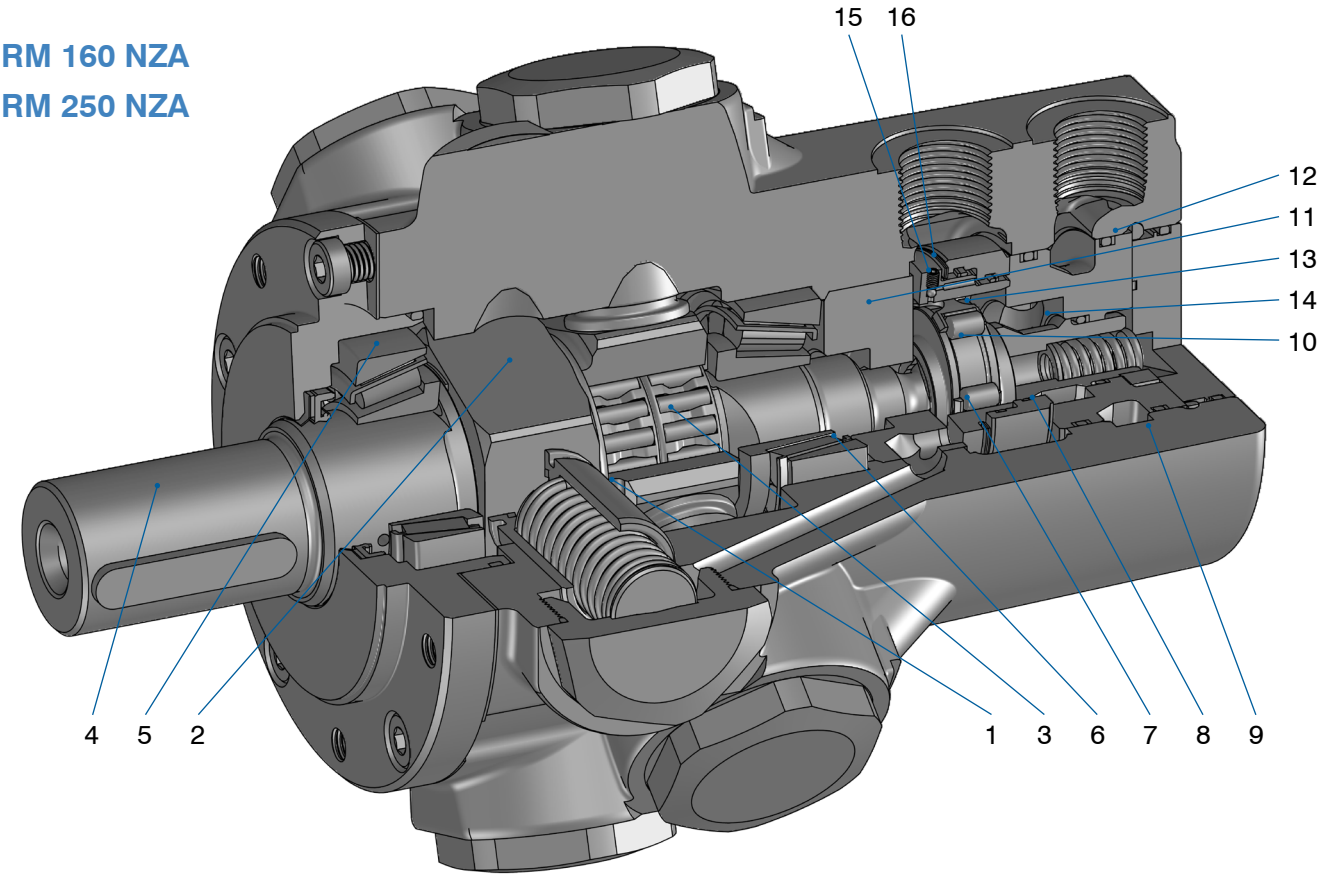
Design:
Hydrostatic radial piston motor

Purpose:
Transformation of hydraulic power to drive power.

High efficiency, also suitable for very low speeds, low moment of inertia, rapidly reversible, capable of supporting high total loads fourquadrant operation possible, very suitable for applications as a control, extremely quiet operation.

2. Structure and function

RM 160 NZA
RM 250 NZA



2.1 Drive unit

Design:
Internal piston support

Method of functioning:
Five or ten radial pistons (1) load the crakshaft (4) via pentagon ring(s) (2) with needle bearing cages (3).

Drive details
Crank shaft bearing:
Pre-loaded, large taper roller bearings 5,6), in X arrangement

Precise guidance, therefore quiet running, high radial and axial loading capacity (e.g. if a gear wheel is mounted at the shaft end).

Force transmission: Piston (1) - crankshaft (4) via pentagon ring (2) with needle bearing cage (3).

Low frictional losses, very long service life, relatively insensitive to dirt, also suitable for extremely high pressure and speed, high starting torque, no stick-slip effect at low speeds, only minor leakage (necessary for the lubrication and cooling of the drive), high efficiency, self-adjusting play to compensate for wear, temperature shock resistant, damping properties of the hydrostatic strain release reduce noise.

2.2 Control

Design:

Planar translational distribution valve with play self-adjustment

Purpose:
Distribution of the volume feed to the 5 or 10 cylinders, collection of the return volume flow.

Method of functioning:

Control rings (7/8) with the motor casing (9) and the eccentric(10) form an external and an internal ring space. By moving the control rings (7/8) between the control plate (11) and the liner (12) by means of the eccentric (10) which is fixed to the crankshaft (4), the internal and the external ring spaces are connected to the cylinders in turn. The ring spaces themselves are connected to the outside through pressure connections on the motor.

Control details:
Roller bearing between the control rings (7/8) and the eccentric (10)

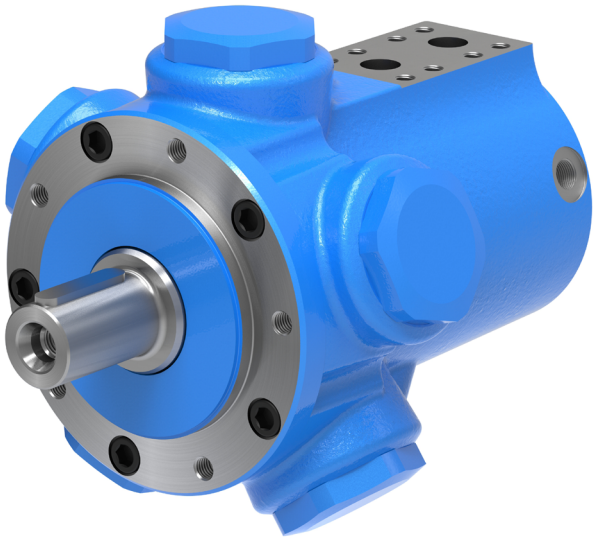
The control rings mainly move translationally, however, rotation is possible (2 degrees of freedom) - this means small frictional losses at the control rings (7/8) and a cleaning effect in the sealing gap, approximately equal relative speeds of the sealing faces, sinusoidal opening function for the control openings – this means smooth running even at low speeds and quiet running at high speeds, large volume flow diameters between the rollers (13) in the roller bearing.

Adjustment of the play on the control rings (7/8) and the flats on the eccentric:
Hydrostatic, low control ring (7/8) force against the flats, pressure supported by spring washers (for zero and low pressure situations), hydrostatic play self-adjustment on the eccentric flats by means of a thrust piece (14) supported by a helical spring.

Very low leakage and small frictional losses, automatic compensation for pressure and temperature influences (temperature shocks among others), relatively insensitive to dirt.

Miniature shuttle valve (15,16):
The effect is that in the ring space between the control rings (7/8), the higher pressure connected to the motor is always effective.

Reliable play self-adjustment even at high reversion frequencies.



Technical data RM 80N

Geom. displacement	:	81	[cm³/U]
Theor. spec. torque	:	1,29	[Nm/bar]
Average spec. torque	:	1,16	[Nm/bar]
Cont. pressure	:	250	[bar]
Max. pressure	:	315	[bar]
Peak pressure	:	400	[bar]
Max. operating torque	:	365	[Nm]
Cont. torque	:	290	[Nm]
Operating speed range	:	5 - 800	[rpm]
Cont. power	:	12	[kW]
Interm. power	:	15	[kW]
Moment of inertia	:	0,0017	[kgm²]
Weight	:	40	[kg]

Further information

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Measuring shaft version	**M :**	Page 15
Shaft version	**Z / H :**	Page 16

Mounting position: any

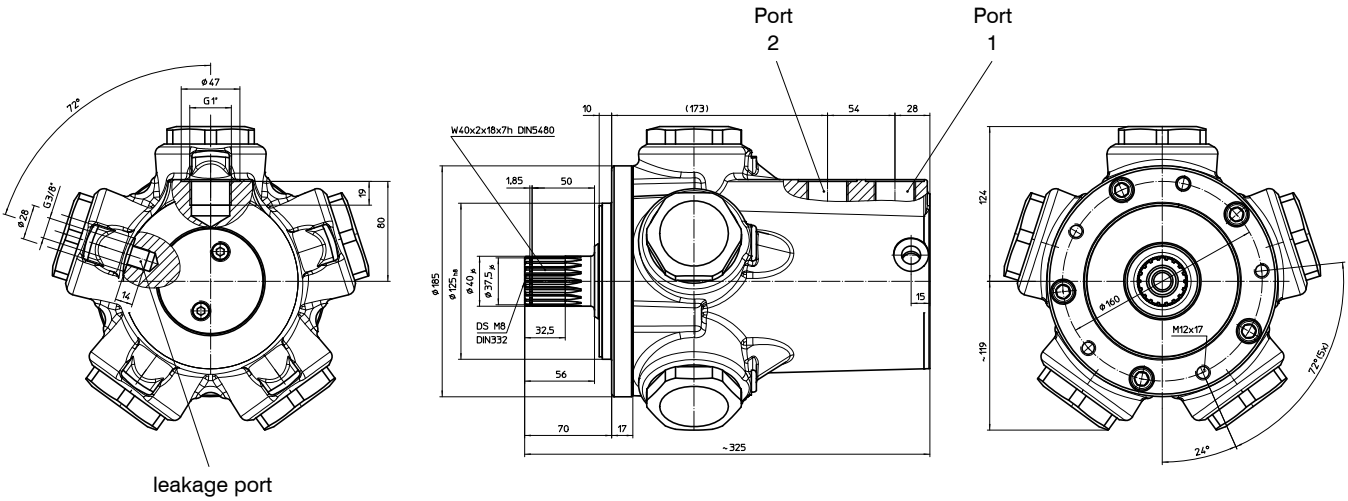
Sense of rotation:

viewed onto output shaft front side

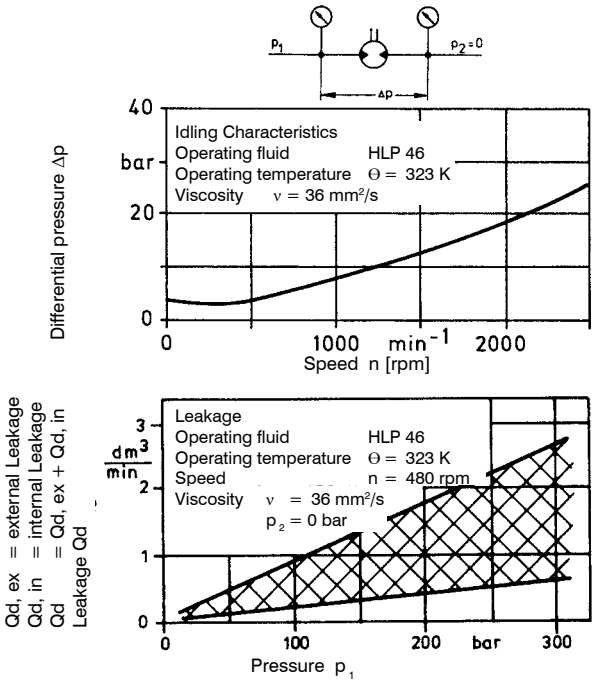
clockwise: at flow from port 2 to 1

anti clockwise: at flow from port 1 to 2

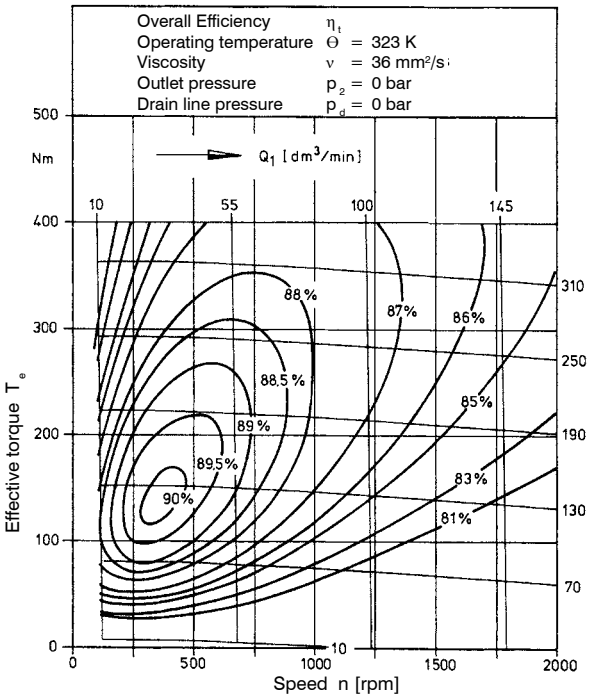
RM 80 NKA



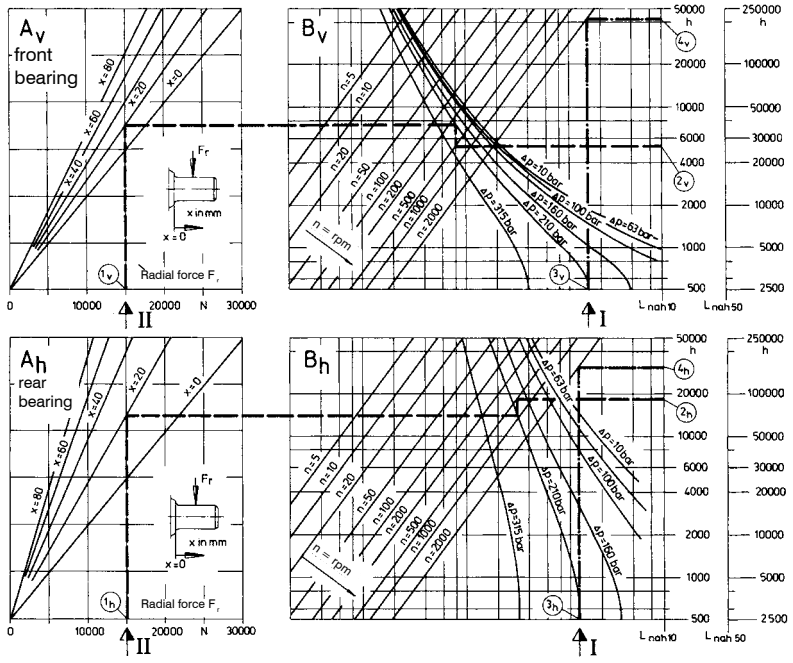
Characteristics



Characteristics according to iso



Service life of the rolling bearings



I

Given: F_r=0 N ; Δp=210 bar ; n= 2000 rpm
Required: Service life of the bearing
Diagram B: Points of intersection of Δp=210 bar (3v) and (3h) with the abscissa, vertically to the speed line n=2000 rpm , then horizontally ⟶ the bearing life
(4v) L_{nah10} = 42000 h resp. L_{nah50} = 210000 h
and
(4h) L_{nah10} = 31000 h resp. L_{nah50} = 155000 h.

II

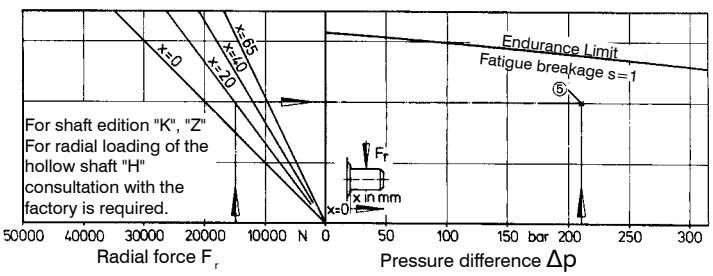
Given: F_r=15000 N ; x=20 mm ; Δp=210 bar ; n= 500 rpm
Required: Service life of the bearing
Diagram A: From F_r=15000 N (1v), (1h) to the sectional point with x=20 mm, then horizontally acc. to diagram B.
Diagram B: Cut the horizontal line from diagram A with the curve Δp=210 bar, vertically to the sectional point with n=500 rpm, then horizontal ⟶ the bearing life (2v)
L_{nah10}=5200 h resp. L_{nah50}= 26000 h and (2h)
L_{nah10}=17500 h resp. L_{nah50}=187500 h.

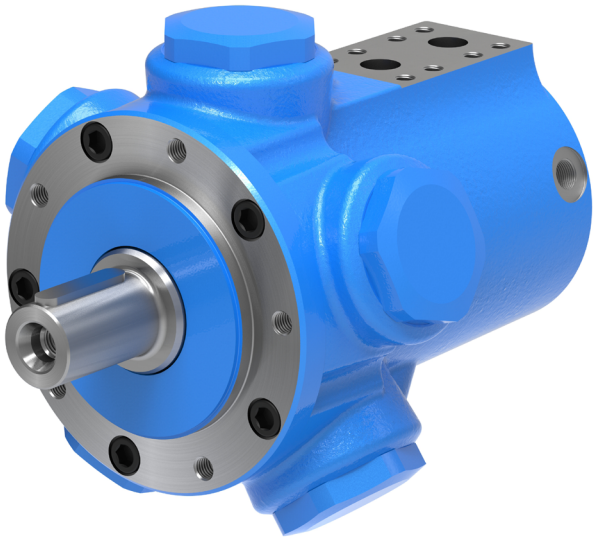
L_{nah10} is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s [36 c St] at which 10% the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing L_{nah50} is five times L_{nah10}.

Shaft strength

Example:
Given: F_r=15000 N ; x=20 mm, Δp=210 bar
Required: Shaft strength

Make a vertical line of F_r=15000 N to the distance x=20 mm and from there a horizontal line. Lies the point of intersection ⑤ from the horizontal with teh vertical from Δp=210 bar under the curve S=1 so the shaft is constantly strong.
Admissible axial forces calculate the works on request.





Technical data RM 125N

Geom. displacement	:	126	[cm³/U]
Theor. spec. torque	:	2,0	[Nm/bar]
Average spec. torque	:	1,8	[Nm/bar]
Cont. pressure	:	200	[bar]
Max. pressure	:	315	[bar]
Peak pressure	:	350	[bar]
Max. operating torque	:	567	[Nm]
Cont. torque	:	360	[Nm]
Operating speed range	:	5 - 600	[rpm]
Cont. power	:	12	[kW]
Interm. power	:	15	[kW]
Moment of inertia	:	0,0017	[kgm²]
Weight	:	40	[kg]

Further information

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Mounting position: any

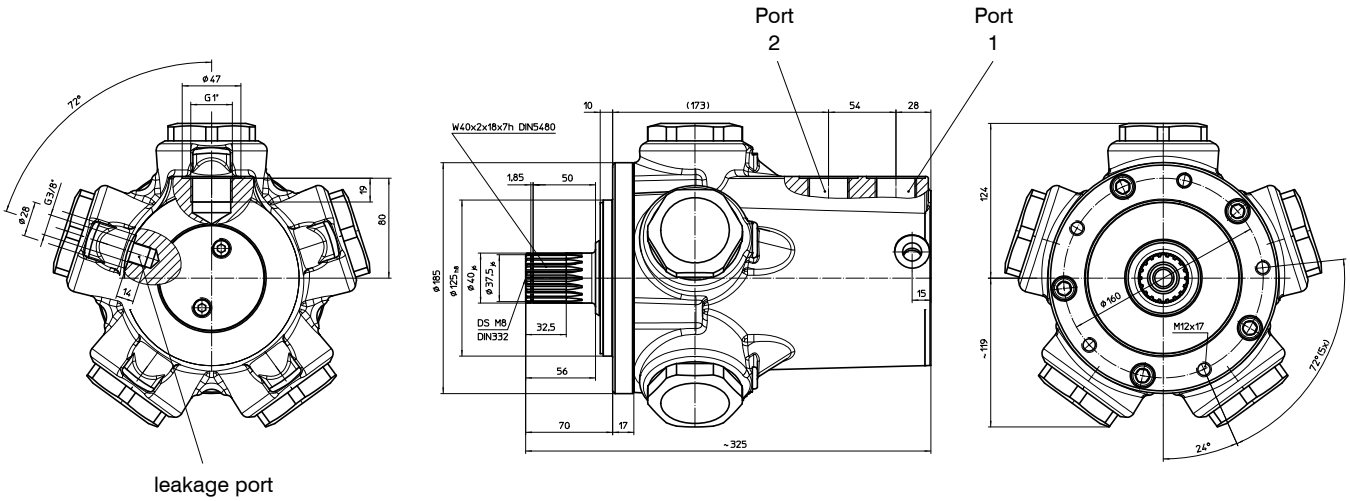
Sense of rotation:

viewed onto output shaft front side

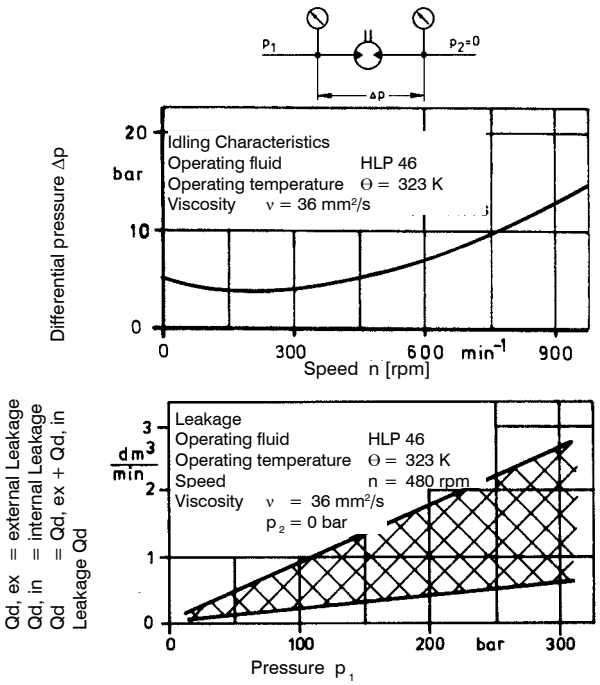
clockwise: at flow from port 2 to 1

anti clockwise: at flow from port 1 to 2

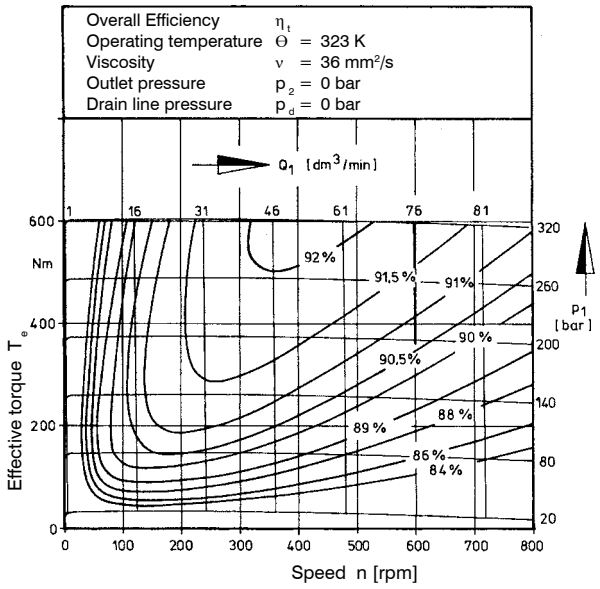
RM 125 NKA



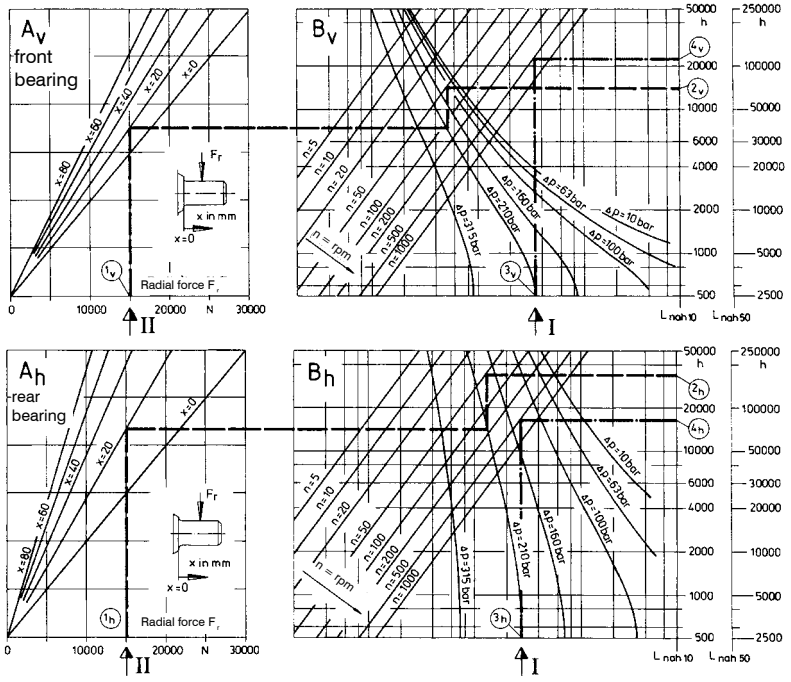
Characteristics



Characteristics according to iso



Service life of the rolling bearings



I

Given: F_r=0 N ; Δp=210 bar ; n= 500 rpm
Required: Service life of the bearing
Diagram B: Points of intersection of Δp=210 bar (3v) and (3h) with the abscissa, vertically to the speed line n=500 rpm , then horizontally ⟶ the bearing life
(4v) L_{nah10} = 22000 h resp. L_{nah50} = 110000 h and
(4h) L_{nah10} = 16500 h resp. L_{nah50} = 82500 h.

II

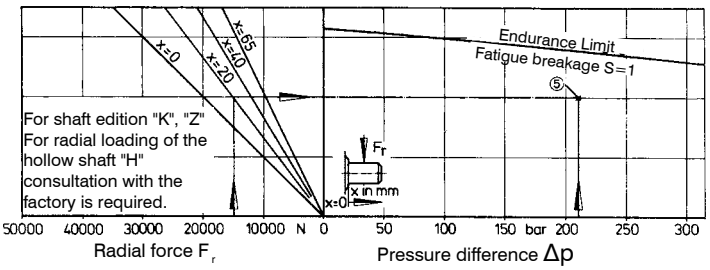
Given: F_r=15000 N ; x=20 mm ; Δp=210 bar ; n= 50 rpm
Required: Service life of the bearing
Diagram A: From F_r=15000 N (1v), (1h) to the sectional point with x=20 mm, then horizontally acc. to diagram B.
Diagram B: Cut the horizontal line from diagram A with the curve Δp=210 bar, vertically to the sectional point with n=50 rpm, then horizontal ⟶ the bearing life (2v)
L_{nah10}=13500 h resp. L_{nah50}= 67500 h and (2h)
L_{nah10}=32500 h resp. L_{nah50}=162500 h.

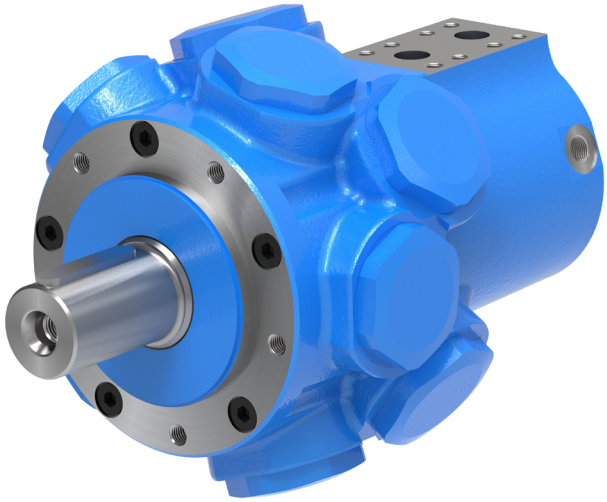
L_{nah10} is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s [36 c St] at which 10% the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing L_{nah50} is five times L_{nah10}.

Shaft strength

Example:
Given: F_r=15000 N ; x=20 mm, Δp=210 bar
Required: Shaft strength

Make a vertical line of F_r=15000 N to the distance x=20 mm and from there a horizontal line. Lies the point of intersection ⑤ from the horizontal with teh vertical from Δp=210 bar under the curve S=1 so the shaft is constantly strong.
Admissible axial forces calculate the works on request.





Technical data RM 160N

Geom. displacement	:	161	[cm³/U]
Theor. spec. torque	:	2,56	[Nm/bar]
Average spec. torque	:	2,38	[Nm/bar]
Cont. pressure	:	250	[bar]
Max. pressure	:	315	[bar]
Peak pressure	:	400	[bar]
Max. operating torque	:	750	[Nm]
Cont. torque	:	595	[Nm]
Operating speed range	:	5 - 800	[rpm]
Cont. power	:	24	[kW]
Interm. power	:	30	[kW]
Moment of inertia	:	0,0023	[kgm²]
Weight	:	58	[kg]

Further information

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Shaft version	**Z / H :**	Page 16

Mounting position: any

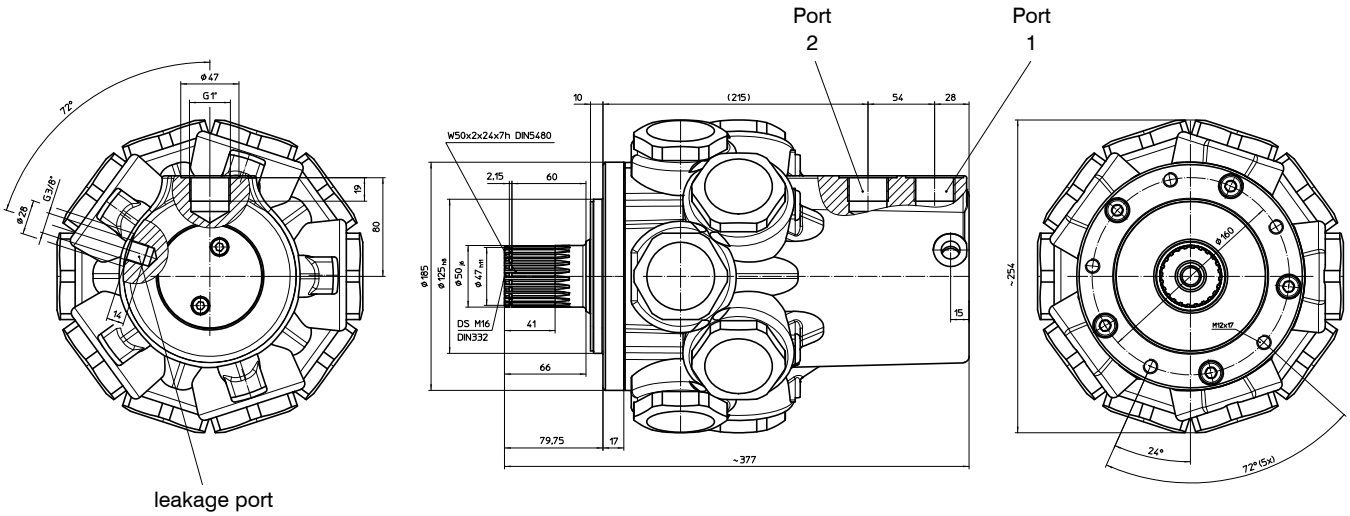
Sense of rotation:

viewed onto output shaft front side

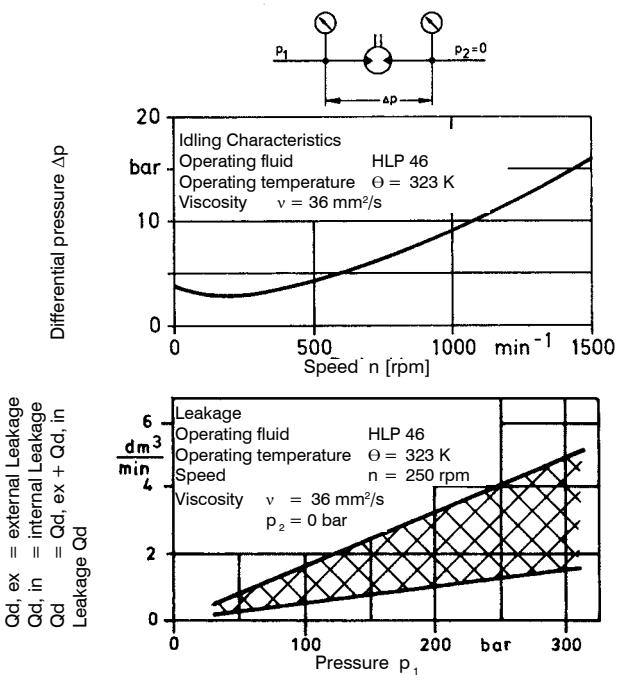
clockwise: at flow from port 2 to 1

anti clockwise: at flow from port 1 to 2

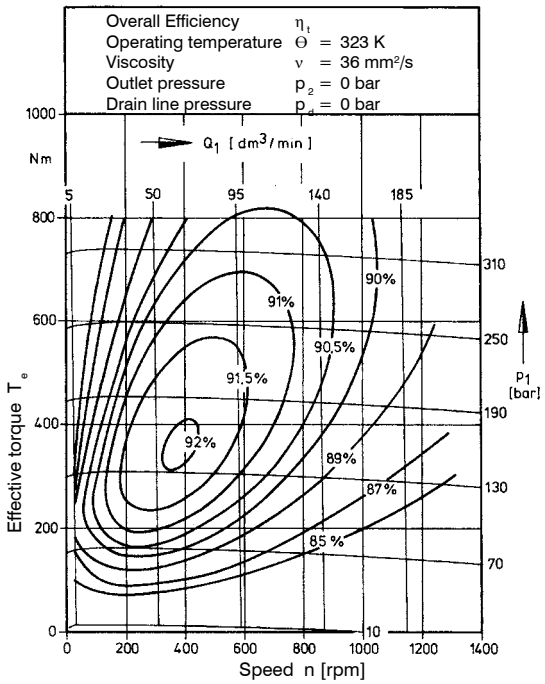
RM 160 NKA



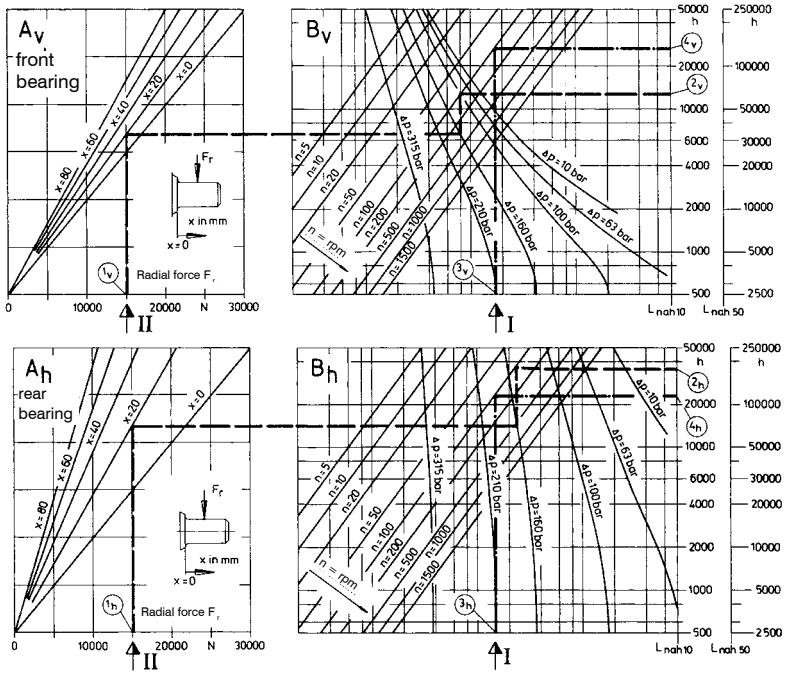
Characteristics



Characteristics according to iso



Service life of the rolling bearings



I

Given: F_r=0 N ; Δp=210 bar ; n= 100 rpm
Required: Service life of the bearing
Diagram B: Points of intersection of Δp=210 bar (3v) and (3h) with the absciss, vertically to the speed line n=100 rpm , then horizontally ⟶ the bearing life
(4v) L_{nah10} = 26300 h resp. L_{nah50} = 131500 h and
(4h) L_{nah10} = 22200 h resp. L_{nah50} = 111000 h.

II

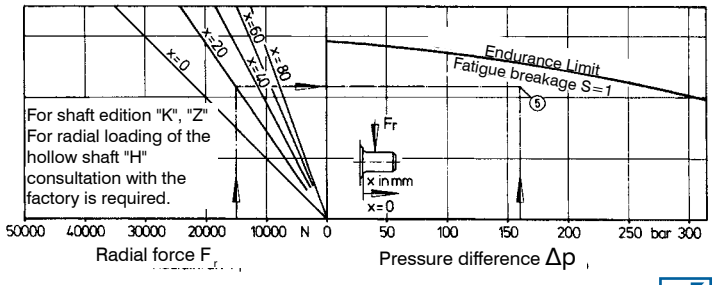
Given: F_r=15000 N ; x=20 mm ; Δp=210 bar ; n= 100 rpm
Required: Service life of the bearing
Diagram A: From F_r=15000 N (1v), (1h) to the sectional point with x=20 mm, then horizontally acc. to diagram B.
Diagram B: Cut the horizontal line from diagram A with the curve Δp=160 bar, vertically to the sectional point with n=100 rpm, then horizontal⟶ the bearing life (2v)
L_{nah10}=12200 h resp. L_{nah50}= 61000 h and (2h)
L_{nah10}=35000 h resp. L_{nah50}=175000 h.

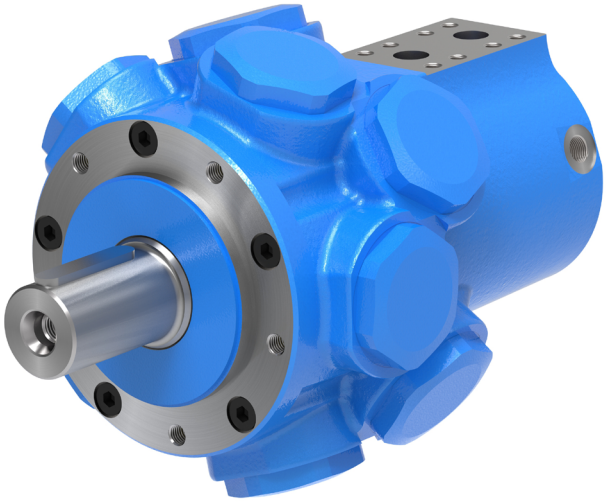
L_{nah10} is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s [36 c St] at which 10% the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing L_{nah50} is five times L_{nah10}.

Shaft strength

Example:
Given: F_r=15000 N ; x=20 mm, Δp=210 bar
Required: Shaft strength

Make a vertical line of F_r=15000 N to the distance x=20 mm and from there a horizontal line. Lies the point of intersection ⑤ from the horizontal with teh vertical from Δp=210 bar under the curve S=1 so the shaft is constantly strong.
Admissible axial forces calculate the works on request.





Technical data RM 250N

Geom. displacement	:	251	[cm³/U]
Theor. spec. torque	:	4,0	[Nm/bar]
Average spec. torque	:	3,7	[Nm/bar]
Cont. pressure	:	200	[bar]
Max. pressure	:	315	[bar]
Peak pressure	:	350	[bar]
Max. operating torque	:	1165	[Nm]
Cont. torque	:	740	[Nm]
Operating speed range	:	5 - 600	[rpm]
Cont. power	:	24	[kW]
Interm. power	:	30	[kW]
Moment of inertia	:	0,0023	[kgm²]
Weight	:	58	[kg]

Further information

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Mounting position: any

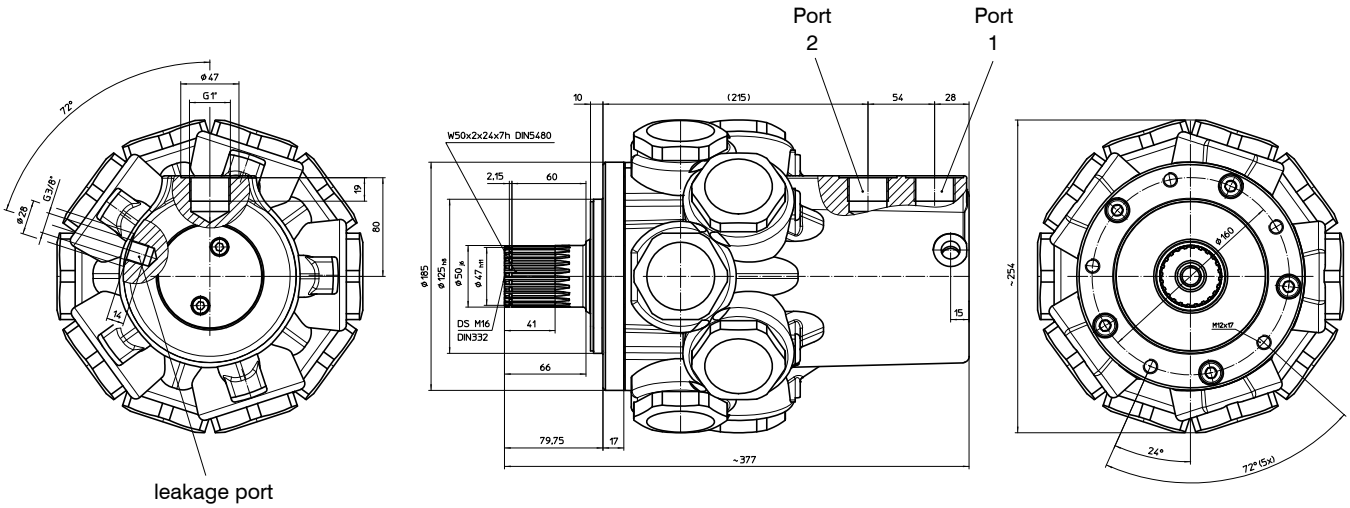
Sense of rotation:

viewed onto output shaft front side

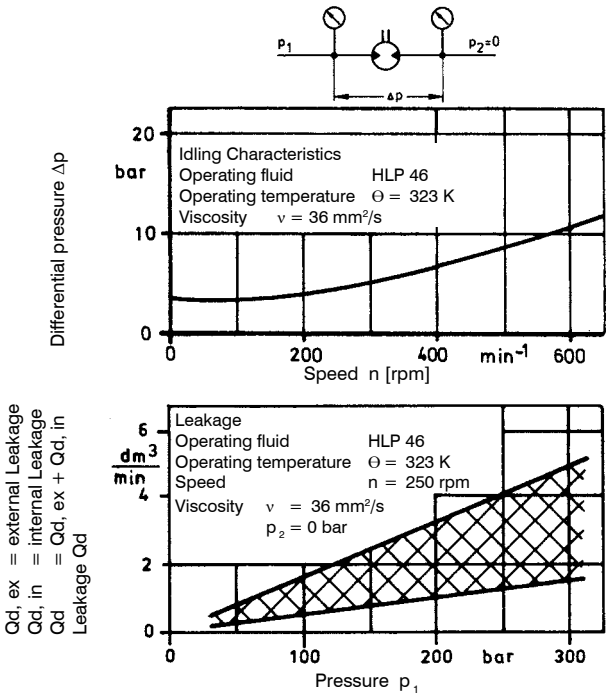
clockwise: at flow from port 2 to 1

anti clockwise: at flow from port 1 to 2

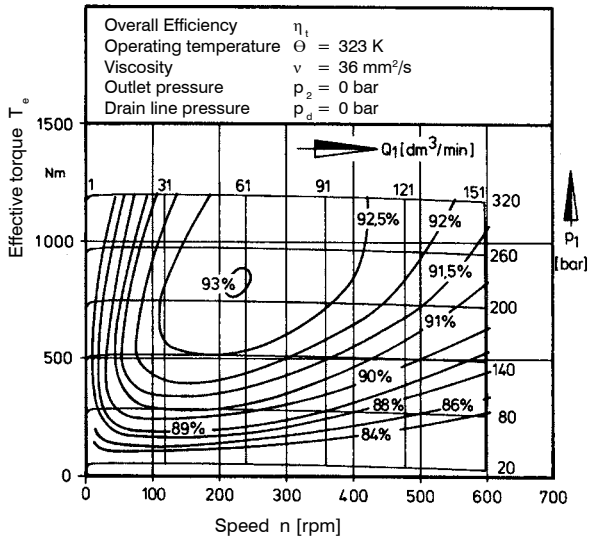
RM 250 NKA



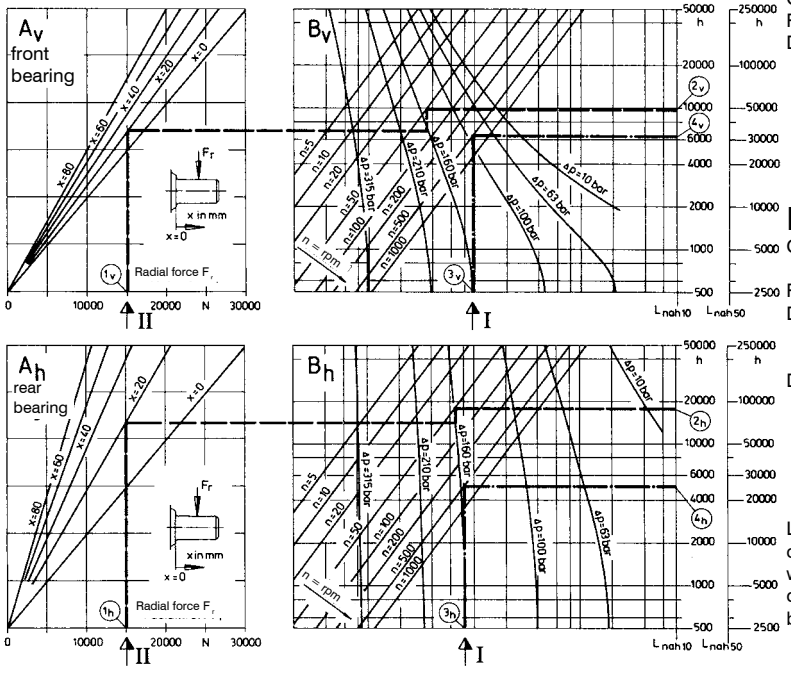
Characteristics



Characteristics according to iso



Service life of the rolling bearings



I

Given: F_r=0 N ; Δp=160 bar ; n= 500 rpm
Required: Service life of the bearing
Diagram B: Points of intersection of Δp=160 bar (3v) and (3h) with the abscissa, vertically to the speed line n=500 rpm , then horizontally ⟶ the bearing life
(4v) L_{nah10} = 6100 h resp. L_{nah50} = 30500 h and
(4h) L_{nah10} = 4850 h resp. L_{nah50} = 24250 h.

II

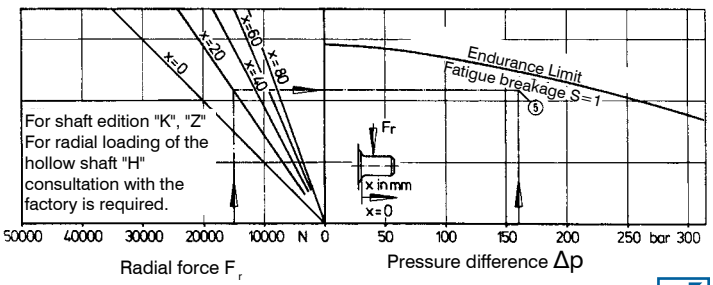
Given: F_r=15000 N ; x=20 mm ; Δp=160 bar ; n= 50 rpm
Required: Service life of the bearing
Diagram A: From F_r=15000 N (1v), (1h) to the sectional point with x=20 mm, then horizontally acc. to diagram B.
Diagram B: Cut the horizontal line from diagram A with the curve Δp=160 bar, vertically to the sectional point with n=100 rpm, then horizontal ⟶ the bearing life (2v)
L_{nah10}=9600 h resp. L_{nah50}= 48000 h and (2h)
L_{nah10}=17300 h resp. L_{nah50}=86500 h.

L_{nah10} 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% the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing L_{nah50} is five times L_{nah10}.

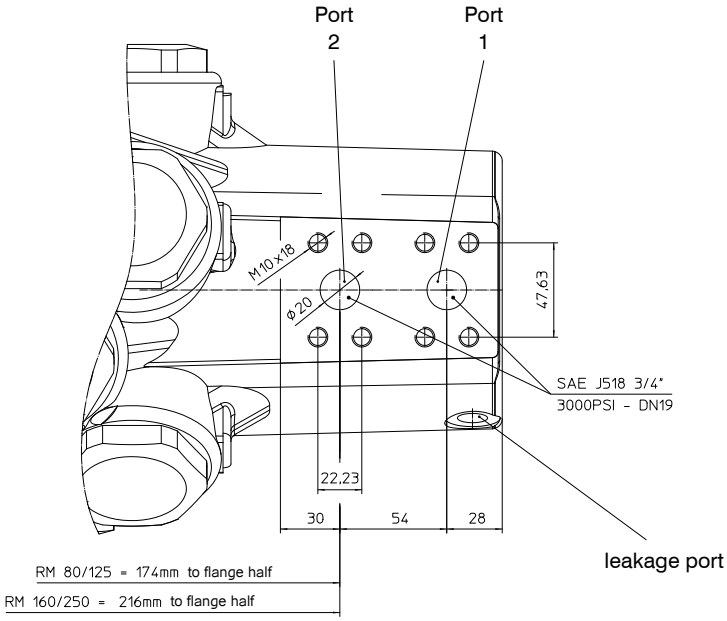
Shaft strength

Example:
Given: F_r=15000 N ; x=20 mm, Δp=210 bar
Required: Shaft strength

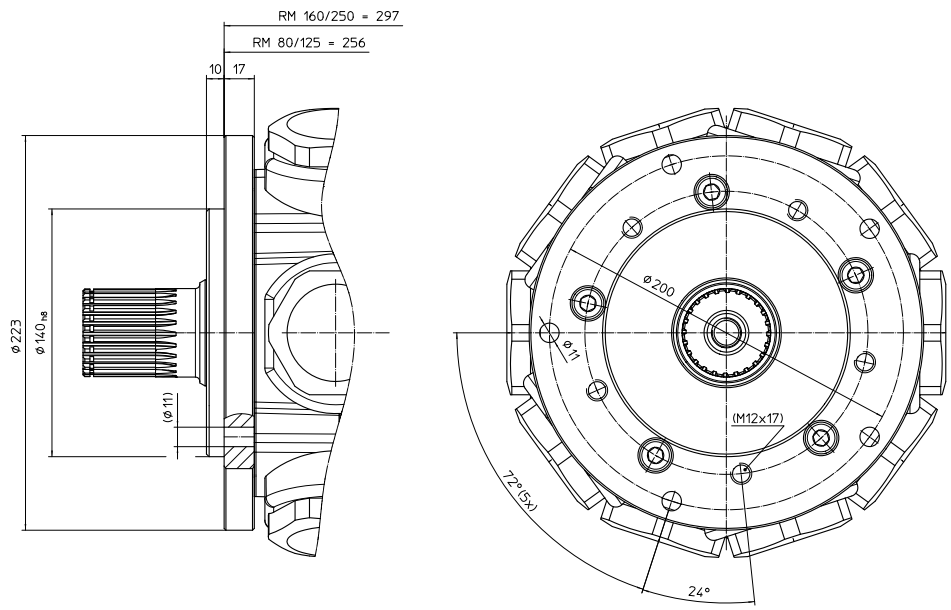
Make a vertical line of F_r=15000 N to the distance x=20 mm and from there a horizontal line. Lies the point of intersection ⑤ from the horizontal with teh vertical from Δp=210 bar under the curve S=1 so the shaft is constantly strong.
Admissible axial forces calculate the works on request.



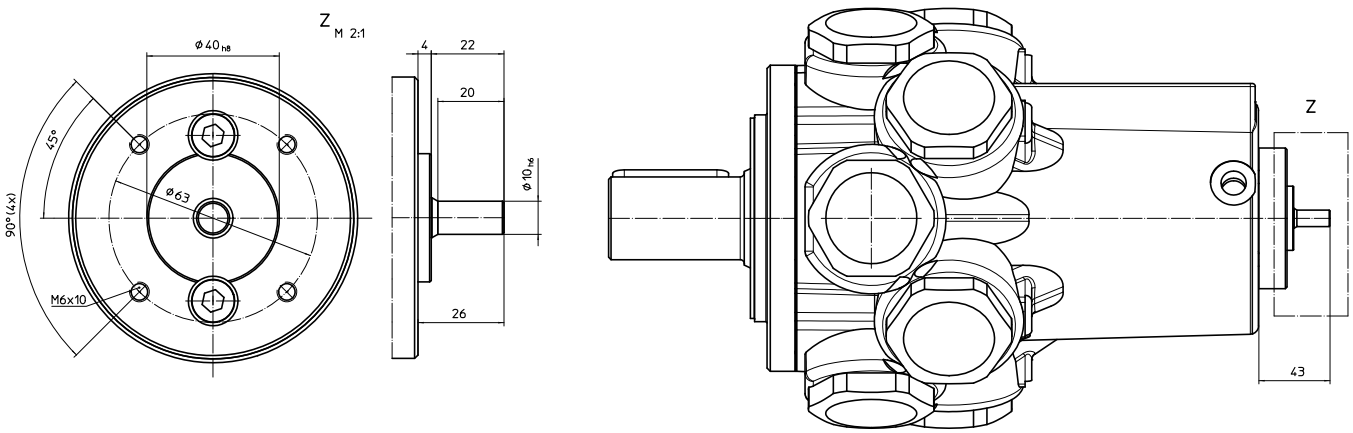
Case edition A1



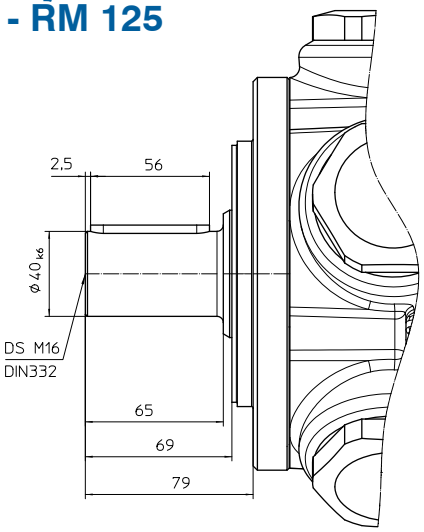
flange edition F

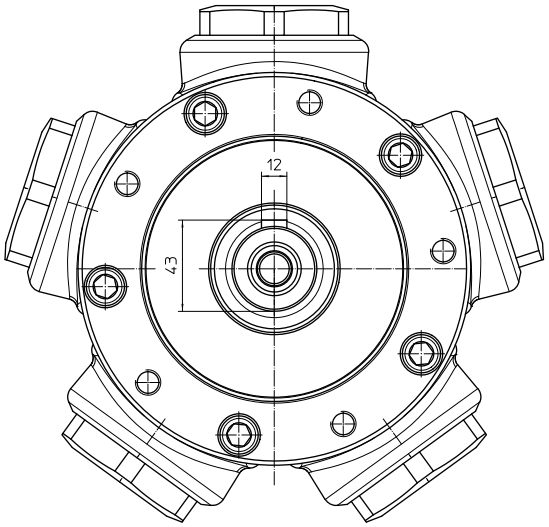


measuring shaft edition M

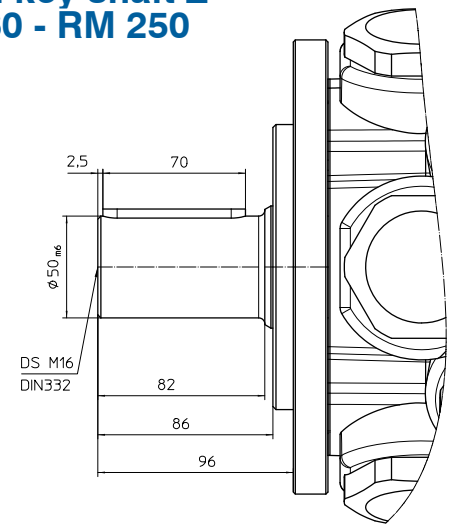


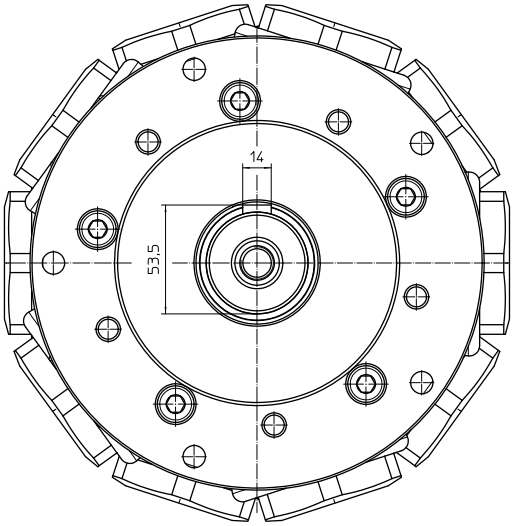
Parallel key shaft Z
RM 80 - RM 125



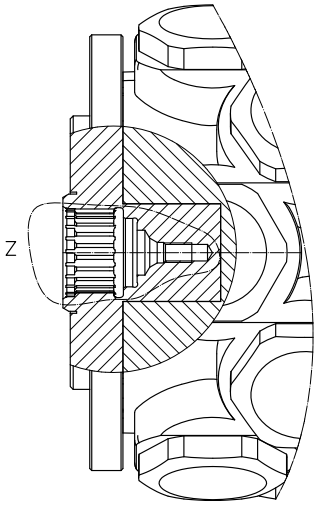


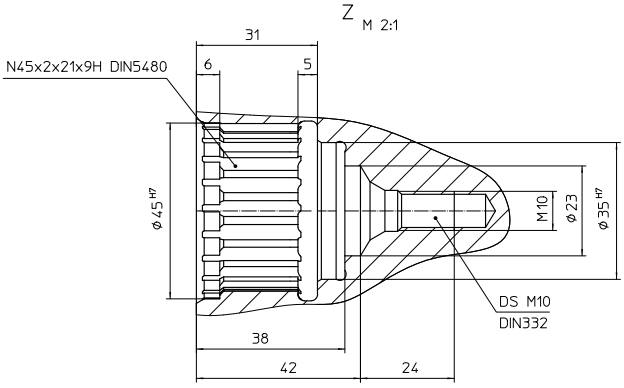
Parallel key shaft Z
RM 160 - RM 250





Hollow shaft H
RM 80 - RM 250





Pressure fluids:

HLP Mineral oil in conformity with DIN 51524 part 2
Biodegradable liquids (seal NBR / FPM, clarify seal with manufacturer).

HFC reduce pressure to 70% , check the bearing service life.

HFD Phosphoric acid ester, FPM - seals (Viton) are required.

Filtering:

For a long service life of the motor, the purity class of the hydraulic fluid should be better than CODE 20/18/15 according to ISO 4406.

Attachment:

The mounting position of the motor location is arbitrary.
Align the motor well.
Use fastening screws of strength class 10.9.
In case of frequent reversing, make two fastening screws as fitting screws.

Coupling:

Mount the coupling with a suitable device.

Leakage line:

Before start-up, fill the motor housing with hydraulic oil.
Lay the leakage line in such a way that the motor does not run dry and no air bubble forms in the housing.

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.

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- 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.

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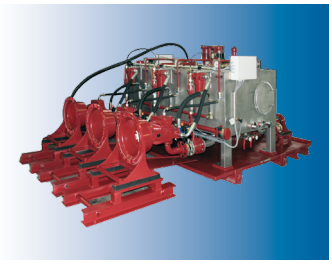
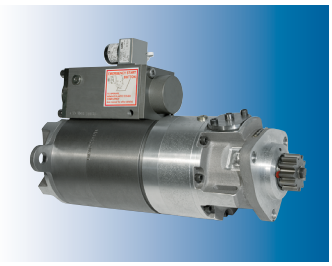
- Foundry machines
- Testing machines
- Shipbuilding (diesel engines)
- Offshore technology
- Printing and paper technology
- Vehicle construction
- Manipulators
- Environmental technology
- Mining equipment
- Materials handling equipment





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DÜSTERLOH Fluidtechnik

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