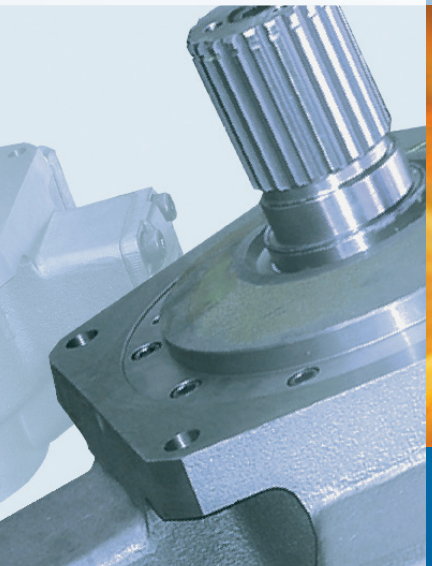
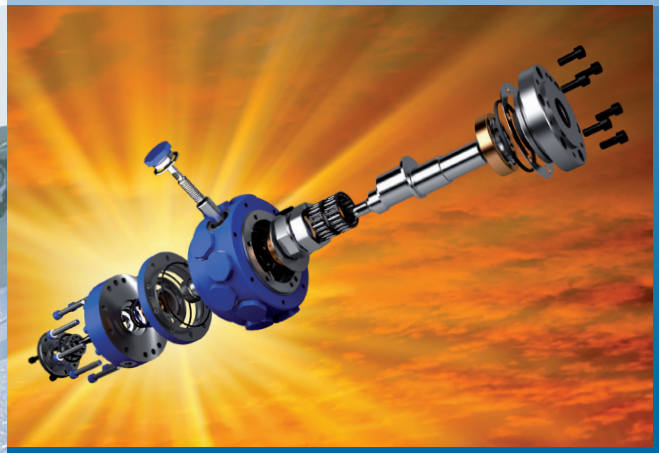
DÜSTERLOH Fluidtechnik

Hydraulic-Motors

Radial Piston Motors

with fixed displacement
KM 11 - RM 250N series
V_g = 11 ccm/rev - 250 ccm/rev





Dok.-Nr. HM1-014 EN

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
- with SAE flange connections
- 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

Fixed displacement motor (constant hydraulic displacement)

Motor Typ		Displace-ment	Torque		Speed		Cont. operating pressure	Maximum operating pressure	Peak pressure	Output	
		V_g	$T_{spec.\,aver.}$	T_{max}	n_{min}*	n_{max}	p_{cont}	p_{max}	p_{peak}	P_{cont}	$P_{intermit.}$
KM	RM	cm³/rev	Nm/bar	Nm	rpm	rpm	bar	bar	bar	kW	kW
11		11	0,15	31,5	10	3000	140	210	250	3,5	4,3
	11	11	0,15	37,5	5	3600	160	250	315	4,7	5,8
22		22	0,31	77,9	10	2250	160	250	315	6,0	7,5
32		33	0,47	118	10	1500	160	250	315	6,0	7,5
45		44	0,62	156	5	1800	160	250	315	9,5	11
63		66	0,95	236	5	1200	160	250	315	9,5	11
90		89	1,27	267	5	900	140	210	250	8,5	10
110		110	1,59	333	5	750	140	210	250	8,5	10
	80N	81	1,15	363	5	800	250	315	400	12	15
	125N	126	1,80	567	5	600	200	315	350	12	15
	160N	160	2,36	742	5	800	250	315	400	24	30
	250N	251	3,68	1159	5	600	200	315	350	24	30

* 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 $P_{intermit.}$ 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)

Radial Piston Motor | | | | | | | | |

control

with clearance seal in the control **KM**
NG 11, 22, 32, 45, 63, 90, 110

with play self-adjustment **RM**
NG 11, 80N, 125N, 160N, 250N

Displacement **Rated Size NG**

11 cm³/rev	=	**11**
22 cm³/rev	=	**22**
33 cm³/rev	=	**32**
44 cm³/rev	=	**45**
66 cm³/rev	=	**63**
81 cm³/rev	=	**80N**
89 cm³/rev	=	**90**
110 cm³/rev	=	**110**
126 cm³/rev	=	**125N**
161 cm³/rev	=	**160N**
251 cm³/rev	=	**250N**

Drive Shaft

Cylindrical Keyway DIN 6885 T1 = **Z**

Male involute splined shaft DIN 5480 NG 22 bis 250N = **K**

Female involute splined shaft DIN 5480 NG 80N, 125N, 160N, 250N = **H**

Connections

Threaded connection, radial NG 11, 22, 32, 45, 63, 90, 110 G ½ DIN ISO 228-1 = **A**

Threaded connection, radial NG 80N, 125N, 160N, 250N G 1 DIN ISO 228-1 = **A**

Flange connection, radial NG 11, 22, 32,45, 63, 90, 110 Duesterloh standard (for mounting the valve) = **A1**

Flange connection, radial NG 80N, 125N, 160N, 250N SAE J 518 ¾" Standard 3000 psi = **A1**

Threaded connection, axial NG 22, 32, 45, 63, 90, 110 G ¾ DIN ISO 228-1 = **B5**

* No information given in the type key number.

Additional information

Designation

E2 = Actuator quality NG 22, 32, 45, 63, 90,110

S99 = Flush connection

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

Flange dimensions

Designation

Attachment to the face

***** = NG 22, 32, 45, 63, 90, 110 S = ø80 K = ø100

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

F3 = NG 22, 32, 45, 63, 90, 110 S = ø120 K = ø140

Flange connection

F = NG 11 ISO 3019/2 S = ø125 K = ø160

F = NG 22, 32, 45, 63, 90, 110 ISO 3019/2 S = ø160 K = ø200

F = NG 80N, 125N, 160N, 250N S = ø140 K = ø200

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

Second shaft end

Designation

***** = without second shaft end

M = cylindrical measuring shaft $ø10_{h6}$ for sensor (incremental speed sensor etc.)

M10 = second driven shaft W28x1,25x30x21-7h DIN 5480 NG 22, 32, 45, 63, 90, 110

Sealing material

Designation

***** = NBR seals, suitable for HLP mineral oils according to DIN 51524 part 2

V = FPM (Viton) seals, suitable for ester of phosphoric acid (HFD)

1. General properties and features

Design:
hydrostatic radial piston motor

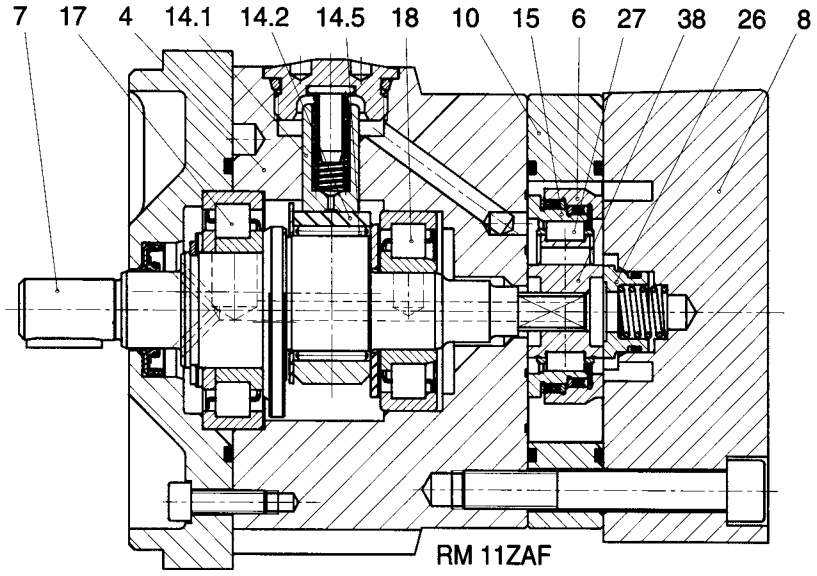
Purpose:
transformation of hydraulic power to drive power.
High efficiency, also suitable for very low speeds, low moment of inertia, rapidly reversible, capable of supporting high total loads, four-quadrant operation possible, very suitable for applications as a control, extremely quiet operation.

2. Structure and function

2.1 Drive unit

Design:
Internal piston support

Method of functioning:
Seven radial pistons (14.1) load the crankshaft via a heptagon ring with a needle bearing cage.



Drive details
Seven radial pistons (14.1) load the crankshaft via a heptagon ring with a needle bearing cage.
Drive details
Crankshaft bearing: cylinder roller bearing (17,18) partially balanced crankshaft.
Transmission of force between the pistons (14.1) and the crankshaft (7):
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.

2.2 Control RM 11

Design:
Planar translational distribution valve with play adjustment

Purpose:
Distribution of the volume feed to the 7 cylinders, collection of the return volume flow
Method of functioning:
Control rings (6/15) with the external ring (10) and with the eccentric (38) form an external and an internal ring space.
By moving the control rings (6/15) between the motor housing (4) and the end cover (8) by means of the eccentric (38) which is fixed to the crankshaft (7), 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 to the motor.

Control details
Roller bearing between the control rings (6/15) and the eccentric (38)

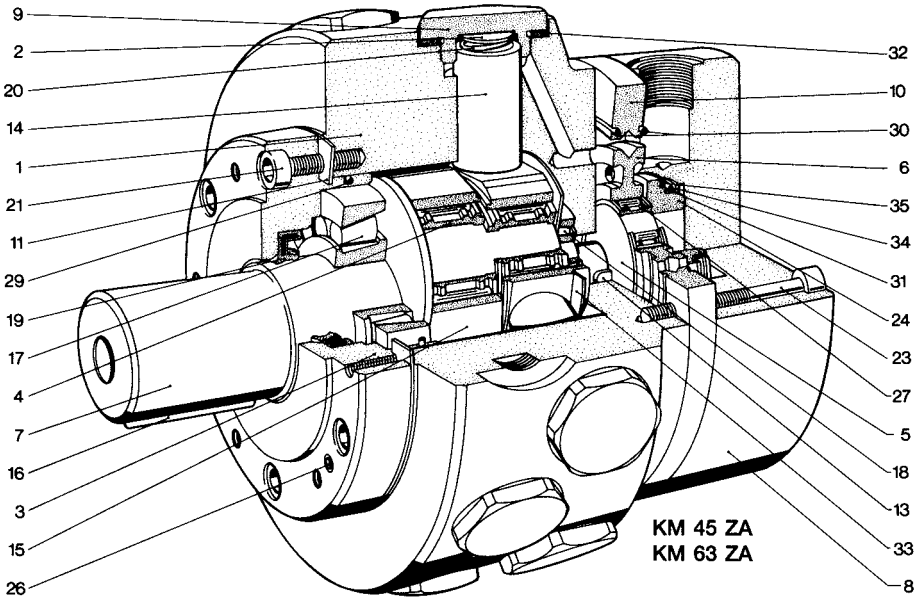
The control rings mainly move translationally, however, rotation is possible (2 degrees of freedom) – this means small frictional losses at the control rings (6/15) and a cleaning effect in the sealing gap, approximately equal relative speeds of the sealing faces, sinusoidal opening function for the control openings – this means smooth running even at low speeds and quiet running at high speeds, large volume flow diameters between the rollers (27) in the roller bearing.
Adjustment of the play on the control rings (6/15) and the flats on the eccentric:
Hydrostatic, low control ring (6/15) force against the flats, spring-supported pressure by means of spring washers (for zero pressure and low pressure situations), hydrostatic re-adjustment of the eccentric flats by means of a pressure thrust piece (26) 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.

2.3 Control KM 11

The control corresponds to series KM 22 to KM 110.

1. General properties 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, four-quadrant operation possible, very suitable for applications as a control, extremely quiet operation.



2. Structure and function

2.1 Drive unit

Design:
Internal piston support
Method of functioning:
Seven, fourteen or twenty-one radial pistons (14) load the crankshaft (7) via heptagon rings (15) with needle bearing cages (4).

Drive details

Crankshaft bearing: Pre-loaded, large taper roller bearings (17,18), 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). Transmission of force between the pistons (14) and the crankshaft (7): via heptagon ring (15) with needle bearing cage (4).
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.

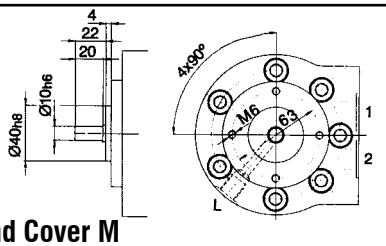
2.2 Control

Design:
Planar translationally moving distributor with clearance seal to prevent internal leakage and with play self-adjusting seal to prevent leakage to the outside.
Purpose:
Distribution of the volume feed to the cylinders, collection of the return volume flow
Method of functioning:
The control disc (6) has an integrated internal ring space and forms an external ring space in conjunction with ring (10). By moving the control disc (6) between the motor housing (1) and the end cover (8) by means of the eccentric (5) which is fixed to the crankshaft (7), 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 to the motor.

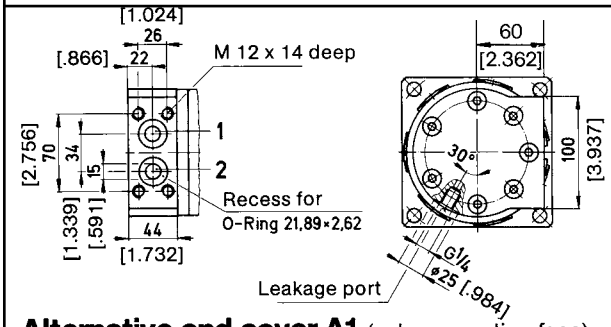
Control details

Needle bearing cage (27) between control disc (6) and eccentric (5):
The control disc (6) mainly moves translationally, however, rotation is possible (2 degrees of freedom) – this means small frictional losses at the control disc (6) 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 (27) in the roller bearing.
Play self-adjusting seal against leakage to the outside:
Low hydrostatic force of the thrust piece (24) against the control disc (6) supported by the spring washer (35). Reduction in the leakage to the outside at only low frictional losses, automatic compensation for pressure or temperature influences, relatively insensitive to dirt.

Flange
DIN-ISO 3019/2 **KM 11 ZAF**



Alternative End Cover M



Alternative end cover A1 (valve mounting face)

Hydraulic characteristic values

		KM	RM
Geometr. displacement	[cm³/rev]	11	
Theor. spec. torque	[Nm/bar]	0,17	
Average spec. torque	[Nm/bar]	0,15	
Peak pressure*	[bar]	250	315
Max. operating pressure**	[bar]	210	250
Continuous pressure	[bar]	140	160
Max. operating torque	[Nm]	31,5	37,5
Continuous torque	[Nm]	21	24
Drain line pressure	[bar]	max. 1	
Hydraulic fluid temperature range	[K]	243 - 363	
	[°C]	- 30 - + 90	
Viscosity range	[mm²/s]	20 - 150	
	(max. 1000 mm²/s at start)		

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

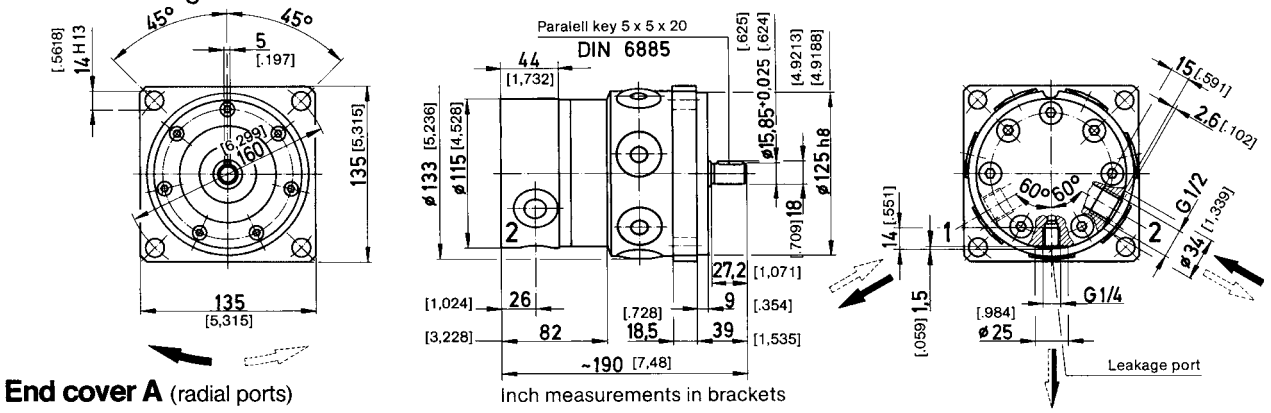
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

Weight:	[kg]	12,0	
Mounting position:	as required		
Direction of rotation, if viewed at the shaft end			
clockwise:	flow from connection 2 to connection 1		
anti-clockwise:	flow from connection 1 to connection 2		
Operating speed range:	[rpm]	10 ÷ 3000	5 ÷ 3600
Moment of inertia:	[kgm²]	0,000263	
Continuous power:	[kW]	3,5	4,7
Intermittent power:	[kW]	4,3	5,8

Standard Design



End cover A (radial ports)

Inch measurements in brackets

Type number key for radial piston motor KM 11 ; RM 11

	Size	Shaft end	End cover	Seal	Instrument shaft	Flange	additional specs.
	11						
Radial Piston Motor KM / RM		Keyway Z	Radial ports A / Valve face A1	NBR / Viton V	without / with M	ISO 3019/2 F	

KM = motor control with clearance seal
RM = play self-adjusting motor control (the motor is 10mm longer, dimension 82 becomes 92)

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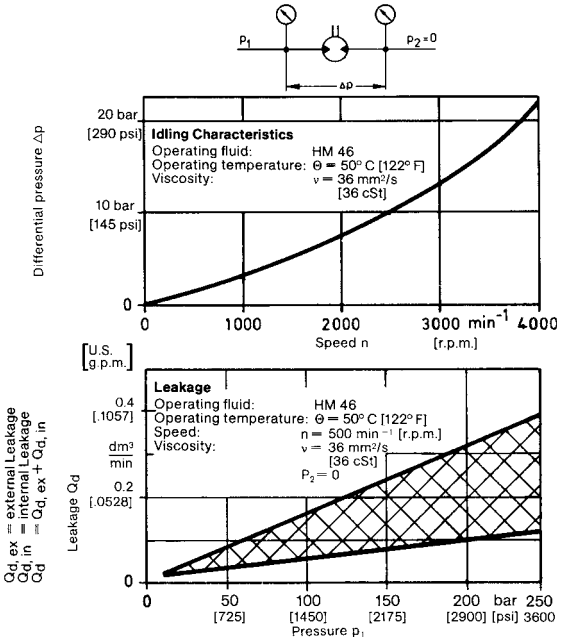
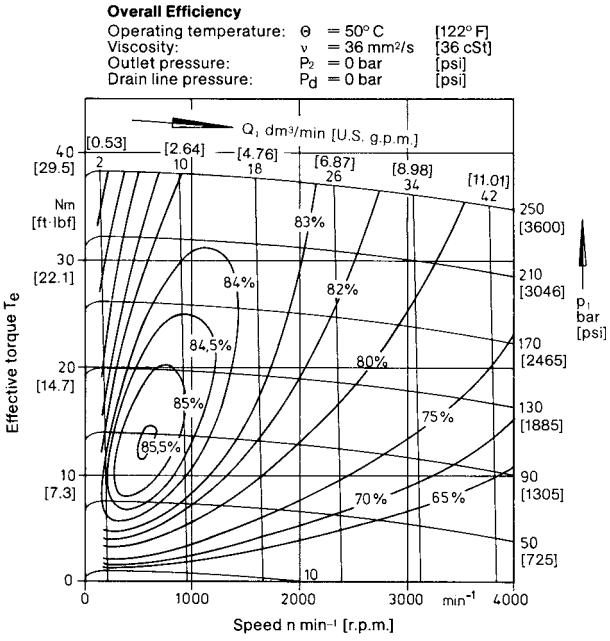
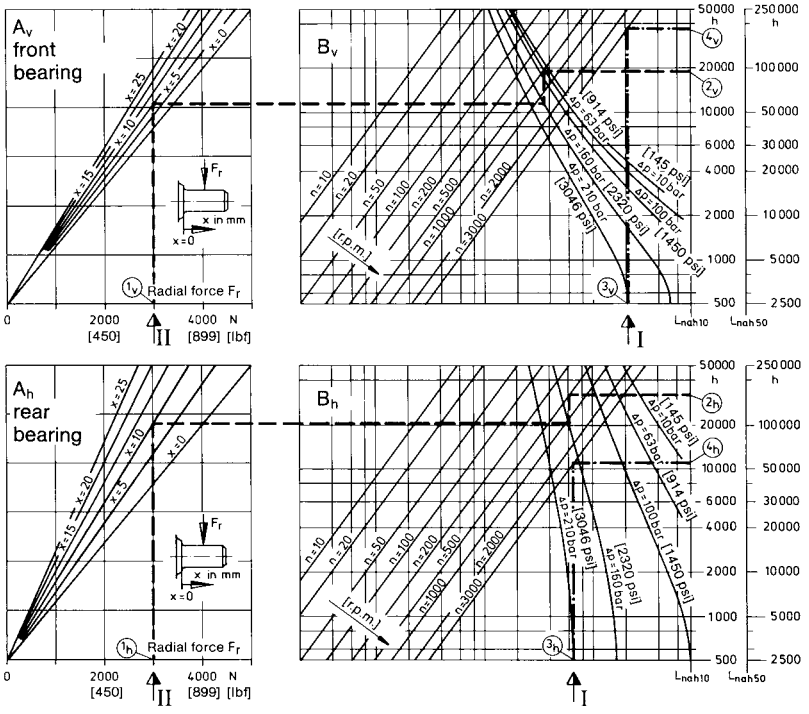
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 210 bar [3046 psi]; n = 3000 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 = 3000 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 36000 hours resp. L_{nah50} = 180000 hours and (4h) L_{nah10} = 10500 hours resp. L_{nah50} = 53000 hours.

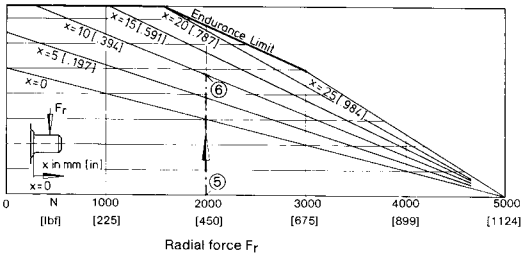
II

Given: F_r = 3000 N [674 lbf]; x = 10 mm [.394 in]; Δp = 160 bar [2320 psi]; n = 500 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 3000 N [674 lbf] (1v), (1h) to the sectional point with x = 10 mm [.394 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 = 500 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 18700 hours resp. L_{nah50} = 93500 hours and (2h) L_{nah10} = 29000 hours resp. L_{nah50} = 145000 hours.

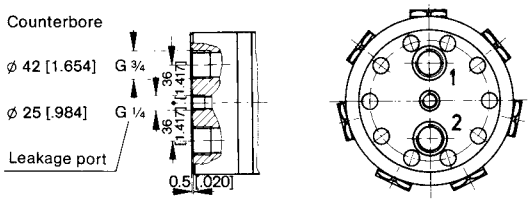
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10% of the bearings can fail, 90% reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Strength of the shaft

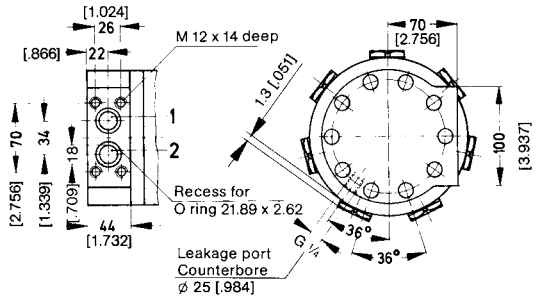
Example:
Given: F_r = 2000 N [674 lbf] x = 10 mm [.394 in]
Required: Shaft strength
Make a vertical line of ⑤ F_r = 2000 N [674 lbf] to the distance ⑥ x = 10 mm [.394 in]
Lies the point of intersection in the diagram so the shaft is constantly strong. Admissible axial forces calculate the works on request.



Flange
DIN-ISO 3019/2 **KM 22 ZAF**



Alternative end cover B5



Alternative end cover A1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	22
Theor. spec. torque	[Nm/bar]	0,35
Average spec. torque	[Nm/bar]	0,32
Peak pressure*	[bar]	315
Max. operating pressure**	[bar]	250
Continuous pressure	[bar]	160
Max. operating torque	[Nm]	78
Continuous torque	[Nm]	50
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

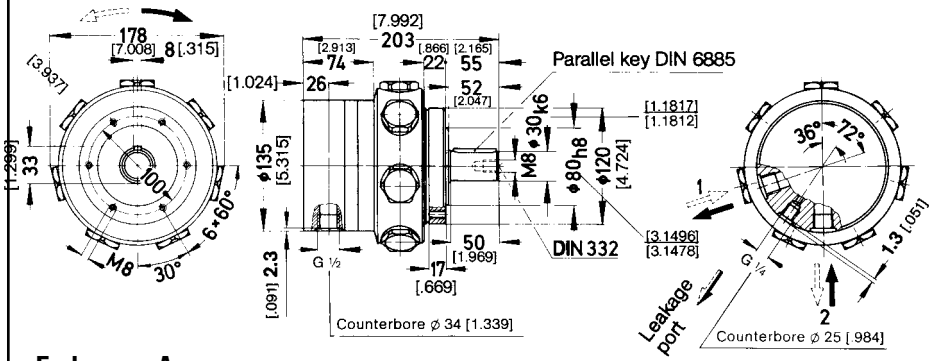
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

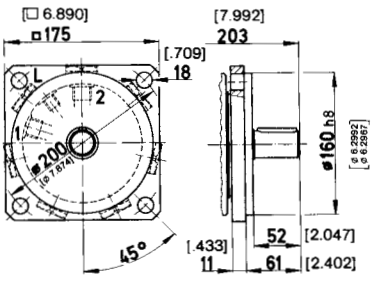
Weight:	[kg]	17,4
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	10 ÷ 2250
Moment of inertia:	[kgm²]	0,00028
Continuous power:	[kW]	6,0
Intermittent power:	[kW]	7,5

Standard Design



End cover A

Mounting Flange **F**
ISO 3019/2



Inch measurements in brackets

Type number key for radial piston motor KM 22

Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
KM	22						
Radial Piston Motor		Keyway Z K	Radial ports A Valve face A1 Axial ports B5	NBR Viton V	without Instrument M Driving M10	normal ISO 3019/2 F	

[1]) With end cover version B5 a 2nd shaft is not possible.

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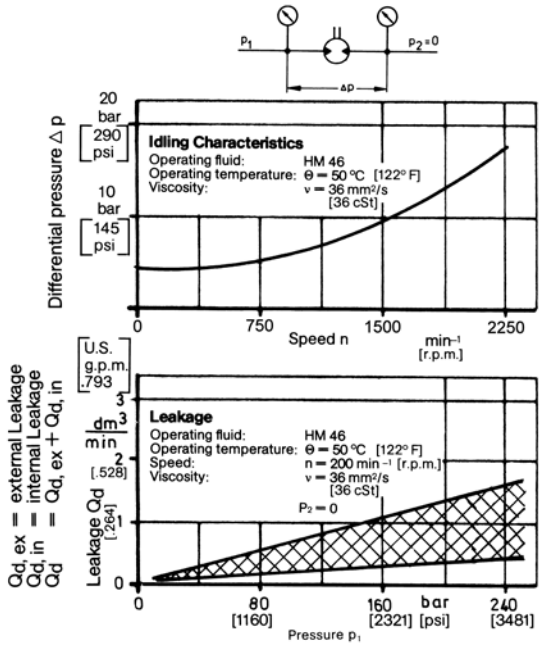
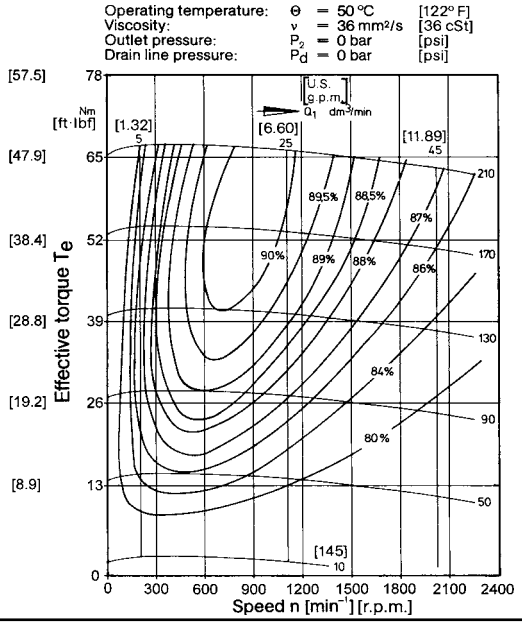
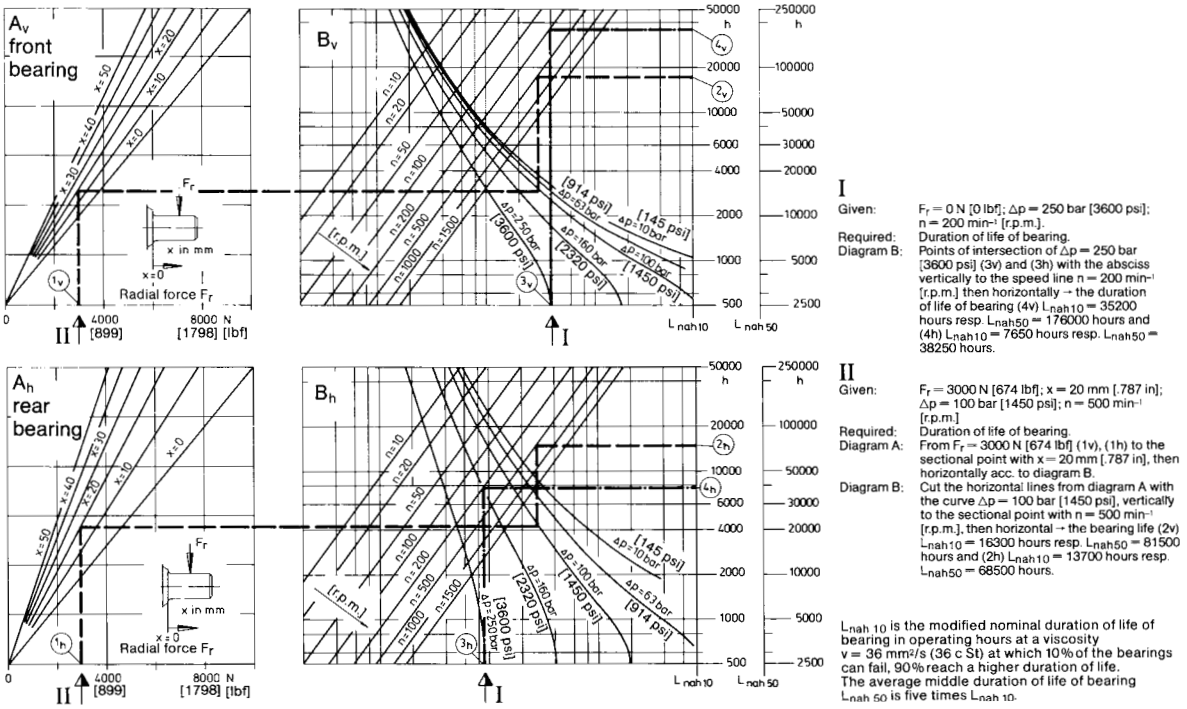
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



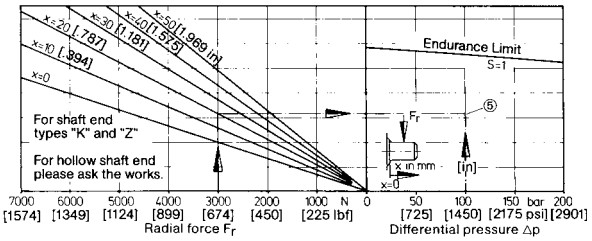
I
Given: F_r = 0 N [0 lbf]; Δp = 250 bar [3600 psi]; n = 200 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 250 bar [3600 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 200 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 35200 hours resp. L_{nah50} = 176000 hours and (4h) L_{nah10} = 7650 hours resp. L_{nah50} = 38250 hours.

II
Given: F_r = 3000 N [674 lbf]; x = 20 mm [.787 in]; Δp = 100 bar [1450 psi]; n = 500 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 3000 N [674 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 100 bar [1450 psi], vertically to the sectional point with n = 500 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 16300 hours resp. L_{nah50} = 81500 hours and (2h) L_{nah10} = 13700 hours resp. L_{nah50} = 68500 hours.

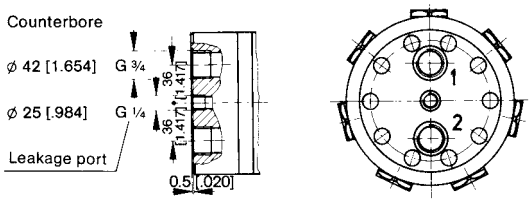
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10 % of the bearings can fail, 90 % reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Strength of the shaft

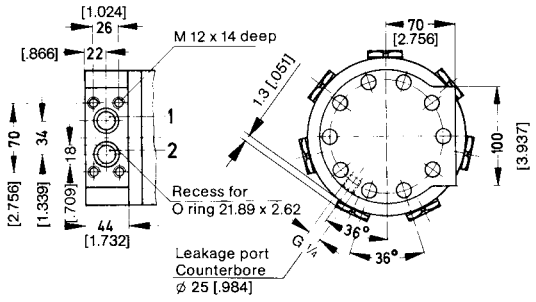
Example:
Given values: F_r = 3000 N [674 lbf] x = 20 mm [.787 in] Δp = 100 bar [1450 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 3000 N [674 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 100 bar [1450 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



Flange
DIN-ISO 3019/2 **KM 32 ZAF**



Alternative end cover B5



Alternative end cover A1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	33
Theor. spec. torque	[Nm/bar]	0,52
Average spec. torque	[Nm/bar]	0,48
Peak pressure*	[bar]	315
Max. operating pressure**	[bar]	250
Continuous pressure	[bar]	160
Max. operating torque	[Nm]	120
Continuous torque	[Nm]	76,8
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

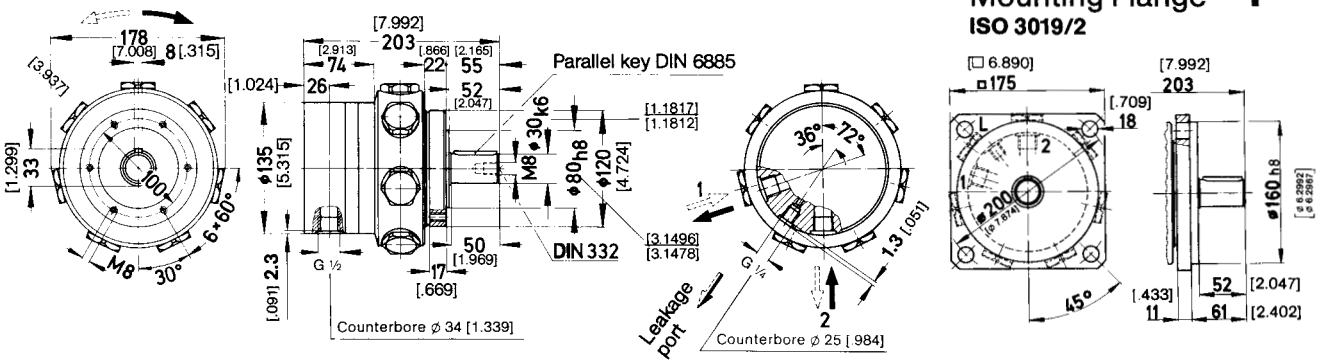
Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

Weight:	[kg]	17,4
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	10 ÷ 1500
Moment of inertia:	[kgm²]	0,00028
Continuous power:	[kW]	6,0
Intermittent power:	[kW]	7,5

Standard Design

Mounting Flange **F**
ISO 3019/2



End cover A

Inch measurements in brackets

Type number key for radial piston motor KM 32

Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
KM	32						
Radial Piston Motor		Keyway Z K	Radial ports A Valve face A1 Axial ports B5	NBR Viton V	without Instrument M Driving M10	normal ISO 3019/2 F	

[1]) With end cover version B5 a 2nd shaft is not possible.

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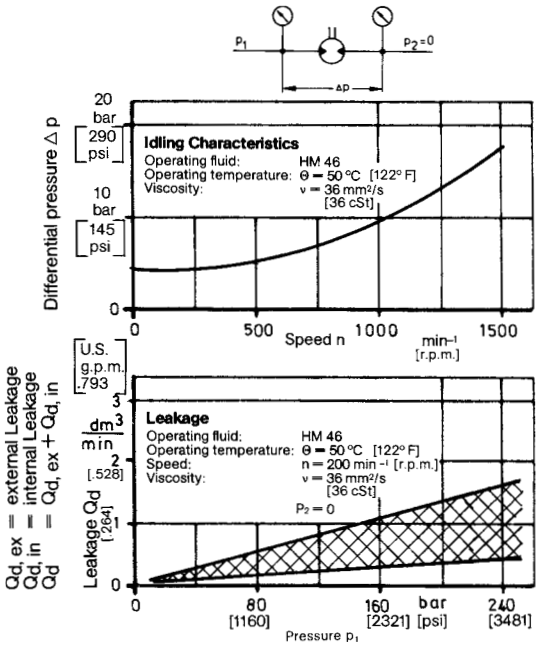
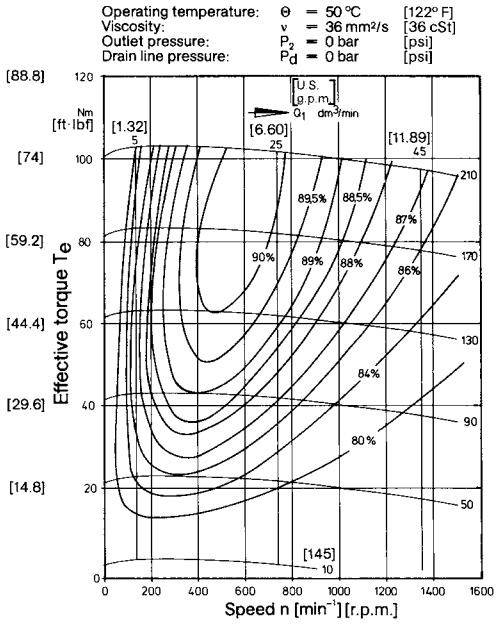
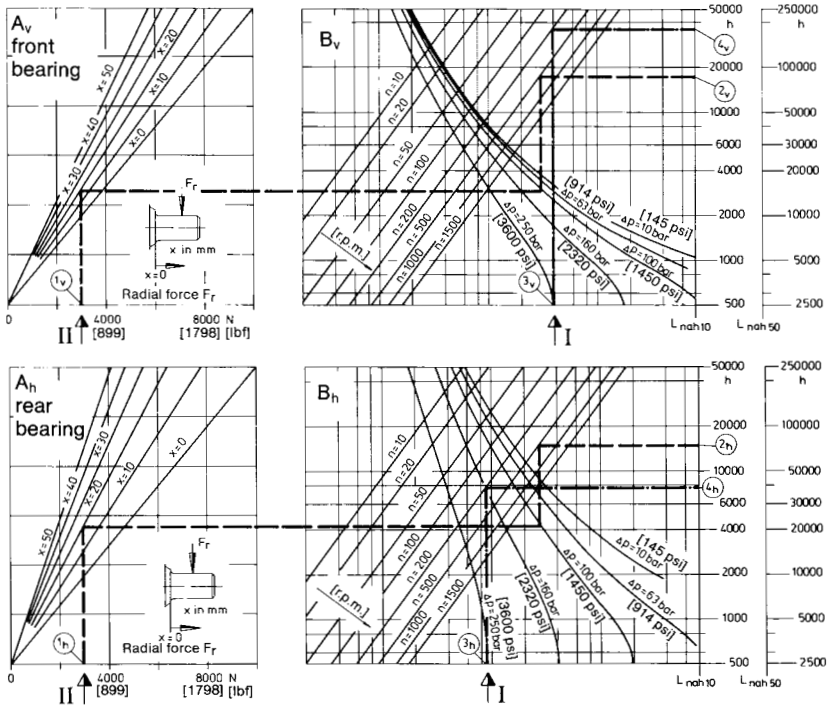
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 250 bar [3600 psi]; n = 200 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 250 bar [3600 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} = 35200 hours resp. L_{nah50} = 176000 hours and (4h) L_{nah10} = 7650 hours resp. L_{nah50} = 38250 hours.

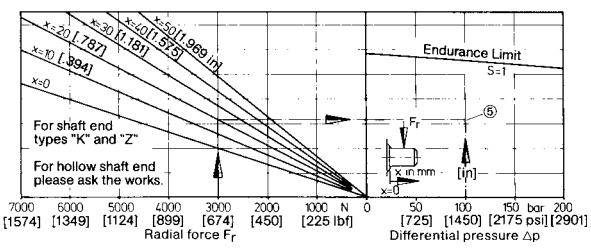
II

Given: F_r = 3000 N [674 lbf]; x = 20 mm [.787 in]; Δp = 100 bar [1450 psi]; n = 500 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 3000 N [674 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 100 bar [1450 psi], vertically to the sectional point with n = 500 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 16300 hours resp. L_{nah50} = 81500 hours and (2h) L_{nah10} = 13700 hours resp. L_{nah50} = 68500 hours.

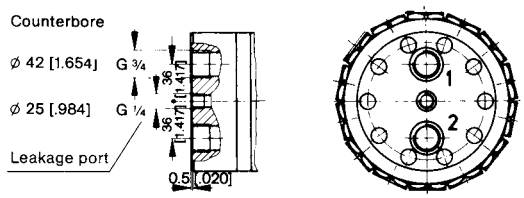
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10 % of the bearings can fail, 90 % reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Strength of the shaft

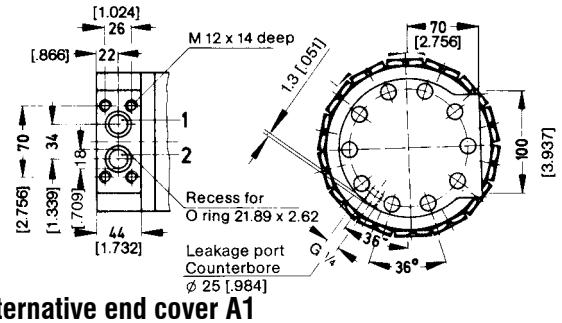
Example:
Given values: F_r = 3000 N [674 lbf] x = 20 mm [.787 in] Δp = 100 bar [1450 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 3000 N [674 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 100 bar [1450 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



Flange
DIN-ISO 3019/2 **KM 45 ZAF**



Alternative end cover B5



Alternative end cover A1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	44
Theor. spec. torque	[Nm/bar]	0,70
Average spec. torque	[Nm/bar]	0,63
Peak pressure*	[bar]	315
Max. operating pressure**	[bar]	250
Continuous pressure	[bar]	160
Max. operating torque	[Nm]	157
Continuous torque	[Nm]	100
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

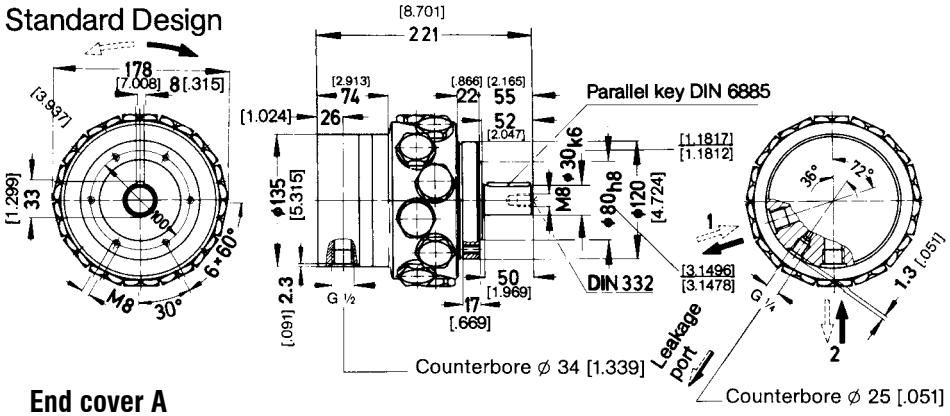
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

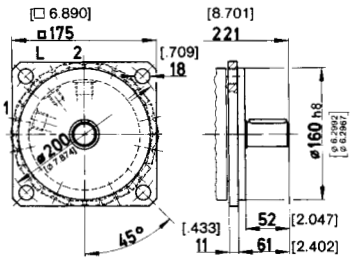
Weight:	[kg]	18,8
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 1800
Moment of inertia:	[kgm²]	0,00033
Continuous power:	[kW]	9,5
Intermittent power:	[kW]	11,0

Standard Design



End cover A

Mounting Flange **F**
ISO 3019/2

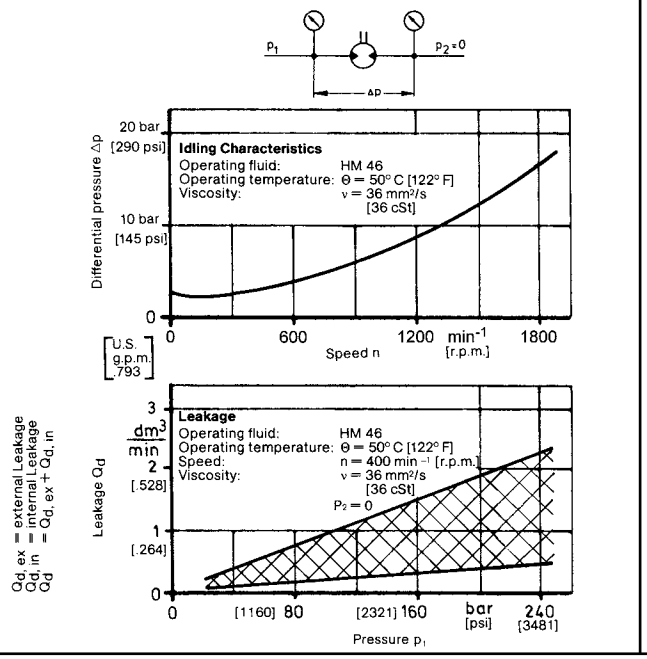


Type number key for radial piston motor KM 45

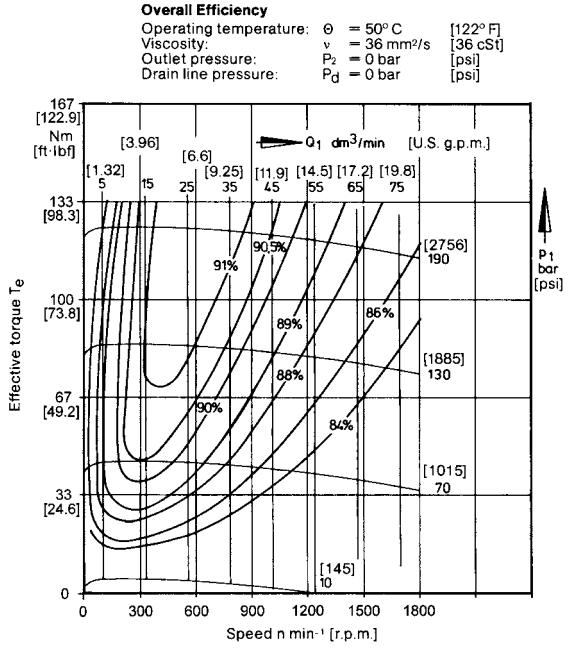
Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
KM	45						
Radial Piston Motor		Keyway Z K	Radial ports A Valve face A1 Axial ports B5	NBR Viton V	without Instrument M Driving M10	normal ISO 3019/2 F	

[1]) With end cover version B5 a 2nd shaft is not possible.

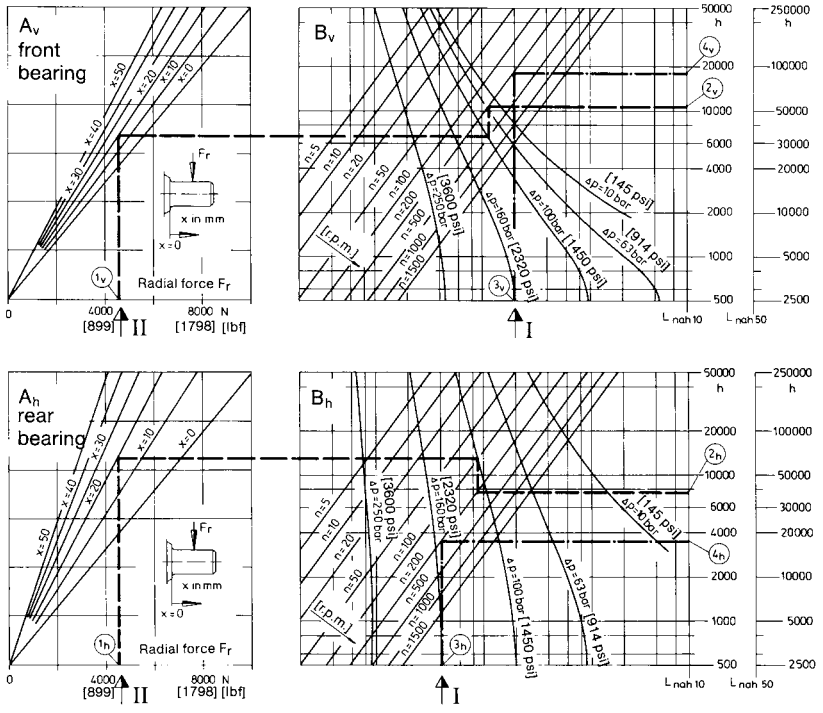
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 160 bar [2320 psi]; n = 200 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 160 bar [2320 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} = 17800 hours resp. L_{nah50} = 89000 hours and (4h) L_{nah10} = 3400 hours resp. L_{nah50} = 17000 hours.

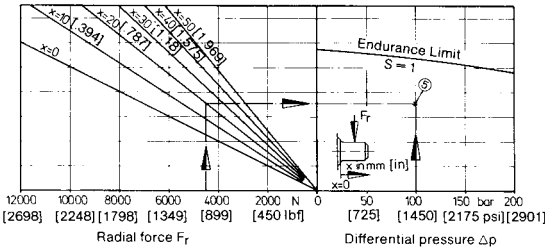
II

Given: F_r = 4500 N [1012 lbf]; x = 20 mm [.787 in]; Δp = 100 bar [1450 psi]; n = 200 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 4500 N [1012 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 100 bar [1450 psi], vertically to the sectional point with n = 200 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 10100 hours resp. L_{nah50} = 50500 hours and (2h) L_{nah10} = 7200 hours resp. L_{nah50} = 36000 hours.

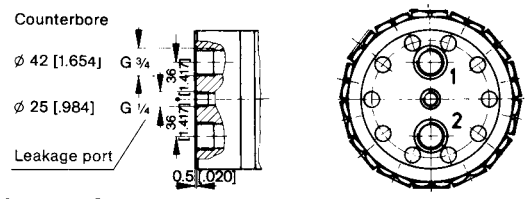
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10 % of the bearings can fail, 90 % reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Strength of the shaft

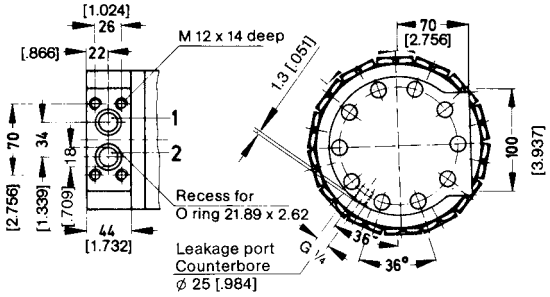
Example:
Given values: F_r = 4500 N [1012 lbf] x = 20 mm [.787 in] Δp = 100 bar [1450 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 4500 N [1012 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 100 bar [1450 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



Flange
DIN-ISO 3019/2 KM 63 ZAF



Alternative end cover B5



Alternative end cover A1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	66
Theor. spec. torque	[Nm/bar]	1,05
Average spec. torque	[Nm/bar]	0,95
Peak pressure*	[bar]	315
Max. operating pressure**	[bar]	250
Continuous pressure	[bar]	160
Max. operating torque	[Nm]	237
Continuous torque	[Nm]	152
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

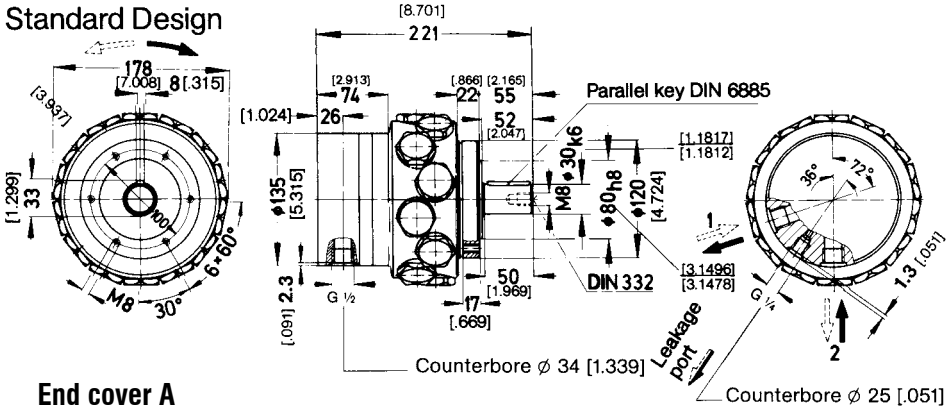
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

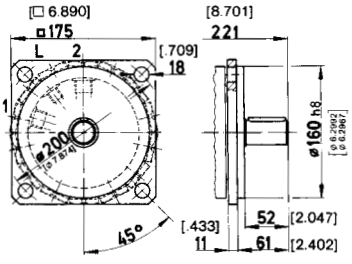
Weight:	[kg]	18,8
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 1200
Moment of inertia:	[kgm²]	0,00033
Continuous power:	[kW]	9,5
Intermittent power:	[kW]	11,0

Standard Design



End cover A

Mounting Flange **F**
ISO 3019/2



Type number key for radial piston motor KM 63

Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
KM	63						
Radial Piston Motor		Keyway Z K	Radial ports A Valve face A1 Axial ports B5	NBR Viton V	without Instrument M Driving M10	normal ISO 3019/2 F	

[1]) With end cover version B5 a 2nd shaft is not possible.

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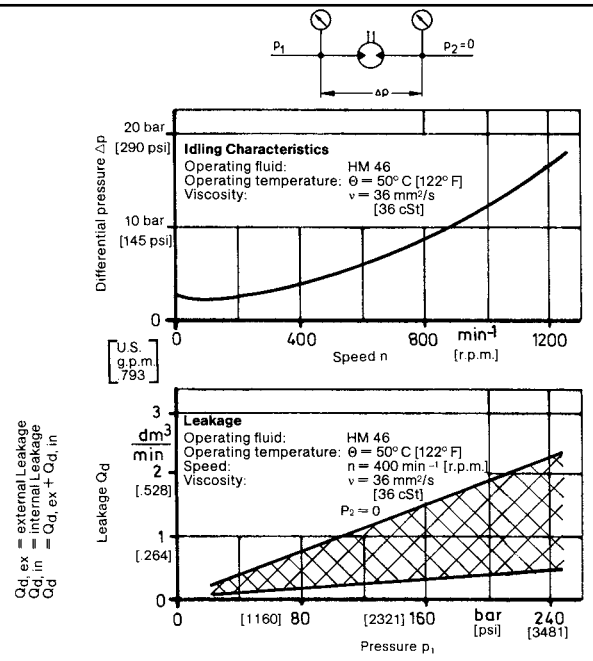
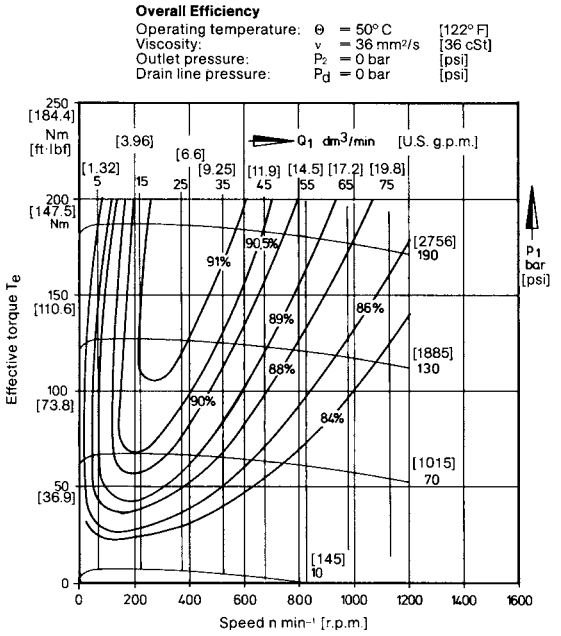
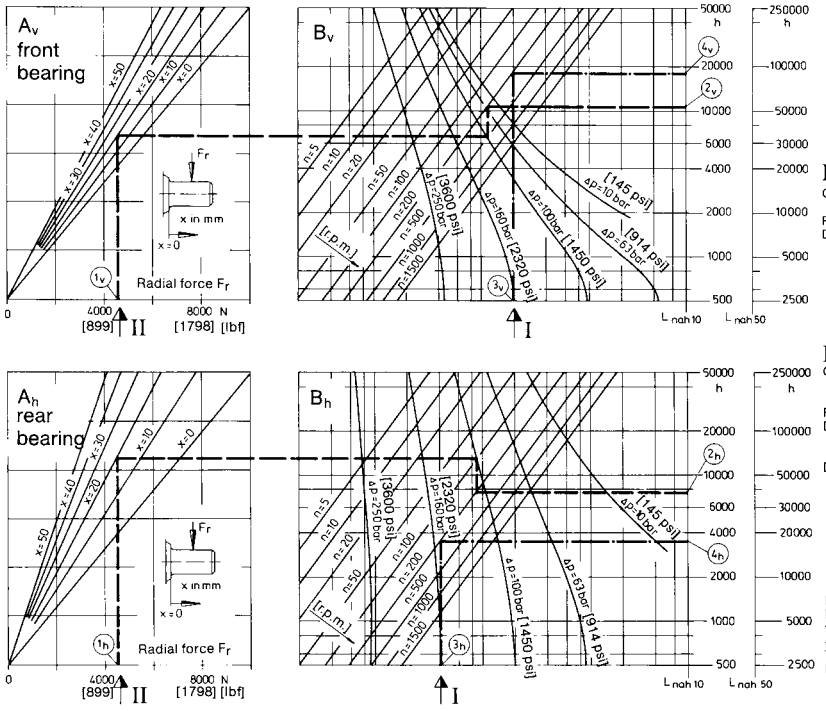
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 160 bar [2320 psi]; n = 200 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 160 bar [2320 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} = 17800 hours resp. L_{nah50} = 89000 hours and (4h) L_{nah10} = 3400 hours resp. L_{nah50} = 17000 hours.

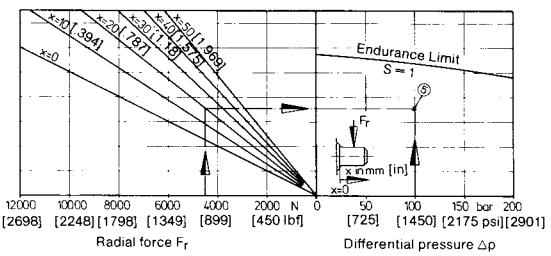
II

Given: F_r = 4500 N [1012 lbf]; x = 20 mm [.787 in]; Δp = 100 bar [1450 psi]; n = 200 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 4500 N [1012 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 100 bar [1450 psi], vertically to the sectional point with n = 200 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 10100 hours resp. L_{nah50} = 50500 hours and (2h) L_{nah10} = 7200 hours resp. L_{nah50} = 36000 hours.

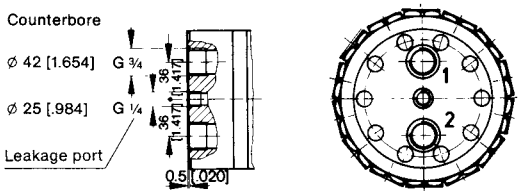
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10 % of the bearings can fail, 90 % reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Strength of the shaft

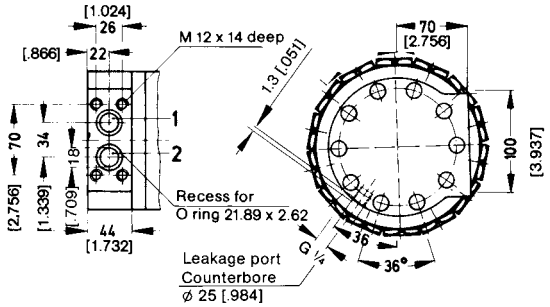
Example:
Given values: F_r = 4500 N [1012 lbf] x = 20 mm [.787 in] Δp = 100 bar [1450 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 4500 N [1012 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 100 bar [1450 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



Flange
DIN-ISO 3019/2 **KM 90 ZAF**



Alternative end cover B5



Alternative end cover A1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	89
Theor. spec. torque	[Nm/bar]	1,41
Average spec. torque	[Nm/bar]	1,27
Peak pressure*	[bar]	250
Max. operating pressure**	[bar]	210
Continuous pressure	[bar]	140
Max. operating torque	[Nm]	266
Continuous torque	[Nm]	178
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

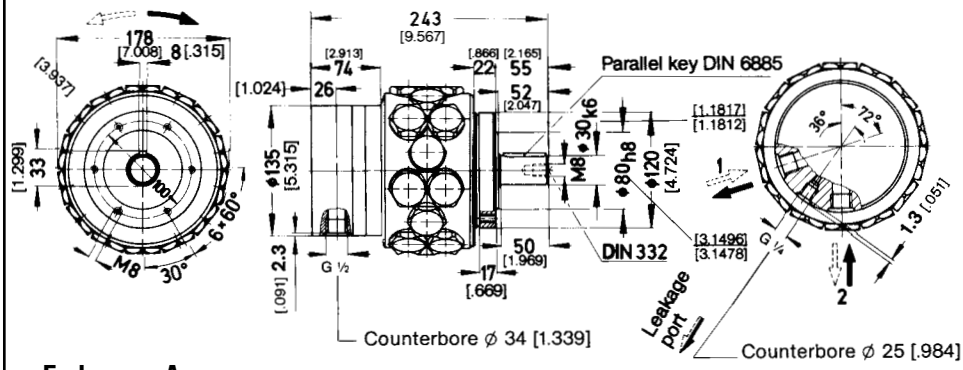
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

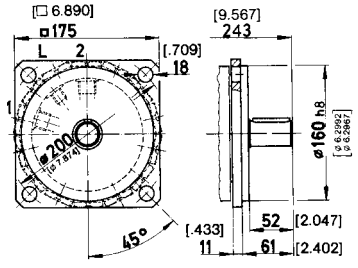
Weight:	[kg]	21,4
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 900
Moment of inertia:	[kgm²]	0,00039
Continuous power:	[kW]	8,5
Intermittent power:	[kW]	10,0

Standard Design



End cover A

Mounting Flange **F**
ISO 3019/2



Type number key for radial piston motor KM 90

Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
KM	90						
Radial Piston Motor		Keyway Z K	Radial ports A Valve face A1 Axial ports B5	NBR Viton V	without Instrument M Driving M10	normal ISO 3019/2 F	

[1]) With end cover version B5 a 2nd shaft is not possible.

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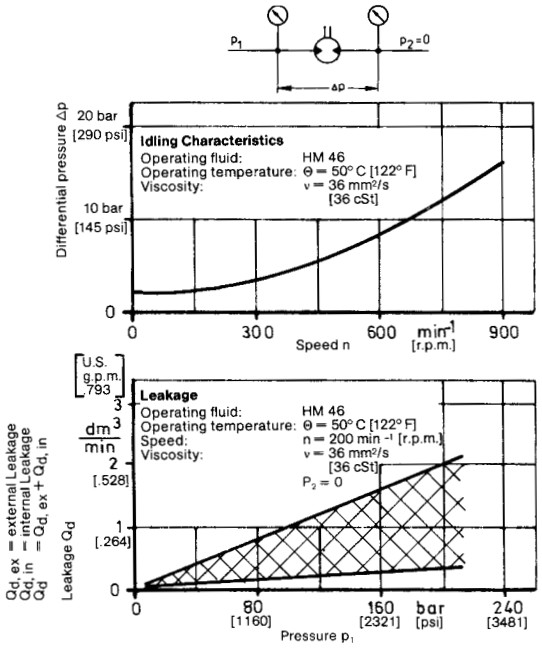
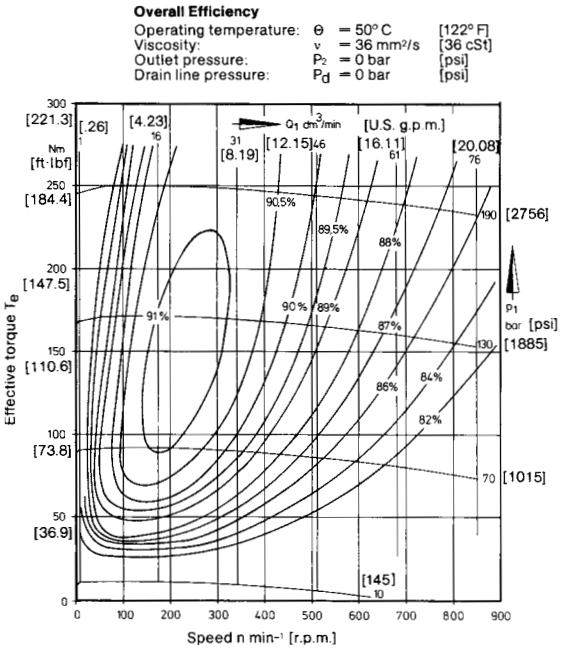
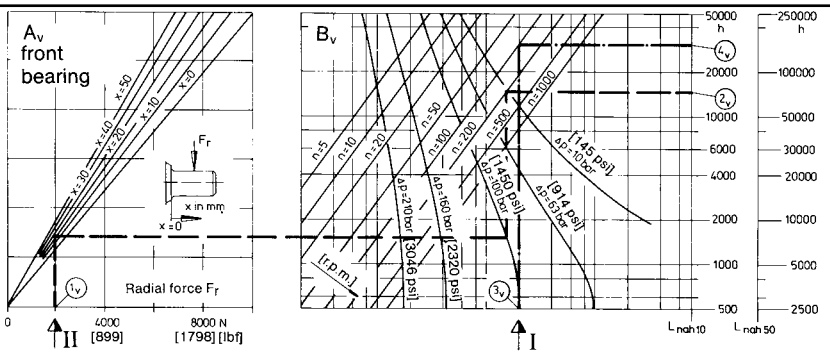
Characteristics



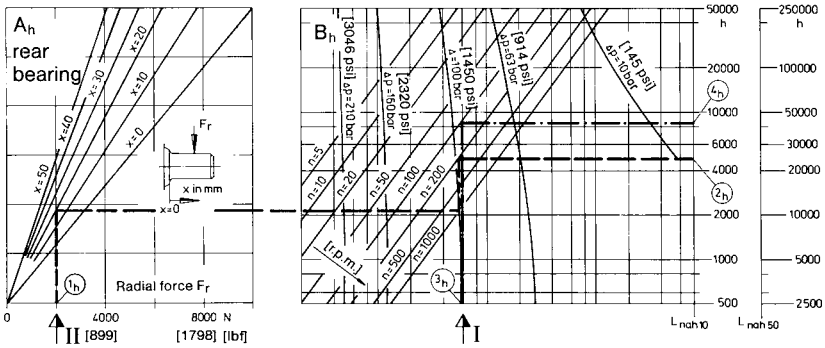
Characteristic performance functions according to ISO



Service life of the roller bearings



I
Given: F_r = 0 N [0 lbf]; Δp = 100 bar [1450 psi]; n = 100 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 100 bar [1450 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 100 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 31000 hours resp. L_{nah50} = 155000 hours and (4h) L_{nah10} = 8500 hours resp. L_{nah50} = 42500 hours.

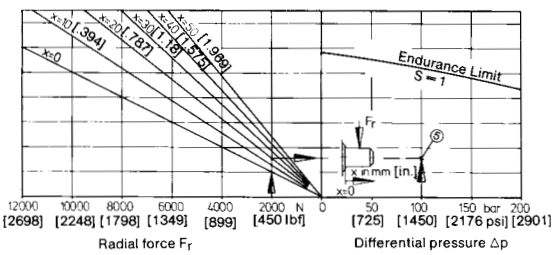


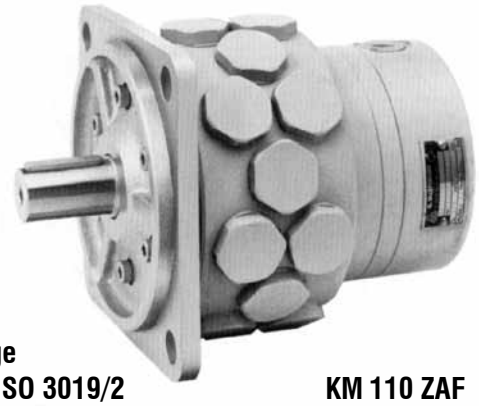
II
Given: F_r = 2000 N [450 lbf]; x = 20 mm [.787 in]; Δp = 100 bar [1450 psi]; n = 200 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 2000 N [450 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 100 bar [1450 psi], vertically to the sectional point with n = 200 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 13600 hours resp. L_{nah50} = 68000 hours and (2h) L_{nah10} = 4600 hours resp. L_{nah50} = 23000 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 $L_{nah\,10}$.

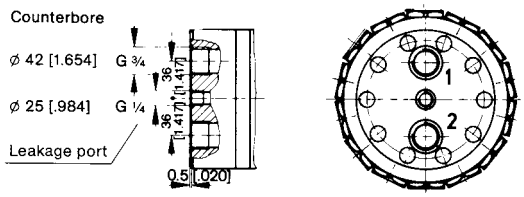
Strength of the shaft

Example:
Given values: F_r = 2000 N [450 lbf] x = 20 mm [.787 in]
Δp = 100 bar [1450 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 2000 N [450 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 100 bar [1450 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.

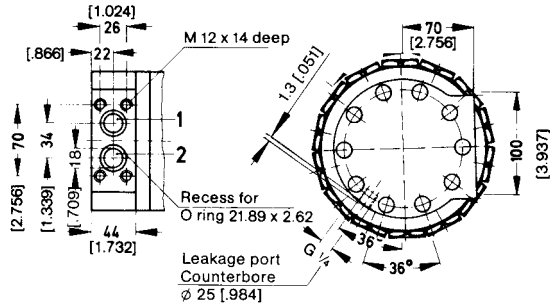




Flange
DIN-ISO 3019/2 **KM 110 ZAF**



Alternative end cover B5



Alternative end cover A1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	110
Theor. spec. torque	[Nm/bar]	1,75
Average spec. torque	[Nm/bar]	1,59
Peak pressure*	[bar]	250
Max. operating pressure**	[bar]	210
Continuous pressure	[bar]	140
Max. operating torque	[Nm]	334
Continuous torque	[Nm]	223
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

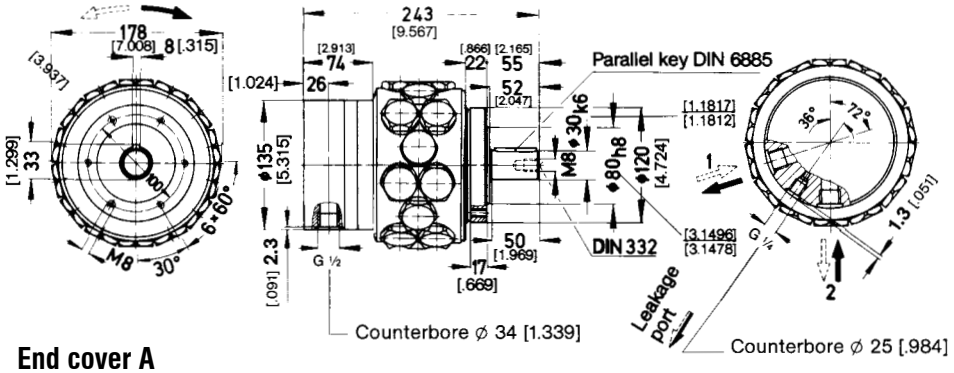
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H
HFD	Viton seals are required	ISO/DIS 6071

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

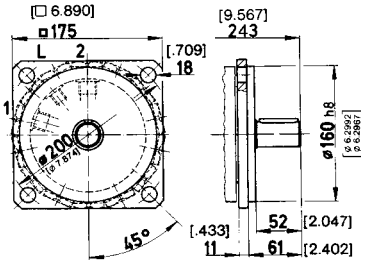
Weight:	[kg]	21,4
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 750
Moment of inertia:	[kgm²]	0,00041
Continuous power:	[kW]	8,5
Intermittent power:	[kW]	10,0

Standard Design



End cover A

Mounting Flange **F**
ISO 3019/2

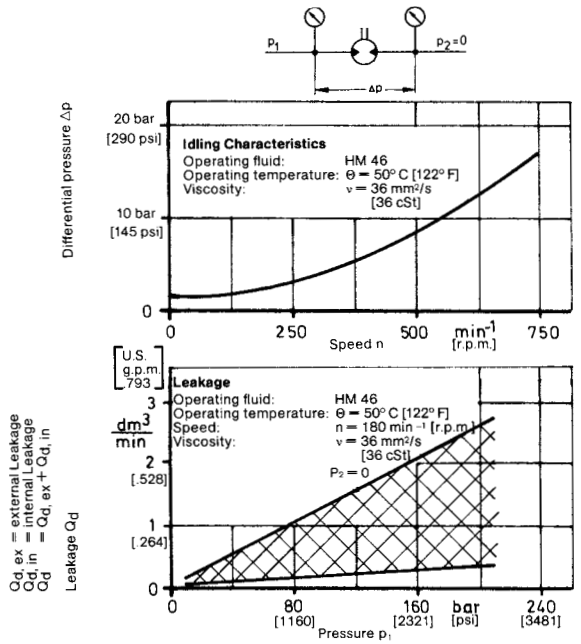


Type number key for radial piston motor KM 110

Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
KM	110						
Radial Piston Motor		Keyway Z K	Radial ports A Valve face A1 Axial ports B5	NBR Viton V	without Instrument M Driving M10	normal ISO 3019/2 F	

[1]) With end cover version B5 a 2nd shaft is not possible.

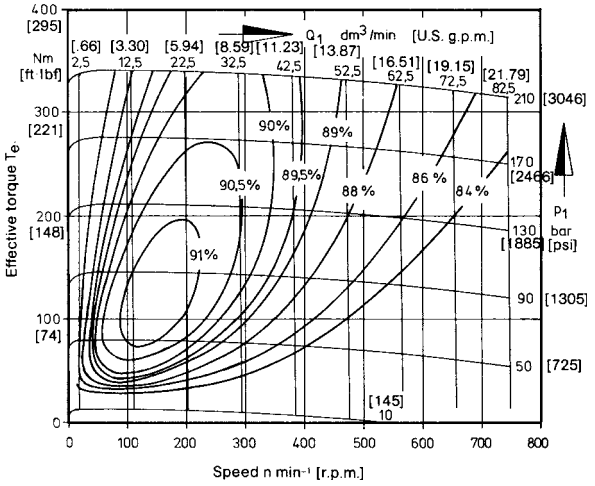
Characteristics



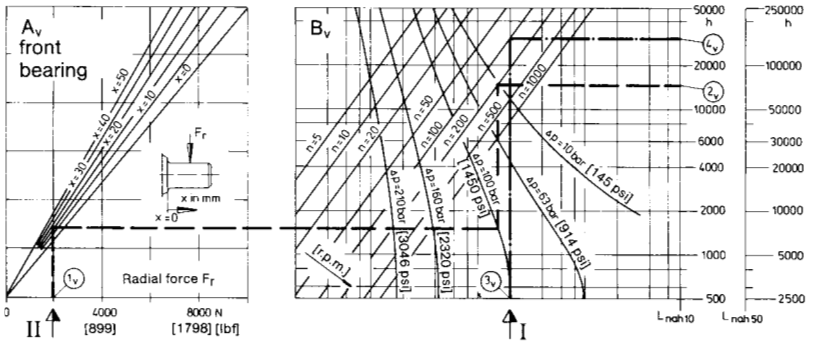
Characteristic performance functions according to ISO

Overall Efficiency

Operating temperature: Θ = 50° C [122° F]
Viscosity: ν = 36 mm²/s [36 cSt]
Outlet pressure: P2 = 0 bar [psi]
Drain line pressure: Pd = 0 bar [psi]

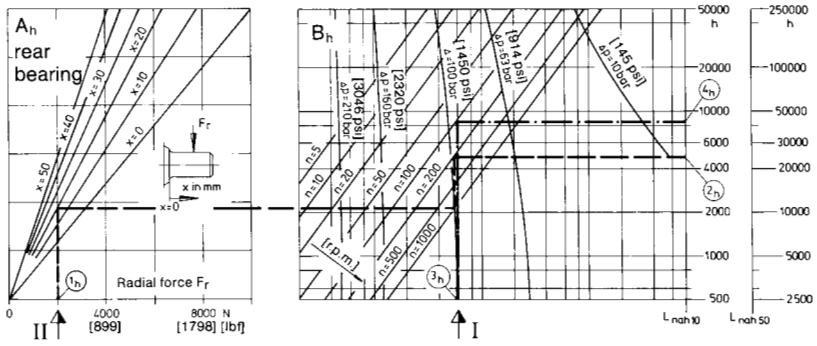


Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 100 bar [1450 psi]; n = 100 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 100 bar [1450 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 100 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 31000 hours resp. L_{nah50} = 155000 hours and (4h) L_{nah10} = 8500 hours resp. L_{nah50} = 42500 hours.



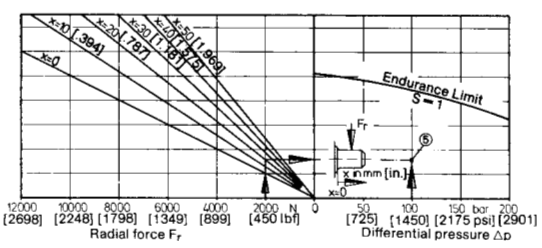
II

Given: F_r = 2000 N [450 lbf]; x = 20 mm [.787 in]; Δp = 100 bar [1450 psi]; n = 200 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 2000 N [450 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 100 bar [1450 psi], vertically to the sectional point with n = 200 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 13600 hours resp. L_{nah50} = 68000 hours and (2h) L_{nah10} = 4600 hours resp. L_{nah50} = 23000 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 $L_{nah\,10}$.

Strength of the shaft

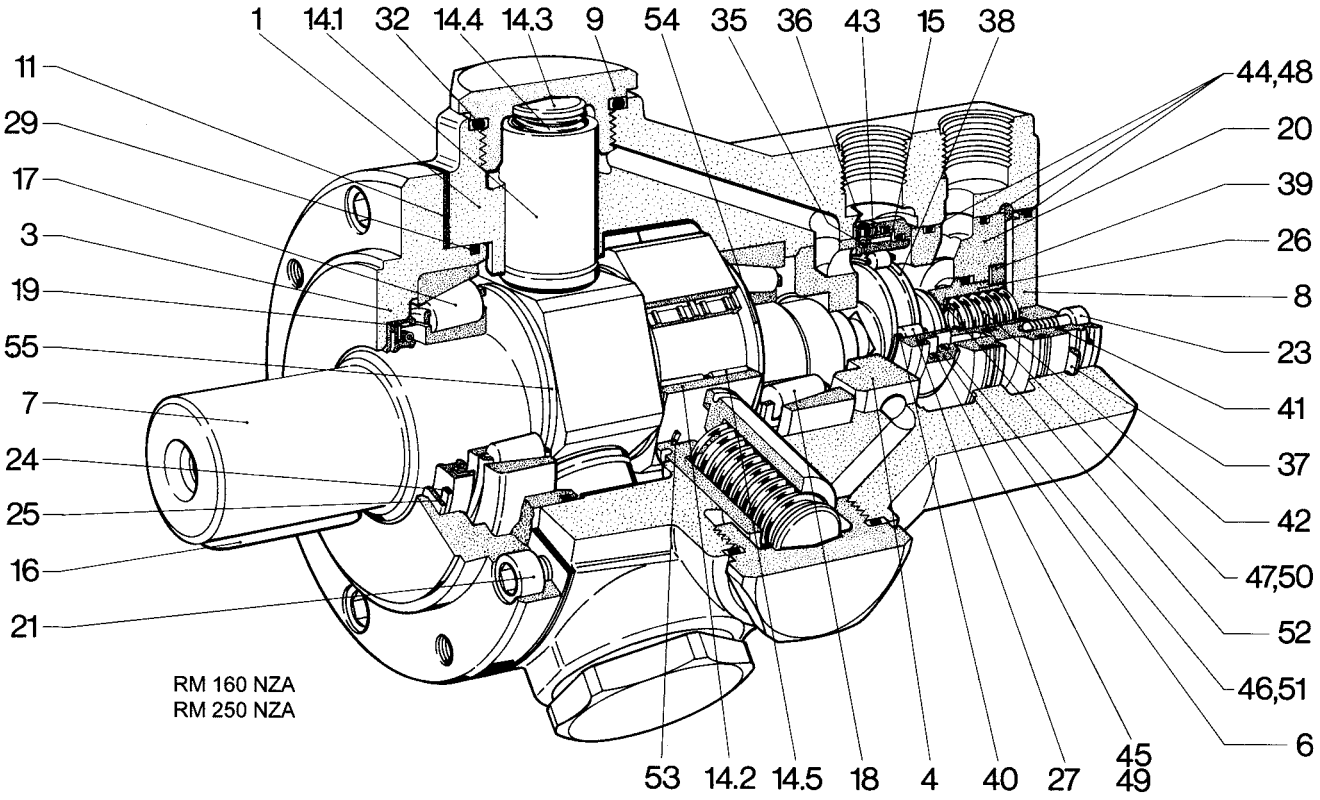
Example:
Given values: F_r = 2000 N [450 lbf] x = 20 mm [.787 in] Δp = 100 bar [1450 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 2000 N [450 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 100 bar [1450 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



1. General properties 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, four-quadrant operation possible, very suitable for applications as a control, extremely quiet operation.

2. Structure and function



2.1 Drive unit

Design:
Internal piston support

Method of functioning:
Five or ten radial pistons (14.1) load the crankshaft via pentagon ring(s) with needle bearing cages (14.5)

Drive details
Crank shaft bearing:
Pre-loaded, large taper roller bearings (17,18), 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 (14.1) – crankshaft (7) via the pentagon ring (14.2) with needle bearing cage (14.5).

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.

Design:
Planar translational distribution valve with play self-adjustment

2.2 Drive unit

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 (6/15) with the external ring (1) and with the eccentric (38) form an external and an internal ring space. By moving the control rings (6/15) between the control plate (4) and the liner (20) by means of the eccentric (38) which is fixed to the crankshaft (5), 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 (6/15) and the eccentric (38)

The control rings mainly move translationally, however, rotation is possible (2 degrees of freedom) – this means small frictional losses at the control rings (6/15) 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 (27) in the roller bearing.

Adjustment of the play on the control rings (6/15) and the flats on the eccentric:
Hydrostatic, low control ring (6/15) 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 (26) 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 (35,36):
The effect is that in the ring space between the control rings (6,15), the higher pressure connected to the motor is always effective.

Reliable play self-adjustment even at high reversion frequencies.

RM 80 NZA1

Hydraulic characteristic values

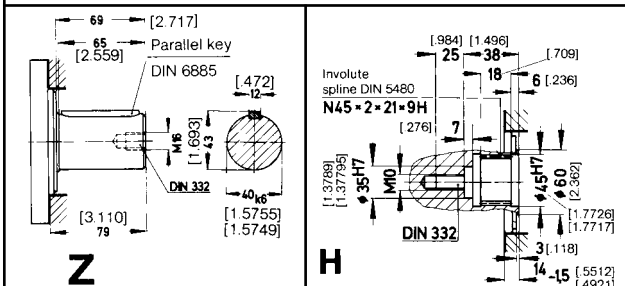
Geometr. displacement	[cm³/rev]	81
Theor. spec. torque	[Nm/bar]	1,29
Average spec. torque	[Nm/bar]	1,15
Peak pressure*	[bar]	400
Max. operating pressure**	[bar]	315
Continuous pressure	[bar]	250
Max. operating torque	[Nm]	365
Continuous torque	[Nm]	290
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

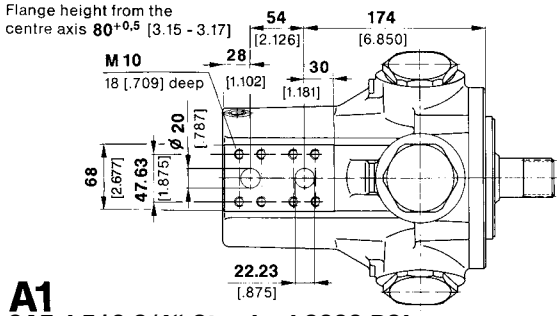
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H ISO/DIS 6071
HFD	Viton seals are required	

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.



Z
Keywayed shaft

H
Hollow shaft

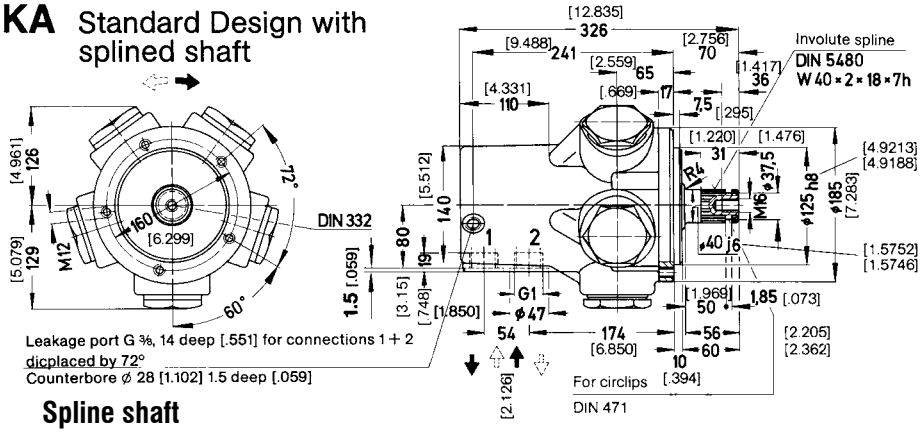


A1
SAE J 518 3/4“ Standard 3000 PSI

Characteristic values according to VDI 3278

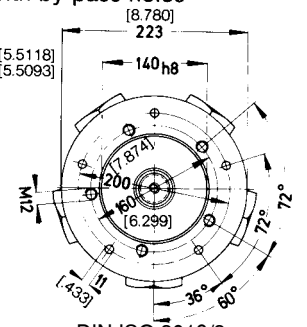
Weight:	[kg]	40,0
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 800
Moment of inertia:	[kgm²]	0,0017
Continuous power:	[kW]	12,0
Intermittent power:	[kW]	15,0

KA Standard Design with splined shaft



Spline shaft

Mounting Flange F
with by-pass holes



DIN ISO 3019/3
Inch measurements in brackets

Type number key for radial piston motor RM 80 N

Motor type	Size	Shaft end		End cover		Seal		Second shaft [1]		Flange		additional specs.
RM	80											
Radial Piston Motor	N	Spline	K	Thread G1	A	NBR		without		normal		
		Hollow	H	SAE J 518	A1	Viton	V	Instrument	M	ISO 3019/2	F	
		Keyway	Z	3/4" standard				Driving				

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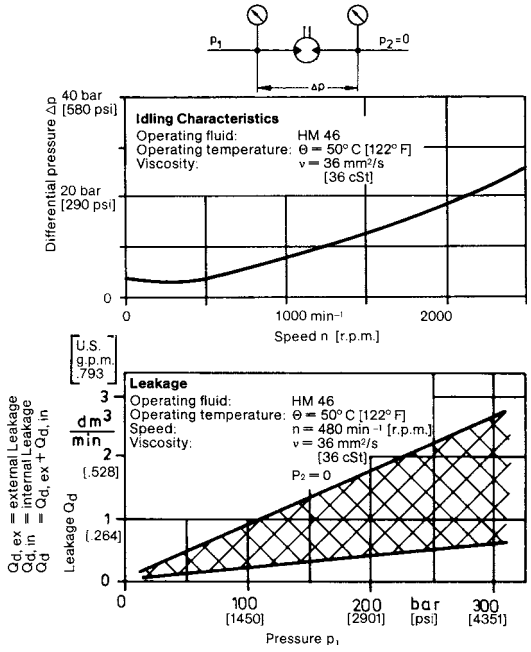
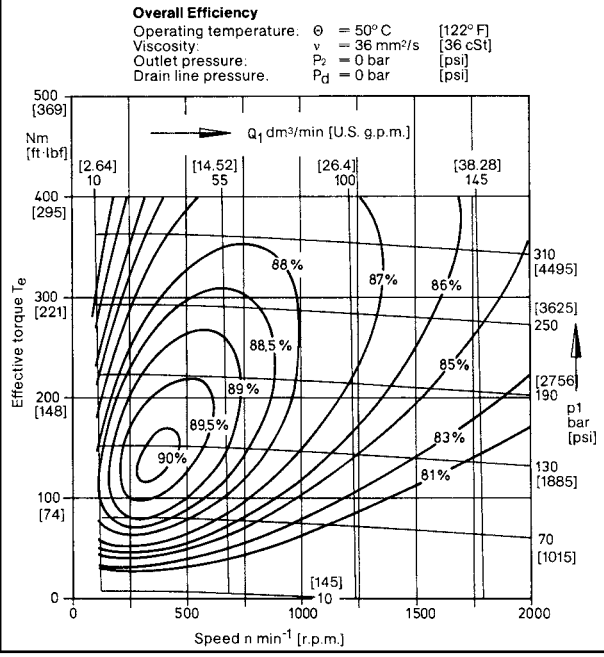
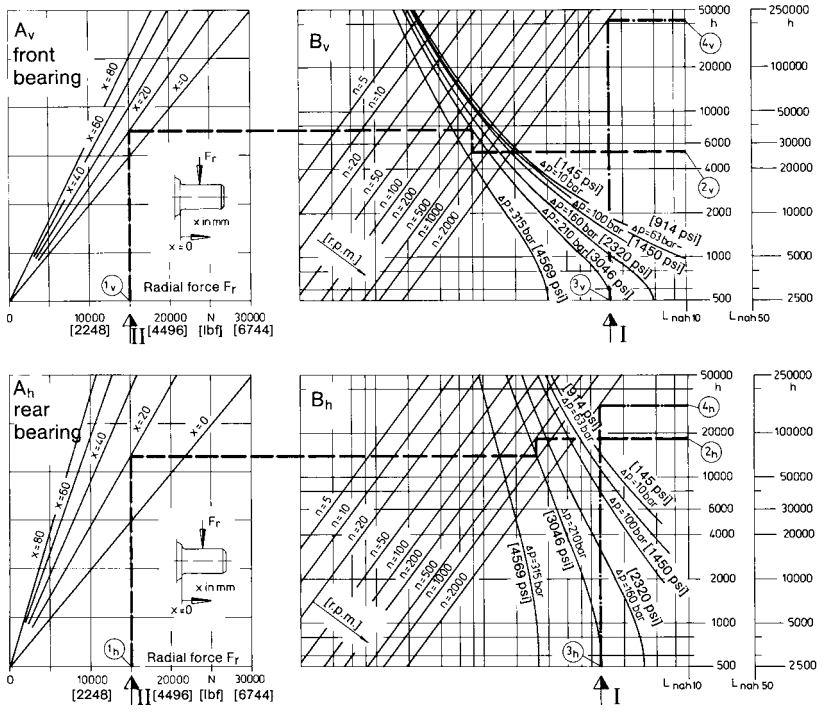
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 210 bar [3046 psi]; n = 2000 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 = 2000 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 42000 hours resp. L_{nah50} = 210000 hours and (4h) L_{nah10} = 31000 hours resp. L_{nah50} = 155000 hours.

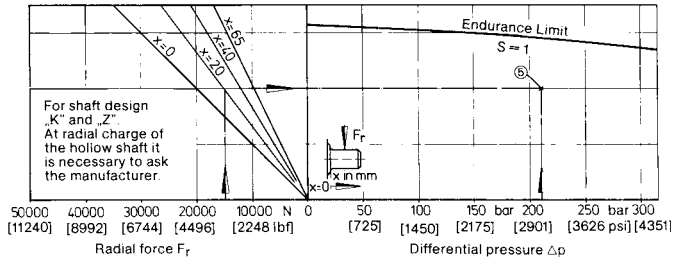
II

Given: F_r = 15000 N [3372 lbf]; x = 20 mm [.787 in]; Δp = 210 bar [3046 psi]; n = 500 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 15000 N [3372 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 210 bar [3046 psi], vertically to the sectional point with n = 500 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 5200 hours resp. L_{nah50} = 26000 hours and (2h) L_{nah10} = 17500 hours resp. L_{nah50} = 87500 hours.

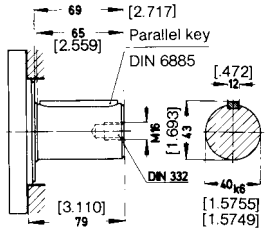
$L_{nah\,10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10 % of the bearings can fail, 90 % reach a higher duration of life. The average middle duration of life of bearing $L_{nah\,50}$ is five times $L_{nah\,10}$.

Strength of the shaft

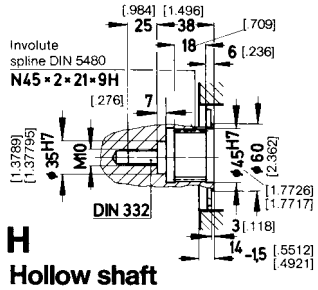
Example:
Given values: F_r = 15000 N [3372 lbf] x = 20 mm [.787 in]
Δp = 210 bar [3046 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 15000 N [3372 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 210 bar [3046 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



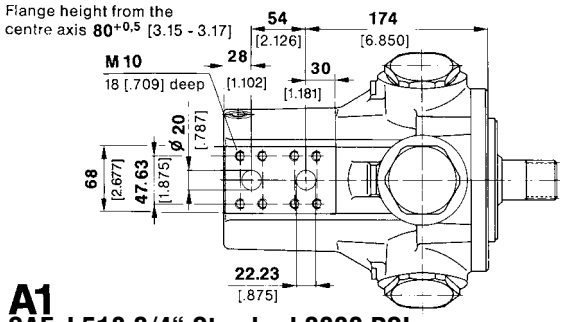
RM 125 NZA1



Z
Keywayed shaft



H
Hollow shaft



A1
SAE J 518 3/4" Standard 3000 PSI

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	126
Theor. spec. torque	[Nm/bar]	2,0
Average spec. torque	[Nm/bar]	1,8
Peak pressure*	[bar]	350
Max. operating pressure**	[bar]	315
Continuous pressure	[bar]	200
Max. operating torque	[Nm]	567
Continuous torque	[Nm]	360
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

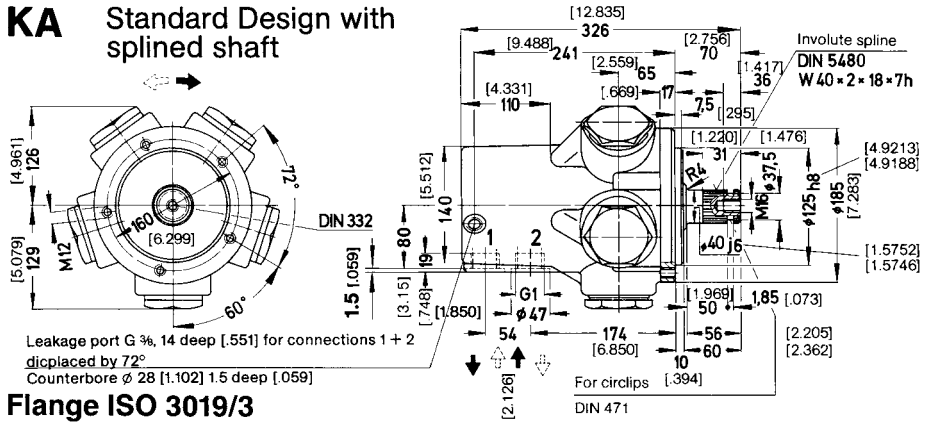
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H ISO/DIS 6071
HFD	Viton seals are required	

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Characteristic values according to VDI 3278

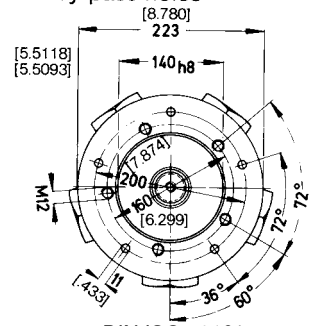
Weight:	[kg]	40,0
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 600
Moment of inertia:	[kgm²]	0,0017
Continuous power:	[kW]	12,0
Intermittent power:	[kW]	15,0

KA Standard Design with splined shaft



Flange ISO 3019/3

F Mounting Flange with by-pass holes

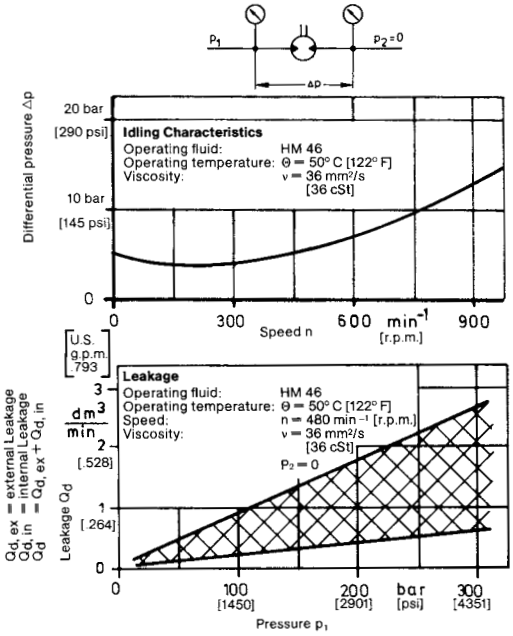


DIN ISO 3019/3
Inch measurements in brackets

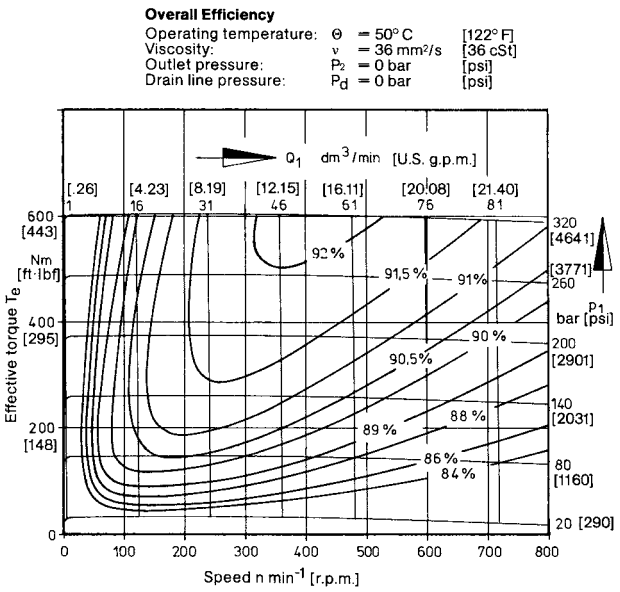
Type number key for radial piston motor RM 125 N

Motor type	Size	Shaft end		End cover		Seal		Second shaft [1]		Flange		additional specs.
RM	125 N											
Radial Piston Motor		Spline	K	Thread G1	A	NBR		without		normal		
		Hollow	H	SAE J 518	A1	Viton	V	Instrument	M	ISO 3019/2	F	
		Keyway	Z	3/4" standard				Driving				

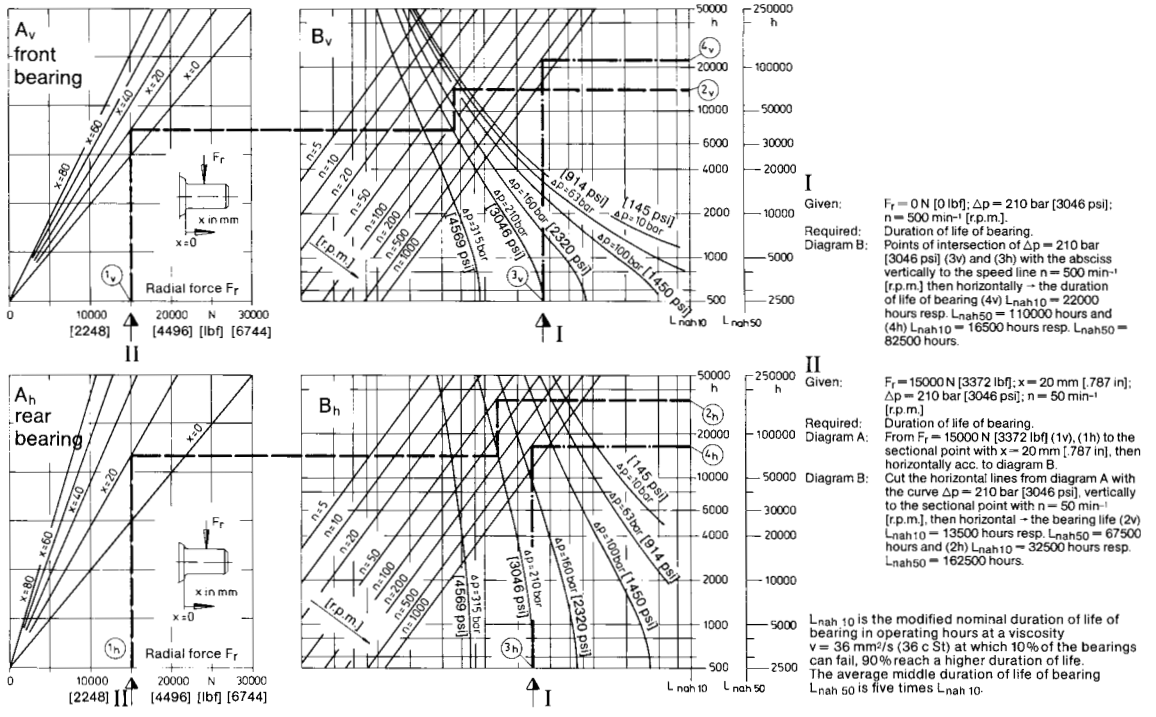
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



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} = 22000 hours resp. L_{nah50} = 110000 hours and (4h) L_{nah10} = 16500 hours resp. L_{nah50} = 82500 hours.

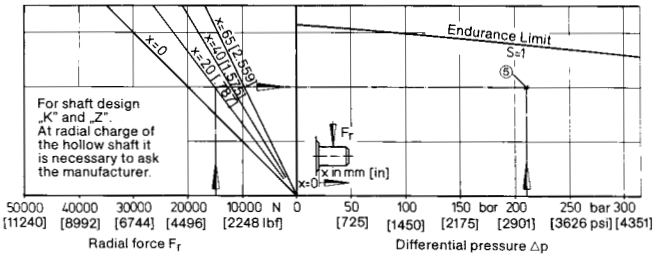
II

Given: F_r = 15000 N [3372 lbf]; x = 20 mm [.787 in]; Δp = 210 bar [3046 psi]; n = 50 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 15000 N [3372 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 in], then horizontally acc. to diagram B.
Diagram B: Cut the horizontal lines from diagram A with the curve Δp = 210 bar [3046 psi], vertically to the sectional point with n = 50 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 13500 hours resp. L_{nah50} = 67500 hours and (2h) L_{nah10} = 32500 hours resp. L_{nah50} = 162500 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 $L_{nah\,10}$.

Strength of the shaft

Example:
Given values: F_r = 15000 N [3372 lbf] x = 20 mm [.787 in]
Δp = 210 bar [3046 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 15000 N [3372 lbf] to distance x = 20 mm [.787 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.



RM 160 NZA1

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	161
Theor. spec. torque	[Nm/bar]	2,56
Average spec. torque	[Nm/bar]	2,36
Peak pressure*	[bar]	400
Max. operating pressure**	[bar]	315
Continuous pressure	[bar]	250
Max. operating torque	[Nm]	750
Continuous torque	[Nm]	595
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

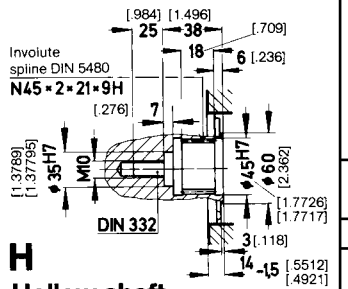
* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.

** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

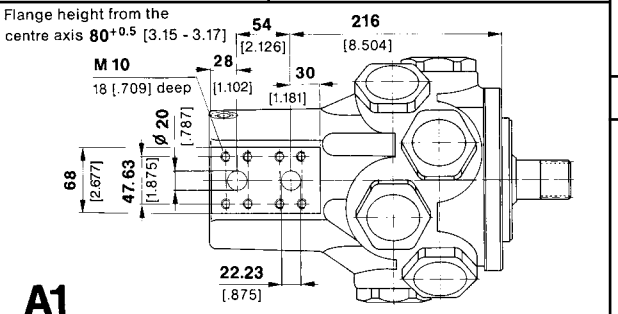
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H ISO/DIS 6071
HFD	Viton seals are required	

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

Z
Keywayed shaft



H
Hollow shaft

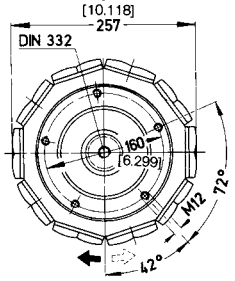


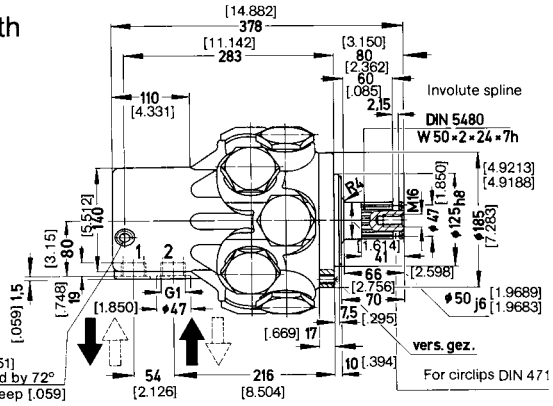
A1
SAE J 518 3/4" Standard 3000 PSI

Characteristic values according to VDI 3278

Weight:	[kg]	58,0
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 800
Moment of inertia:	[kgm²]	0,0023
Continuous power:	[kW]	24,0
Intermittent power:	[kW]	30,0

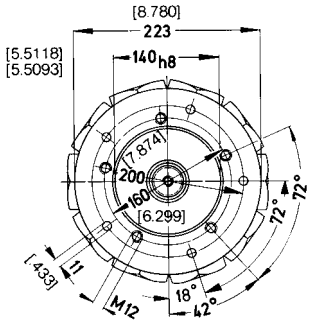
KA Standard Design with shaft splined





Splinded shaft

Mounting Flange **F**
with by-pass holes



Inch measurements in brackets

Type number key for radial piston motor RM 160 N

Motor type	Size	Shaft end	End cover	Seal	Second shaft [1]	Flange	additional specs.
RM	160 N						
Radial Piston Motor		Spline K Hollow H Keyway Z	Thread G1 A SAE J 518 A1 3/4" standard	NBR Viton V	without Instrument M Driving	normal ISO 3019/2 F	

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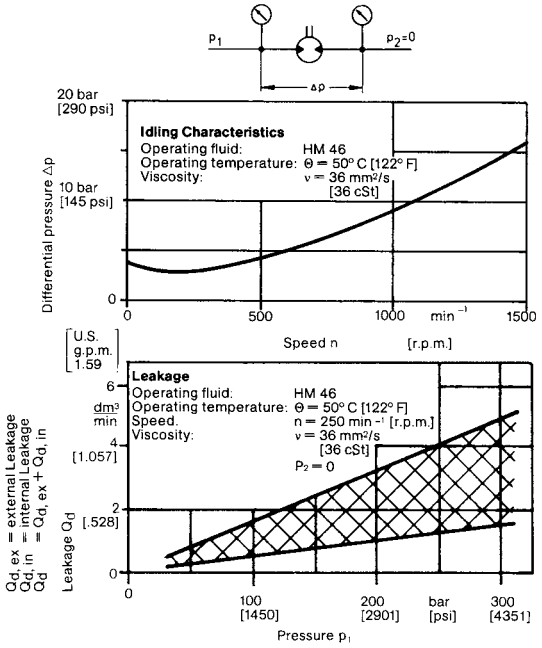
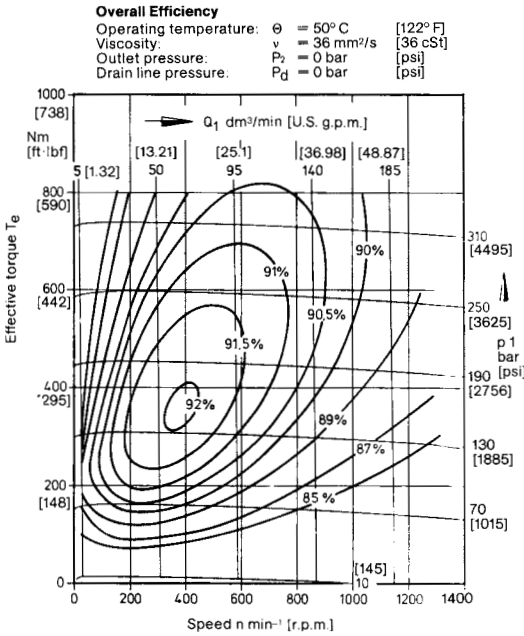
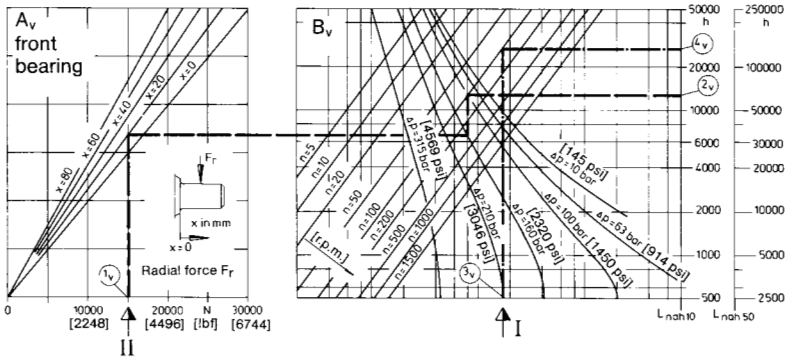
Characteristics

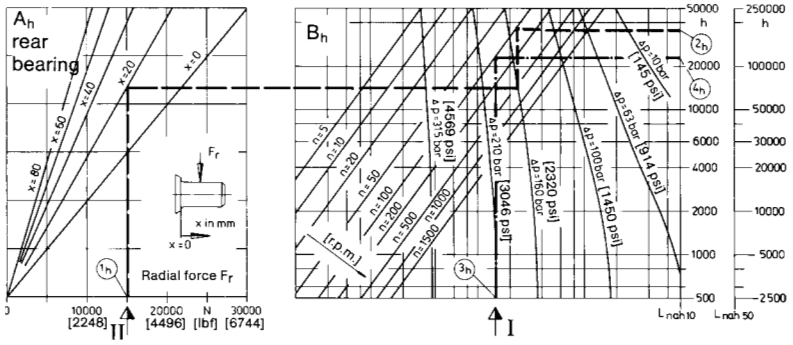


Characteristic performance functions according to ISO



Service life of the roller bearings





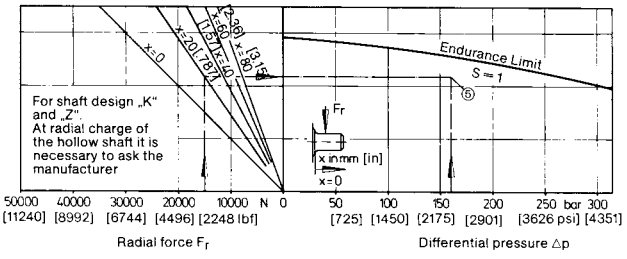
I
Given: F_r = 0 N [0 lbf]; Δp = 210 bar [3046 psi]; n = 100 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 210 bar [3046 psi] (3v) and (3h) with the abscissa vertically to the speed line n = 100 min⁻¹ [r.p.m.] then horizontally → the duration of life of bearing (4v) L_{nah10} = 26300 hours resp. L_{nah50} = 131500 hours and (4h) L_{nah10} = 22200 hours resp. L_{nah50} = 111000 hours.

II
Given: F_r = 15000 N [3372 lbf]; x = 20 mm [.787 in]; Δp = 160 bar [2320 psi]; n = 100 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 15000 N [3372 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 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 = 100 min⁻¹ [r.p.m.], then horizontal → the bearing life (2v) L_{nah10} = 12200 hours resp. L_{nah50} = 61000 hours and (2h) L_{nah10} = 35000 hours resp. L_{nah50} = 175000 hours.

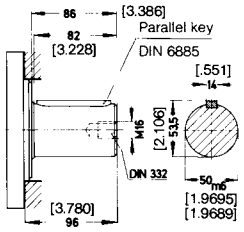
$L_{nah\ 10}$ is the modified nominal duration of life of bearing in operating hours at a viscosity ν = 36 mm²/s (36 c St) at which 10 % of the bearings can fail, 90 % reach a higher duration of life. The average middle duration of life of bearing $L_{nah\ 50}$ is five times $L_{nah\ 10}$.

Strength of the shaft

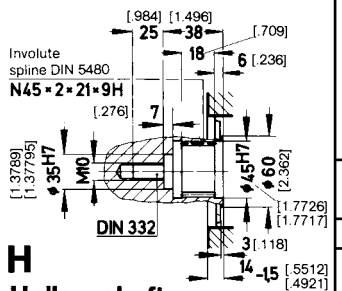
Example:
Given values: F_r = 15000 N [3372 lbf] x = 20 mm [.787 in] Δp = 160 bar [2321 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 15000 N [3372 lbf] to distance x = 20 mm [.787 in] and a straight horizontal line from there.
If the intersection ⑤ of the horizontal with the vertical line of Δp = 160 bar [2321 psi] is below curve the shaft has sufficient fatigue strength.
Allowable axial forces will be provided on request.



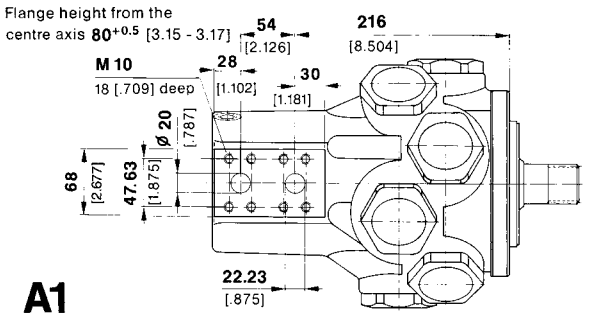
RM 250 NZA1



Z
Keywayed shaft



H
Hollow shaft



A1
SAE J 518 3/4“ Standard 3000 PSI

Hydraulic characteristic values

Geometr. displacement	[cm³/rev]	251
Theor. spec. torque	[Nm/bar]	4,0
Average spec. torque	[Nm/bar]	3,7
Peak pressure*	[bar]	350
Max. operating pressure**	[bar]	315
Continuous pressure	[bar]	200
Max. operating torque	[Nm]	1165
Continuous torque	[Nm]	740
Drain line pressure	[bar]	max. 1
Hydraulic fluid temperature range	[K]	243 - 363
	[°C]	- 30 - + 90
Viscosity range	[mm²/s]	20 - 150
	(max. 1000 mm²/s at start)	

Pressure fluids:
HM and HV, definition to CETOP RP 75 H (mineral oil based fluids).
Mineral oil H-LP in conformity with DIN 51524 part 2.
Bio-degradable fluids available on request.

* Definition according to DIN 24 312.
Peak pressure = Pressure exceeding the maximum operating pressure for a short time at which the motor remains able to function.
** If the sum of inlet pressure and outlet pressure is higher than the peak pressure, please consult the manufacturer.

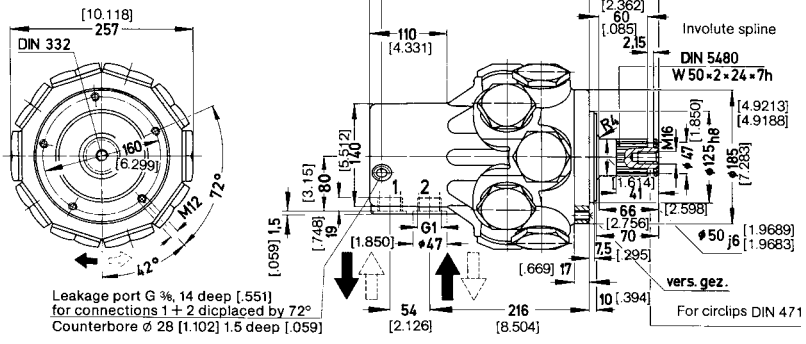
HFC	Reduce HFC pressure to 70 % Check the bearing service life	Definition to CETOP RP 77 H ISO/DIS 6071
HFD	Viton seals are required	

Filtering
Max. permissible degree of contamination of the pressure fluid according to NAS 1638 class 9.
We recommend filters with a minimum retention rate of $\beta_{10} \geq 100$
For a long service life we recommend filtering acc. to NAS 1638 class 8 and filters with a minimum retention rate of $\beta_5 \geq 100$.

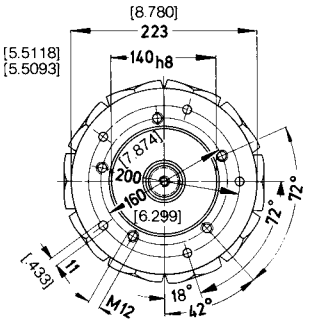
Characteristic values according to VDI 3278

Weight:	[kg]	58,0
Mounting position:	as required	
Direction of rotation, if viewed at the shaft end		
clockwise:	flow from connection 2 to connection 1	
anti-clockwise:	flow from connection 1 to connection 2	
Operating speed range:	[rpm]	5 ÷ 600
Moment of inertia:	[kgm²]	0,0023
Continuous power:	[kW]	24,0
Intermittent power:	[kW]	30,0

KA Standard Design with splined shaft



Mounting Flange **F** with by-pass holes



Inch measurements in brackets

Type number key for radial piston motor RM 250 N

Motor type	Size	Shaft end		End cover		Seal		Second shaft [1]		Flange		additional specs.
RM	250 N											
Radial piston motor		Spline	K	Thread G1	A	NBR		without		normal		
		Hollow	H	SAE J 518	A1	Viton	V	Instrument Driving	M	ISO 3019/2	F	
		Keyway	Z	3/4" standard								

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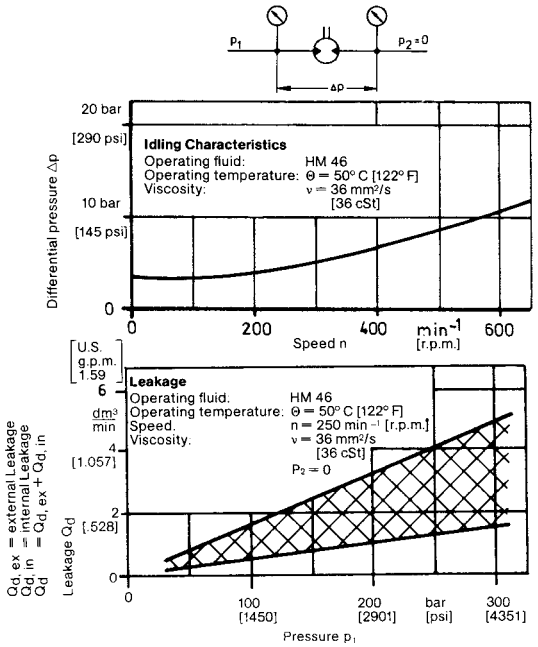
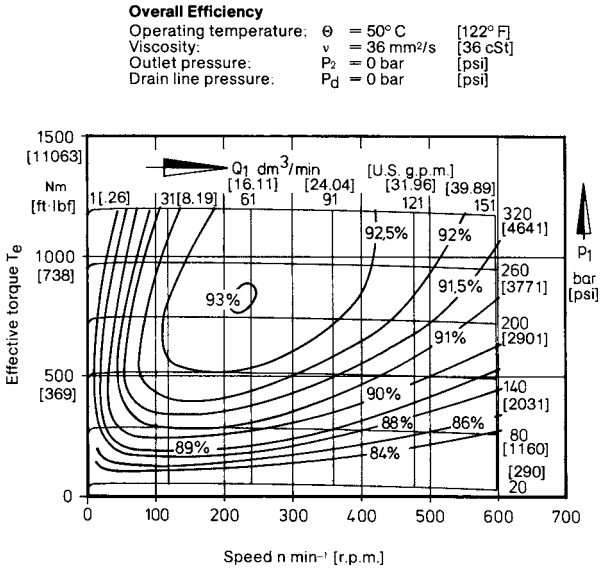
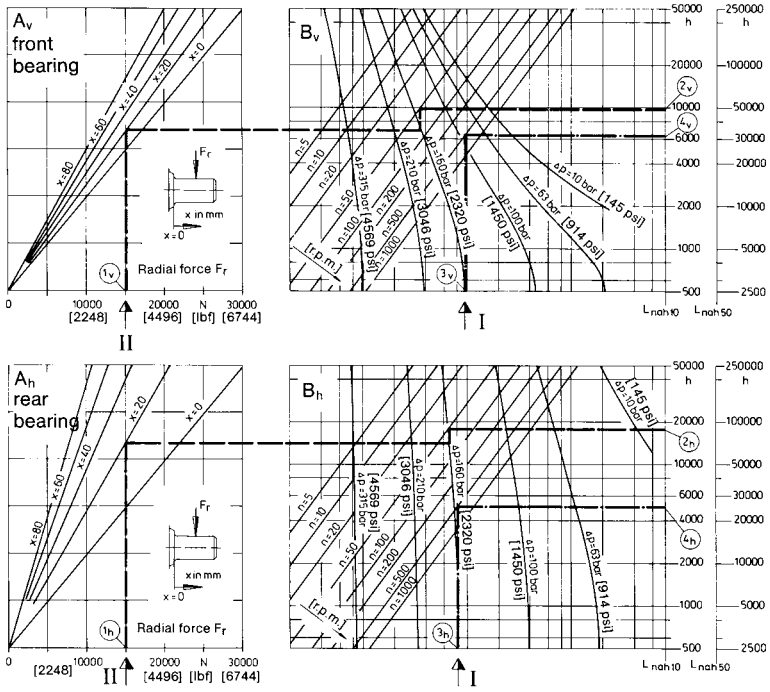
Characteristics



Characteristic performance functions according to ISO



Service life of the roller bearings



I

Given: F_r = 0 N [0 lbf]; Δp = 160 bar [2320 psi]; n = 500 min⁻¹ [r.p.m.].
Required: Duration of life of bearing.
Diagram B: Points of intersection of Δp = 160 bar [2320 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} = 6100 hours resp. L_{nah50} = 30500 hours and (4h) L_{nah10} = 4850 hours resp. L_{nah50} = 24250 hours.

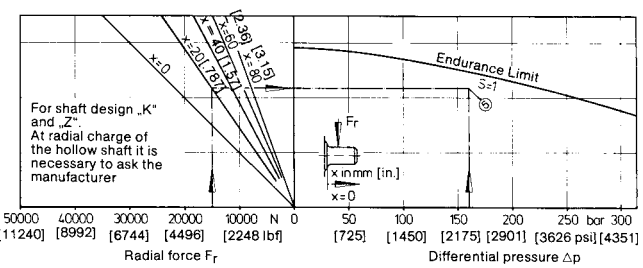
II

Given: F_r = 15000 N [3372 lbf]; x = 20 mm [.787 in]; Δp = 160 bar [2320 psi]; n = 50 min⁻¹ [r.p.m.]
Required: Duration of life of bearing.
Diagram A: From F_r = 15000 N [3372 lbf] (1v), (1h) to the sectional point with x = 20 mm [.787 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} = 9600 hours resp. L_{nah50} = 48000 hours and (2h) L_{nah10} = 17300 hours resp. L_{nah50} = 86500 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 $L_{nah\ 10}$.

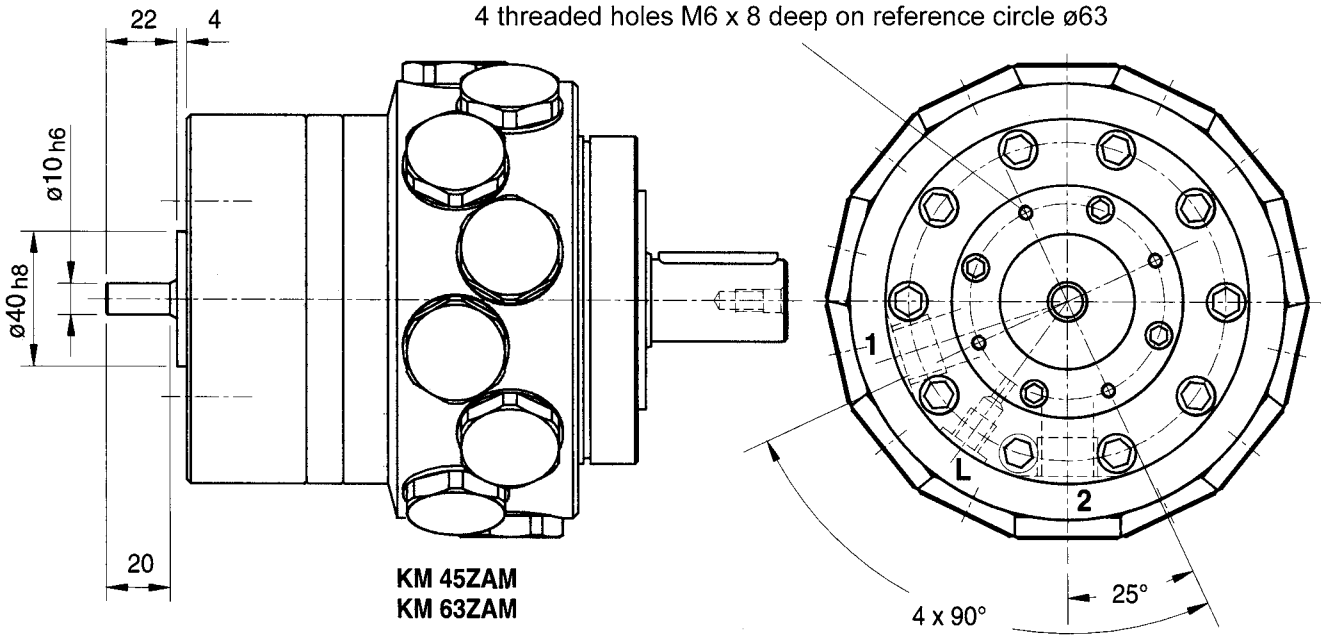
Strength of the shaft

Example:
Given values: F_r = 15000 N [3372 lbf] x = 20 mm [.787 in] Δp = 160 bar [2321 psi]
Required value: Shaft strength
Draw a vertical line from F_r = 15000 N [3372 lbf] to distance x = 20 mm [.787 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.



Measuring shaft design: M

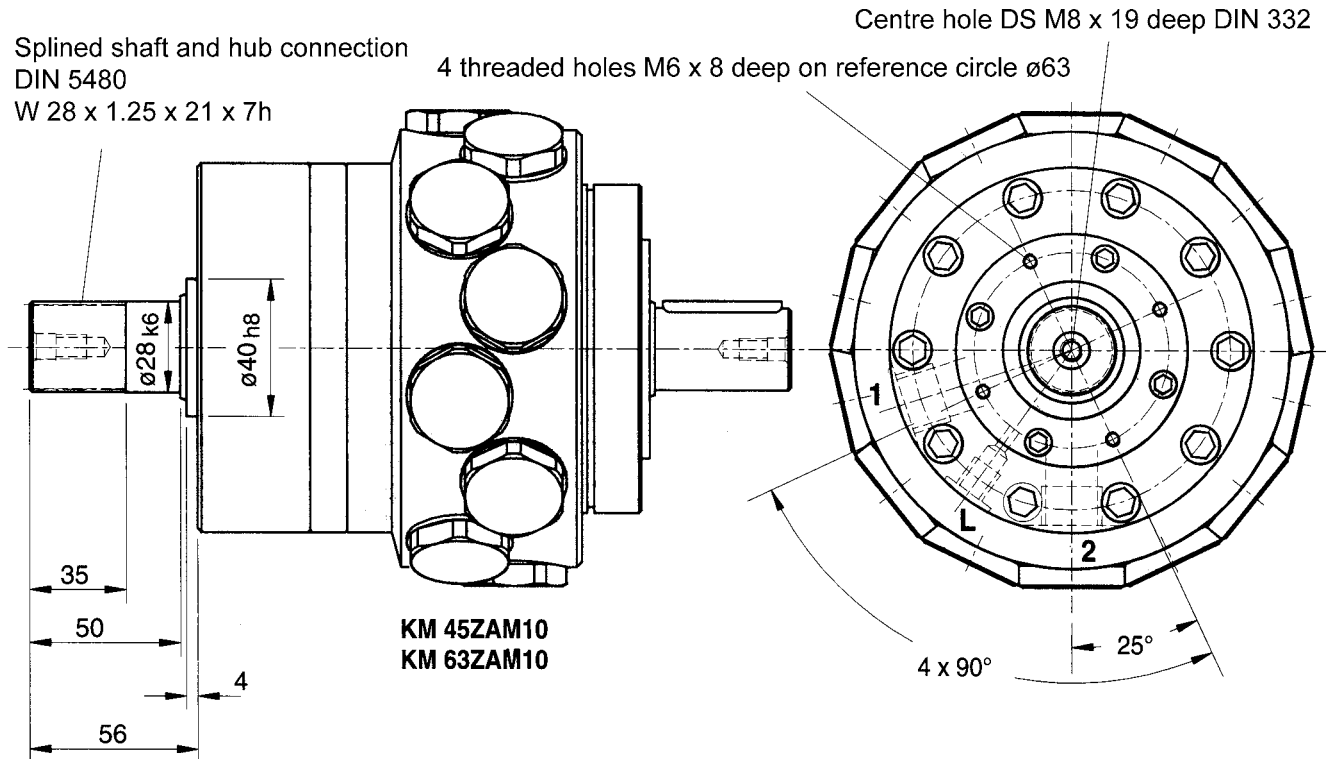
Radial piston motors Type Km 11 - KM 110 with the type key "M" are equipped with a measuring shaft to determine the motor speed. The measering shaft is rigidly connected to the motor-driven shaft and transmits a maximum torque of 5 Nm. If you require a higher torque, please approach the manufacturer or distributor. Please request the documentation on the mounting of the encoder, pulse transmitter and AC transmitters.



KM 45ZAM
KM 63ZAM

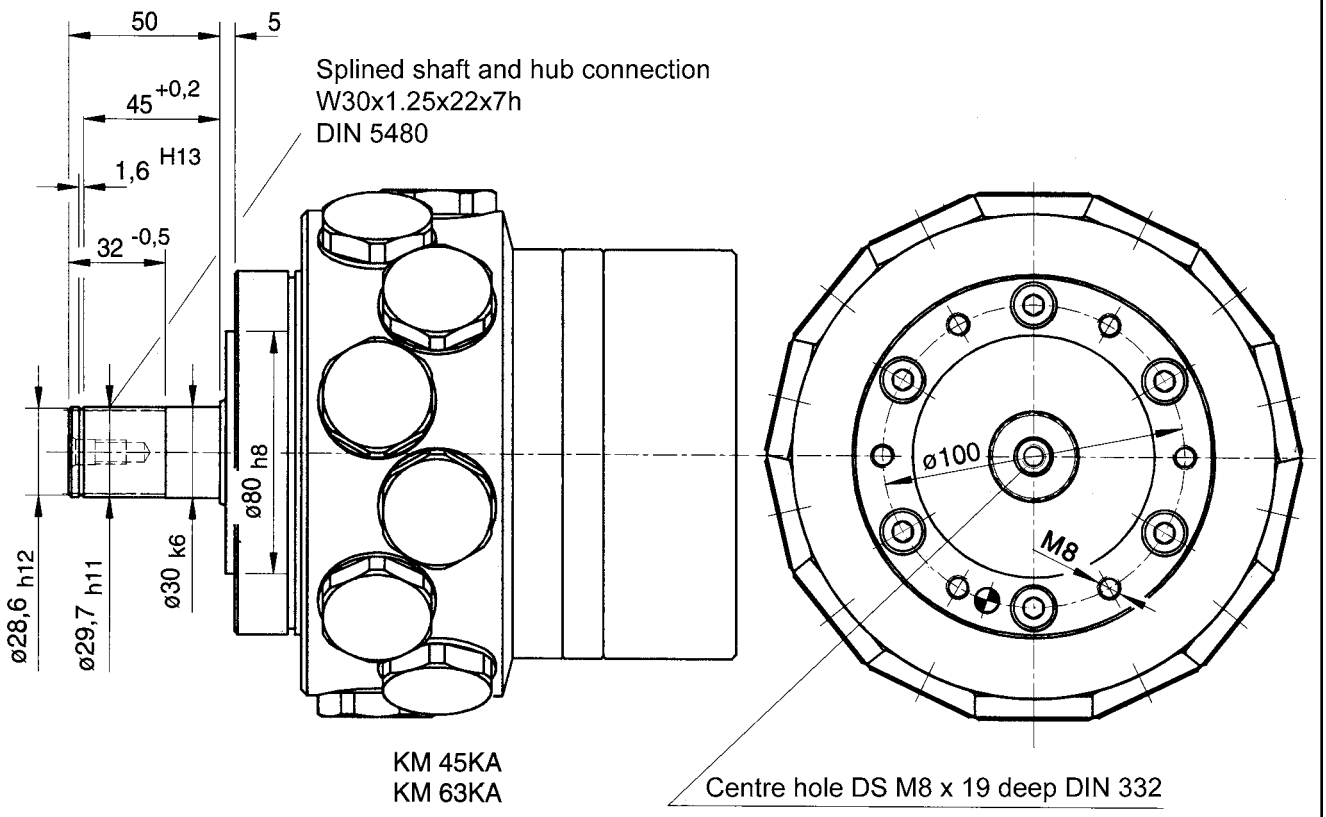
Motors with continuous driven shaft: M10 (only for KM 22 to KM 110)

These radial piston motors can be supplied with a one-piece driven shaft, type designation M10, for the transmission of the full motor torque. Cylindrical shaft design available on request.



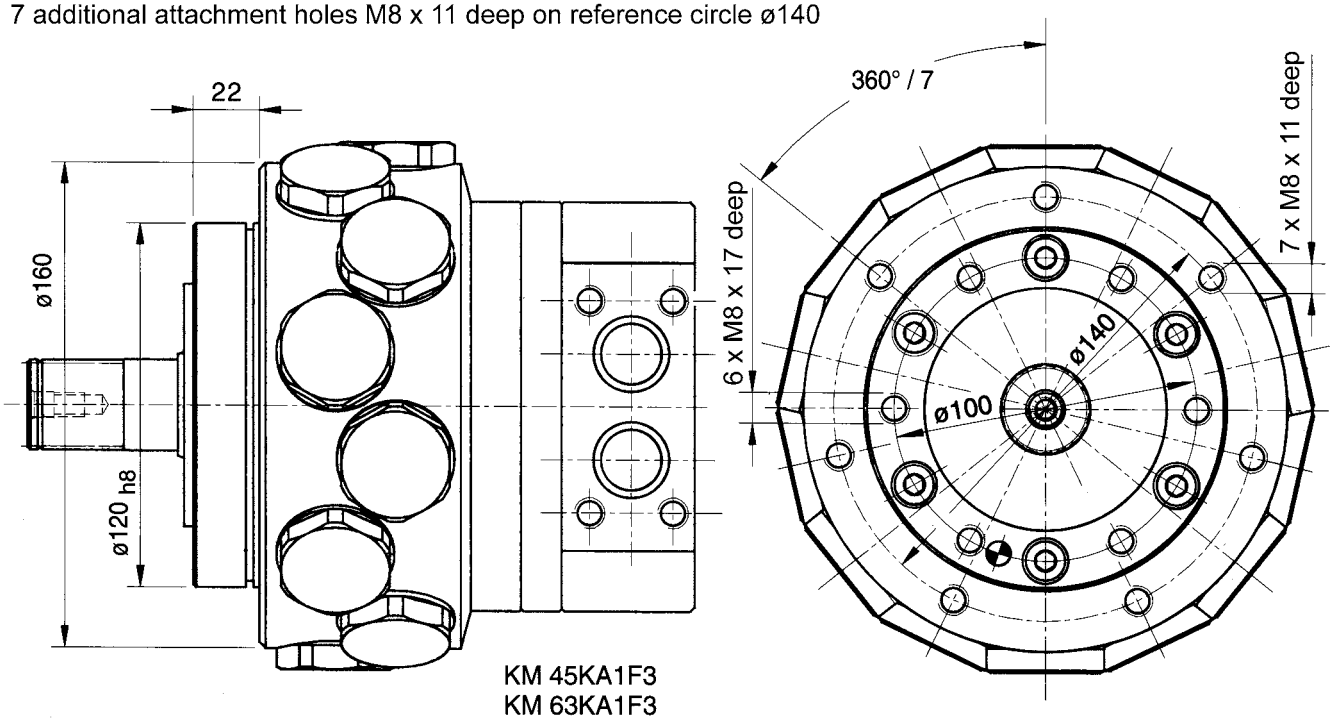
KM 45ZAM10
KM 63ZAM10

Shaft design : K



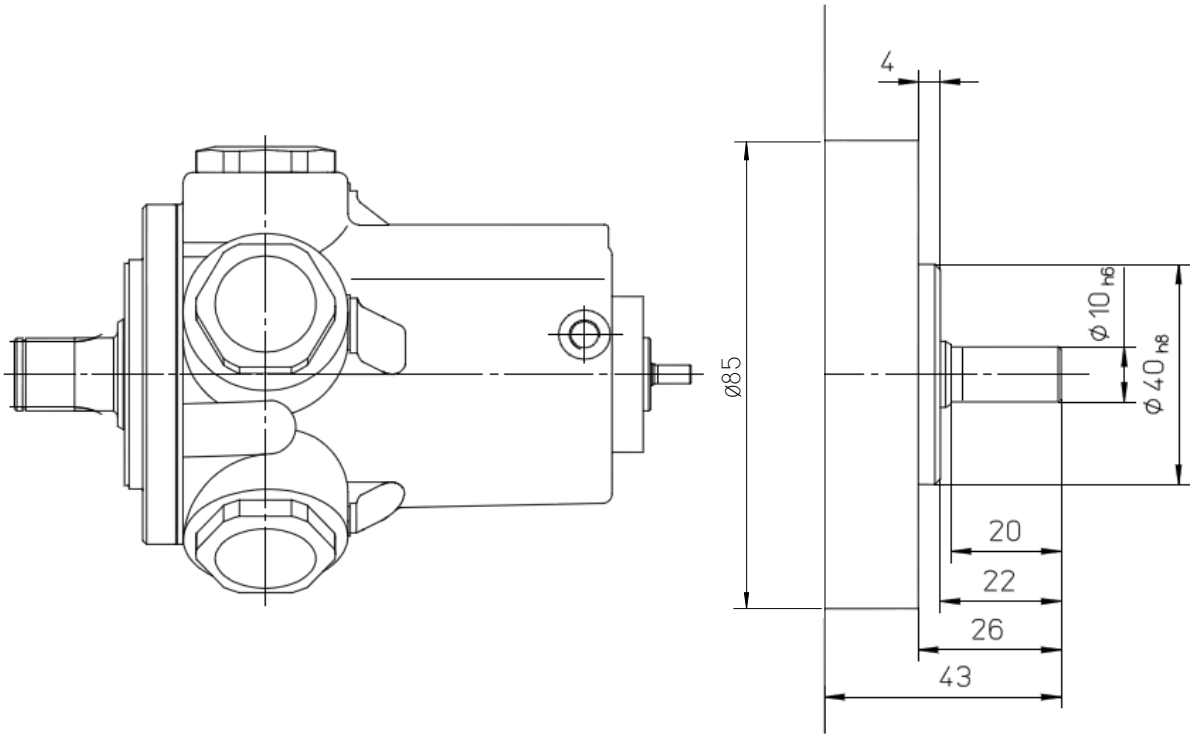
Face attachment : F3

7 additional attachment holes M8 x 11 deep on reference circle ø140

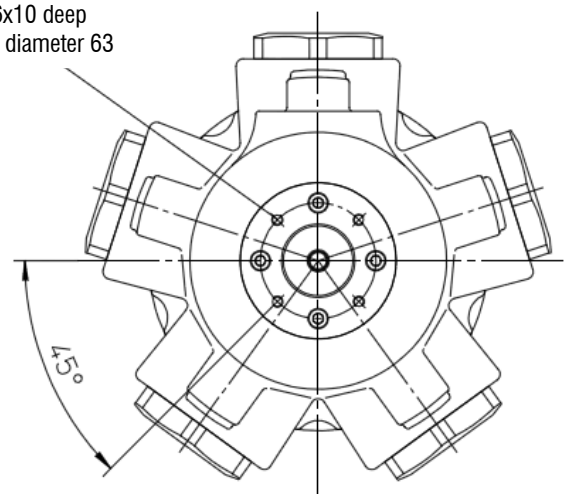


Measuring shaft design: M

Radial piston motors Type RM 80N - RM 250N with the type key "M" are equipped with a measuring shaft to determine the motor speed. The measuring shaft is rigidly connected to the motor-driven shaft and transmits a maximum torque of 5 Nm. If you require a higher torque, please approach the manufacturer or distributor. Please request the documentation on the mounting of the encoder, pulse transmitter and AC transmitters.



4 threaded holes M6x10 deep
on screw hole circle diameter 63



NOTES

DÜSTERLOH has been developing fluid technology products for more than 100 years. The drives, controles 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.

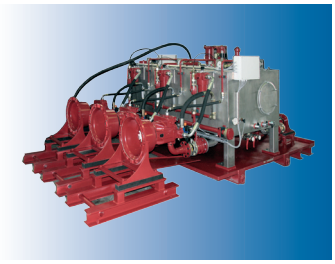
Products

- Hydraulic radial piston motors
- Hydraulic axial piston motors
- 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 standardised 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



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