RE 15 224/07.02

Replaces: 09.97

Radial piston hydraulic motor with fixed displacement Types MRT, MRTE

Nominal sizes 710 to 1080
Maximum working pressure 420 bar
Maximum displacement 10802 cm^3
Maximum torque 43000 Nm

A product of RIVA CALZONI S.p.A., Bologna

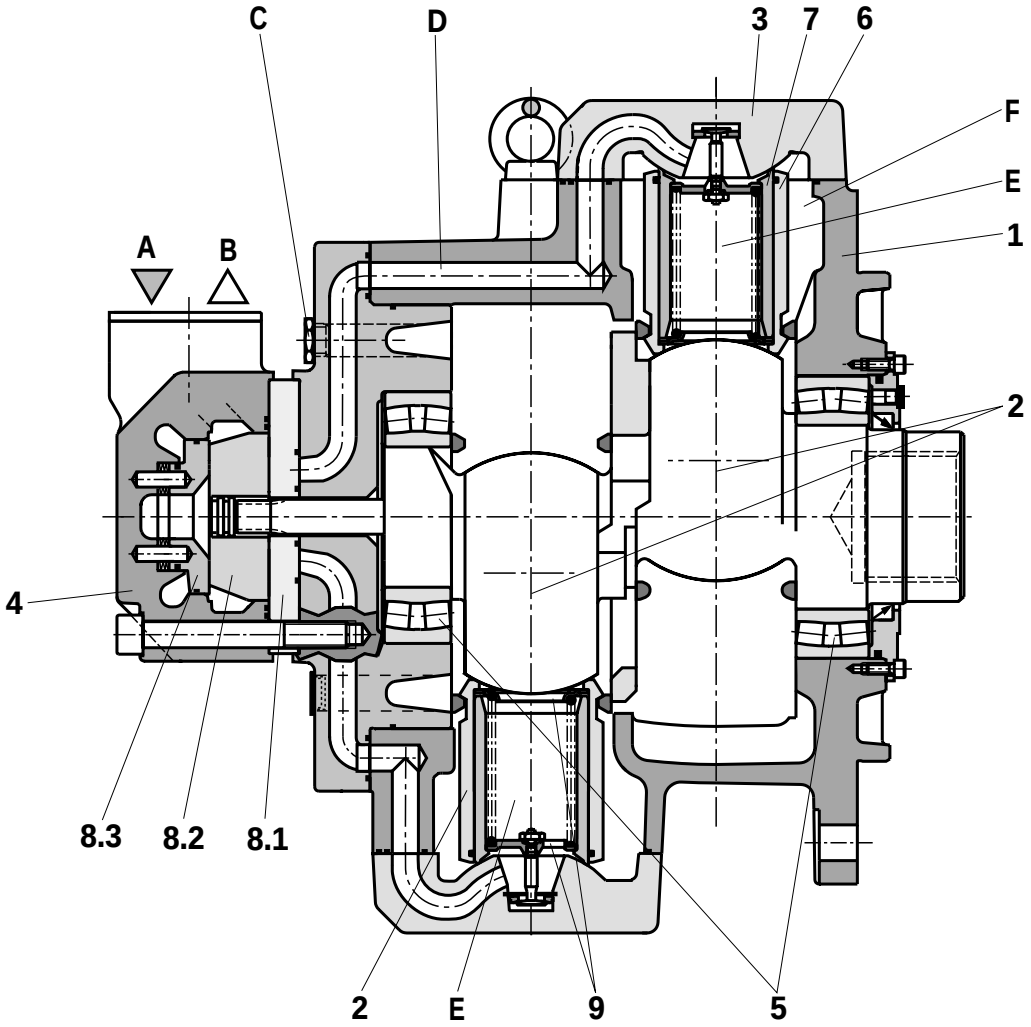
H/A/D 5662/97

Types MRT, MRTE

Overview of contents

Features

- Very high starting torque
- Smooth rotation even at low speeds
- Very low operating noise
- High temperature shock resistance
- Reversable
- High service life
- Very suitable for closed loop control applications
- Version with sensing shaft



The MRT and MRTE hydraulic motors are of a 10 piston design with a fixed displacement volume and have the forces applied externally. Due to the 10 piston design the external dimensions are compact. The diameter is approx. the size of motors with half of the displacement volume.

Design
The main components are the housing (1), excentric shaft (2), cover (3), control housing (4), roller bearing (5), cylinder (6), piston (7) and controls (8.1; 8.2; 8.3).

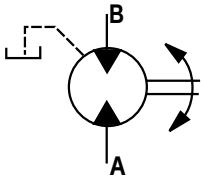
Supply and return of the operating medium
The operating medium feeds or returns from ports A or B of the motor. Via the control and the channels (D) in the housing (1) the cylinder chambers (E) are either filled or drained.

Drive group; torque generation
The cylinder and pistons support themselves on the spherical surfaces (9) which are located on the excentric shaft (2) and cover (3). Due to this the piston and cylinder, whilst the shaft is rotating, can align themselves without any transverse forces. The hydro-static unloading of the pistons and cylinder results in low friction and a very high efficiency.

The pressure in the cylinder chambers (E) acts without any mechanical connecting elements directly on the excentric shaft. Of the 10 cylinders there are always 4 or 6 connected with the feed or return sides. The two shaft excentrics are located opposite to each other, therefore the piston forces are virtually for compensated internally. This greatly reduces the bearing forces and guarantees a long bearing life.

Control
The control comprises of the distributor plate (8.1) and the distributor valve (8.2). Whilst the control plate is fixed to the housing by pins, the distributor valve rotates at the same speed as the excentric shaft. Drillings in the distributor valve makes the connection between the distributor plate and the piston chambers. The reaction ring (8.3) acts in conjunction with the spring and system pressure and compensates for the clearances. This results in there being a very high temperature shock resistance and constant power values over the entire service life.

Leakage
The low leakage into the housing (F) which comes from the pistons and control must be drained via one of the 4 drain connections (C).

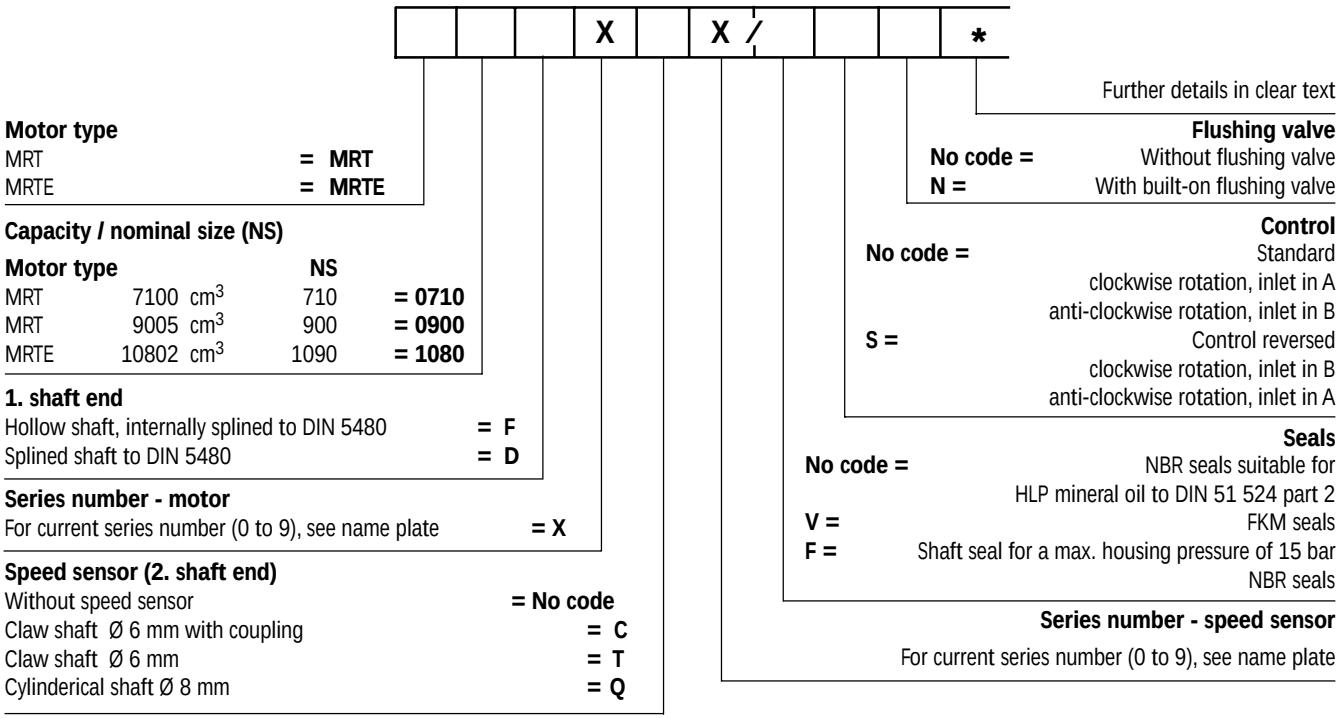


General technical data - MRT; MRTE

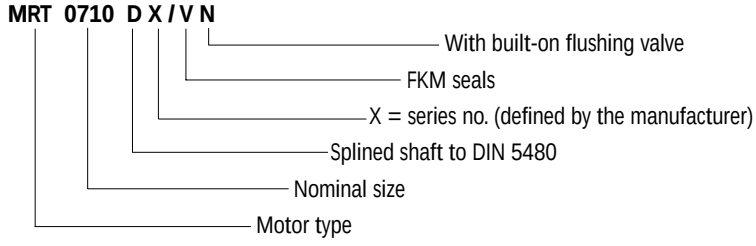
Design			Radial piston hydraulic motor. forces are applied externally, fixed displacement
Type			MRT; MRTE
Mounting style			Flange mounting
Connection type			4 SAE connections 2", 6000 psi for MRT 0900 and MRTE 1080 2 SAE connections 2", 6000 psi for MRT 0710
Installation			Optional (installation guidelines on page 12 to be taken into account)
Direction of rotation			Clockwise/anti-clockwise - reversable
Pressure fluid			HLP mineral oil to DIN 51 524 part 2; HFB and HFC as well as bio-degradable fluids on request; for phosphate ester (HFD), FKM seals are necessary
Pressure fluid temperature range	ϑ	°C	– 30 to + 80
Viscosity range[1])	ν	mm^2/s	18 to 1000, recommended operating range 30 to 50 in the motor housing, is to be complied with for high continuous loads
Degree of contamination			Maximum permissible degree of contamination of the pressure fluid is to NAS 1638 class 9. We therefore recommend a filter with a minimum retention rate of $\beta_{10} \geq 100$.
			To ensure a long working life we recommend class 8 to NAS 1638. This is achievable with a filter with a minimum retention rate of $\beta_5 \geq 100$.

[1]) For other values please consult the Technical Sales Dept.

Ordering details



Ordering example



Technical data (for applications outside these parameters, please consult us!)

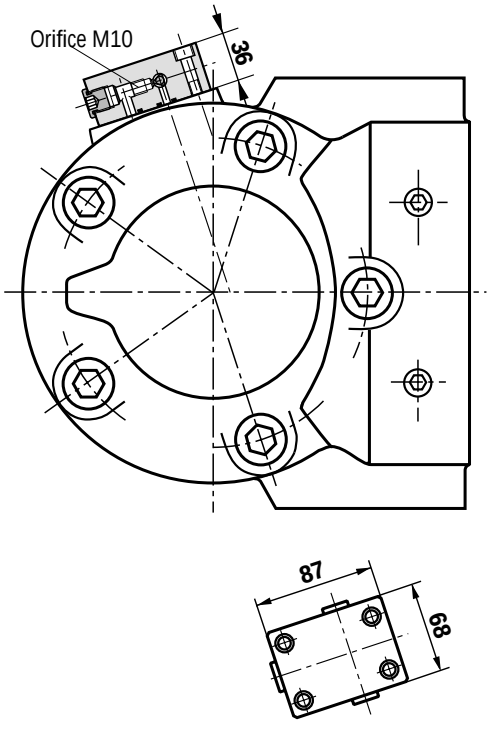
All parameters at ν = 36 mm²/s; ϑ = 45 °C; p_{output} = zero pressure

MRT - MRTE

Nominal size - series number				MRT 0710-1	MRT 0900-1	MRTE 1080-1
Displacement volume		V	cm³	7100	9005	10802
Moment of inertia		J	kg m²	0.82	1.32	1.32
Specific torque			Nm/bar	113.1	143.4	172.0
Min. start torque/theoretical torque			%	91	91	91
Max. input pressure	Continuous	p	bar	250	250	210
	Intermittent	p	bar	300	300	250
	Peak value	p	bar	420	420	350
Max. summating pressure in ports A+B		p	bar	400	400	400
Max. leakage pressure		p	bar	5 (15 bar with type ... F...) also see page 5		
Speed range	Without flushing	n	min⁻¹	0.5 - 75	0.5 - 70	0.5 - 65
	With flushing	n	min⁻¹	0.5 -150	0.5 - 130	0.5 -110
Max. continuous power	Without flushing	P	kW	–	–	–
	With flushing	P	kW	330	370	310
Weight (with hollow shaft "F")		m	kg	920 (900)		

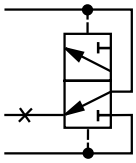
Housing flushing

In order to achieve the maximum continuous performance values, flushing of the housing is necessary (see diagrams on pages 6 to 8). Under special conditions, in order to achieve the recommended operating viscosity 30 - 50 mm²/s in the motor housing, flushing of the motor may also be necessary in the operating area without flushing (also see page 5).
The oil temperature inside the motor housing can be obtainable by adding 3 °C to the motor housing surface temperature, measured between two cylinders.



Housing flushing is recommended for all applications.

Function:
The flushing valve always takes the flushing flow from the low pressure side of the motor. The diameter of the orifice has to be choosen in order to ensure that the flushing flow of 23 L/min is reached at the associated low pressure value.



Some orifice diameter values relating to the low pressure values can be found in the table below:

Low pressure in bar	Orifice diameter
3	4.8
6	4.0
9	3.6
15	3.2
20	3.0
25	2.9
30	2.8

The flushing valve is delivered with a blank orifice.

Attention:
Flushing does not work until the blank orifice is replaced by one with the correct orifice diameter.

Pressure fluid

See catalogue sheet RE 07 075 for detailed information regarding the selection of pressure fluids before carrying out any engineering/design work. Further notes on installation and commissioning can be found on page 12 of this catalogue sheet.
When operating with HF pressure fluids or bio-degradable pressure fluids possible limitations to the technical data must be taken into consideration, please see information sheet TCS 85, or contact ourselves.

Operating viscosity range

We recommend that the operating viscosity is so selected (at operating temperature) that it lies in the optimum range of

$v_{rec.}$ = recommended operating viscosity 30...50 mm²/s

for efficiency and service life, referring to the circulation temperature in closed circuit and the tank temperature in open circuit as well as the motor housing temperature (drain fluid temperature).

Limiting viscosity range

For the limiting conditions the following values are valid:

$v_{min.abs.}$ = 10 mm²/s in emergency, briefly
$v_{min.}$ = 18 mm²/s with reduced performance data
$v_{max.}$ = 1000 mm²/s briefly with cold start

Selection diagram

Choosing the type of pressure fluid

A prerequisite for the selection of a pressure fluid is that the operating temperature in relation to the ambient temperature is known. In closed circuits the circulation temperature, in open circuits the tank temperature. To achieve the maximum continuous power values the oil viscosity must be within the optimum operating viscosity range, referring to the inlet temperature as well as the drain oil temperature.

Example:
With an ambient temperature of X °C the operating temperature settles to a temperature of 50 °C (closed circuit: circulation temperature, open circuit: tank temperature). For an optimum viscosity range this ($v_{rec.}$; rastor field) relates to a viscosity class of VG 46 or VG 68; select: VG 68.
The drain oil temperature which is influenced by the pressure and speed lies above the circulation or tank temperature. At no point in the system must this exceed 80 °C.
If the above stated conditions cannot be maintained due to extreme operating conditions or high ambient temperatures we recommend that, also outside the foreseen range, housing flushing is used (see diagrams on pages 6 to 8), or consult ourselves.

Filtering of pressure fluid

The finer the filtration and the better the cleanliness class that can be achieved the longer the service life of the radial piston motors.
To guarantee the functional safety of the radial piston motors a cleanliness class of at least

9 to NAS 1638
6 to SAE, ASTM, AIA
18/15 to ISO/DIS 4406 is necessary.

If the above stated classes cannot be achieved, please consult ourseleves.

Leakage fluid pressure

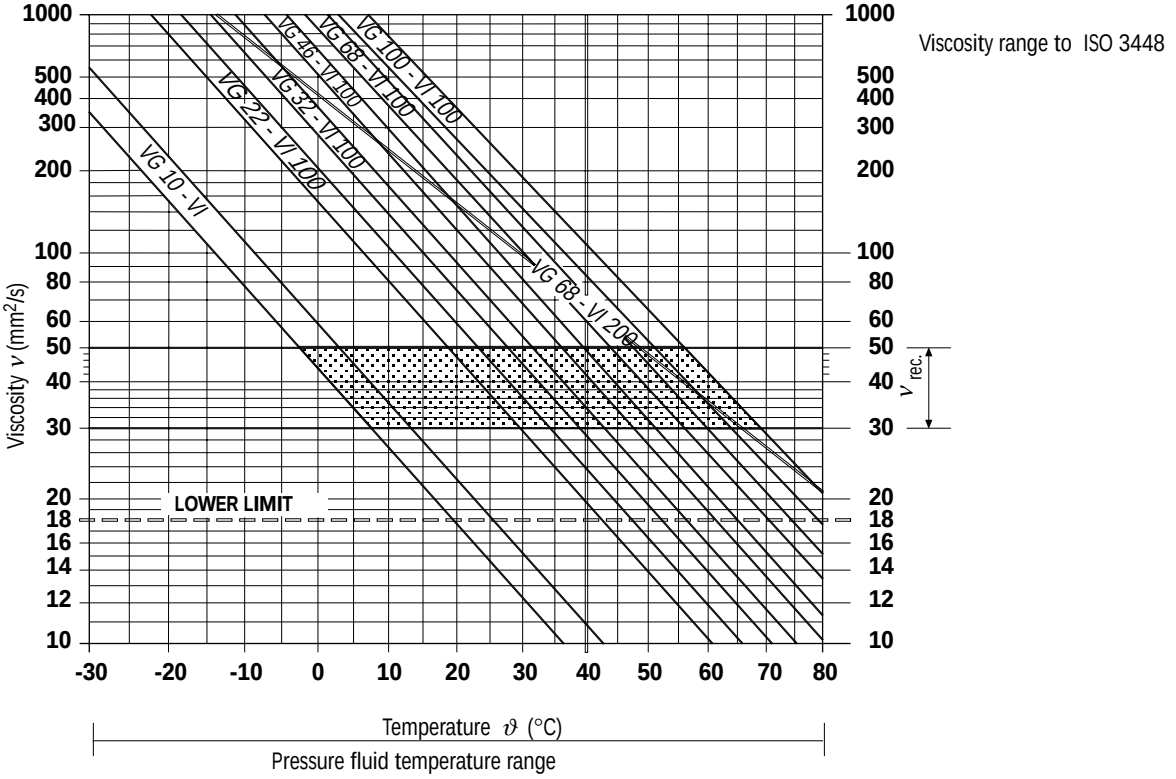
The lower the speed and the leakage fluid pressure, the longer the life of the shaft seal ring. The maximum permissible housing pressure is

$$p_{max} = 5 \text{ bar}$$

which is independent of the motor speed.
For higher housing pressures a shaft seal which is suitable up to a **p_{max} = 15 bar** can be fitted (version F). Further information regarding housing flushing can be found on page 4.

Shaft seal ring FKM

Some fluids require the use of FKM seals and shaft seal rings (type: HFD ...). We recommend the use of FKM shaft seal rings with high operating temperatures in order to extend the service life.

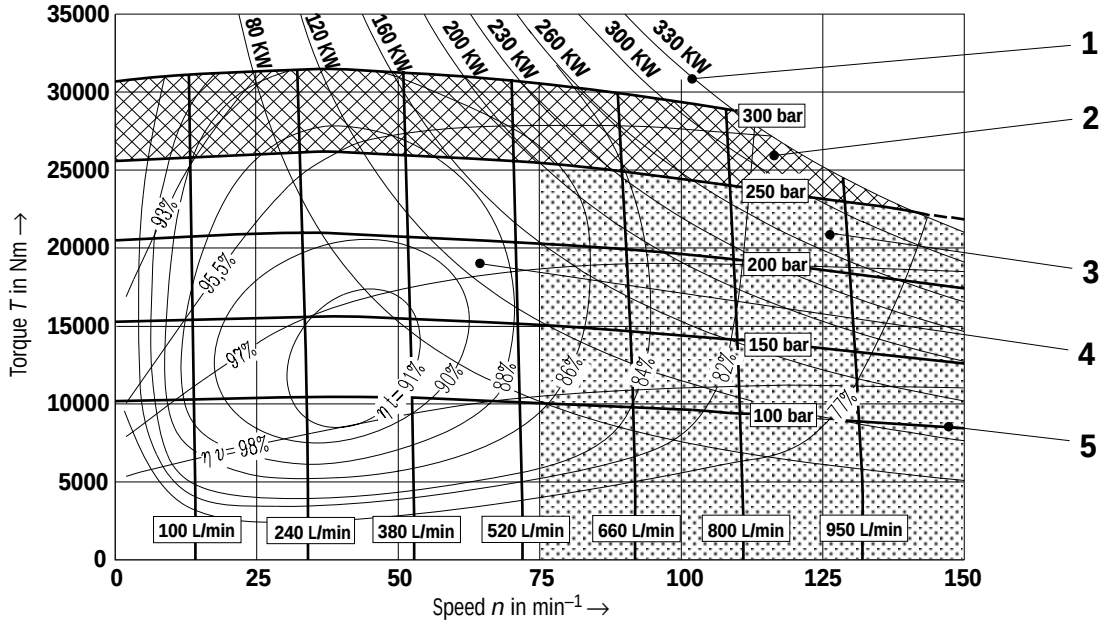


Characteristic curves (average values) measured at ν = 36 mm²/s; ϑ = 45 °C; p_{output} = zero pressure

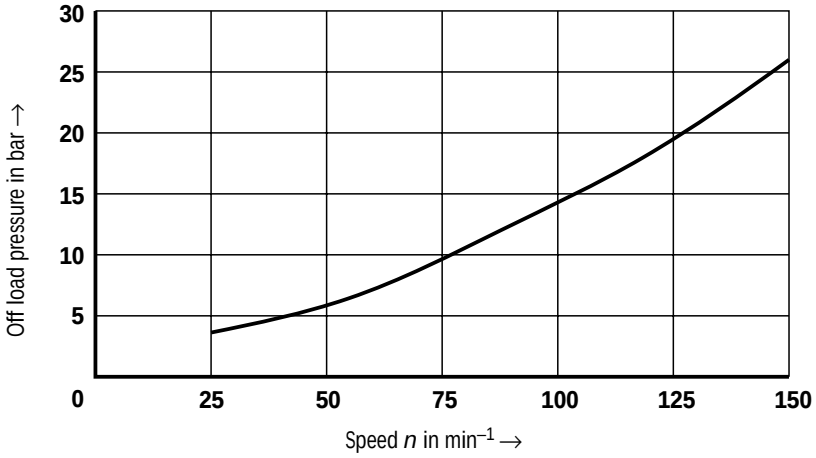
1 Output power **2** Permissible for intermittent operation **3** Permissible for continuous operating with flushing **4** Permissible for continuous operation **5** Inlet pressure

η_t = Total efficiency
η_v = Volumemetric efficiency

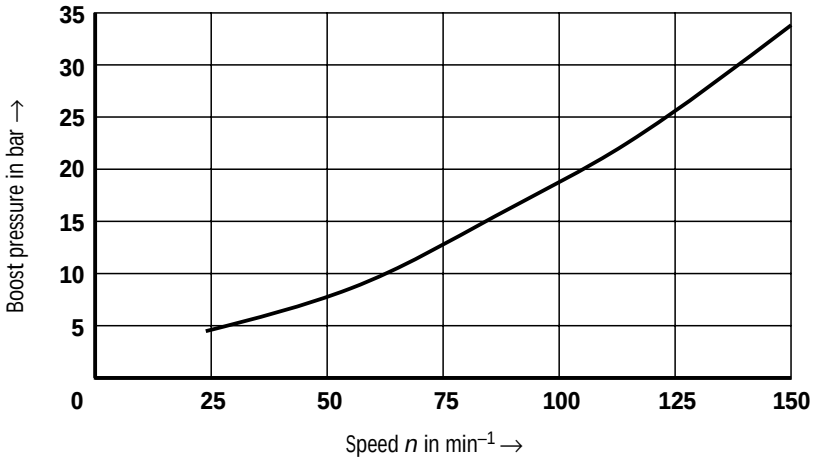
MRT 0710-1



Min. required pressure differential Δp at off load speed (shaft unloaded)



Min. required boost pressure for pump operation



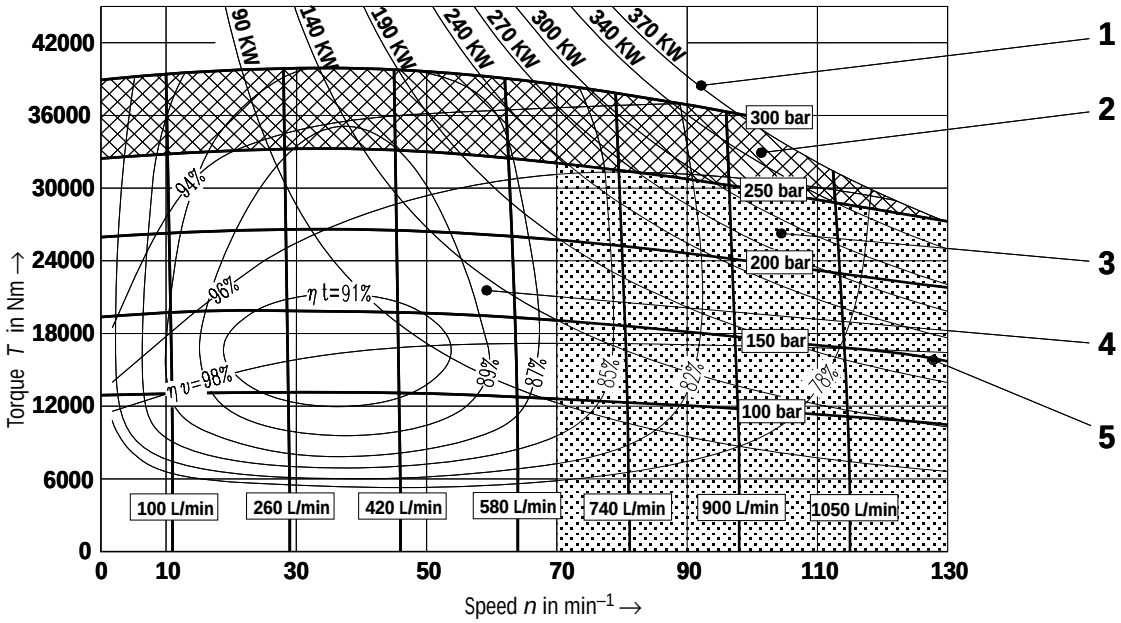
Characteristic curves (average values) measured at ν = 36 mm²/s; ϑ = 45 °C; p_{output} = zero pressure

1 Output power **2** Permissible for intermittent operation **3** Permissible for continuous operation with flushing **4** Permissible for continuous operation **5** Inlet pressure

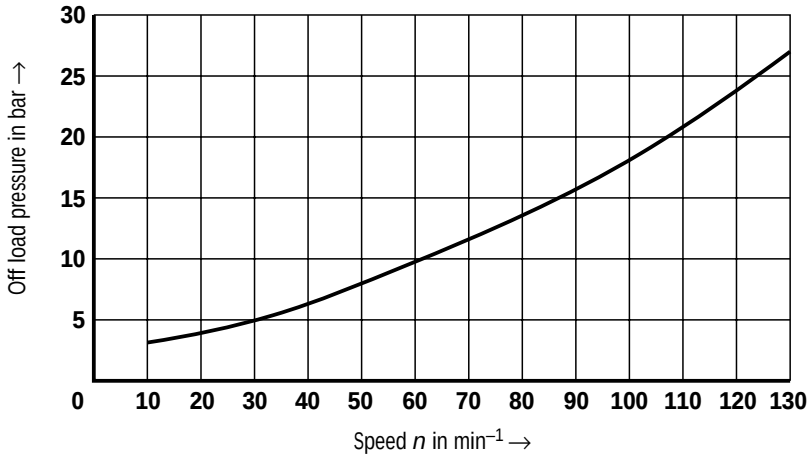
η_t = Total efficiency

η_v = Volumemetric efficiency

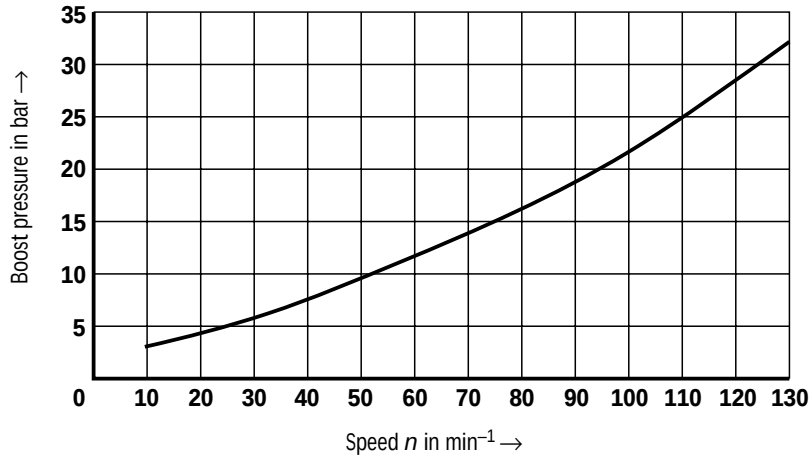
MRT 0900-1



Min. required pressure differential Δp at off load speed (shaft unloaded)



Min. required boost pressure for pump operation



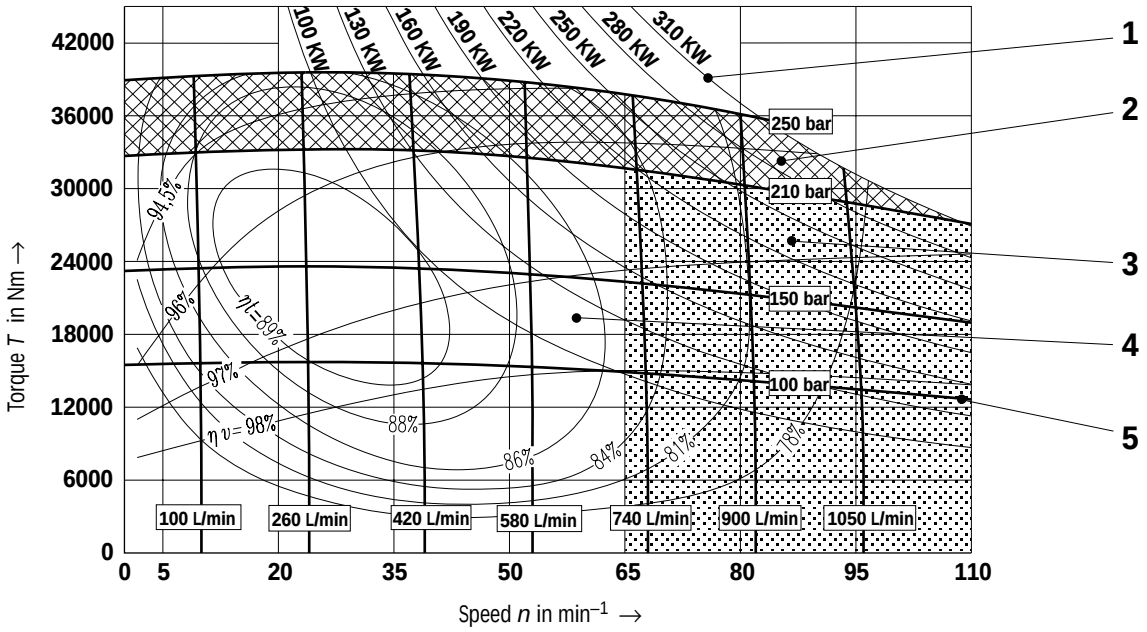
Characteristic curves (average valves) measured at n = 36 mm²/s; J = 45 °C; p_{output} = zero pressure

1 Output power **2** Permissible for intermittent operation **3** Permissible for continuous operating with flushing **4** Permissible for continuous operation **5** Inlet pressure

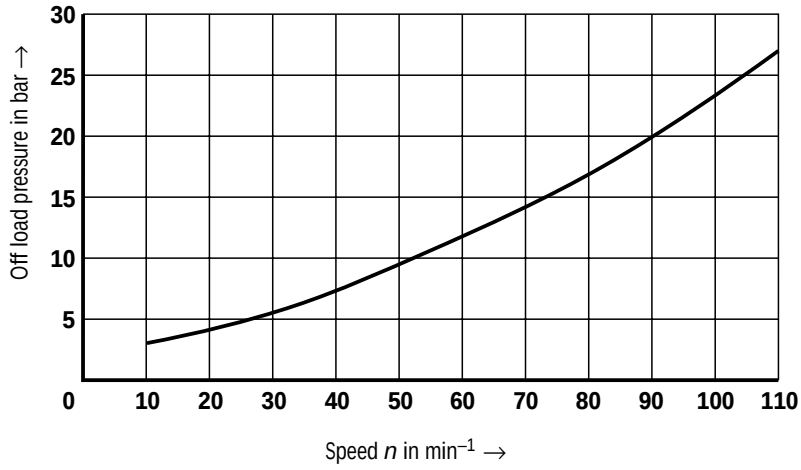
η_t = Total efficiency

η_v = Volumemetric efficiency

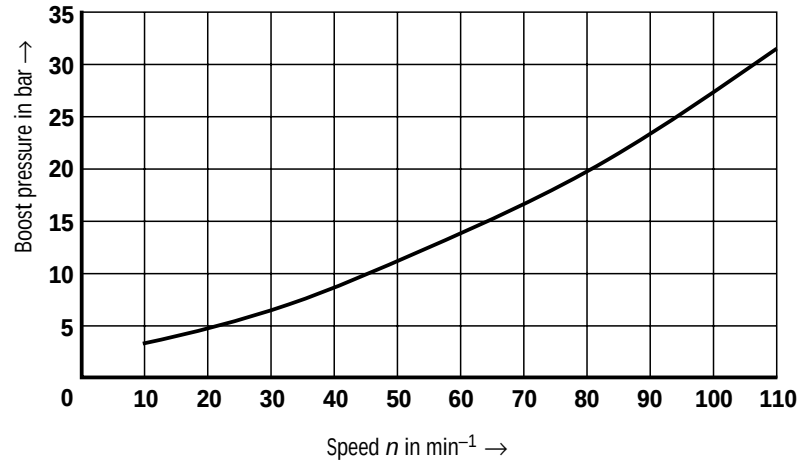
MRTE 1080-1



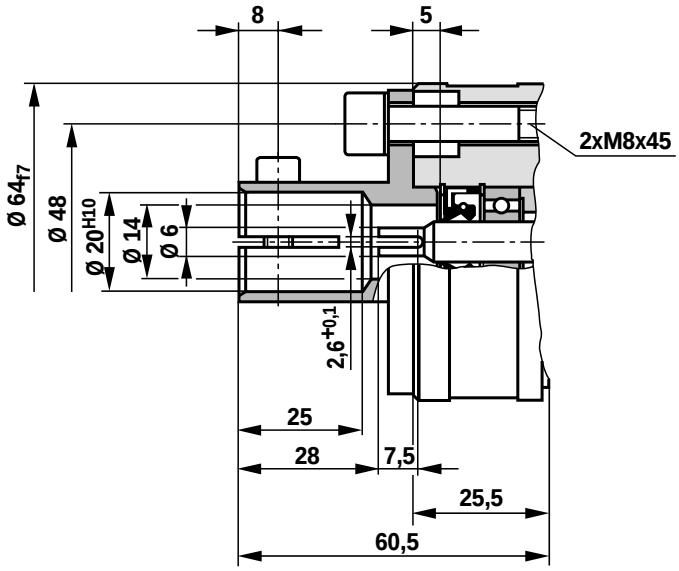
Min. required pressure differential Δp at off load speed (shaft unloaded)



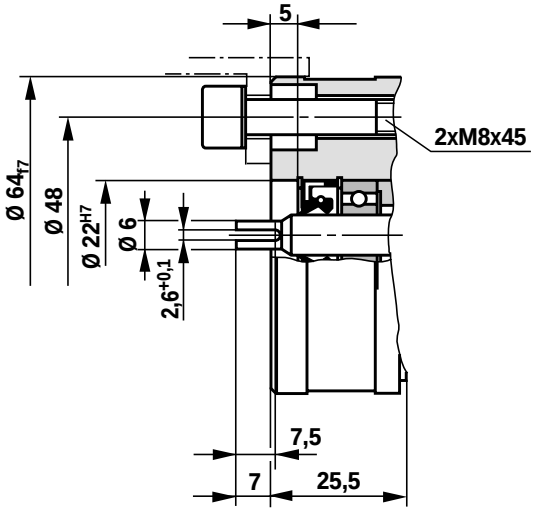
Min. required boost pressure for pump operation



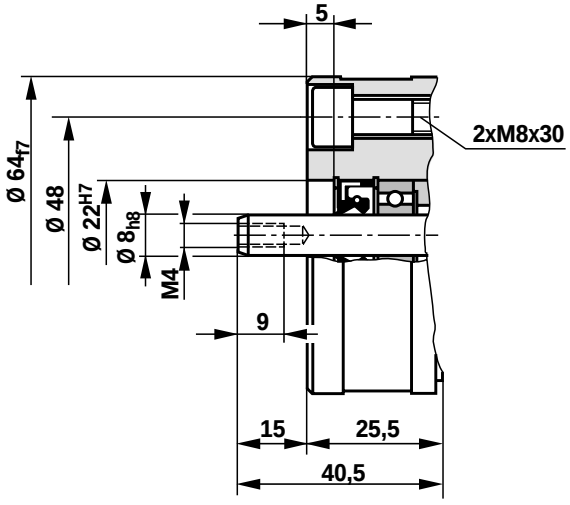
Connection “C”
(Claw shaft
with clamping bush)



Connection “T”
(Claw shaft)

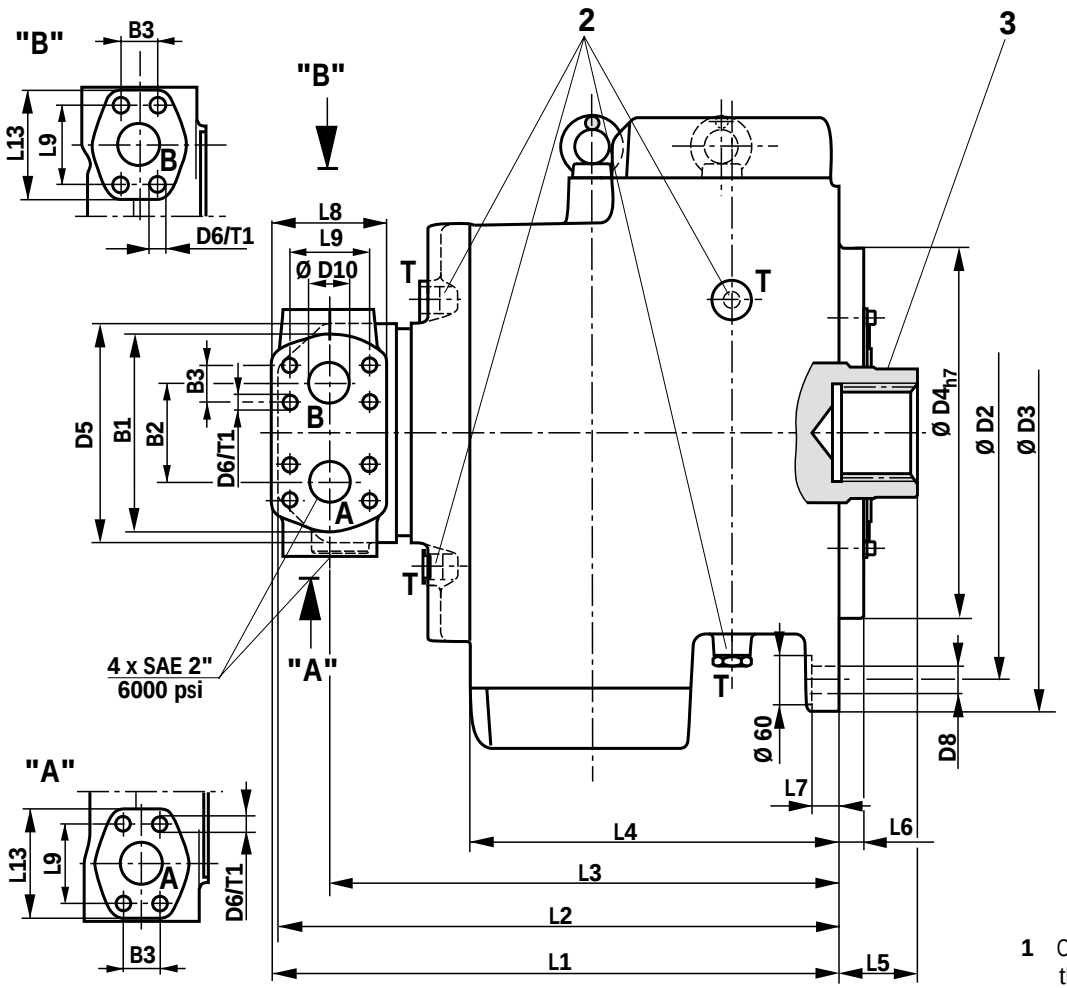


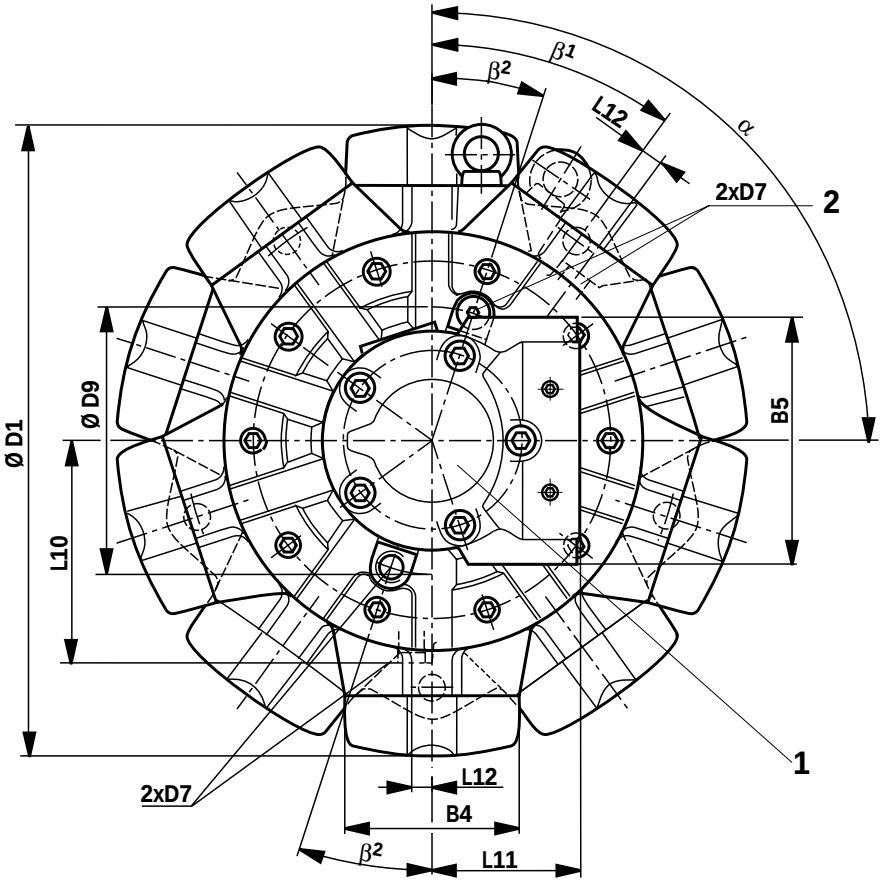
Connection “Q”
(Cylinderical shaft)



This concerns the connections for RPM acquisition. For reversal operation and positional control please contact the Technical Sales Dept.

Unit dimensions: MRT and MRTE





***)** These SAEconnections are only present in the MRT 0900 and MRTE 1080

1 On request the control housing can be turned through 72°.

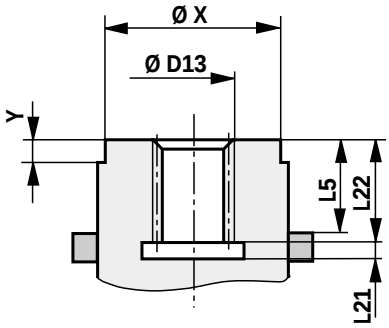
2 Drain connection
Pipe thread "G" to ISO 228/1

3 See dimensions on page 11

Rotation (viewed on the shaft end)	Inlet in port	Ordering details
Clockwise Anti-clockwise	A B	Standard „No code“
Clockwise Anti-clockwise	B A	„S“

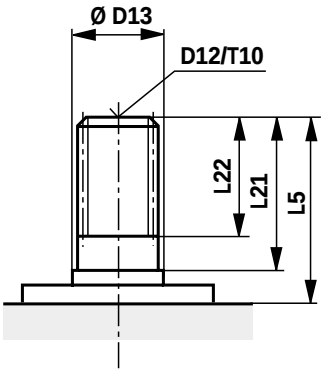
Motor type series no.	L1	L2	L3	L4	L6	L7	L8	L9	L10	L11	L12	L13	B1	B2	B3	B4	B5	ØD1	ØD2	ØD3	$ØD4_{h7}$	ØD5	D6	D7	T1	D8	ØD9	ØD10	α	ß1	ß2
MRT0710-1 **MRT0900-1** **MRTE1080-1**	688.5	681.5	618.5	448.5	30	35	140	96.8	270	180	25	133	240	120	44.4	212	300	766	600	676	450	266	M20	G1"	40	5x33	325	50	90°	36°	18°

Version F
Hollow shaft with internal spline to DIN 5480



1st shaft end / Motor type series no.	Version F					
	L5	L21	L22	Ø D13	Ø X	Y
MRT 0710-1	50	12	78	N110x3x35-9H	156_{h8}	5
MRT 0900-1 **MRTE 1080-1**	95	12	88	N120x4x28-9H	156_{h8}	50

Version D
Splined shaft to DIN 5480



1st shaft end / Motor type series no.	Version D					
	L5	L21	L22	Ø D13	D12	T10
MRT 0710-1	230	188	153	W120x4x28-8f	2xM16 - Ø 70	27
MRT 0900-1 **MRTE 1080-1**	250	205	167	W140x5x26-8f	2xM16 - Ø 70	32

Assembly and commissioning guidelines

Mounting, fixing

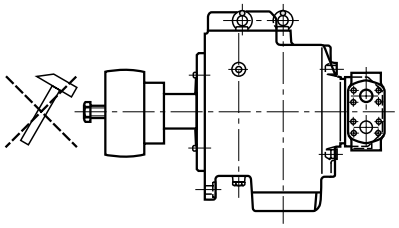
- Installation position, optional
  – Take oil drain into account (see below)
- Align the motor correctly
  – Mounting surface even, resistant to bending
- Min. tensile strength of fixing screws is to grade 10.9
  – Take prescribed tightening torque into account

Note: With frequent start/stop operation or high reversal frequencies, 2 screws must be fitting screws

Pipe lines, pipe connections

- Use suitable fittings!
- Select pipe and hose lines according to application conditions!
  – Take manufacturer's data into account!
- Before commissioning fill-up with oil
  – Use prescribed filter!

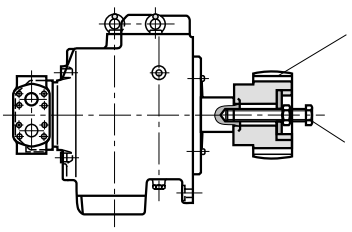
Coupling



Pull on with screw

Use threaded hole in the output shaft

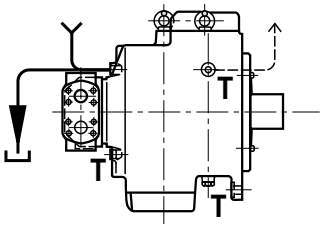
Withdraw with an extractor

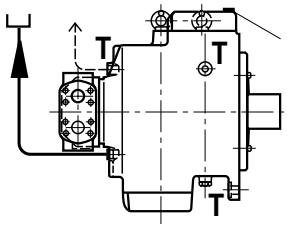


Leakage and flushing line linstallation examples

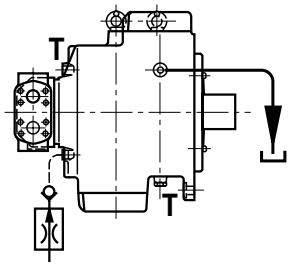
Note: Install leakage line in such a way that motor **cannot** run empty.

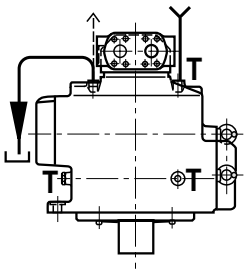
T = Plug
Y = Filling point of the motor housing
← = Bleeding

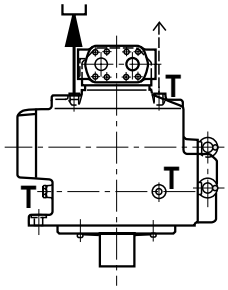


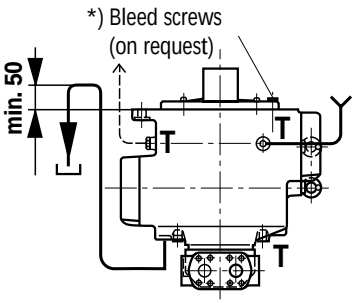


Cooling circuit for high power continuous operation, the max. permissible housing pressure has to be taken into account









*) Special design for applications which require a complete filling with oil.
E.g. in a salty atmosphere

Bosch Rexroth AG
Industrial Hydraulics
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Zum Eisengießer 1 • D-97816 Lohr am Main
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Telefax 0 93 52 / 18-23 58 • Telex 6 89 418-0
eMail documentation@boschrexroth.de
Internet www.boschrexroth.de

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