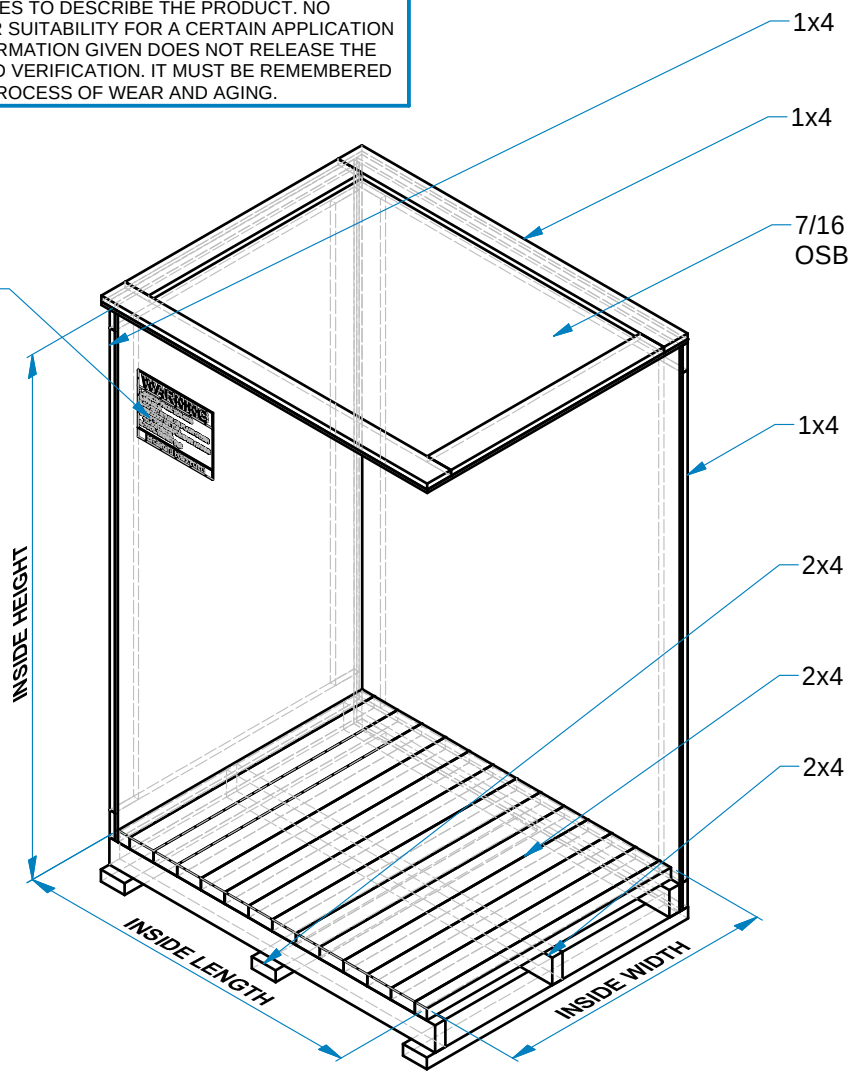
LIABILITY NOTICE

THE DATA SPECIFIED ON THIS DOCUMENT ONLY SERVES TO DESCRIBE THE PRODUCT. NO STATEMENTS CONCERNING A CERTAIN CONDITION OR SUITABILITY FOR A CERTAIN APPLICATION CAN BE DERIVED FROM OUR INFORMATION. THE INFORMATION GIVEN DOES NOT RELEASE THE USER FROM THE OBLIGATION OF OWN JUDGMENT AND VERIFICATION. IT MUST BE REMEMBERED THAT OUR PRODUCTS ARE SUBJECT TO A NATURAL PROCESS OF WEAR AND AGING.

NOTES:

1. PRODUCT LAG BOLTED TO RUNNERS (4x)
2. LOCATE WARNING LABEL ON THE SIDE THE LIFT TRUCK IS TO LIFT FROM.
3. WEIGHT OF THE PRODUCT (INCLUDING CRATE) ADDED TO LABEL WITH PERMANENT MARKER, IN kg.
4. SCREW THE SIDE WITH THE LABEL ON IT. ALL OTHER SIDES CAN BE NAILED.
5. CRATE SUITABLE FOR CROSS BORDER SHIPMENT.
6. FOR OUTSIDE DIMENSIONS, ADD 2.5" TO LENGTH AND WIDTH, 7.75 TO HEIGHT



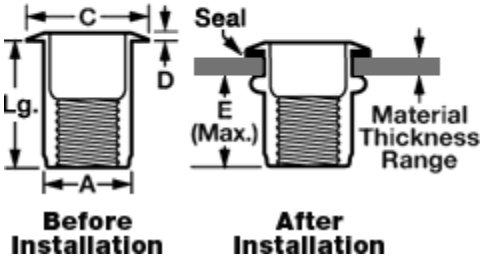
	43" High	Inside Width (in)					
Inside Length (in)		36	48	60	72	84	96
	33 1/2	R987422146					
	45 1/2	R987422147	R987422153				
	57 1/2	R987422148	R987422154	R987422158			
	69 1/2	R987422149	R987422155	R987422159	R987422162		
	81 1/2	R987422151	R987422156	R987422160	R987422163	R987422165	
	93 1/2	R987422152	R987422157	R987422161	R987422164	R987422166	R987422167

	67" High	Inside Width (in)					
Inside Length (in)		36	48	60	72	84	96
	33 1/2	R987422168					
	45 1/2	R987422169	R987422174				
	57 1/2	R987422170	R987422175	R987422179			
	69 1/2	R987422171	R987422176	R987422180	R987422183		
	81 1/2	R987422172	R987422177	R987422181	R987422184	R987422186	
	93 1/2	R987422173	R987422178	R987422182	R987422185	R987422187	R987422188

	91" High	Inside Width (in)					
Inside Length (in)		36	48	60	72	84	96
	33 1/2	R987422189					
	45 1/2	R987422190	R987422195				
	57 1/2	R987422191	R987422196	R987422200			
	69 1/2	R987422192	R987422197	R987422201	R987422204		
	81 1/2	R987422193	R987422198	R987422202	R987422205	R987422208	
	93 1/2	R987422194	R987422199	R987422203	R987422207	R987422209	R987422210

Threaded Inserts

Catalog Page | Bookmark



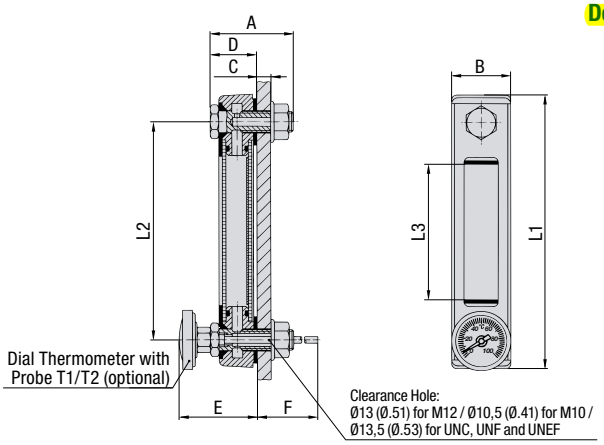
93484A752

Packs of 5

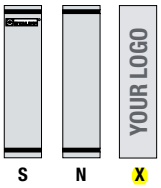
In stock for $10.51 per pack

Type	Rivet Nuts
Rivet Nut, Nut Insert, or Rivet-Type Stud Type	Open-End Knurled Rivet Nuts with Seal
For Use With	Metal
Application	Create New Threads
Material	Steel
Steel Type	C1008 - C1010
Finish/Coating	Zinc Yellow Chromate Plated
Threaded Type	Right-Hand Threaded
System of Measurement	Inch
Internal Thread Size	3/8"-16
Internal Thread Fit	2B
Insert Length	.805"
Drill Size	17/32"
Material Thickness Range	.115" - .250"
Dimension A	.53"
Dimension C	.685"
Dimension D	.035"
Dimension E	.425"
Rockwell Hardness	Not Rated
Minimum Tensile Strength	Not Rated
Specifications Met	Not Rated
Note	PVC foam seal bonded under the flange.
Installation Instructions	Determine material thickness. Thread nut onto mandrel of an installation tool, place in drilled hole of material, and crimp to create a backside flange. A secure permanent fit between the top flange and the crimped bottom section is formed.
Installation Tool	**95603A770**

Level Gauge ▪ Type SNA



Design of Scale Plates



Thermometer Options

Capillary Tube Thermometer with a dual Celsius / Fahrenheit scale up to +80 °C / +180 °F

Characteristics

Visual fluid level indication in hydraulic reservoirs with maximum tank pressures not exceeding 2 bar / 29 PSI

Nominal Sizes and Designs

- 6 nominal sizes from 76 mm / 2.99 in to 305 mm / 12.00 in
- Display either undivided (SNA 076 ... 176) or subdivided by strut(s) into 2 (SNA 254) or 3 sections (SNA 305)

Please see page E5 for alternative nominal sizes and designs.

Media Compatibility

- Suitable for use with Mineral and Petroleum based hydraulic fluids (HL and HLP)

Materials

- Housing made of Steel St 12, black epoxy-coated
- Sight tube and plugs made of Polyamide (PA)
- Sealings made of NBR (Buna-N®)
- Scale plate made of PVC

Special sight tube materials for improved UV or chemical resistance and use with special media (such as bio-degradable fluids, diesel oils, gasolines, etc.) as well as special sealing materials, e.g. FPM (Viton®), and scale plate materials, e.g. Aluminium, are available on request.

Please see page E5 for alternative housing materials.

Technical Data

- IP 65 protection rating: Dust tight and protected against water jets (IP 67 on request)
- Operating temperature range: -30 °C ... +80 °C / -22 °F ... +176 °F
- Recommended tightening torque: 8 N·m / 5 9 ft·lb

Accessories / Options

- Red / blue capillary tube thermometers with a dual Celsius / Fahrenheit scale and a temperature display range of up to +80 °C / +180 °F
- Dial thermometers with probe and a Celsius or a dual Celsius / Fahrenheit scale with a temperature display range of up to +100 °C / +212 °F
- Thermo Switches
- Temperature Sensors

Please see pages E8 and E9 for details.

Dimensions

Maximum admissible tolerance for the bolt center spacing (dimension L2) according to DIN ISO 2768-f: ±0,20 mm / .008 in for all nominal sizes.

Nominal Size	Dimensions (mm/in)									
	A	B	C (Max.)	D	E	F (with T1)	F (with T2)	L1	L2	L3
SNA 076	45	34,5	8	27	43,5	165,5	265,5	108	76	31
	1.77	1.36	.32	1.06	1.71	6.52	10.45	4.25	2.99	1.22
SNA 127	45	34,5	8	27	43,5	165,5	265,5	159	127	76
	1.77	1.36	.32	1.06	1.71	6.52	10.45	6.26	5.00	2.99
SNA 150	45	34,5	8	27	43,5	165,5	265,5	182	150	99
	1.77	1.36	.32	1.06	1.71	6.52	10.45	7.17	5.91	3.90
SNA 176	45	34,5	8	27	43,5	165,5	265,5	208	176	124
	1.77	1.36	.32	1.06	1.71	6.52	10.45	8.19	6.93	4.88
SNA 254	45	34,5	8	27	43,5	165,5	265,5	285	254	192
	1.77	1.36	.32	1.06	1.71	6.52	10.45	11.22	10.00	7.56
SNA 305	45	34,5	8	27	43,5	165,5	265,5	336	305	244
	1.77	1.36	.32	1.06	1.71	6.52	10.45	13.23	12.00	9.61

Order Codes

SNA 127 B - S - 0 - 12 - 0 - 60

① ② ③ ④ ⑤ ⑥ ⑦ ⑧

① Type

Level Gauge with visual fluid level indication	SNA

② Nominal Size

SNA 076 (nominal size of 76 mm / 2.99 in)	076
SNA 127 (nominal size of 127 mm / 5.00 in)	127
SNA 150 (nominal size of 150 mm / 5.91 in)	150
SNA 176 (nominal size of 176 mm / 6 93 in)	176
SNA 254 (nominal size of 254 mm / 10.00 in)	254
SNA 305 (nominal size of 305 mm / 12.00 in)	305

Please see page E5 for alternative nominal sizes.

③ Sealing Material

NBR (Buna-N®) (standard option)	B
FPM (Viton®)	V

④ Design of Scale Plate

With STAUFF logo (standard option)	S
Neutral design without any logo	N
Custom-designed scale plate (please specify)	X

⑤ Thermometer Option

Supplied without thermometer	0
Red Capillary Tube thermometer on scale plate	T
Blue Capillary Tube thermometer on scale plate	TB
Dial thermometer with probe (200 mm / 7 87 in) and a Celsius scale up to 100 °C	T1C
Dial thermometer with probe (300 mm / 11.81 in) and a Celsius scale up to 100 °C	T2C
Dial thermometer with probe (200 mm / 7 87 in) and a dual scale up to 100 °C / 212 °F	T1CF
Dial thermometer with probe (300 mm / 11.81 in) and a dual scale up to 100 °C / 212 °F	T2CF

⑥ Banjo Bolt Size

Metric ISO thread M12 (standard option)	12
Metric ISO thread M10	10
Unified coarse thread 1/2–13 UNC	U1
Unified fine thread 1/2–20 UNF (special option)	U2
Unified extra-fine thread 1/2–28 UNEF (special option)	U3

⑦ Thermo Switch / Temperature Sensor Option

Supplied without Thermo Switch / Temperature Sensor	-
Thermo Switch TS-SNA/SNK; Break contact (normally closed); Equipped with standard connector	0
Thermo Switch TS-SNA/SNK; Break contact (normally closed); Equipped with connector M12	0D
Thermo Switch TS-SNA/SNK; Make contact (normally open); Equipped with standard connector	C
Thermo Switch TS-SNA/SNK; Make contact (normally open); Equipped with connector M12	CD
Temperature Sensor TS-SNA/SNK-PT100; Equipped with connector M12	PT100

Thermo Switches / Temperature Sensors only available for banjo bolt size M12. Please see pages E8 and E9 for details.

⑧ Switching Temperature

Contact switches at +60 °C / +140 °F	60
Contact switches at +70 °C / +158 °F	70
Contact switches at +80 °C / +176 °F	80
Contact switches at +90 °C / +194 °F	90

Only to be indicated when using a Thermo Switch.

Options T1C/T1CF and T2C/T2 CF are not available for banjo bolt size M10 and not be used in conjunction with Thermo Switches or Temperature Sensors.
Please see page E8 for details.

Dimensional drawings: All dimensions in mm (in).

rexroth
A Bosch Company

Breathing filter

Type FEF 0, FEF 1

RD 51513
Edition: 2019-12

- Size 0 ... 1
- Flow, max.: 400 l/min *[106 gpm]*
- Connection up to DN 30, up to DN 55
- Operating temperature –30 °C to +100 °C *[–22 °F to 212 °F]*

Features

- Special highly efficient filter materials
- Air filtration in hydraulic and lubricating oil tanks
- Prevention of initial damage of pumps, bearings and system components
- Filter rating optional 10 µm *[10 micron]* (paper) or 3 µm *[3 micron]* (micro glass)

Contents

Ordering code

Breathing filter Type FEF 1

01	02	03	04	05	06	07	08
FEF	**1**	**– 2X /**		**– M**	**– K**	**– ES100**	**–**

Design

01	Filling and breathering filter	**FEF**
02	Size	**1**

Component series

03	**Component series** 20 ... 29 (20 ... 29: unchanged installation and connection dimensions)	**2X**

Filter rating in µm

04	**Absolute**	Micro glass, not cleanable	**H3V3**
	Nominal	Filter paper, not cleanable	**P10**

Seal

05	NBR seals	**M**

Material

06	CED-coated steel	**K**

Supplementary information

07	Filling strainer, length 100 mm *[3.94 in]*	**ES100**
08	Chain	**KT**
	Side clip	**L**
	Backflow prevention	**R**

Order example and Preferred types[1)]

Order example

Material number	Description
R928052084	FEF1-2X/H3V3-M-K-ES100-L
R928018808	FEF 0 P10-F00

Preferred types

Material number	Description
R928052084	FEF1-2X/H3V3-M-K-ES100-L
R928052088	FEF1-2X/H3V3-M-K-ES100
R928052102	FEF1-2X/P10-M-K-ES100
R928052112	FEF1-2X/H3V3-M-K-ES100-R
R928058351	FEF1-2X/H3V3-M-K-ES100-KT
R928058352	FEF1-2X/P10-M-K-ES100-KT
R928018808	FEF 0 P10-F00

1) Further versions are available on request.

Function, section

Combination of flange-mounting filling filter and cap removable over the bayonet lock as air breather with internal filter element. The filter element must be exchanged with the cap. The breathing filters are used in hydraulic systems for filtration of the suction air of the fluid tank. They are designed for installation on fluid tanks.

Depending on the process cycles, the air and contamination are drawn into the fluid tank. By use of our breathing filters, air circulation at the fluid tank can still be ensured and the system be protected against contamination.

They basically consist of a cap (1) with bayonet lock including filter element (2) as well as a base (3) with filling strainer (4) for mounting at the tank.

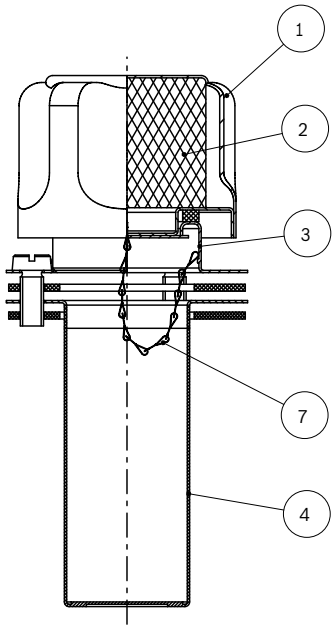
Via the bayonet lock, the cap (1) is connected to the base (3). The contaminated air flow is directed via opening (A) through the filter element and into the fluid tank (T). Before entering the fluid tank, any air is filtered. The outflowing air is also directed through the filter element.

Type FEF 0
By default, the cap (1) is connected via a chain (7) to the base (3).

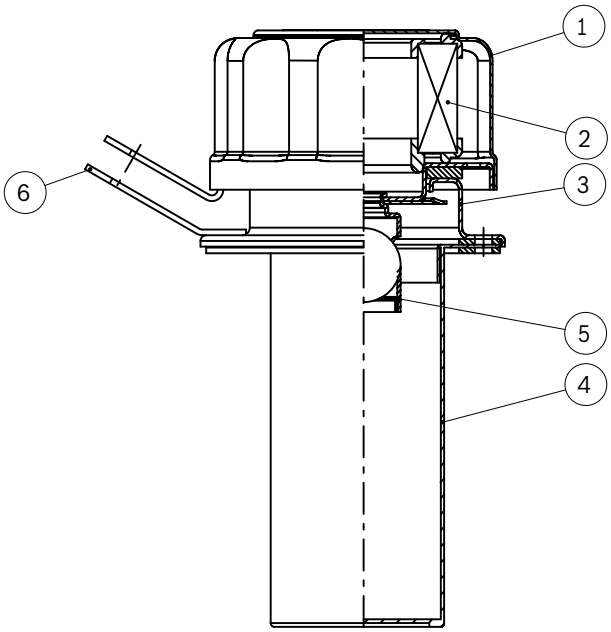
Type FEF 1
The filter is optionally available with return flow protection (amending specification of R (5)). Additionally, a configuration with lockable lateral clip (amending specification of L (6)) can be realized. The cap (1) can also be connected to the base (3) via a chain (amending specification of KT) to prevent loss of the cap.

The scope of delivery of both breathing filters includes slotted hexagon socket head cap screws, galvanized, M5x12 DIN84 4.8.

Type FEF 0



Type FEF 1



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

General				
Installation position			Vertical	
Operating temperature range		°C *[°F]*	–30...+100 *[–22...+212]*	
Ambient temperature range		°C *[°F]*	–30...+100 *[–22...+212]*	
Storage conditions		°C *[°F]*	–30...+100 *[–22...+212]*	
Connection		**NG**	**0**	**1**
		Standard	up to DN 30	up to DN 55
Material	▶ Cap		Galvanized steel Fibers (organic or inorganic); Polyurethane end disks	CED-coated steel Fibers (organic or inorganic); Polyurethane end disks
	▶ Seals		NBR-bound cellulose fibers	NBR
	▶ Flange		Galvanized steel	CED-coated steel
	▶ Filling strainer		Galvanized steel / rating 800 µm	Galvanized steel / rating 500 µm
	▶ Hexagon socket head cap screw		Cylinder head screw M5x12 DIN84 Material 4.8	
Weight		kg *[lbs]*	0,17 *[0.37]*	0,32 *[0.71]*

Compatibility with permitted hydraulic fluids

Hydraulic fluid	**Classification**	**Suitable sealing materials**	**Standards**
Mineral oil	HLP	NBR	DIN 51524

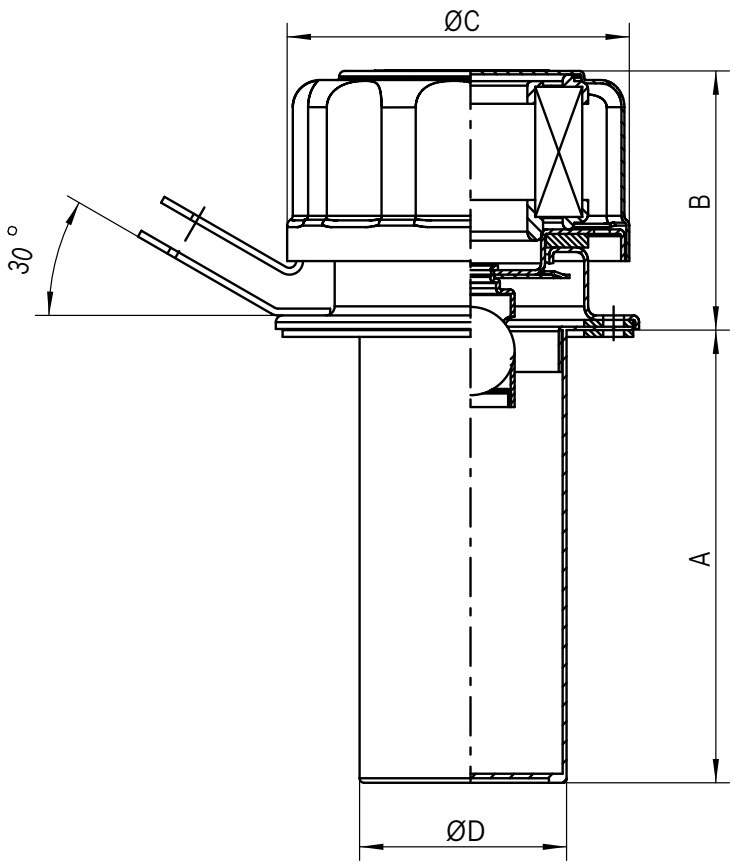
☞ **Important information on hydraulic fluids:**
- ▶ For more information and data on the use of other hydraulic fluids, please refer to data sheet 90220 or contact us.

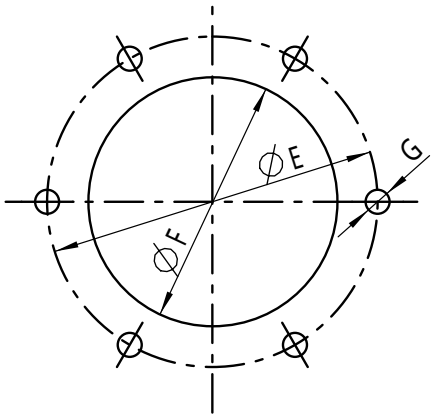
The following table shows the areas of application of the breathing and air bleed filter in hydraulic systems.

Type	**Capacity fluctuation** **Maximum air flow at a pressure differential of 0,01 bar *[0.15 psi]* l/min *[gpm]* at pure element**		**Comment**
	Standard hydraulic range	**Use in potentially explosive areas (see directive 2014/34/EU (ATEX))**	
FEF 0 P10-F00	42 l/min *[11.1 gpm]*	21 l/min *[5.5 gpm]*	–
FEF1-2X/*-M-K-ES100	400 l/min *[106 gpm]*	200 l/min *[52.8 gpm]*	* Includes all variants except versions with R
FEF1-2X/*-M-K-ES100-R	85 l/min *[22.5 gpm]*	42 l/min *[11.1 gpm]*	* Includes all variants including versions with R

Dimensions: FEF 1

(dimensions in mm *[inch]*)





A	B	Ø C	Ø D	Ø E	Ø F	G
100 *[3.94]*	56 *[2.2]*	81 *[3.19]*	49 *[1.93]*	73 *[2.87]*	55 *[2.17]*	M5

Mounting, Commissioning, Maintenance

Mounting

- Filter connection must correspond to the hole pattern (DIN 24557-2) at the tank.
- Position the seal on the hole pattern at the tank, insert the filling strainer and apply the second seal.
- Over the flange, all parts are fitted at the tank. For this purpose, the screws included in the scope of delivery (see tightening torques) must be used.
- Screw-in the cap in clockwise direction (see tightening torques).
- We recommend a minimum clearance of 140 mm *[5.51 inch]* between filter and oil level.

Commissioning

For commissioning of the system, no measures must be taken regarding the breathing filter.

Maintenance

Exchanging the cap:
The cap with integrated filter element must be replaced at least every 6 months. The degree of contamination of the filter element can be indicated by means of vacuum monitoring at the tank (see accessories). We recommend changing the cap at an underpressure of 0.05 bar *[0.73 psi]*.

Tightening torques

Cap		FEF...
Tightening torque with μ_{total} = 0.14	Nm *[lb-ft]*	30 *[22]*
Screws M5	Nm *[lb-ft]*	0,9 *[0.66]*

Exchanging the cap

Filter application range	Environmental conditions medium dust content	Maintenance interval
General mechanical engineering	9...25 mg/m³ *[0.05...0.14 oz/in³]*	4000 h
Heavy industry	50...80 mg/m³ *[0.29...0.46 oz/in³]*	3000 h
Mobile hydraulics	30...100 mg/m³ *[0.17...0.58 oz/in³]*	3000 h

Directives and standardization

Product validation

Rexroth filters, the filter elements built into them and filter accessories are tested and quality-monitored according to different ISO test standards:

Filtration performance test (multipass test)	ISO 16889:2008-06
Compatibility with hydraulic fluid	ISO 2943:1998-11

The development, manufacture and assembly of Rexroth industrial filters and Rexroth filter elements is carried out within the framework of a certified quality management system in accordance with ISO 9001:2000.

Classification according to the Pressure Equipment Directive

Bosch Rexroth FEF1 breathing and air bleed filters according to data sheet 51513 are not classified as devices or components according to Pressure Equipment Directive 2014/68/EU (PED).

Use in potentially explosive areas according to directive 2014/34/EU:

This filter is not classified as device or component according to directive 2014/34/EU and does not bear a CE mark. It has been proven with the ignition risk analysis that this breathing filter does not have own ignition sources according to DIN EN ISO 80079-36.

The filter can be used for the following potentially explosive atmospheres:

	Zone suitability	
Gas	1	2
Dust	21	22

Breathing filter			
Use/assignment		**Gas 2G**	**Dust 2D**
Assignment		Ex h IIC T4...T1 Gb	Ex h IIC T100°C...T450°C Db [1]
Minimum conductivity of the medium pS/m	min	300	
Dust accumulation	max	–	0,5 mm *[0.019 inch]*

[1] The temperature depends on the temperature of the medium in the filter and must not exceed the value specified here.

Intended use

This filter consists of a filter cap with bayonet lock and filter element, base and filling strainer which serve as components in the sense of the EC Machinery Directive 2006/42/EC in hydraulic machinery for the separation of dirt particles.

This filter may be used under the following boundary conditions and limits:
- Only in systems with fluids of group 2, according to Pressure Equipment Directive 2014/68/EU.
- Only according to the application and environmental conditions in the section “Technical data”
- Only in compliance with the specified performance limits in the section “Technical data“; extended operational durability/load cycles on request
- Only with hydraulic fluids and the intended seals according to the section „Compatibility with hydraulic fluids”
- Use in potentially explosive areas according to the section „Directives and standardization”.
- The notes regarding the operating modes according to the section „Assembly, commissioning, maintenance” must be observed.
- Compliance with application and environmental conditions according to the technical data.
- Compliance with the specified performance limits.
- Use in the original condition, without damage.
- For any maintenance including replacement of the filter cap, original Bosch Rexroth spare parts must always be used.
- Repair by the customer, particularly at pressurized components, is inadmissible.
- This filter is exclusively intended for professional use and not for private use.
- The filter cap may only be used as spare part if it is combined with the original Bosch Rexroth base.
- Regarding the installation position, it must be ensured that the filter cap is always aligned to „12 o‘clock“.

Improper use

Any use deviating from the intended use is improper and thus not admissible.
Improper use of the filters includes:
- Incorrect storage
- Incorrect transport
- Lack of cleanliness during storage, assembly and operation
- Incorrect installation
- Use of inappropriate/non-admissible hydraulic fluids
- Exceedance of the specified maximum pressures and load cycles
- Operation outside the approved temperature range
- Installation and operation in an inadmissible device group or category
- Operation outside the specified limits for the operating voltage, see the section „Technical data“

Bosch Rexroth AG does not assume any liability for damage caused by improper use. The user assumes all risks involved with improper use.

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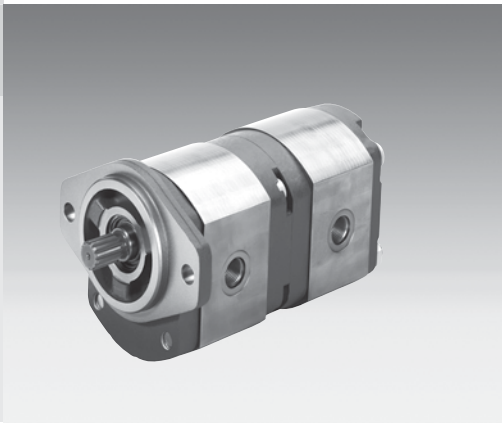
External Gear Pumps Series F

RA 10089/08.11 1/60
Replaces: RA 10097

AZPF-...



Fixed pumps
Size 4.0...28 cm^3/rev (.25 - 1.71 in^3/rev)

Overview of contents

Features

- Displacements 4 cc - 28 cc
- Nominal pressure 280 bar
- Slide bearings for heavy duty applications
- Drive shafts to SAE or ISO
- Ports: threaded or flange
- Wide range of configurations
- Tandem and multi-pump configurations

General

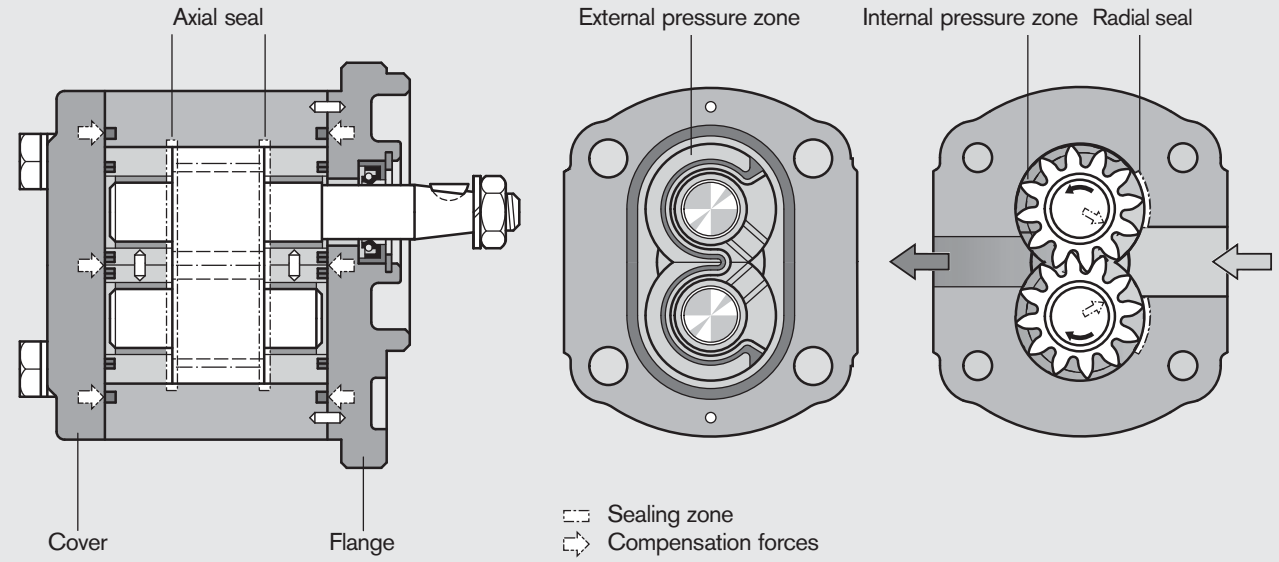
Rexroth external gear pumps are available as standard gear pumps in the B, F, N and G series, and as SILENCE gear pumps in the S, T and U series. The displacements are graded by different gear widths. Further configuration variants are given by different flanges, shafts, valve arrangements and multiple pump combinations.

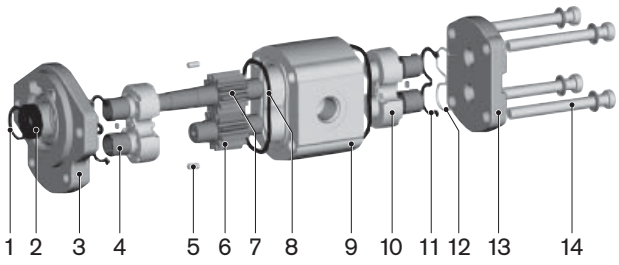
Construction

The external gear pump consists essentially of a pair of gears supported in bearing bushings, and the case with a front and a rear cover. The drive shaft protrudes from the front cover where it is sealed by the shaft seal ring. The bearing forces are absorbed by special bearing bushings with sufficient elasticity to produce surface contact instead of line contact. They also ensure excellent resistance to galling – especially at low speed. The gears have 12 teeth. This keeps both flow pulsation and noise emission to a minimum.

The internal sealing is achieved by forces which are proportional to delivery pressure. This ensures optimum efficiency. The bearings provide the seal at the ends of the gaps between the teeth which carry the pressurized oil. The sealing zone between the gear teeth and the bearing is controlled by the admission of operating pressure to the rear of the bearing bushings. Special seals form the boundary of the zone. The radial clearance at the tips of the gear teeth is sealed by internal forces pushing them against the case.

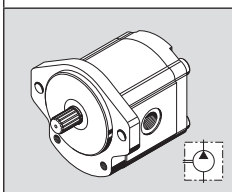
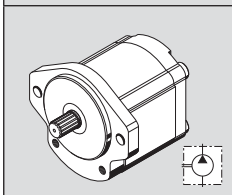
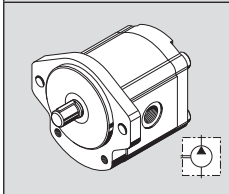
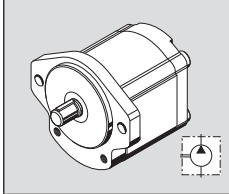
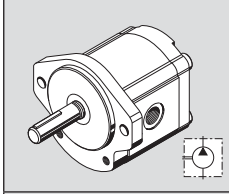
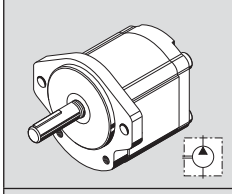
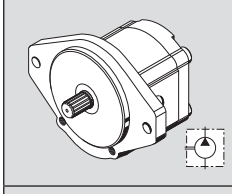
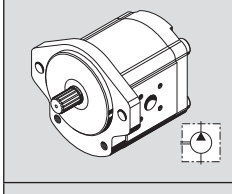
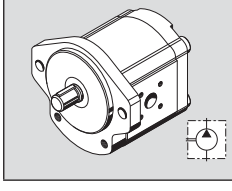
Gear pump axial compensation

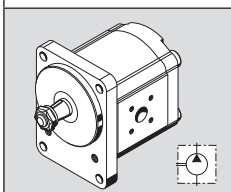
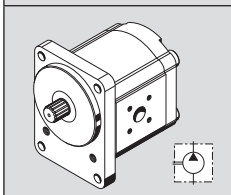
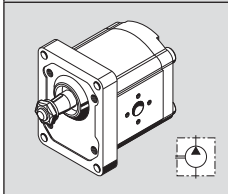
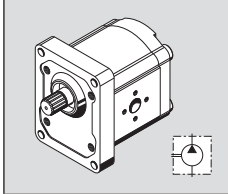
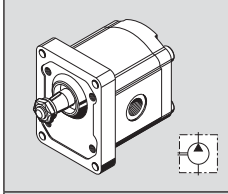
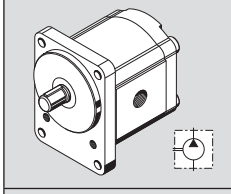
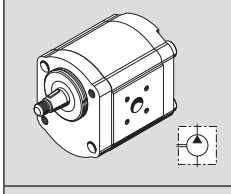
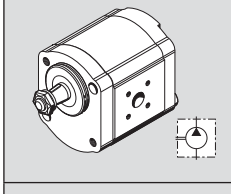
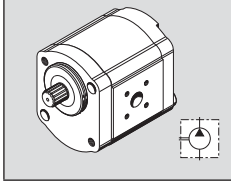


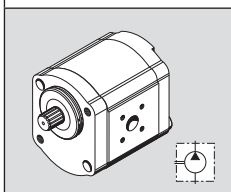
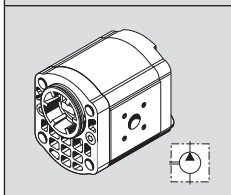
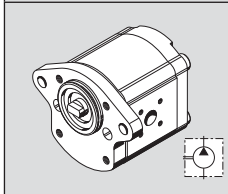
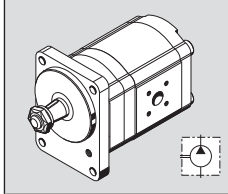
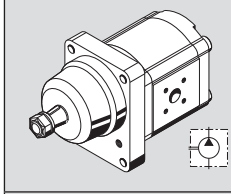
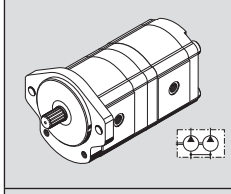
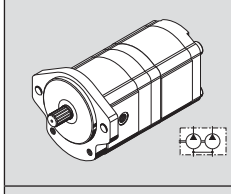
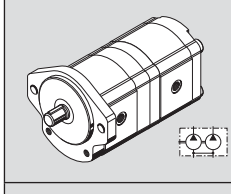
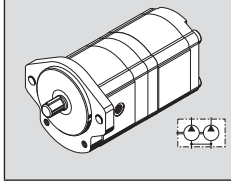


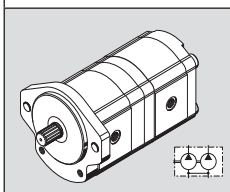
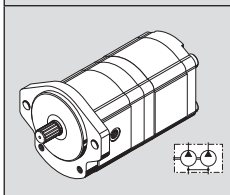
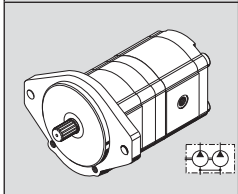
1 Retaining ring
2 Shaft seal ring
3 Front cover
4 Slide bearing
5 Centering pin
6 Gear (driven)
7 Gear (drive)
8 Case seal
9 Pump case
10 Bearing
11 Axial zone seal
12 Support
13 End cover
14 Fixing screws

Product overview of "Series F" standard types

Version	Page
	20 24
	21
	22
	23
	25
	26
	27
	28
	29

Version	Page
	30
	31
	32
	33
	34
	35
	36
	37
	38

Version	Page
	39
	40
	41
	42
	43
	44
	46
	48
	49

Version	Page
	50
	51
	52

AZ P F – 1☐ or 2☐ - 016 R R R 12 M B -☐☐☐ ☐☐ -S☐☐☐☐

Special Design*

PRV (bar) FCV (l/min)

Example:
180 bar, 9 l/min = 180 09
Use XXX if valve not applicable

Function

P = Pump

Size (F)

.25 in3 (4.1 cm3) = 004
.34 in3 (5.6 cm3) = 005
.50 in3 (8.2 cm3) = 008
.69 in3 (11.3 cm3) = 011
.88 in3 (14.4 cm3) = 014
1.00 in3 (16.5 cm3) = 016
1.20 in3 (19.6 cm3) = 019
1.40 in3 (22.9 cm3) = 022
1.55 in3 (25.5 cm3) = 025
1.74 in3 (28.5 cm3) = 028

Direction of rotation

Right = R
Left = L

End cover

Standard	= B
Rear ports	= A
FCV, excess flow ext.	= E
PRV + FCV	= V
Priority flow control	= P
Pressure relief valve	= D

Seals

NBR	= M
FPM	= P
NBR, shaft seal in FPM	= K

Drive shafts

		Matching front flange	
C	Conical 1:5 (Tapered key)	B	P
S	Conical 1:5 for flange A (Tapered key)	A	
H	Conical 1:8 (Tapered key)	O	
N	Dihedral claw (Dog tang)	M	
A	Straight keyed ISO Ø 18 mm	B	
Q	Straight keyed SAE J744 16-1 A	R	
Q	SAE 5/8" Keyed, long *Use SO022 suffix	R	
R	9T spline SAE J744 16-4 9T	R	C
P	11T spline SAE J744 19-4 11T	R	C
F	Spline shaft DIN 5482 B17x14	B	P

Front flange

B	Square flange Pilot Ø 80 mm
R	SAE J744 82-2 A 2-bolt flange Ø 82.55 mm
P	Transmission flange Pilot Ø 50 mm
O	Square flange Pilo Ø 36.47 mm
C	SAE J744 102-2 B 2-bolt flange Ø 101.6 mm
M	2-bolt flange Pilot Ø 52 mm with O-ring
A	Outboard bearing Pilot Ø 80 mm Type 1
N	2-bolt mounting Pilot Ø 50 mm
T	4-bolt mounting Ø 52 mm w/O-ring
G	Outboard bearing Ø 80 mm Type 2

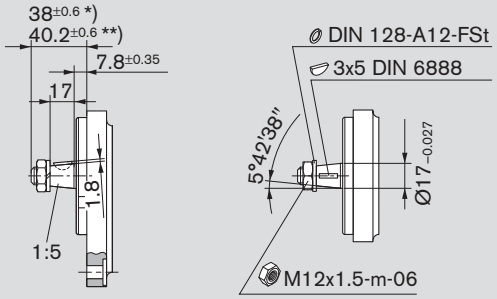
Line connections

20	Rectangular flange
12	Thread (UN-2B) SAE O-ring BOSS
01	BSP pipe thread ISO 228/1
30	Rectangular flange
07	Split flange SAE* ISO 61 62-1 Type 1 Metric threads
40	Split flange SAE* ISO 61 62-1 Type 2 UNC threads
03	Thread, metric ISO 6149 w/seal ring

*07 and 40 line connections limited to 19 cc and larger sizes.

Drive shafts

C



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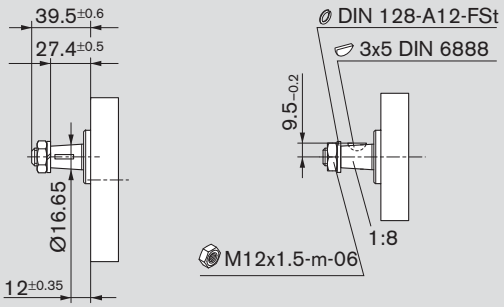

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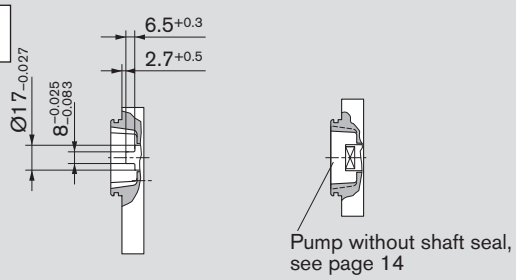

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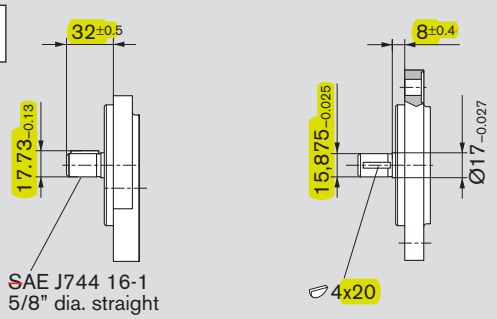

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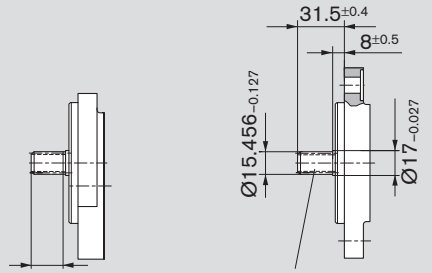

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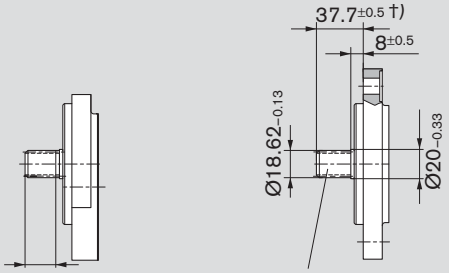

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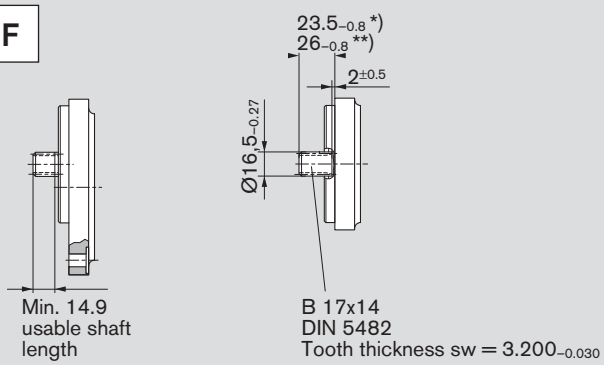

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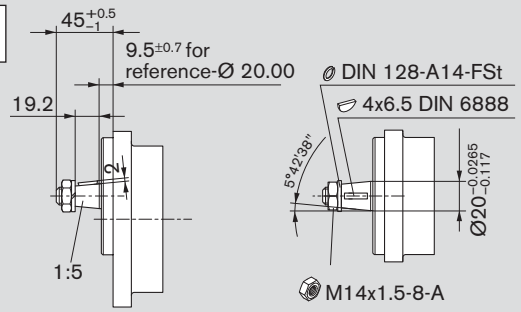
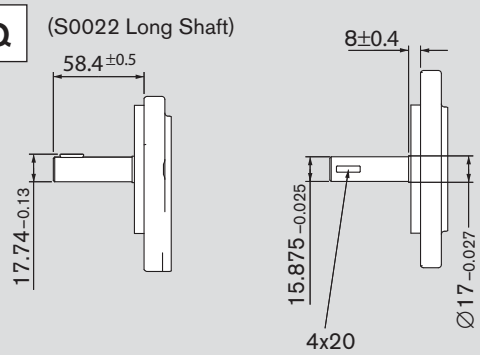
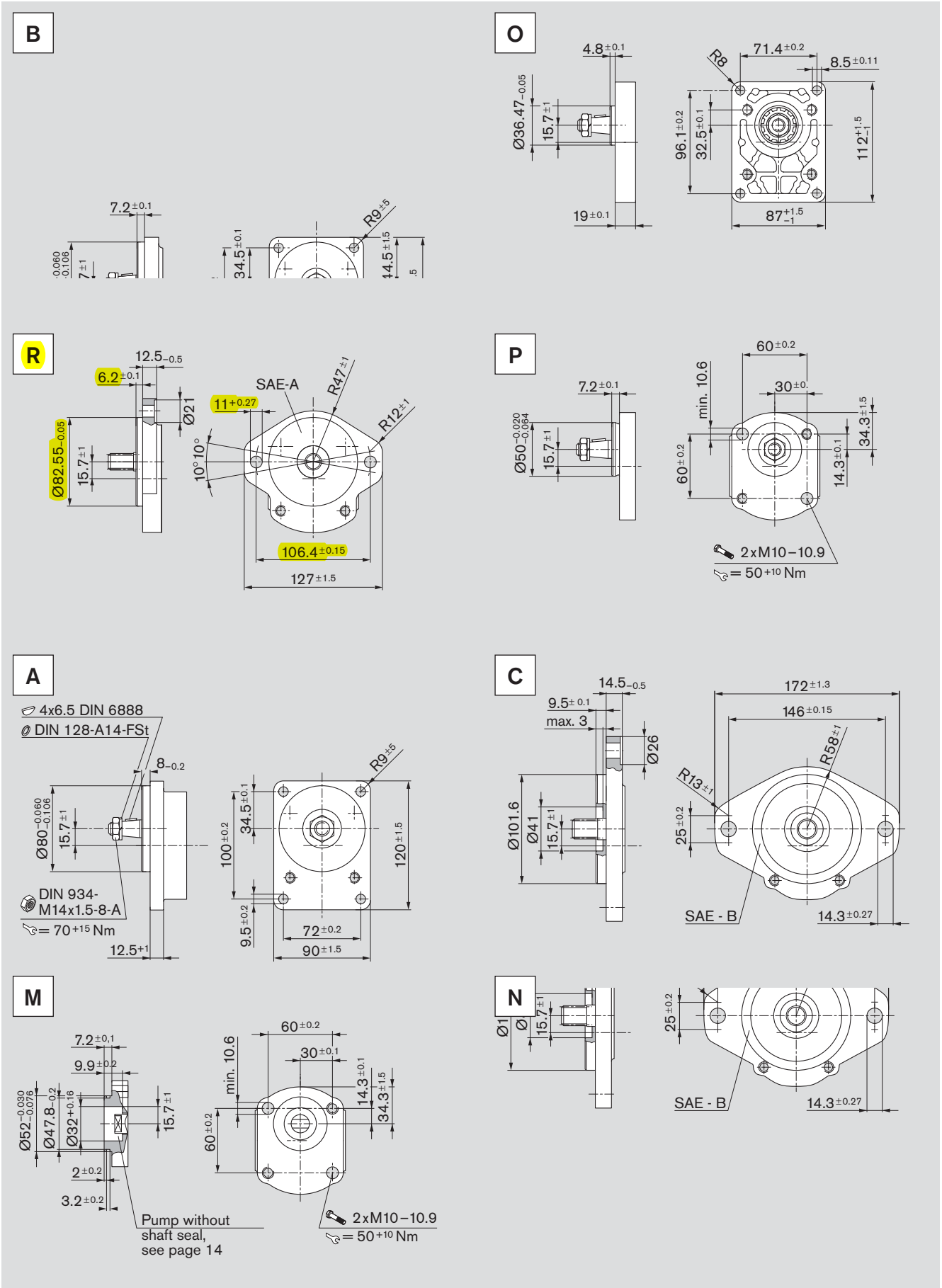


Q (S0022 Long Shaft)

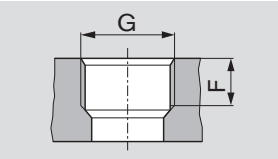


*) in combination with front cover B
**) in combination with front cover P
†) Older version dim. is 31.5±0.4. Some units still use this length. Check specific pump for dimensions.

Front cover


B
7.2±0.1
7±1
34.5±0.1
R9±5
44.5±1.5
O
4.8±0.1
Ø36.47-0.05
15.7±1
19±0.1
R8
71.4±0.2
8.5±0.11
96.1±0.2
32.5±0.1
112+1.5-1
87+1.5-1
R
12.5-0.5
6.2±0.1
Ø21
Ø82.55-0.05
15.7±1
SAE-A
11+0.27
R47±1
R12±1
10°
10°
106.4±0.15
127±1.5
P
7.2±0.1
Ø50-0.020-0.064
15.7±1
60±0.2
min. 10.6
30±0.
34.3±1.5
60±0.2
14.3±0.1
2xM10–10.9
= 50+10 Nm
A
4x6.5 DIN 6888
DIN 128-A14-FSt
8-0.2
Ø80-0.060-0.106
15.7±1
DIN 934-
M14x1.5-8-A
= 70+15 Nm
12.5+1
R9±5
34.5±0.1
100±0.2
120±1.5
9.5±0.2
72±0.2
90±1.5
C
14.5-0.5
9.5±0.1
max. 3
Ø26
Ø101.6
Ø41
15.7±1
172±1.3
146±0.15
R58±1
R13±1
25±0.2
SAE - B
14.3±0.27
M
7.2±0.1
9.9±0.2
Ø52-0.030-0.076
Ø47.8-0.2
Ø32+0.16
15.7±1
2±0.2
3.2±0.2
Pump without
shaft seal,
see page 14
60±0.2
30±0.1
min. 10.6
14.3±0.1
34.3±1.5
60±0.2
2xM10–10.9
= 50+10 Nm
N
Ø1
Ø
15.7±1
25±0.2
SAE - B
14.3±0.27

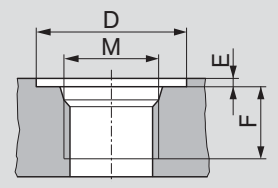
Ports



01 **Pipe thread ISO 228/1**

At pressures $p_2 > 210$ bar limited fatigue strength

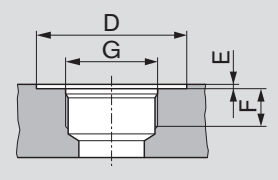
Ordering code	Size	Pressure side G	F	Suction side G	F
01	4...16 cm³	G 1/2	16	G 3/4	16
	19...28 cm³	G 3/4		G 1	19



03 **Thread, metric ISO 6149 with seal ring**

At pressures $p_2 > 210$ bar limited service life

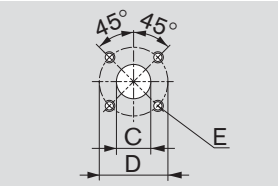
Ordering code	Size	Pressure side M	D	E	F	Suction side M	D	E	F
03	4...5.5 cm³	M 18 x 1.5	29	0.5	16	M 18 x 1.5	29	0.5	16
	8...16 cm³	M 22 x 1.5	34		18	M 27 x 2	40		19
	19...28 cm³					M 33 x 2	46		22



12 **Thread (UN-2B, UNF-2B) SAE J1926-1 seal ring BOSS**

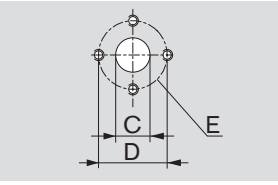
At pressures $p_2 > 210$ bar limited service life

Ordering code	Size	Pressure side G	D	Emax	F	Suction side G	D	Emax	F
12	4...5.5 cm³	3/4–16 UNF-2B	30	2.4	14.3	7/8–14 UNF-2B	34	2.4	16.7
	8 cm³ – 14 cm³	7/8–14 UNF-2B	34		16.7	1-1/16–12 UN-2B	41		19
	16...28 cm³					1 5/16–12 UN-2B	49	3.2	19



20 **Rectangular flange**

Ordering code	Size	Pressure side C	D	E	Suction side C	D	E
20	4...5.5 cm³	15	35	M 6, depth 13	15	40	M 6, depth 13
	8...22.5 cm³				20		
	19...28 cm³ *)				26	55	M 8, depth 13



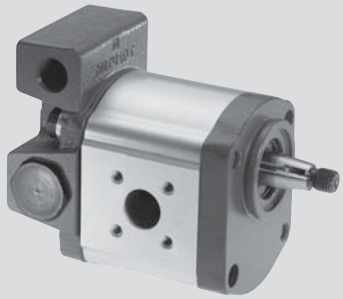
30 **Rectangular flange**

Ordering code	Size	Pressure side C	D	E	Suction side C	D	E
30	4...8 cm³	13.5	30.2	M 6, depth 13	13.5	30.2	M 6, depth 13
	11...28 cm³				20.0	39.7	M 8, depth 13

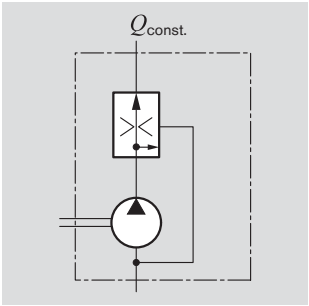
*) Dimension of Series 2

Gear pumps with integral valves

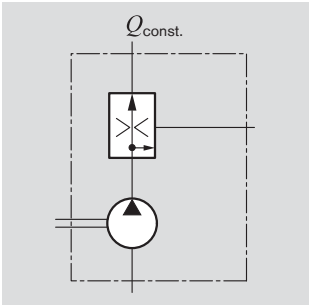
In order to reduce external pipework it is possible to incorporate a flow-control valve or pressure-relief valve in the rear cover of the gear pump. A typical application of this is in the supply of hydraulic oil in power steering systems. The pump delivers a constant flow irrespective of the speed at which it is driven. The excess flow is either returned internally to the suction port or distributed externally to other items of equipment.



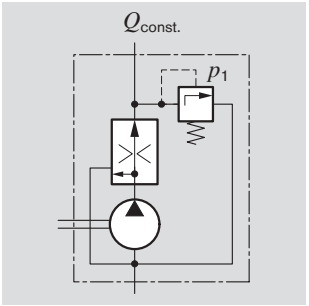
upon request



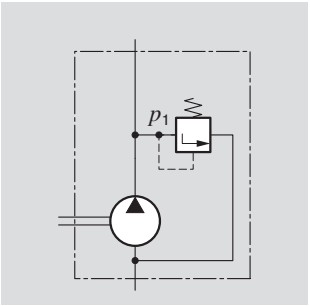
3-way flow-control valve.
Excess flow returned to suction line
$Q_{const.}$ = 2...30 l/min



3-way flow-control valve.
Excess flow distributed externally; loadable
$Q_{const.}$ = 2...30 l/min



3-way flow-control valve with pressure-relief valve.
Excess flow returned to suction line
$Q_{const.}$ = 2...30 l/min
p_1 = 100...180 bar



Pressure-relief valve.
Discharge returned to suction line
p_1 = 5...250 bar

Ordering code

S	**xxx17**

E	**xxx12**

V	**15011** *

D	**180xx**

Design calculations for pumps

The design calculations for pumps are based on the following parameters:

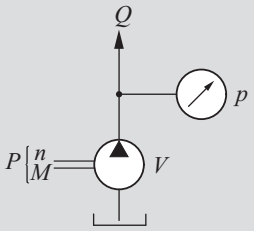
V	[cm³/rev]	Displacement
Q	[l/min]	Delivery
p	[bar]	Pressure
M	[Nm]	Drive torque
n	[rev/min]	Drive speed
P	[kW]	Drive power

It is also necessary to allow for different efficiencies such as:

η_v	Volumetric efficiency
η_{hm}	Hydraulic-mechanical efficiency
η_t	Overall efficiency

The following formulas describe the various relationships.
They include correction factors for adapting the parameters to the usual units encountered in practice.

Caution: Diagrams providing approximate selection data will be found on subsequent pages.



$$Q = V \cdot n \cdot \eta_v \cdot 10^{-5}$$

$$p = \frac{M \cdot \eta_{hm}}{1.59 \cdot V}$$

$$P = \frac{p \cdot Q}{6 \cdot \eta_t}$$

$$V = \frac{Q}{n \cdot \eta_v} \cdot 10^5$$

$$V = \frac{M \cdot \eta_{hm}}{159 \cdot p}$$

$$Q = \frac{6 \cdot P \cdot \eta_t}{p}$$

$$n = \frac{Q}{V \cdot \eta_v} \cdot 10^5$$

$$M = \frac{1.59 \cdot V \cdot p}{\eta_{hm}}$$

$$p = \frac{6 \cdot P \cdot \eta_t}{Q}$$

[%]

n —— η_v ⟶ Q
M —— η_{hm} ⟶ p
P —— η_t ⟶ $p \cdot Q$

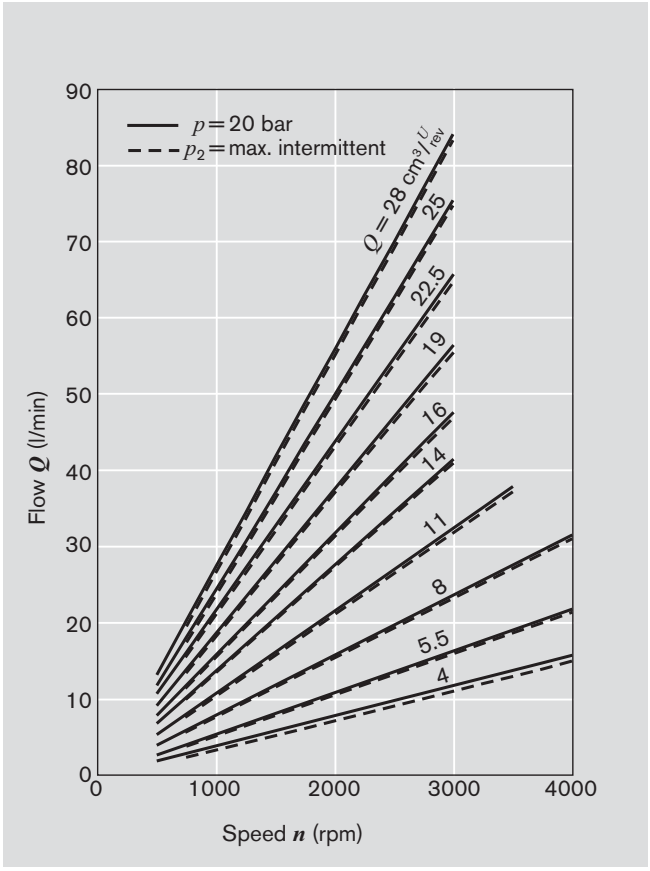
V [cm³/rev] Q [l/min] p [bar]
n [rev/min] P [kW] M [Nm]

Caution: η [%] e.g. 95 [%]

* Some versions have relief line returning to reservoir. Contact factory for additional information.

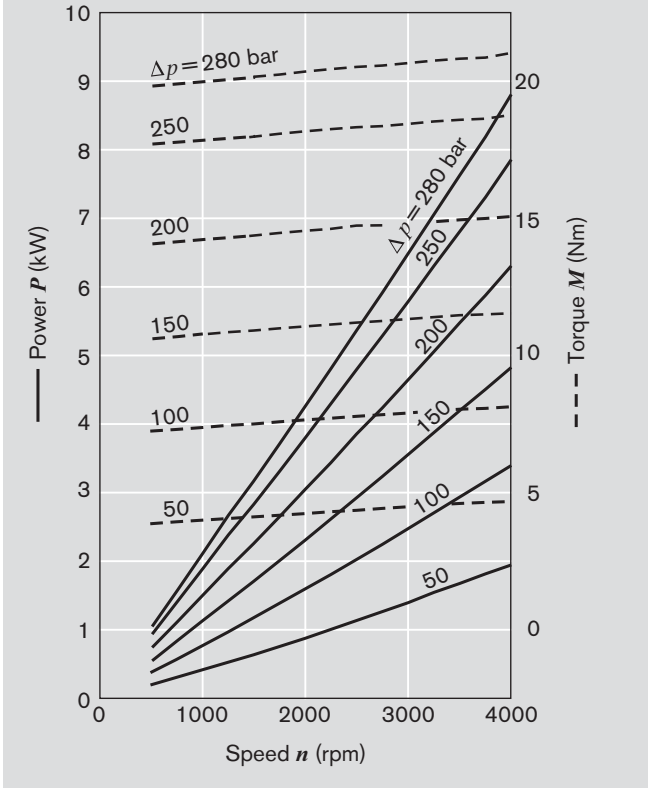
Performance charts

$\nu = 32$ mm²/s, $\vartheta = 50$ °C

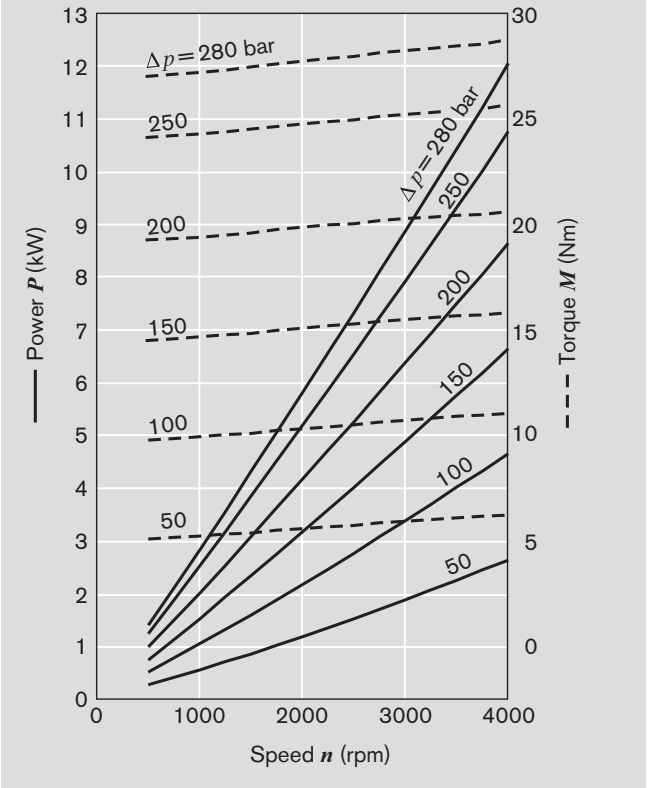


$Q = f(n,V)$ incl. η_v
$P = f(n,p)$ —— incl. η_t
$M = f(n,p)$ - - - incl. η_{hm}

4 cm³/rev *(V)*

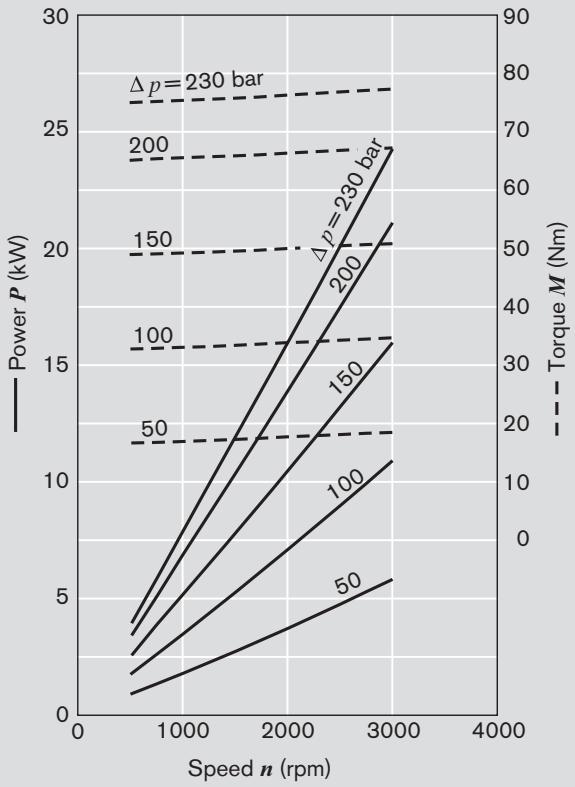


5.5 cm³/rev *(V)*

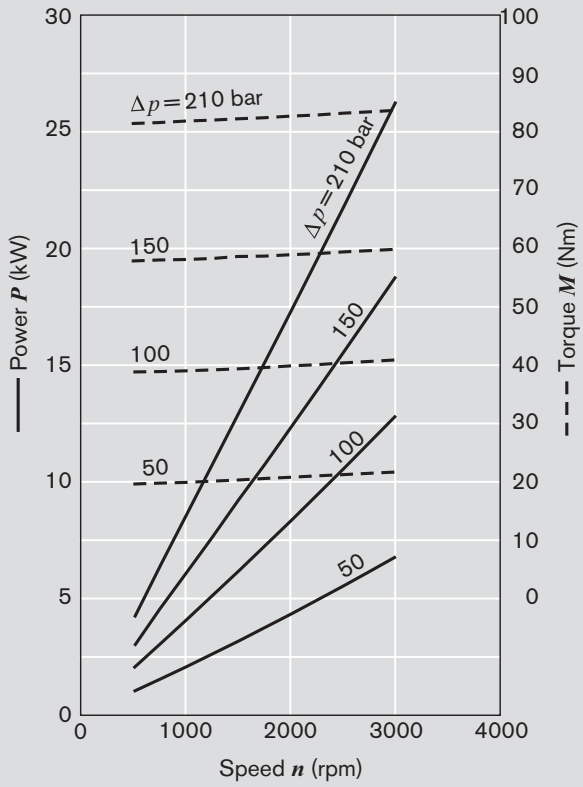


Performance charts (continued)

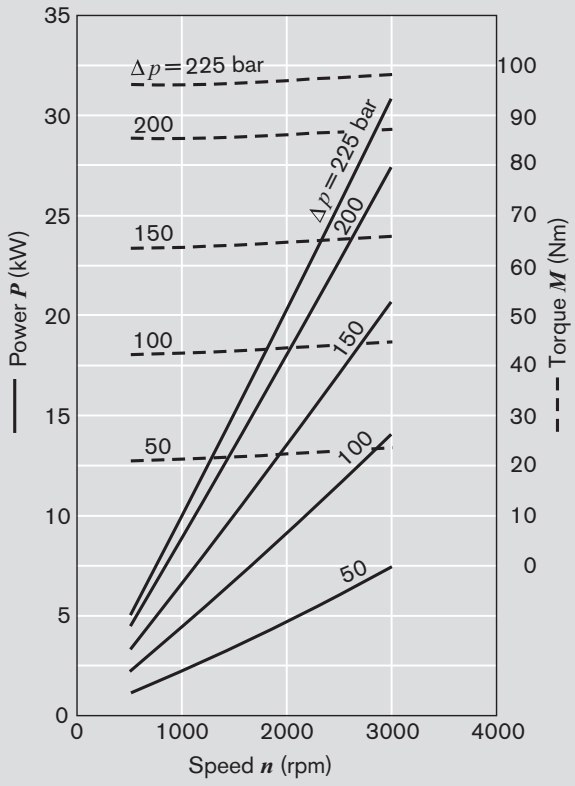
19 cm³/rev *(V)*



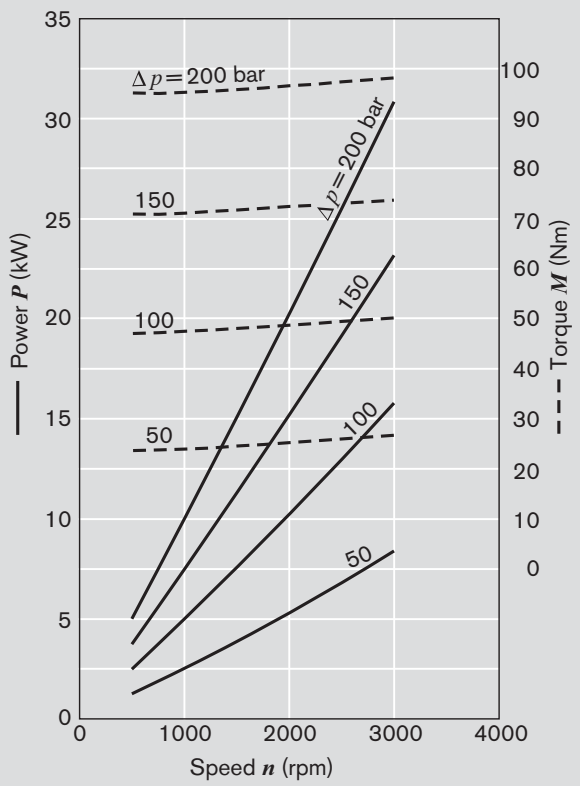
22.5 cm³/rev *(V)*



25 cm³/rev *(V)*



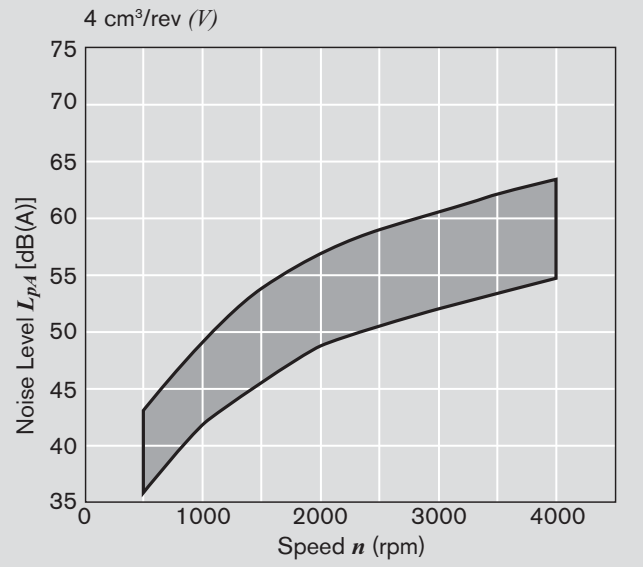
28 cm³/rev *(V)*

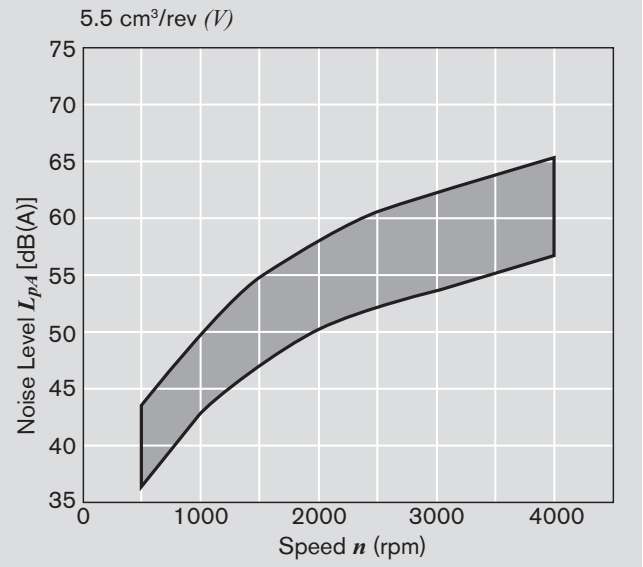


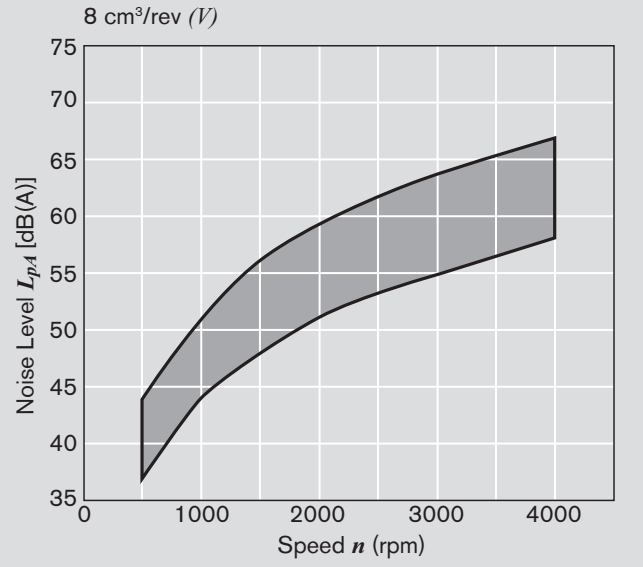
Noise charts

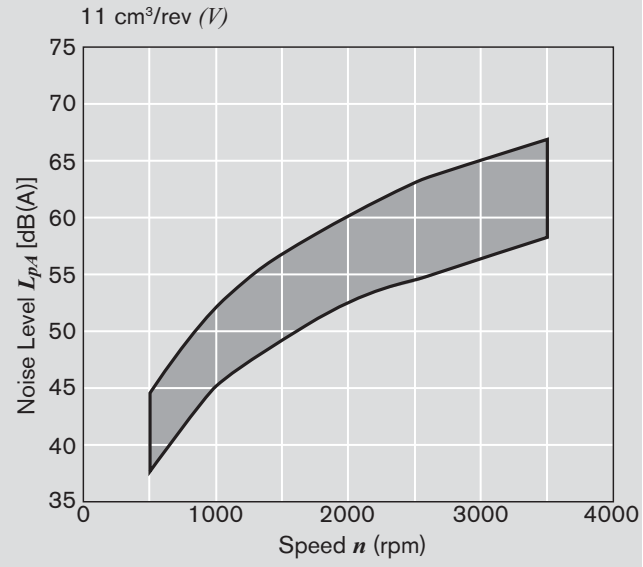
Noise level dependent on rotational speed, pressure range between 10 bar and pressure value p_2 (see page 16 Specifications table).
Oil data: $\nu = 32$ mm²/s, $\vartheta = 50$ °C.
Sound pressure level calculated from noise measurements made in the sound absorbent measuring room compliant with DIN 45 635, Part 26.
Spacing between measuring sensor – pump: 1 m.

These are typical characteristic values for the respective model. They describe the airborne sound emitted solely by the pump. Environmental influences (installation site, piping, further system components) are not taken into consideration.
Each value applies for a single pump.

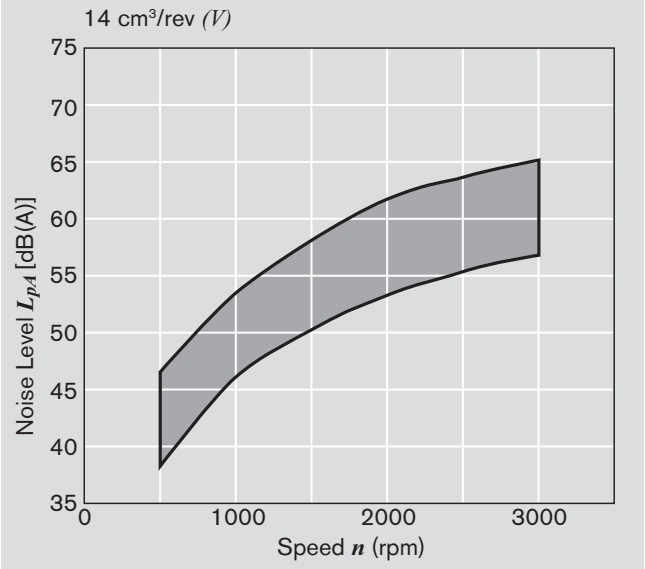


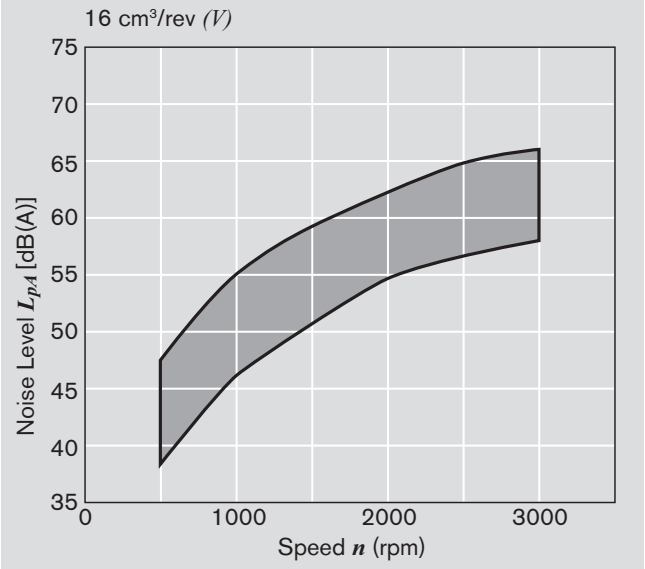


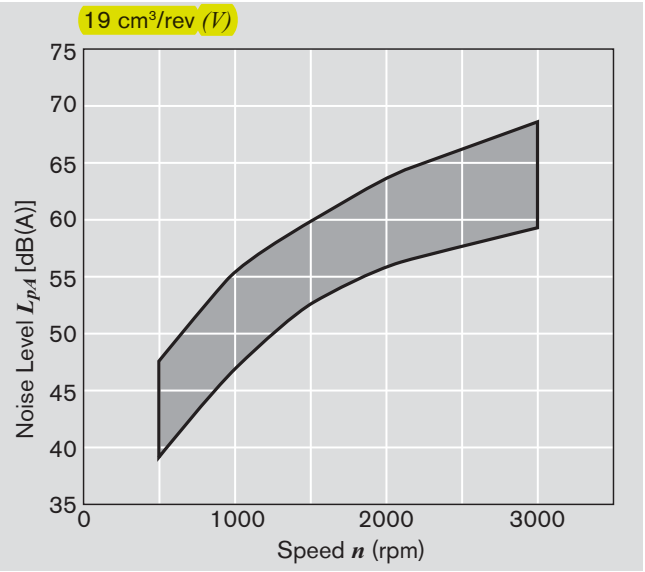


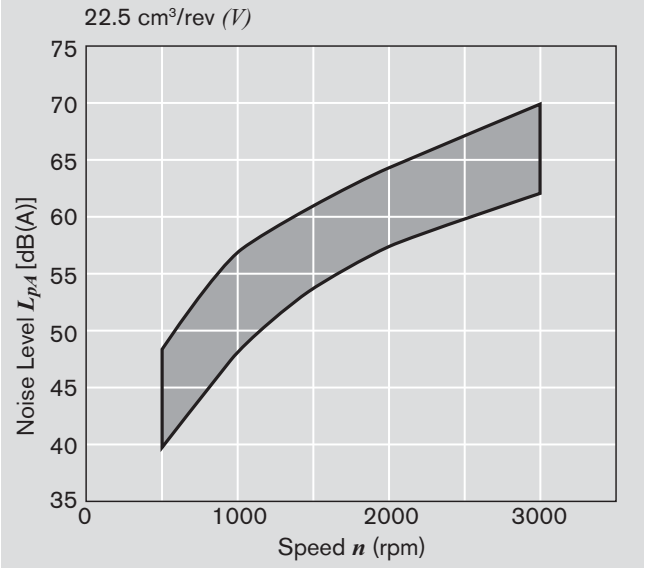


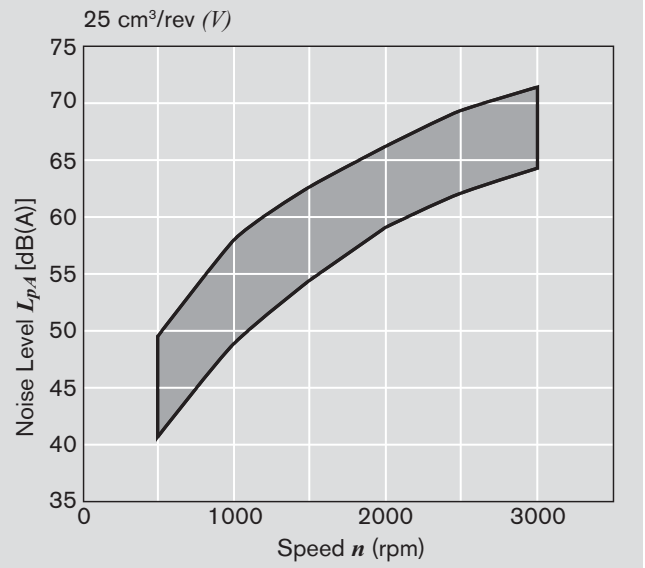
Noise charts (continued)

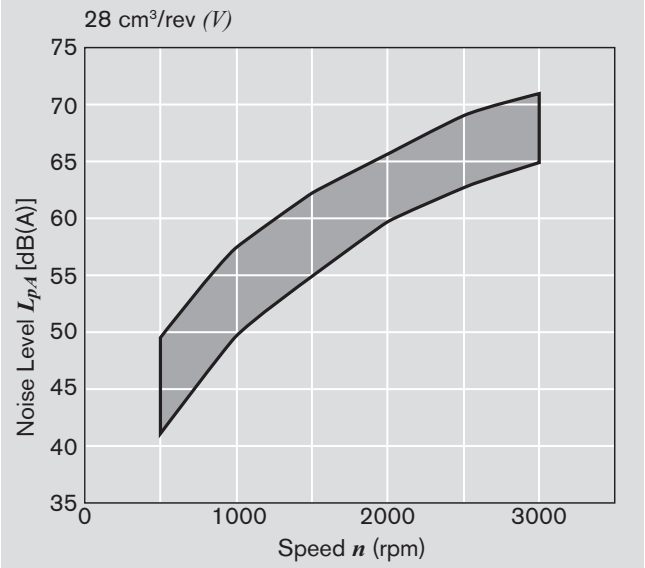












Specifications

General	
Construction	External gear pump
Mounting	Flange or through-bolting with spigot
Ports	Threaded, flange
Direction of rotation (looking on shaft)	Clockwise or counter-clockwise, the pump may only be driven in the direction indicated
Installation position	Any
Load on shaft	Radial and axial forces after consulting
Ambient temperature range	–30 °C...+80 °C (–22 °F... +176 °F) or max. 110 °C (230 °F) with FPM seal
Fluids	– Mineral oil compliant with DIN 51 524, 1–3, however under higher load at least HLP compliant with DIN 51 524 Part 2 recommended. – Comply with RE 90220 – Further operating fluids possible after consultation
Viscosity	12...800 mm^2/s permitted range 20...100 mm^2/s recommended range ...2000 mm^2/s range permitted for starting
Fluid temperature range	max. +80 °C (176 °F) with NBR seals*) max. +110 °C (230 °F) with FPM seals**)
Filtration ***)	At least cleanliness level 20/18/15 compliant with ISO 4406 (1999)

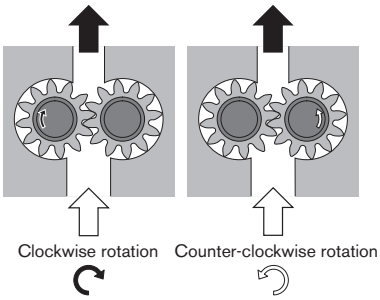
*) NBR = Perbunan®
**) FPM = Viton®
***) During the application of control systems or devices with critical counter-reaction, such as steering and brake valves, the type of filtration selected must be adapted to the sensitivity of these devices/systems.

Safety requirements pertaining to the whole systems are to be observed.

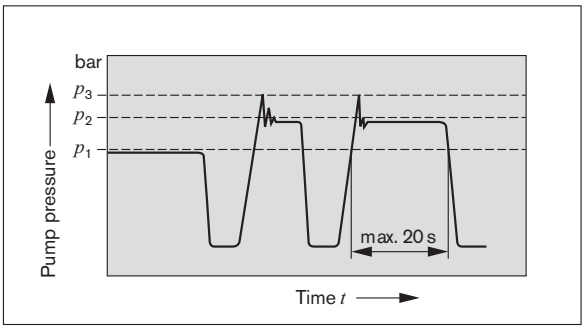
In the case of applications with high numbers of load cycles please consult the factory.

Definition of direction of rotation

Always look on the drive shaft.
Caution: Dimensions drawings always show clockwise-rotation pumps. On counter-clockwise-rotation pumps the positions of the drive shaft and the suction and pressure ports are different.



Definitions of pressures



p_1 max. continuous pressure
p_2 max. intermittent pressure
p_3 max. peak pressure

AZPF-1x* *)

Displacement	V	cm^3/rev	4	5.5	8	11	14	16	19	22.5	22.5
Suction pressure	p_e	bar	0.7...3 (absolute), with tandem pumps: p_e (p_2) = max. 0.5 > p_e (p_1)								
Max. continuous pressure	p_1		250*						210	180	210
Max. intermittent pressure	p_2		280*						230	210	230
Max. peak pressure	p_3		300						250	230	250
Min. rotational speed	<100	rpm	600	500	500	500	500	500	500	500	500
at bar 12 mm^2/s	100...180		1200	1200	1000	1000	800	800	800	800	800
	180... p_2		1400	1400	1400	1200	1000	1000	1000	1000	1000
25 mm^2/s	p_2		700	700	700	600	500	500	500	500	500
Max. rotational speed at	p_2		4000			3500	3000	3000	3000	2500	3000

*) Version with extended bearings

AZPF-2x*

Displacement	V	cm^3/rev	4	5.5	8	11	14	16	19	22.5	25	28
Suction pressure	p_e	bar	0.7...3 (absolute), with tandem pumps: p_e (p_2) = max. 0.5 > p_e (p_1)									
Max. continuous pressure	p_1		250							220	195	170
Max. intermittent pressure	p_2		280							250	225	200
Max. peak pressure	p_3		300							290	265	240
Min. rotational speed	<100	rpm	600	500	500	500	500	500	500	500	500	500
at bar 12 mm^2/s	100...180		1200	1200	1000	1000	800	800	800	800	800	800
	180... p_2		1400	1400	1400	1200	1000	1000	1000	1000	1000	1000
25 mm^2/s	p_2		700	700	700	600	500	500	500	500	500	500
Max. rotational speed at	p_2		4000			3500	3000	3000	3500	3500	3000	3000

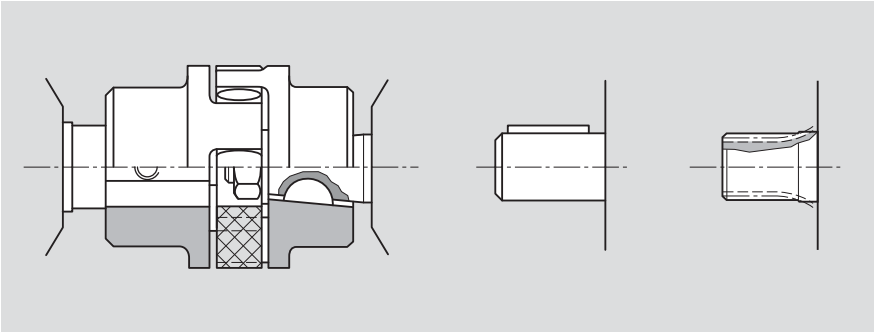
* Pumps with threaded ports may experience reduced life if used continuously above 210 bar.

Drive arrangements

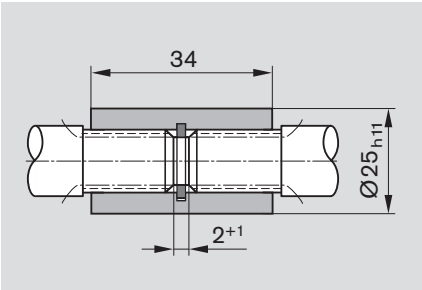
1. Flexible couplings
The coupling must not transfer any radial or axial forces to the pump.

The maximum radial runout of shaft spigot is 0.2 mm.

Refer to the fitting instructions provided by the coupling manufacturer for details of the maximum permitted shaft misalignment.



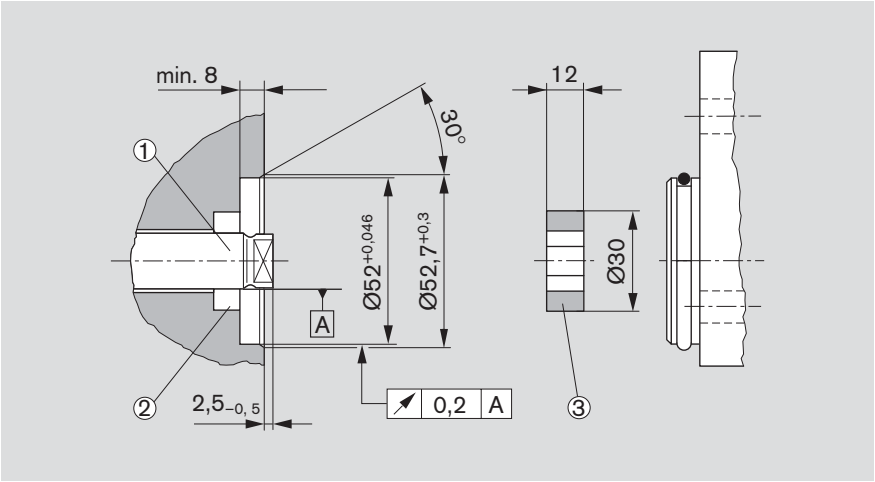
2. Coupling sleeve
Used on shafts with DIN or SAE splining. Caution: There must be no radial or axial forces exerted on the pump shaft or coupling sleeve. The coupling sleeve must be free to move axially. The distance between the pump shaft and drive shaft must be 2^{+1}. Oil-bath or oil-mist lubrications is necessary.



Splined shaft	Torque M_{max} [Nm]	Displacement V [cm³/rev]	Pressure p_{max} [bar]
DIN	100	4...28	p_{max}
SAE 9t	110		
SAE 11t	180		

3. Drive shaft with tang
For the close-coupling of pumps to electric motor or internal-combustion engine, gear, etc.
The pump shaft has a special tang and driver ③ (not included in supply).
There is no shaft seal.

The recommended arrangements and dimensions for the drive end and sealing are as follows.



① Drive shaft
Case-hardening steel DIN 17 210
e.g. 20 MnCrS 5
case-hardened 0.6 deep; HRC 60 ±3.
Surface for sealing ring
ground without rifling $R_{max.} \leq 4\mu m$

② Radial shaft seal ring
Rubber-covered seal (see DIN 3760, Type AS or double-lipped ring).
Cut 15° chamfer or fit shaft seal ring with protection sleeve.

Drive with tang

AZPF-1x

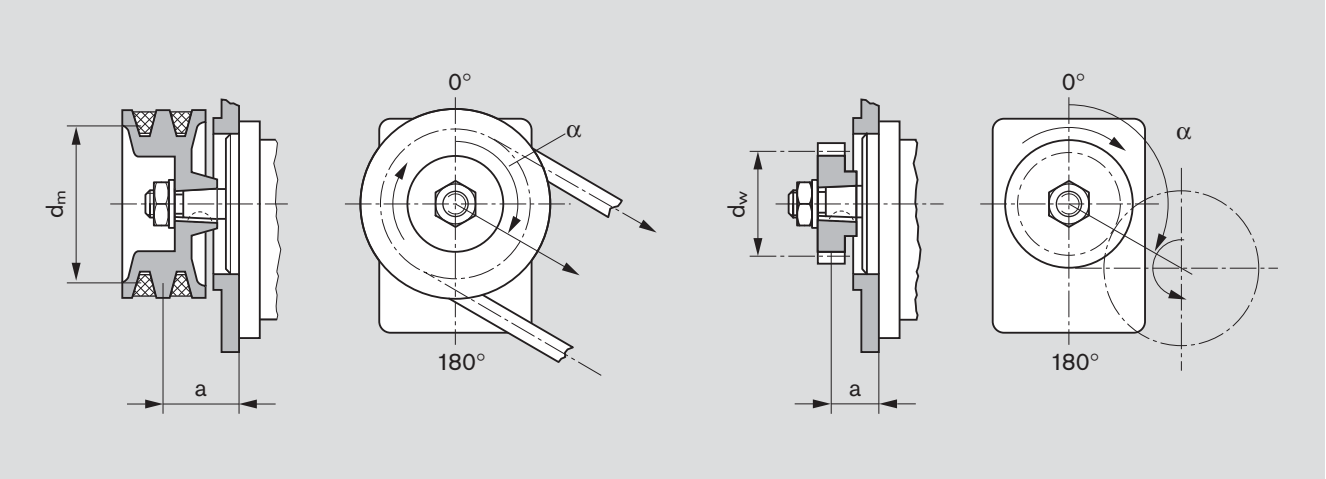
Torque $M_{max.}$ [Nm]	Displacement V [cm³/rev]	Pressure $p_{max.}$ [bar]
65	4...14	280
	16	230
65	19	190
	22.5	160

AZPF-2x

Torque $M_{max.}$ [Nm]	Displacement V [cm³/rev]	Pressure $p_{max.}$ [bar]
85	4...14	280
	16	280
	19	250
	22.5	210
	25	190
	28	170

4. V-belts and gearwheels without outboard bearing

When proposing to use V-belt or gear drive, please submit details of the application for our evaluation (especially dimensions a, d_m, d_w and angle α).

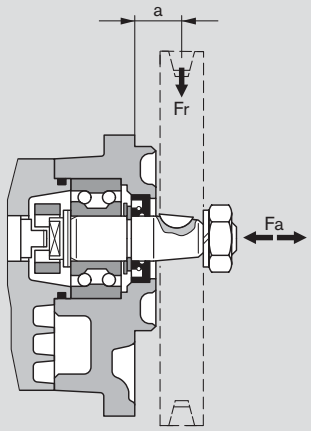


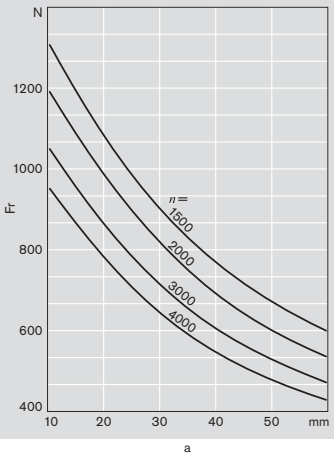
5. Outboard bearing

Outboard bearings eliminate possible problems when pumps are driven by V-belts or gearwheels. The diagrams below show the maximum radial and axial loads that can be tolerated based on a bearing life of $L_H = 1000$ hours.

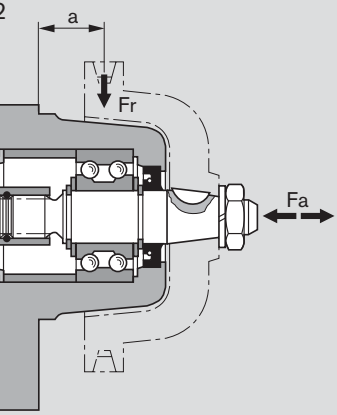
Torque $M_{max.}$ [Nm]	Displacement V [cm³/rev]	Pressure $p_{max.}$ [bar]
65	16	230
	19	190
	22.5	160

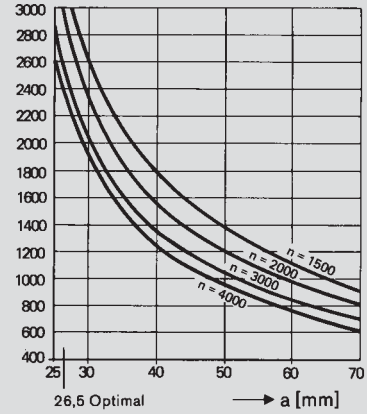
Type 1





Type 2





Multiple gear pumps

Gear pumps are well-suited to tandem combinations of pumps in which the drive shaft of the first pump is extended to drive a second pump and sometimes a third pump in the same manner. A coupling is fitted between each pair of pumps.
In most cases each pump is isolated from its neighbor, i.e. the suction ports are separate from one another. A common suction port is also possible as an option.

Caution: Basically, the specifications for the single pumps apply, but with certain restrictions:
Max. speed: This is determined by the highest rated pump speed in use.
Pressures: These are restricted by the strength of the drive shaft, the through drives and the drivers. Appropriate data is given in the dimensional drawings.

Pressure restrictions during standard through drive
In the case of series S, the driver for the second pumping stage can carry a load of up to $M_{max.}$ = 65 Nm, i.e. there is a pressure restriction for the second stage and any further stages.

$M_{max.}$ [Nm]	V [cm³/rev]	$p_{max.}$ [bar]
65	16	230
	19	190
	22.5	160
	25	140
	28	130

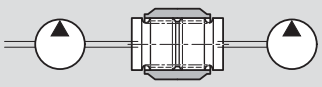
If the first stage is driven through a tang (driver) or outboard bearing type 1, pressure restrictions apply as indicated in the formula below.

Reinforced through drives are available for applications with higher transfer torques and/or rotational vibrations. Customized designs available on request.

In instances where common inlet is required, contact factory to determine flow capability.

Reinforced through drive

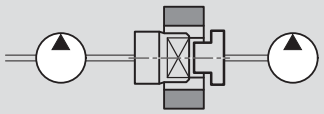
$M_{max.}$ = 160 Nm



F F

Standard through drive

$M_{max.}$ = 65 Nm



F F

Combinations

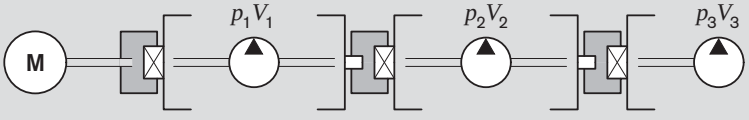
Series pump 1	Torque $M_{max.}$ [Nm]	Series pump 2
F	65	F
F	65	S
F	12	B

Max. transferrable drive torque *

Function	Code letter	Designation	Max. transferrable drive torque * [Nm]
Splined shafts	R	SAE J744 16-4 9T	110
	P	SAE J744 19-4-11T	180
Tapered key shaft	C	1:5	155
	H	1:8	160
Cylinder shafts	G	Shafts Ø 15.875	55
	A	Shafts Ø 18	75
	Q	5/8" keyed SAE J744 16-1A	55
Claw	N	Dihedral claw	65

* These values only apply when the conditions described on page 16 are complied with. Bosch Rexroth is to be consulted if the stated values are exceeded.

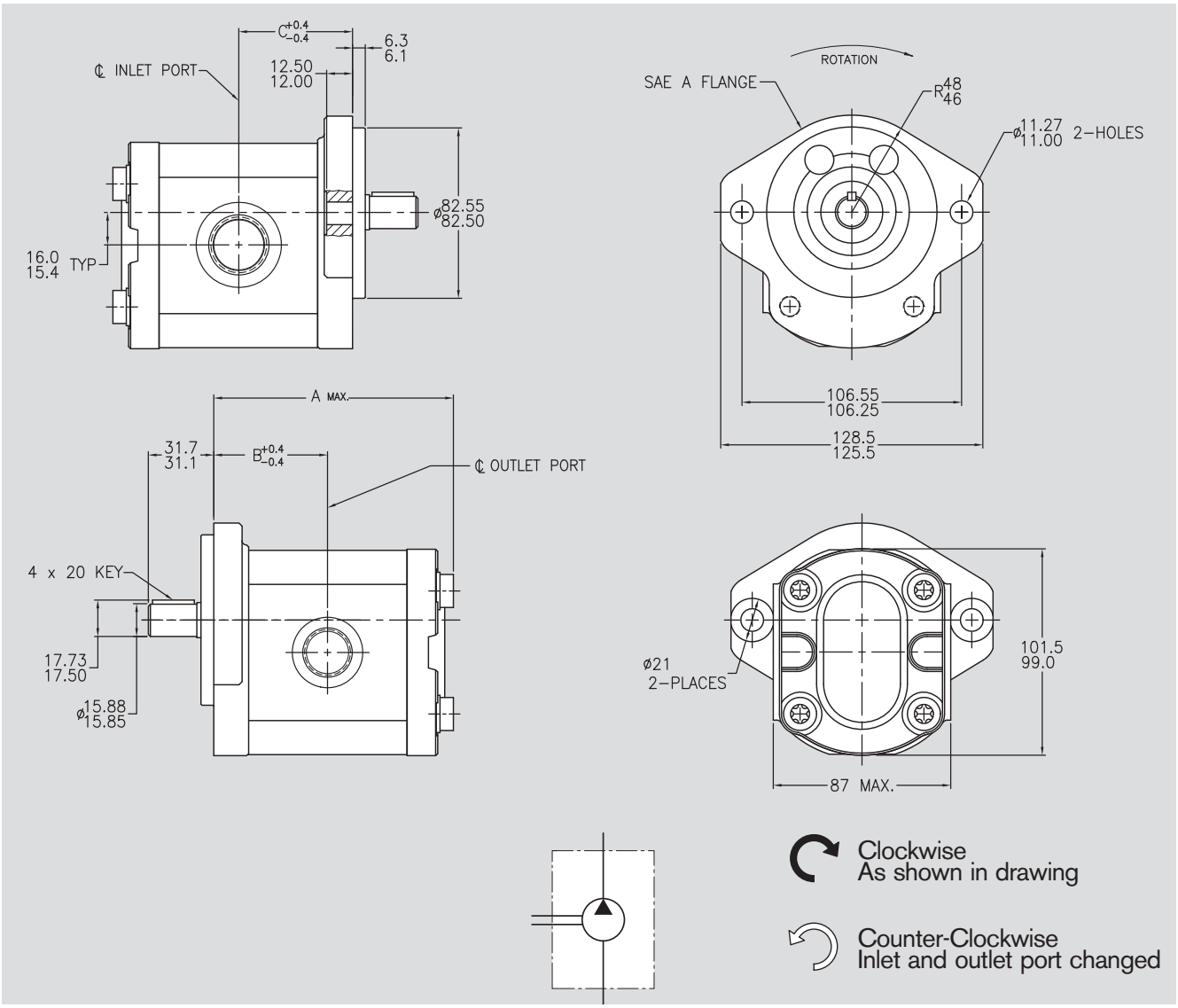
Torque M_{max} calculation



$$M_{max.} \geqq \Delta p_1 \cdot V_1 \cdot 0.0177 + \Delta p_2 \cdot V_2 \cdot 0.0177 + \Delta p_3 \cdot V_3 \cdot 0.0177$$

Δp [bar] V [cm³/rev]

Example: 19 cc + 16 cc tandem (F+F) with R splined shaft
Pressure P_1 = 200 / P_2 = 150
$M_{max.}$ = (200 x 16 x .0177) + (150 x 19 x .0177) = 56.64 + 50.45 = 107.08
R shaft acceptable because $M_{max.}$ is <110 [Nm]



Ordering code

AZPF – 12 – ☐☐☐ ☐Q R 12 MB

AZPF – 22 – ☐☐☐ ☐Q R 12 MB*

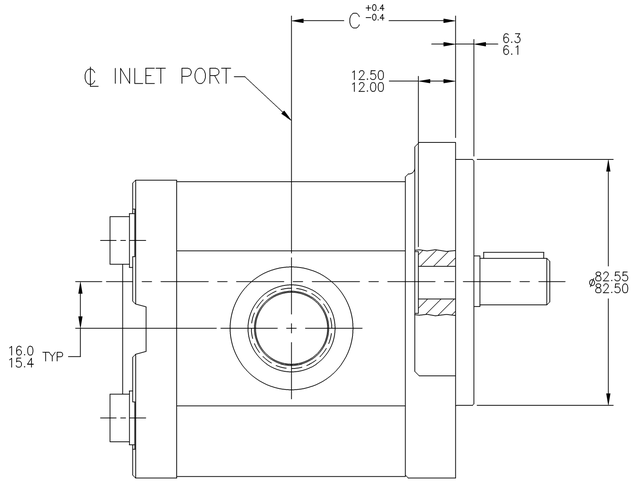
Displacement	Ordering Number		Dimension (mm)				
	↺	↻				Inlet Port	Outlet Port
(cm³/rev)	L	R	A	B	C	(SAE O-Ring Boss)	(SAE O-Ring Bpss)
4.0	9 510 290 044	9 510 290 021	85.0	39.9	39.9	-10	-8
5.5	9 510 290 045	9 510 290 022	85.6	41.1	41.1	-10	-8
8.0	9 510 290 046	9 510 290 023	91.6	43.2	43.2	-12	-10
11.0	9 510 290 047	9 510 290 024	96.6	47.0	47.0	-12	-10
14.0	9 510 290 048	9 510 290 025	101.6	47.5	47.5	-12	-10
16.0	9 510 290 130	9 510 290 122	105.0	47.5	47.5	-16	-10
19.0	9 510 290 131	9 510 290 123	110.0	47.5	47.5	-16	-10
22.5	9 510 290 132	9 510 290 124	115.4	55.1	55.1	-16	-10
25.0	9 510 290 118*	9 510 290 112*	131.6	63.2	63.2	-16	-10
28.0	9 510 290 121*	9 510 290 115*	136.4	65.6	65.6	-16	-10

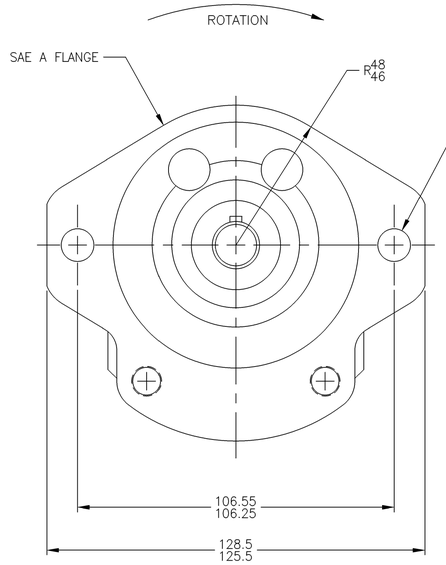
Notes:

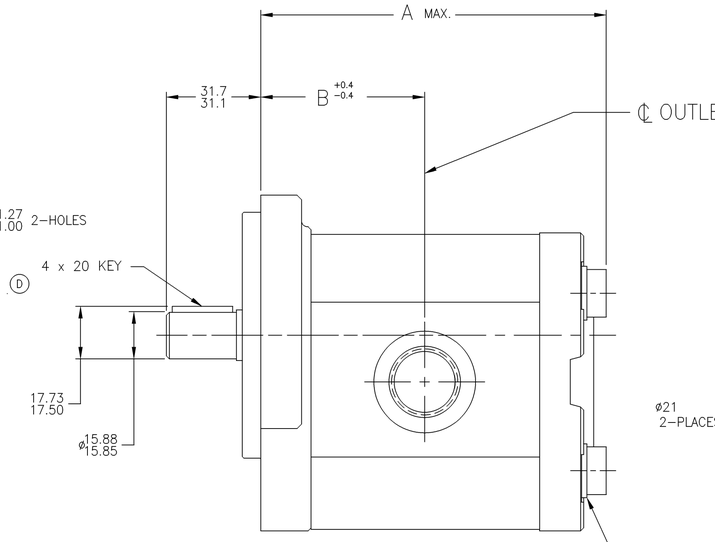
1. Refer to page 16 for performance specifications by displacement size.
2. Contact factory for product weight.

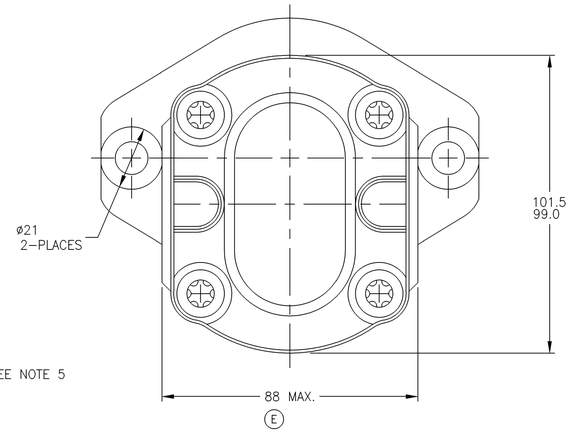
MODEL NUMBER	CATALOG NUMBER	DISPLACEMENT CM^3/REV	OUTPUT FLOW ⚠3 LITERS/MIN	A DIM.	B DIM.	C DIM.	INLET PORT (SAE O-RING BOSS)	OUTLET PORT (SAE O-RING BOSS)
9 510 290 021	AZ-P-F-12-004-RQR12MB	4.1	7.1	85.0	39.9	39.9	.875-14 UNF-2B THD.	.750-16 UNF-2B THD.
9 510 290 022	AZ-P-F-12-005-RQR12MB	5.6	10.1	85.6	41.1	41.1		
9 510 290 023	AZ-P-F-12-008-RQR12MB	8.2	15.0	91.6	43.2	43.2	1.062-12 UN-2B THD.	.875-14 UNF-2B THD.
9 510 290 024	AZ-P-F-12-011-RQR12MB	11.3	21.0	96.6	47.0	47.0		
9 510 290 025	AZ-P-F-12-014-RQR12MB	14.4	26.9	101.6	47.5	47.5		
9 510 290 026	AZ-P-F-12-016-RQR12MB	16.5	31.0	105.0	47.5	47.5		
9 510 290 027	AZ-P-F-12-019-RQR12MB	19.6	37.4	110.0	47.5	47.5		
9 510 290 028	AZ-P-F-12-022-RQR12MB	22.9	43.8	115.4	55.1	55.1		

REV	DESCRIPTION	DATE	BY	CKD
D	CHANGED TO STRAIGHT KEY (CRR1476)	01-16-06	GRJ	GRJ
E	WAS 87 MAX. (CRR1453)	01-25-06	GRJ	GRJ









GENERAL NOTES:

1. METRIC LINEAR MEASUREMENTS ARE IN MILLIMETERS
2. ROTATION VIEWING DRIVE END: CLOCKWISE
3. ⚠3 OUTPUT FLOWS ARE AT 2000 RPM & 138 BAR USING SAE NO. 10 OIL AT 48°C
4. MAX RATED SPEED: UP TO 3500 RPM
5. LOCKWASHER EXCLUDED IN INSTALLATION 9 510 290 022

DO NOT SCALE
UNLESS OTHERWISE SPECIFIED:
TOLERANCES PER DIN 7168m

LINEAR DIMENSION	TOL.
0- 6=	±0.1
6- 30=	±0.2
30- 120=	±0.3
120- 400=	±0.5
400-1000=	±0.8

ANGLES = ± 1°

METRIC

THIRD ANGLE PROJECTION

DRN D.M. DATE 05-20-02
CKD D.N. DATE 06-14-02
APPVD DATE
REF.

CAD-ORIGINAL
Revisions thru CAD Only

DESCRIPTION
SCALE FULL
TITLE PUMP-GEAR, INSTALLATION
DWG. NO. 9 510 290 021TAB
SHEET 1 OF 1
REV. E
MATERIAL

D

Rexroth
Bosch Group
WOOSTER, OHIO 44691

Notes for commissioning

Filter recommendation
The majority of premature failures in external gear pumps are caused by contaminated pressure fluid.
As a warranty cannot be issued for dirt-specific wear, we recommend filtration compliant with cleanliness level 20/18/15 ISO 4406 (1999), which reduces the degree of contamination to a permissible dimension in terms of the size and concentration of dirt particles.

We recommend that a full-flow filter always be used. Basic contamination of the pressure fluid used may not exceed class 20/18/15 according to ISO 4406 (1999). Experience has shown that new fluid quite often lies above this value. In such instances a filling device with special filter should be used.

General
- The pumps supplied by us have been checked for function and performance. No modifications of any kind may be made to the pumps; any such changes will render the warranty null and void.
- Pump may only be operated in compliance with permitted data (see pages 16 – 19).

Project planning notes
Comprehensive notes and suggestions are available in Hydraulics Trainer, Volume 3 RE 00 281, “Project planning notes and design of hydraulic systems”.

Technical data
All stated technical data is dependent on production tolerances and is valid for specific marginal conditions.
Note that, as a consequence, scattering is possible, and at certain marginal conditions (e.g. viscosity) **the technical data may change**.

Characteristics
When designing the external gear pump, note the maximum possible service data based on the characteristics displayed on pages 11 to 15.

Additional information on the proper handling of hydraulic products from Bosch Rexroth is available in our document: “General product information for hydraulic products” RE 07 008.

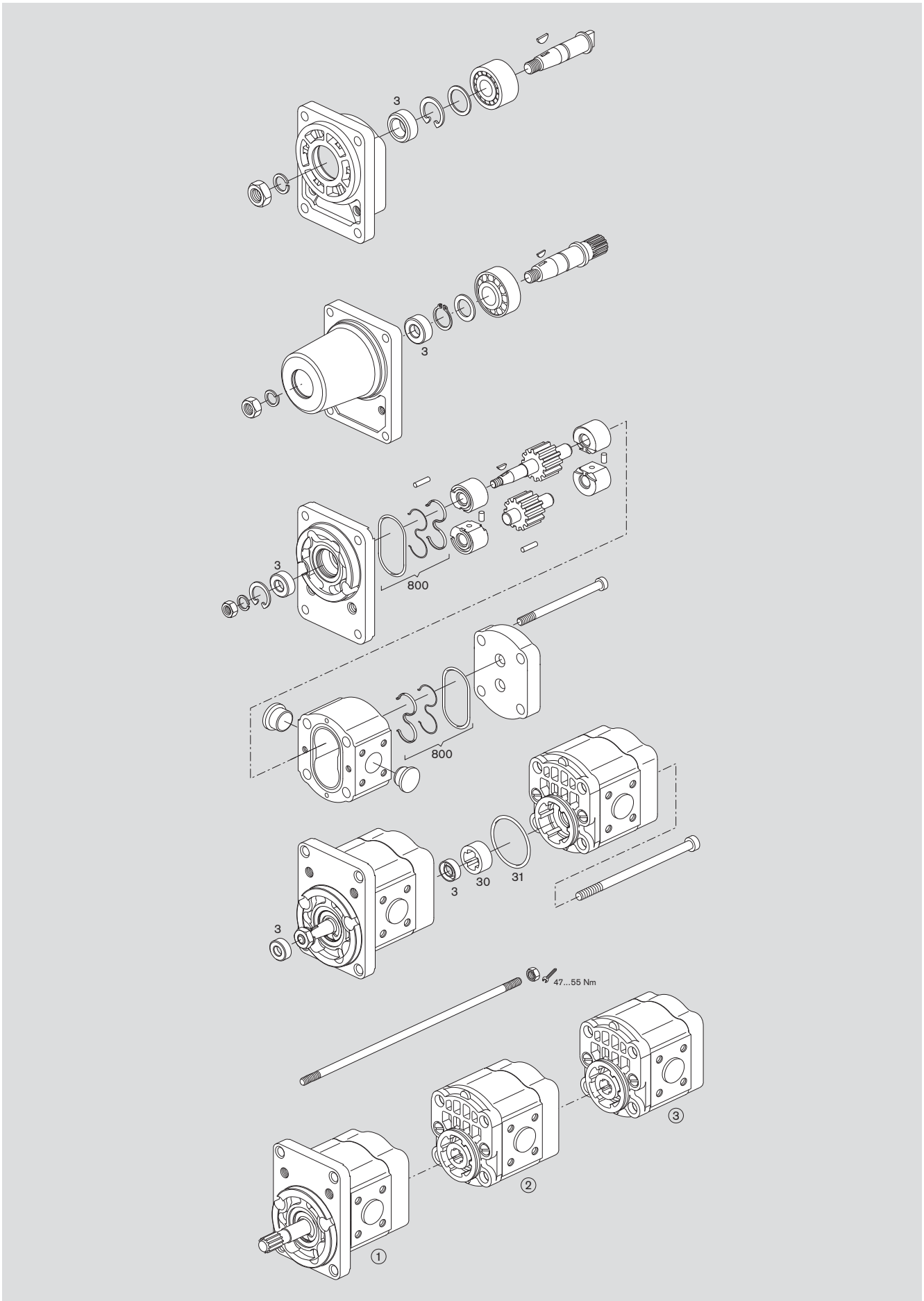
You can find further information in our publication: “General Operating Instructions for External Gear Units” RE 07 012-B1.

Service parts

Pg.	Ordering code	Seal Pos. 800 and Pos. 3	Seal kit Pos. 800 1 517 010 ...	Shaft seal ring Pos. 3 1 510 283 ...	Shaft Seal Material	Shaft Seal Dimension	Seal ring Pos. 31 1 900 210 ...	Material	Dimension
20	AZPF – 12 – □□□□ RR12**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF – 22 – □□□□ RR12**MB**	R98640006P	152 NBR	035	FPM	17x30x7			
21	AZPF – 12 – □□□□ RR12**MA**	R98640006P	152 NBR	035	NBR	17x30x7			
22	AZPF – 12 – □□□□ QR12**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF – 22 – □□□□ QR12**MB**	n/a	152 NBR	035	NBR	17x30x7			
23	AZPF – 12 – □□□□ QR12**MA**	R98640006P	152 NBR	035	NBR	17x30x7			
24	AZPF – 22 – □□□□ PR12**MB**	n/a	152 NBR	009	NBR	17x30x7			
25	AZPF – 12 – □□□□ QR12**MB** – S0022	R98640006P	152 NBR	035	NBR	17x30x7			
26	AZPF – 12 – □□□□ QR12**MA** – S0022	R98640006P	152 NBR	035	NBR	17x30x7			
27	AZPF – 22 – □□□□ PC12**CB**	n/a	152 NBR	009	NBR	20x40x7			
28	AZPF – 12 – □□□□ RR20MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF – 12 – □□□□ RR20KB	n/a	152 NBR	065	FPM	17x30x7			
29	AZPF – 1X – □□□□ QR20**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
30	AZPF – 1X – □□□□ CB20**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
31	AZPF – 1X – □□□□ FB20**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
32	AZPF – 1X – □□□□ HO30KB	––	152 NBR	044	FPM	18x30x7			
	AZPF – 2X – □□□□ HO30KB	––	152 NBR	044	FPM	18x30x7			
33	AZPF – 1X – □□□□ FO30MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF – 1X – □□□□ FO30PB	n/a	193 FPM	065	FPM	17x30x7			
	AZPF – 2X – □□□□ FO30PB	n/a	193 FPM	065	FPM	17x30x7			
34	AZPF – 1X – □□□□ HO01**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
35	AZPF – 1X – □□□□ AB01**MB**	––	208 FPM	037	NBR	18x30x7			
36	AZPF – 1X – □□□□ CP20MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF – 1X – □□□□ CP20KB	n/a	152 NBR	065	FPM	17x30x7			
	AZPF – 1X – □□□□ CP20PB	n/a	193 FPM	065	FPM	17x30x7			
37	AZPF – 1X – □□□□ CN20**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
38	AZPF – 1X – □□□□ FN20**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
39	AZPF – 1X – □□□□ FP20**PB**	n/a	193 FPM	065	FPM	17x30x7			
	AZPF – 2X – □□□□ FP20**PB**	n/a	193 FPM	065	FPM	17x30x7			
40	AZPF – 1X – □□□□ NT20**MB**	R98640006P	152 NBR	035	NBR	17x30x7			
41	AZPF – 1X – □□□□ NL20**KB**	n/a	152 NBR	065	FPM	17x30x7			
	AZPF – 2X – □□□□ NL20**KB**	n/a	152 NBR	065	FPM	17x30x7			
42	AZPF – 1X – □□□□ SA20MB	R98640006P	152 NBR	035	NBR	17x30x7			
	AZPF – 1X – □□□□ SA20KB	n/a	152 NBR	065	FPM	17x30x7			
43	AZPF – 1X – □□□□ SG20MB	n/a	152 NBR	009	NBR	20x40x7			
44	AZPFF – 1X – □□□ – □□□□ RR1212MB	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
	AZPFF – 1X – □□□ – □□□□ RR1212KB	n/a	152 (2x) NBR	065	FPM	17x30x7	145	NBR	45x2.5
46	AZPFF – 1X – □□□ – □□□□ RR1212MB – S0XXX	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
48	AZPFF – 1X – □□□ – □□□□ QR1212MB	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
	AZPFF – 1X – □□□ – □□□□ QR1212PB	n/a	152 (2x) NBR	065	FPM	17x30x7	1 520 210 101	FPM	45x2.5
49	AZPFF – 1X – □□□ – □□□□ QR1212MB – S0XXX	R98640006P (2x)	152 (2x) NBR	035	NBR	17x30x7	145	NBR	45x2.5
50	AZPFF – 1X – □□□ – □□□□ PR1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
	AZPFF – 2X – □□□ – □□□□ PR1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
51	AZPFF – 1X – □□□ – □□□□ PR1212MB – S0XXX	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
	AZPFF – 2X – □□□ – □□□□ PR1212MB – S0XXX	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
52	AZPFF – 1X – □□□ – □□□□ PC1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5
	AZPFF – 2X – □□□ – □□□□ PC1212MB	R98640006P (2x)	152 (2x) NBR	009	NBR	20x40x7	145	NBR	45x2.5

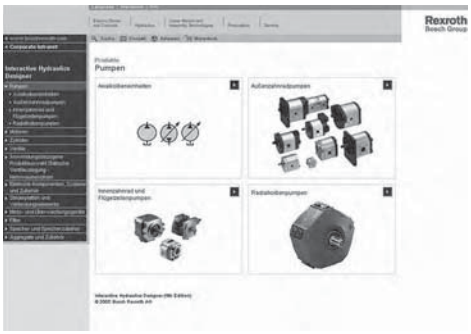
NBR = Perbunan® FPM = Viton®

For further service parts refer to CD-ROM HYparts 1 987 760 010


3
3
3
800
800
3
30
31
3
47...55 Nm
①
②
③

The AZ configurator at www.boschrexroth-us.com/azconfigurator

The AZ configurator assists you to configure your individual external gear unit easily and user-friendly. You only need to specify your requirements: From the displacement, direction of rotation, drive shaft, connection flange right up to the required rear cover. You immediately receive a project drawing (PDF format) if a configuration already exists. You receive the price of the configured external gear unit upon request.



The AZ configurator assists you to configure your individual external gear unit easily and user-friendly – all data needed for project planning are acquired thru menu guidance.

Selection is made either on an ordering code or your technical requirements. This means that you can search for external gear units that have already been configured, or you specify the configuration variant of the external gear unit based upon the operating parameters you require.

If the external gear unit you selected has been released you will receive the part number, ordering code and a detailed installation drawing. If your special configuration is not available please send your specification to Rexroth. One of our employees will then contact you.

Notes:

Notes:

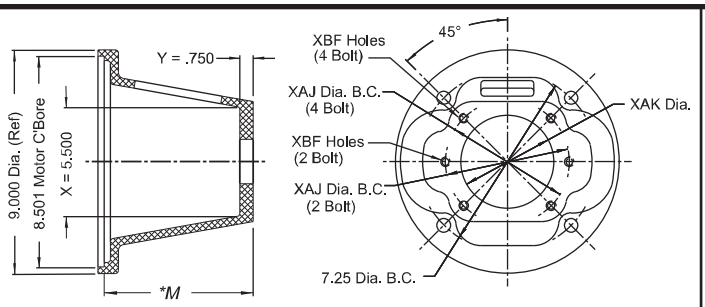
Bosch Rexroth Corporation
Hydraulics
8 Southchase Court
Fountain Inn, SC 29644-9018, USA
Telephone (864) 967-2777
Facsimile (864) 967-8900
www.boschrexroth-us.com

PUMP MOUNTS for ELECTRIC MOTORS

182TC thru 256TC

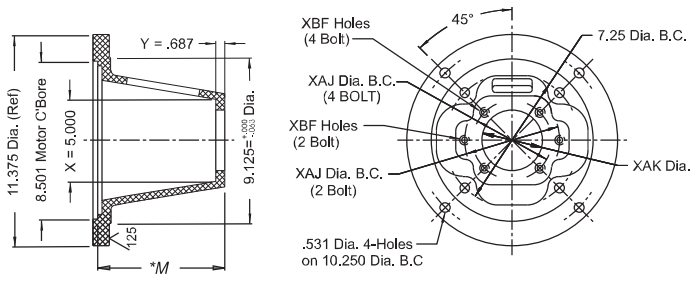
213UC thru 256UC

Motor Size	182TC	184TC	213TC	215TC	254TC	256TC	213UC	215UC	254UC	256UC
HP/1800 RPM	3	5	7-1/2	10	15	20	2	3	7-1/2	10
Shaft Diameter	1.125	1.125	1.375	1.375	1.625	1.625	1.125	1.125	1.375	1.375
Key Size	1/4	1/4	5/16	5/16	3/8	3/8	1/4	1/4	5/16	5/16
Shaft Length	2.625	2.625	3.125	3.125	3.750	3.750	2.750	2.750	3.500	3.500



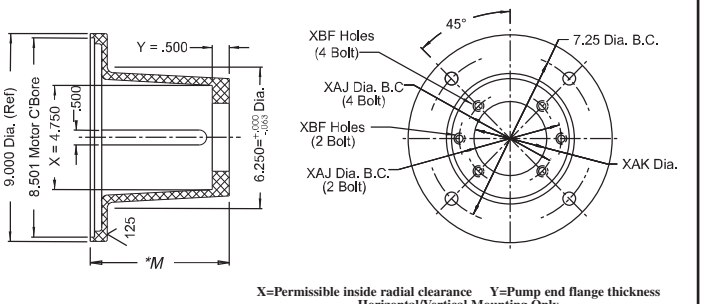
STYLE 5 ADAPTER

X=Permissible inside radial clearance Y=Pump end flange thickness
Horizontal Mounting Only



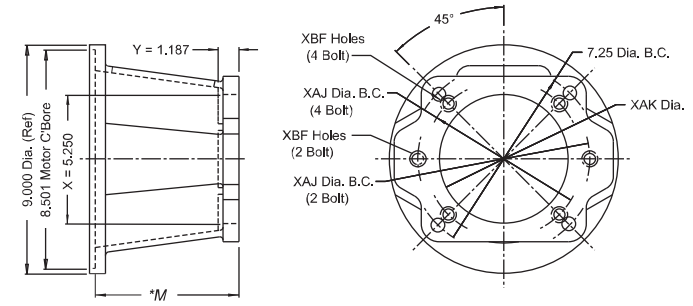
STYLE 6 ADAPTER

X=Permissible inside radial clearance Y=Pump end flange thickness
Vertical Mounting Only
(see page 145 for vertical mounting information & vertical mounting gasket)



STYLE 7 ADAPTER

X=Permissible inside radial clearance Y=Pump end flange thickness
Horizontal/Vertical Mounting Only
(see page 145 for vertical mounting information & vertical mounting gasket)



STYLE 8 ADAPTER

X=Permissible inside radial clearance Y=Pump end flange thickness
Horizontal Mounting Only

If your pump is not listed or is a non-standard pump, contact us for special machining and/or information. Not all pump mounting holes are supplied on every adapter.

Pump Type	Flange	XAJ Bolt Circle	XAK Pump Pilot	XBF Mounting Holes	Adapter Style	Mounting Horiz	Mounting Vert	Face to Face	Vescor Part Number
Standard SAE Pump Flanges									
					7	yes	yes	4.38	**2194**
					7	yes	yes	4.63	**3371**
					5	yes	no	5.00	**2000**
					7	yes	yes	5.00	**6033**
					6	no	yes	5.00	**6053**
USA4F17	4 Bolt	2.84	1.781	5/16-18	7	yes	yes	5.25	**168199+**
					7	yes	yes	5.44	**157199**
					6	no	yes	5.75	**6056**
					5	yes	no	5.81	**1965**
					7	yes	yes	5.88	**6037**
					7	yes	yes	6.88	**6041+**
					6	no	yes	6.81	**6059+**
					7	yes	yes	4.38	**2196**
SAE AA	2 Bolt	3.25	2.001	3/8-16	7	yes	yes	4.63	**3373**
					5	yes	no	5.00	**1994**

+NON-STOCK SPECIAL ORDER ITEM

(see page 142 for Motor Mounting Spacers, page 143 for Vertical Mounting Rings)

NOTE: WITH VESCORS' POLICY OF CONSTANTLY IMPROVING ITS PRODUCTS, SPECIFICATIONS ARE SUBJECT TO CHANGE WITHOUT NOTICE.

PUMP MOUNTS for ELECTRIC MOTORS

182TC thru 256TC

213UC thru 256UC

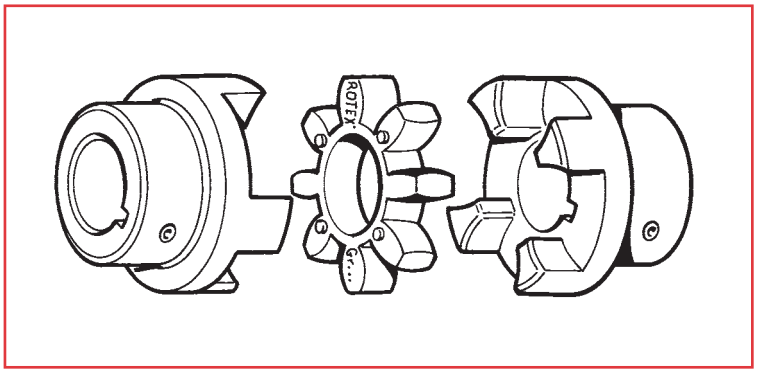
Pump Type	Flange	XAJ Bolt Circle	XAK Pump Pilot	XBF Mounting Holes	Adapter Style	Mounting Horiz	Mounting Vert	Face to Face	Vescor Part Number
Standard SAE Pump Flanges									
SAE AA	2 Bolt	3.25	2.001	3/8-16	7	yes	yes	5.00	**6031**
					6	no	yes	5.00	**6052**
					7	yes	yes	5.25	**168299**
					7	yes	yes	5.44	**157299**
					6	no	yes	5.75	**6057**
					7	yes	yes	5.88	**6035**
					7	yes	yes	6.88	**6039+**
					6	no	yes	6.81	**6060+**
SAE A	2 Bolt	4.19	3.251	3/8-16	7	yes	yes	4.38	**2198***
					7	yes	yes	4.63	**6026***
					5	yes	no	5.00	**1960**
					7	yes	yes	5.00	**6030***
					6	no	yes	5.00	**6054**
					7	yes	yes	5.25	**168399***
					7	yes	yes	5.44	**3364***
					6	no	yes	5.75	**6055**
					5	yes	no	5.81	**1959**
					7	yes	yes	5.88	**6034***
					8	yes	no	6.38	**3365**
					5	yes	no	6.81	**1950**
					6	no	yes	6.81	**6058**
					7	yes	yes	6.88	**6038***
					8	yes	no	7.38	**3361**
SAE B	2 Bolt 4 Bolt	5.75 5.00	4.001	1/2-13	5	yes	no	5.00	**1964**
					6	no	yes	5.00	**6032**
					8	yes	no	5.44	**254199**
					6	no	yes	5.75	**6036**
					5	yes	no	5.81	**1952**
					8	yes	no	6.38	**254299**
					5	yes	no	6.81	**1951**
					6	no	yes	6.81	**6040**
					8	yes	no	7.38	**254399**
SAE C	2 Bolt 4 Bolt	7.12 6.38	5.001	5/8-11 1/2-13	8	yes	no	5.44	**1946**
					8	yes	no	6.38	**1955**
					8	yes	no	7.38	**1956**
SAE D	2 Bolt 4 Bolt	9.00	6.001	3/4-10	Steel	yes	no	7.00	**1886**
					Steel	yes	no	8.25	**1884**

†NON-STOCK SPECIAL ORDER ITEM

*contains (2) SAE 45° mounting patterns

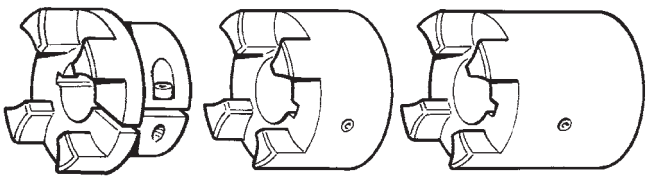
ROTEX® Coupling Features

For over 30 years, the **ROTEX®** curved jaw coupling has provided unmatched reliability and efficiency in the most demanding applications. The vast selection of hub and spider materials, combined with design features such as vibration damping, fail safe and lubrication free, makes the **ROTEX®** coupling an ideal choice for shaft connections.



Hub Materials, Sizes and Styles

- Four standard hub materials to suit every application
  - Cast Aluminum
  - Cast Iron
  - Nodular Iron
  - Steel
- Sixteen coupling sizes
- Bore sizes up to 7.875 inches
- Nominal torque up to 309,750 lb in
- Three hub designs to fit your requirements
  - Regular (low mass)
  - Large (larger bores)
  - Long (extended shaft gaps)



Regular Hub (Cross Clamped) | **Large Hub (Set Screw)** | **Long Hub (Set Screw)**

Lubrication Free

• The non-lubricated design simplifies every application and is ideal for clean environments or difficult access installations.

Fail Safe

• The interlocking jaw design will allow a controlled shutdown should a spider overload failure occur.

Maintenance Free

• The **ROTEX®** coupling does not require any periodic maintenance. Its open design allows a simple visual inspection.

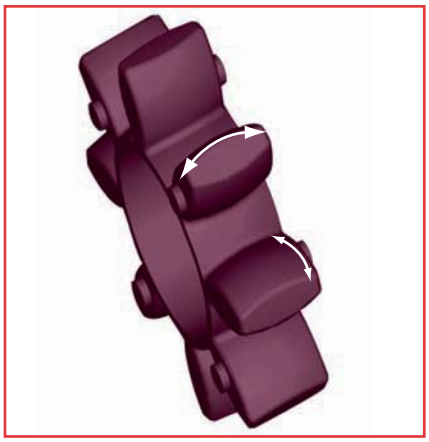
Hub-Shaft Connections

• **ROTEX®** hubs can be ordered in many configurations, such as
  - Straight bore and set screw,
  - Splined bore and cross clamp,
  - Tapered bore and set screw.

ROTEX® Special Spider Materials 1)

Spider Durometer	Spider Color	Spider Material	Admissible Temp. (F)		Material Characteristics
			Continuous	Intermittent	
94 Sh A-T	Blue (2)	Urethane	-60 to +230	-75 to +265	Moisture and hydrolysis resistant, high load damping effect.
64 Sh D-H	Green	Hytrel	-60 to +230	-75 to +265	High temperature resistant, high torsional stiffness.
PA	White	Polyamide	-4 to +230	-22 to +245	High temp. and chemical resistant, high torsional stiffness.

1) Please consult KTR for size availability on special spiders. 2) 94 Sh A-T (Blue) spiders have yellow dots on the end of spider legs.



ROTEX® Spider Design

ROTEX® double crowned spiders are made with high grade urethane or Hytrel® in several hardnesses to suit the vibration or shock absorption needs of your application. The spider materials offer excellent memory to regain shape maintaining the integrity of the coupling.
The double crowned leg design eliminates edge pressure normally caused by angular and parallel misalignments, allowing the spider to outlast the conventional flat design.

Misalignment

• Due to the double crowned spider and concave jaw design, the **ROTEX®** coupling allows angular misalignment without edge pressure.

Excellent Durability

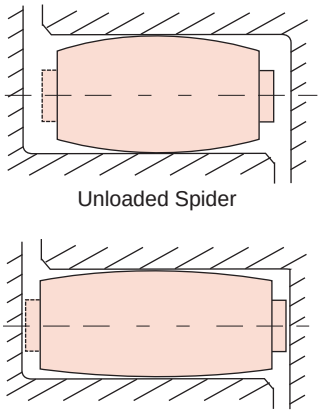
• Urethane and Hytrel® spiders are resistant to most chemicals and higher ambient temperatures for outdoor and industrial environments.

Long Life

• Spider low mass and special compounding dissipate heat and minimize hysteresis, giving the spider long life and superior performance.

Electrical Isolation

• Urethane spiders prevent electrical surges to be transmitted between driver and driven side.



Vibration Damping

• A progressive damping effect is accomplished through the **ROTEX®** double crowned design and materials. This design adjusts to the concave hub jaw providing a controlled expansion which absorbs shocks and reduces vibrations. The high grade molded urethane spider offers excellent memory to regain shape after absorbing high shocks.

ROTEX® Standard Spider Materials

Spider Durometer	Image	Spider Color / Material	Admissible Temp. [F] Continuous / Intermittent	Sizes Available
92 Sh A		Yellow / Urethane	-40 to 195 / -55 to 245	19 - 180
98 Sh A 2)		Red / Urethane	-20 to 195 / -40 to 245	19 -180
64 Sh D-F		White 2) / Urethane	-20 to 230 / -20 to 265	24 - 180

1) For sizes 65 and above the durometer is 95 Sh A.
2) White spiders have green dots at the end of spider legs.

• Special Spider materials are available on request.

The following information is required for the selection of a **ROTEX®** coupling;

- Drive power (HP) _____
- Drive speed (RPM) _____
- Driver component shaft size _____
- Driven component shaft size _____
- Ambient Temperature _____
- Starts per hour _____

Selection Procedure:

1) Calculate **Nominal system torque (T_N)**:
Using the formula below, calculate the **Nominal system torque (T_N)** for your application.

$T_N = 63000 \bullet HP / RPM$

2) Calculate **Total Service Factor (S)**:
Using safety factor tables select **application service factor (S_B), starts per hour (S_Z) and ambient temp. (S_t)**. Select multipliers which best fit your application. Using the formula below calculate **total service factor (S)**.

$S = S_B \bullet S_Z \bullet S_t$

3) Select a coupling:
Select the **ROTEX®** coupling which has a **nominal coupling torque (T_{KN})** equal to or greater than the **nominal system torque (T_N)** multiplied by the **total service factor (S)**.

$T_{KN} \geq T_N \bullet S$

4) Verifying maximum permissible torque:
Using the torque table on page 15, ensure the **rated maximum torque (T_{Kmax})** of the selected coupling is equal to or greater than **system peak torque (T_S)** multiplied by the **ambient temperature service factor (S_t)**.

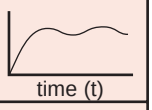
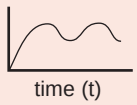
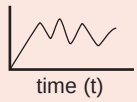
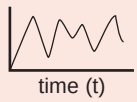
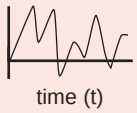
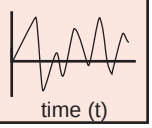
$T_{Kmax} \geq T_S \bullet S_t$

5) Verify maximum permissible speed:
Using the table on page 15, please verify the speed of your application does not exceed the maximum speed allowed.

6) Verify maximum permissible bore and dimensions:
Using tables on pages 16, 17 and 18, ensure the maximum bore of the coupling selected is not exceeded. Please, note that different materials may allow different maximum bores. Also, verify that length, diameter and mimimum shaft gap (E) recommended fit your application needs.

7) Verify maximum permissible misalignment:
Using the table on page 26, verify permissible misalignments for the coupling size selected. Please, note that max. angular and max. parallel misalignments are not to be used concurrently. For further information please consult KTR.

Application Service Factors:

Application Style	S_B	TorqueCurve
Uniform operation (small driven masses) Hydraulic-gear pumps, fans	1.0	
Uniform operation (medium driven masses) Axial piston pumps,machine tools, textile and mixing machines, metal bending machines, blowers, screw compressors	1.2	
Non-uniform operation (medium driven masses) Generators, freight elevators, winches belt conveyors	1.5	
Non-uniform operation (medium driven masses w/ shocks) Centrifuges, concrete mixers, chain conveyors, lifts, cement mills	1.6	
Non-uniform operation (heavy masses w/ large shocks) Hammer drills, piston pumps, forging presses, rubber rollers, rotary boring machines	1.8	
Non-uniform operation (heavy masses w/ extreme shocks) Piston compressors, stone crushers, brick presses, rolling mills	2.5	

Ambient Temperature Service Factors:

Temperature (F)	-20°/ 80°	100°	140°	175°
S_t	1.0	1.2	1.4	1.8

Starts per Hour Service Factors:

Starts per hour	100	200	400	800
S_Z	1.0	1.2	1.4	1.6

Table of Terms

Term	Abbreviation	Definition
Nominal system torque	T_N	Nominal torque of the system to be transmitted by the coupling
Peak torque of the system	T_S	Peak torque of the system to be transmitted by the coupling
Operating service factor	S_B	Service factor used to account for different types of driven machine
Temperature service factor	S_t	Service factor used to account for ambient temperatures
Start up service factor	S_Z	Service factor used to account for frequency of start ups
Nominal coupling torque	T_{KN}	Continuous torque to be transmitted throughout the entire coupling speed range
Maximum coupling torque	T_{Kmax}	Torque to be transmitted $1x10^5$ times as a peak load or $0.5x10^4$ times as an alternating load during the entire life of the coupling

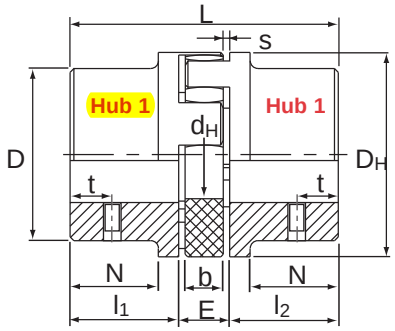
Size (for all hub materials)	Maximum speed [1] [RPM]	Wind-up Angle		Torque [3] [lb in]		Dynamic Torsional Stiffness [X10³ lb in / rad]				HP [RPM]		
		Nominal Torque	Maximum Torque	Nominal	Maximum	100% T_{KN}	75% T_{KN}	50% T_{KN}	25% T_{KN}	100	1200	1800
Urethane Spider - 92 Shore A (yellow)												
19	14000			88	177	11.3	9.3	7.1	4.2	0.1	1.7	2.5
24	10600			310	620	43.0	35.2	26.6	15.8	0.5	6.0	9.0
28	8500			840	1,680	96.5	79.1	59.8	35.5	1	16	24
38	7100			1,680	3,360	186.3	152.8	115.5	68.5	3	32	45
42	6000			2,345	4,690	210.1	172.3	130.3	77.3	4	45	67
48	5600			2,740	5,485	324.8	266.3	201.3	119.4	4	52	78
55	4750			3,625	7,255	448.9	368.1	278.3	165.0	6	69	104
65	4250	3.2°	5°	5,530	11,060	859.6	704.9	532.9	315.9	9	105	158
75	3550			11,325	22,655	1,002.9	822.3	621.8	368.6	18	216	324
90	2800			21,240	42,480	1,682.3	1,379.4	1,043.1	618.3	34	404	607
100	2500			29,205	58,410	2,239.8	1,836.6	1,388.7	823.1	46	556	834
110	2240			42,480	84,960	2,757.7	2,261.4	1,709.8	1,013.5	67	809	1213
125	2000			58,850	117,705	4,202.5	3,446.1	2,605.5	1,544.4	93	1121	1681
140	1800			75,665	151,335	5,845.3	4,793.2	3,624.1	2,148.2	120	1441	2161
160	1500			113,280	226,560	7,879.7	6,461.4	4,885.5	2,895.8	180	2157	3235
180	1400			165,050	330,105	22,731.8	18,640.0	14,093.7	8,354.0	262	3143	4714
Urethane Spider - 98 Shore A / 95 Shore A size 65 and above (red)												
19	14000			150	300	25.8	21.2	16.0	9.5	0.2	2.9	4.3
24	10600			530	1,060	87.9	72.0	54.5	32.3	0.8	10	15
28	8500			1,415	2,830	236.9	194.3	146.9	87.1	2	27	40
38	7100			2,875	5,750	429.8	352.5	266.5	158.0	5	55	82
42	6000			3,980	7,965	482.3	395.5	299.0	177.3	6	76	114
48	5600			4,645	9,290	577.8	473.8	358.2	212.4	7	88	133
55	4750			6,060	12,125	840.5	689.2	521.1	308.9	10	115	173
65	4250	3.2°	5°	8,320	16,635	1,146.2	939.9	710.7	421.3	13	158	238
75	3550			16,990	33,980	1,747.9	1,433.3	1,083.7	642.3	27	324	485
90	2800			31,860	63,720	2,763.0	2,265.6	1,713.0	1,015.4	51	607	910
100	2500			43,805	87,615	3,391.9	2,781.3	1,102.9	1,246.5	71	834	1251
110	2240			63,720	127,440	6,107.0	5,007.8	3,786.4	2,244.4	101	1213	1820
125	2000			88,500	177,000	11,891.2	9,750.8	7,372.6	4,370.0	140	1685	2528
140	1800			113,280	226,560	12,607.5	10,338.2	7,816.7	4,633.3	180	2157	3235
160	1500			169,920	339,840	21,967.7	18,013.6	13,620.0	8,073.1	270	3235	4853
180	1400			247,800	495,600	31,518.8	25,845.5	19,541.7	11,583.2	393	4718	7077
Urethane Spider of 64 Shore D-F (white w/ green dots on spider legs) [2]												
19	14000			185	370	47.3	38.9	29.4	17.4	0.3	3.5	5.3
24	10600			660	1,325	133.7	109.7	82.9	49.1	1	13	19
28	8500			1,770	3,540	243.6	199.7	151.0	89.6	3	34	51
38	7100			3,585	7,170	620.8	509.1	384.9	228.2	6	68	102
42	6000			4,955	9,910	706.8	579.6	438.3	259.7	8	94	142
48	5600			5,795	11,590	845.3	693.1	524.1	310.6	9	110	166
55	4750			7,300	14,600	955.1	783.2	592.2	351.0	12	139	209
65	4250	2.5°	3.6°	10,395	20,795	1,337.1	1,096.5	829.1	491.4	16	198	297
75	3550			21,240	42,480	2,196.7	1,801.3	1,362.0	807.3	34	404	607
90	2800			39,825	79,650	5,969.5	4,895.0	3,701.1	2,193.8	63	758	1137
100	2500			54,735	109,475	7,621.4	6,249.5	4,725.3	2,800.8	87	1042	1563
110	2240			79,650	159,300	10,076.5	8,262.7	6,247.4	3,703.1	126	1517	2275
125	2000			110,625	221,250	12,703.1	10,416.5	7,875.9	4,668.4	176	2106	3159
140	1800			141,600	283,200	15,759.5	12,922.8	9,770.8	5,791.6	225	2696	4044
160	1500			212,400	424,800	27,220.8	22,321.1	16,877.0	10,003.7	337	4044	6066
180	1400			309,750	619,500	53,200.0	43,624.0	32,984.0	19,551.0	491	5898	8846

1) For operating speeds above maximum use only steel or nodular iron hubs, dynamic balancing required.
2) KTR recommends using this spider hardness with steel and nodular iron hubs only.

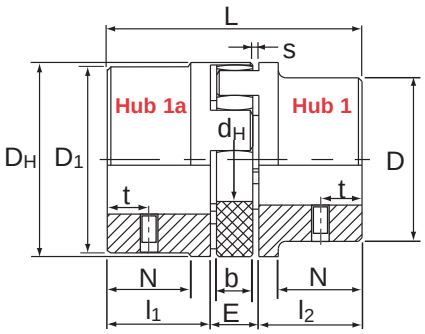
3) Alternating torque = 74% nominal torque

ROTEX® Curved Jaw **Standard Couplings**

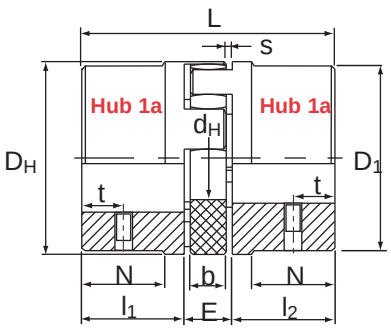
- Low mass cast aluminum hubs up to size 28
- Cast and nodular iron hubs from size 38 up to 180
- Inch bore sizes machined to AGMA 9002-A86 class 1 fit
  Inch key sizes machined to ANSI B17.1
- Metric bore sizes machined to ISO H7 fit
  Metric key sizes machined to DIN 6885 JS9



Coupling Style 01 - 2 hubs design 1



Coupling Style 02 - 1 hub design 1/
1 hub design 1a



Coupling Style 03 - 2 hubs design 1a

Cplg. Size	Hub Design	Cast Aluminum (AL-D) - Dimension [in] *Not recommended with cross clamp*												
		Bore min	Bore max	D; D1	L	l1; l2	E	b	s	DH	dH	N	Set Screw Size	Set Screw t
19	1	0.236	0.750	1.26	2.60	0.98	0.63	0.47	0.08	1.61	0.71	0.79	M5	0.39
	1a	0.750	0.938	1.61										
24	1	0.354	0.938	1.57	3.07	1.18	0.71	0.55	0.08	2.20	1.06	0.94	M5	0.39
	1a	0.866	1.125	2.20										
28	1	0.394	1.125	1.89	3.54	1.38	0.79	0.59	0.10	2.64	1.18	1.10	M8	0.59
	1a	1.102	1.500	2.64										

Cplg. Size	Hub Design	Cast Iron (GG25) - Dimension [in] *Not recommended with cross clamp*												
		Bore min	Bore max	D; D1	L	l1; l2	E	b	s	DH	dH	N	Set Screw Size	Set Screw t
38	1	0.472	1.500	2.60	4.49	1.77	0.94	0.71	0.12	3.15	1.50	1.46	M8	0.59
	1a	1.496	1.750	3.07										
	1b				6.46	2.76						2.44		
42	1	0.551	1.688	2.95	4.96	1.97	1.02	0.79	0.12	3.74	1.81	1.57	M8	0.79
	1a	1.654	2.156	3.70										
	1b				6.93	2.95						2.56		
48	1	0.591	1.875	3.35	5.51	2.20	1.10	0.83	0.14	4.13	2.01	1.77	M8	0.79
	1a	1.890	2.375	4.09										
	1b				7.40	3.15						2.72		
55	1	0.787	2.156	3.86	6.30	2.56	1.18	0.87	0.16	4.72	2.36	2.05	M10	0.79
	1a	2.165	2.750	4.65										
	1b				8.27	3.54								
65	1	0.866	2.500	4.53	7.28	2.95	1.38	1.02	0.18	5.31	2.68	2.40	M10	0.79
75	1	1.181	2.938	5.31	8.27	3.35	1.57	1.18	0.20	6.30	3.15	2.72	M10	0.98
90	1	1.575	3.500	6.30	9.65	3.94	1.77	1.34	0.22	7.87	3.94	3.19	M12	1.18

Note - 1b designates extended length hub

***See pages 30 and 31 for ROTEX® part numbers.**

Cplg. Size	Hub Design	Nodular Iron (GGG40) - Dimension [in] *Not recommended with cross clamp*												
		Bore min	Bore max	D; D1	L	l1; l2	E	b	s	DH	dH	N	Set Screw Size	Set Screw t
100	1	1.969	4.500	7.09	10.63	4.33	1.97	1.50	0.24	8.86	4.45	3.50	M12	1.18
110	1	2.362	4.875	7.87	11.61	4.72	2.17	1.65	0.26	10.04	5.00	3.78	M16	1.38
125	1	2.362	5.688	9.06	13.39	5.51	2.36	1.81	0.28	11.42	5.79	4.40	M16	1.57
140	1	2.362	6.250	10.04	14.76	6.10	2.56	1.97	0.30	12.60	6.50	4.88	M20	1.77
160	1	3.150	7.250	11.42	16.73	6.89	2.95	2.24	0.35	14.57	7.48	5.51	M20	1.97
180	1	3.346	7.875	12.80	18.70	7.68	3.35	2.52	0.41	16.54	8.66	6.14	M20	1.97

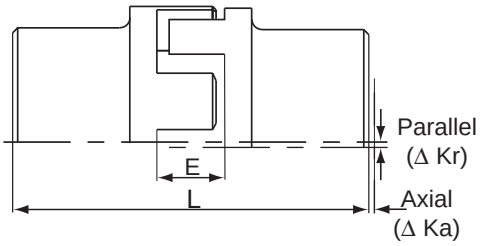
Misalignments

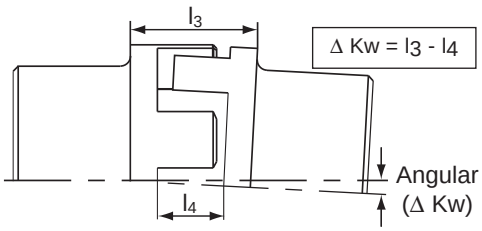
Axial Misalignment (Δ Ka):
Mount hubs on shafts to maintain the ''E'' dimension. If any one shaft must extend into the ''E'' dimension ensure that its maximum diameter is less than the ''d_W'' dimension. If axial travel of either shaft is expected, allow slightly larger gap between hub and spider. Spider pads should not be under axial compression when installed.

Parallel Misalignment (Δ Kr):
Use straight edge and feeler gage on top and sides of coupling without rotating it. A careful parallel alignment will extended the life of coupling and all other drive train components.

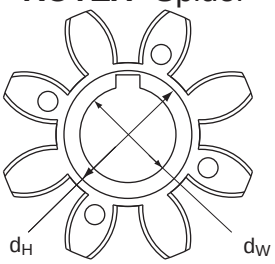
Angular Misalignment (Δ Kw) :
Ensure max. angular misalignment is not exceeded. If a manual calculation is needed please apply misalignment formula.

NOTE: For applications with larger parallel and angular misalignments please see **ROTEX®** style DKM on page22.

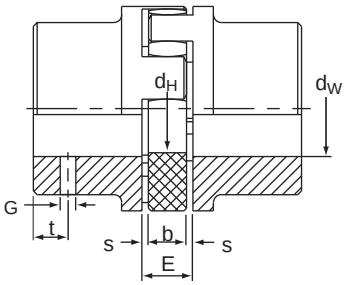




ROTEX® Spider



ROTEX® Assembly



Set-Screw Tightening TQ lb in	
M5	18
M6	42
M8	88
M10	150
M12	350
M16	710
M20	1240

Dimensions \ Coupling Size		19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
E (in)		0.63	0.71	0.79	0.94	1.02	1.10	1.18	1.38	1.57	1.77	1.97	2.17	2.36	2.56	2.95	3.35
s (in)		0.08	0.08	0.10	0.12	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.35	0.41
d_H (in) [1]		0.71	1.06	1.18	1.50	1.81	2.01	2.36	2.68	3.15	3.94	4.45	5.00	5.79	6.50	7.48	8.66
d_W (in) [2]		0.500	0.750	0.875	1.125	1.375	1.500	1.875	2.125	2.500	3.125	3.625	3.875	4.500	5.250	6.000	7.000
G [3]		M5	M5	M8	M8	M8	M8	M10	M10	M10	M12	M12	M16	M16	M20	M20	M20
t (in)		0.39	0.39	0.59	0.59	0.79	0.79	0.79	0.79	0.98	1.18	1.18	1.38	1.57	1.77	1.97	1.97
Max. Axial Misalignment Δ Ka	(in)	-0.02 +0.05	-0.02 +0.06	-0.03 +0.06	-0.03 +0.07	-0.04 +0.08	-0.04 +0.08	-0.04 +0.09	-0.04 +0.10	-0.06 +0.12	-0.06 +0.13	-0.06 +0.15	-0.08 +0.17	-0.08 +0.18	-0.08 +0.20	-0.10 +0.22	-0.12 +0.25
1500 rpm: Max. Parallel [4] Misalignment Δ Kr	(in)	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.018	0.019	0.020	0.021	0.024	0.024	0.025	0.027
1500 rpm: Max. Angular [4] Misalignment Δ Kw	(deg.)	1.2	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2
	(in)	0.03	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.13	0.17	0.19	0.22	0.25	0.26	0.30	0.35

1) Spider inside diameter is equal to d_H.
2) Maximum shaft size (including keyway) to extend into the spider.
3) Inch fasteners available upon request.
(See KTR assembly instructions at www.ktrcorp.com)
4) Maximum angular and maximum parallel misalignments are not to be used concurrently, for further information please consult KTR.

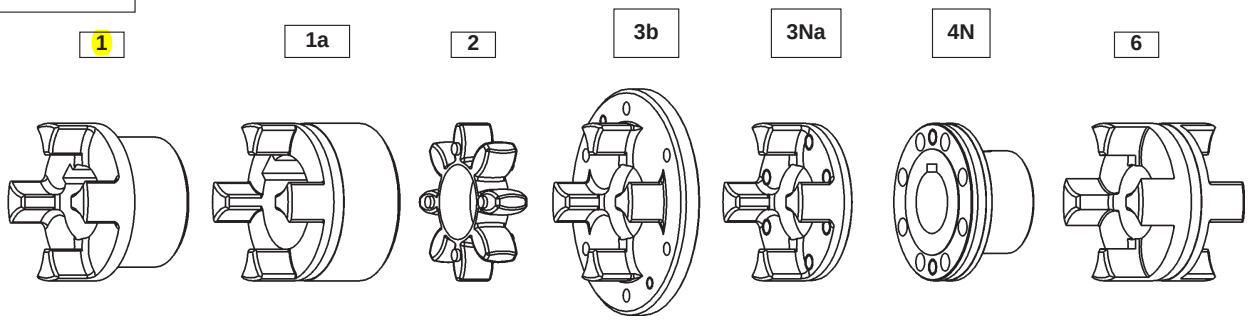
	Size		019		024		028		038	042	048	055	065	075	090
Spider	92 SA Yellow		1000001		1000001		1000001		1000001	1000001	1000001	1000001	1000001	1000001	1000001
	98 SA Red		1000002		1000002		1000002		1000002	1000002	1000002	1000002	1000002	1000002	1000002
	64 SD-H		1000025		1000025		1000025		1000025	1000025	1000025	1000025	1000025	1000025	1000015
	Hub Material		AL	ST	AL	ST	AL	ST	CI	CI	CI	CI	CI	CI	CI
Hub	Bore [in]	Key [in]	Stock Sizes Highlighted												
	1/4	No Key	6070611	5170611											
	5/16	No Key	6070711	5170711											
	3/8	3/32	6070902	5170902	6070902	5170902									
	3/8	1/8	6070903	5170903	6070903	5170903									
	7/16	No Key	6071111	5171111	6071111	5171111	6071111	5171111							
	7/16	3/32	6071101	5171101	6071101	5171101	6071101	5171101							
	7/16	1/8	6071102	5171102	6071102	5171102	6071102	5171102							
	1/2	No Key	6071211	5171211	6071211	5171211	6071211	5171211	3071211						
	1/2	1/8	6071200	5171200	6071200	5171200	6071200	5171200	3071200						
	9/16	No Key	6071411	5171411	6071411	5171411	6071411	5171411	3071411	3071411					
	9/16	1/8	6071400	5171400	6071400	5171400	6071400	5171400	3071400	3071400					
	5/8	No Key	6071511	5171511	6071511	5171511	6071511	5171511	3071511	3071511	3071511				
	5/8	3/32	6071501	5171501	6071501	5171501	6071501	5171501	3071501	3071501	3071501				
	5/8	5/32	6071503	5171503	6071503	5171503	6071503	5171503	3071503	3071503	3071503				
	5/8	3/16	6071500	5171500	6071500	5171500	6071500	5171500	3071500	3071500	3071500				
	11/16	3/16	6071700	5171700	6071700	5171700	6071700	5171700	3071700	3071700	3071700				
	3/4	No Key	6071911	5171911	6071911	5171911	6071911	5171911	3071911	3071911	3071911				
	3/4	1/8	6071901	5171901	6071901	5171901	6071901	5171901	3071901	3071901	3071901				
	3/4	3/16	6071900	5171900	6071900	5171900	6071900	5171900	3071900	3071900	3071900				
	13/16	3/16	6172000	5172000	6072000	5172000	6072000	5172000	3072000	3072000	3072000	3072000			
	7/8	No Key	6172211	5172211	6072211	5172211	6072211	5172211	3072211	3072211	3072211	3072211	3072211		
	7/8	3/16	6172200	5172200	6072200	5172200	6072200	5172200	3072200	3072200	3072200	3072200	3072200		
	7/8	1/4	6172202	5172202	6072202	5172202	6072202	5172202	3072202	3072202	3072202	3072202	3072202		
	15/16	1/4	6172300	5172300	6072300	5172300	6072300	5172300	3072300	3072300	3072300	3072300	3072300		
	1	1/4		5172500	6172500	5172500	6072500	5172500	3072500	3072500	3072500	3072500	3072500		
	1 1/16	1/4			6172600	5172600	6072600	5172600	3072600	3072600	3072600	3072600	3072600		
	1 1/8	1/4			6172800	5172800	6072800	5172800	3072800	3072800	3072800	3072800	3072800		
	1 3/16	1/4				5173000	6173000	5173000	3073000	3073000	3073000	3073000	3073000	3073000	
	1 1/4	1/4				5173100	6173100	5173100	3073100	3073100	3073100	3073100	3073100	3073100	
	1 1/4	5/16				5173102	6173102	5173102	3073102	3073102	3073102	3073102	3073102	3073102	
	1 5/16	5/16				5173300	6173300	5173300	3073300	3073300	3073300	3073300	3073300	3073300	
	1 3/8	5/16				5173400	6173400	5173400	3073400	3073400	3073400	3073400	3073400	3073400	
	1 3/8	3/8					6173401	5173401	3073401	3073401	3073401	3073401	3073401	3073401	
	1 7/16	3/8					6173600	5173600	3073600	3073600	3073600	3073600	3073600	3073600	
	1 1/2	5/16					6173802	5173802	3073802	3073802	3073802	3073802	3073802	3073802	
	1 1/2	3/8					6173800	5173800	3173800	3073800	3073800	3073800	3073800	3073800	
	1 9/16	3/8						5173900	3173900	3173900	3073900	3073900	3073900	3073900	
	1 5/8	3/8							3174100	3074100	3074100	3074100	3074100	3074100	3074100
	1 11/16	3/8							3174200	3174200	3074200	3074200	3074200	3074200	3074200
	1 3/4	3/8							3174400	3174400	3074400	3074400	3074400	3074000	3074000
	1 3/4	7/16							3174402	3174402	3074402	3074402	3074402	3074402	3074402
	1 13/16	1/2								3174600	3074600	3074600	3074600	3074600	3074600
	1 7/8	1/2								3174700	3074700	3074700	3074700	3074700	3074700
	1 15/16	1/2								3174900	3174900	3074900	3074900	3074900	3074900
	2	1/2								3175000	3175000	3075000	3075000	3075000	3075000
	2 1/16	1/2								3175200	3175200	3075200	3075200	3075200	3075200
	2 1/8	1/2								3175300	3175300	3075300	3075300	3075300	3075300
	2 3/16	1/2									3175500	3075500	3075500	3075500	3075500
	2 1/4	1/2									3175700	3075700	3075700	3075700	3075700
	2 3/8	5/8										3176000	3076000	3076000	3076000
	2 5/8	5/8										3176600		3076600	3076600
	2 7/8	3/4												3077300	3077300
	2 15/16	3/4												3077400	3077400
	3	3/4													3077600
	3 1/16	3/4													3077700
	3 1/8	3/4													3077900
	3 3/16	3/4													3077800
	3 1/4	3/4													3078200
	3 3/8	7/8													3078500
	3 7/16	7/8													3078700
	3 1/2	7/8													3078800

For ordering, select the product code, size, bore or **Spider** number above.

Product Code: **ROTEX®: BA02**

Product Code	Size	Part Number
BA02	**019**	**6071500**

Components



ROTEX® components

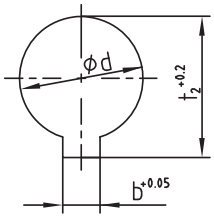
ROTEX® Size	Standard hub				Large hub			Spider	Driving flange			Coupling flange	DKM-spacer
	Part 1				Part 1a			Part 2	Part 3b	Part 3Na		Part 4N	Part 6
	Weight / Mass moment of inertia												
	Alu [lbs] [lbinsec²]	EN-GJL-250 [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	Alu [lbs] [lbinsec²]	EN-GJL-250 [lbs] [lbinsec²]	S [lbs] [lbinsec²]	Polyurethane [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	Alu [lbs] [lbinsec²]
14	–	–	–	–	0.04	–	–	0.01	–	–	–	–	–
	–	–	–	–	0.00003	–	–	–	–	–	–	–	–
19	0.12	–	–	–	0.15	–	0.40	0.02	–	–	–	–	–
	0.00009	–	–	–	0.00018	–	0.00044	0.00003	–	–	–	–	–
24	0.24	–	–	–	0.35	–	0.82	0.04	0.07	0.40	–	0.53	0.31
	0.00035	–	–	–	0.00080	–	0.00186	0.00009	0.00266	0.00080	–	0.00080	0.00053
28	0.40	–	–	–	0.56	–	1.41	0.07	1.28	0.66	–	0.86	0.49
	0.00080	–	–	–	0.00177	–	0.00425	0.00018	0.00708	0.00186	–	0.00177	0.00115
38	0.84	2.23	–	2.20	0.93	2.58	2.80	0.13	1.76	–	0.69	1.37	0.77
	0.00266	0.00797	–	0.00867	0.00389	0.01062	0.01239	0.00044	0.00885	–	0.00416	0.00443	0.00310
42	1.28	3.44	–	3.99	1.57	4.14	4.06	0.20	3.11	–	1.68	2.31	1.12
	0.00620	0.01770	–	0.02213	0.00974	0.02567	0.01505	0.00089	0.03540	–	0.01062	0.00974	0.00620
48	1.76	4.74	–	5.36	1.98	5.62	6.04	0.24	3.57	–	1.96	3.04	1.48
	0.00974	0.02655	–	0.03629	0.01416	0.04160	0.04602	0.00177	0.04425	–	0.01505	0.01593	0.00885
55	–	7.17	–	8.16	–	8.14	8.66	0.31	6.22	–	3.24	4.59	2.14
	–	0.05310	–	0.07257	–	0.07523	0.08850	0.00266	0.10620	–	0.03098	0.03098	0.01770
65	–	10.93	–	9.92	–	–	12.90	0.46	7.63	–	4.17	6.61	3.15
	–	0.10620	–	0.10620	–	–	0.16815	0.00443	0.15045	–	0.05222	0.05664	0.03540
75	–	17.24	–	15.83	–	–	19.97	0.86	11.09	–	6.61	10.71	4.85
	–	0.23010	–	0.23010	–	–	0.35400	0.01770	0.28320	–	0.11063	0.13275	0.07965
90	–	29.54	–	27.56	–	–	37.48	1.54	17.42	–	10.74	19.11	8.60
	–	0.59295	–	0.59295	–	–	1.03545	0.03540	0.64605	–	0.29205	0.37170	0.22125
100	–	–	37.04	–	–	–	–	1.98	–	–	16.64	27.78	–
	–	–	0.97350	–	–	–	–	0.06195	–	–	0.55755	0.68145	–
110	–	–	52.69	–	–	–	–	3.09	–	–	22.38	37.26	–
	–	–	1.77000	–	–	–	–	0.13275	–	–	0.97350	1.16820	–
125	–	–	78.48	–	–	–	–	4.19	–	–	32.85	57.32	–
	–	–	3.45150	–	–	–	–	0.22125	–	–	1.85850	2.38950	–
140	–	–	106.48	–	–	–	–	5.51	–	–	44.31	77.82	–
	–	–	5.75250	–	–	–	–	0.35400	–	–	3.00900	3.98250	–
160	–	–	154.98	–	–	–	–	8.60	–	–	67.02	117.07	–
	–	–	11.15100	–	–	–	–	0.70800	–	–	6.19500	7.87650	–
180	–	–	238.10	–	–	–	–	14.33	–	–	85.32	175.93	–
	–	–	20.79750	–	–	–	–	1.53105	–	–	10.08900	15.75300	–

Weight and mass moment of inertia each refer to the maximum finish bore without keyway.

Inch bores and taper bores

Stock programme inch bores

ROTEX® Size					19	24	28	38	42	48	55	65	75	90
Material					St	St	St	GG	GG	GG	GG	GG	GG	GG
Code	Ød	Ød Inch	$b^{+0,05}$	$t_2{}^{+0,2}$										
Tb	$9,5^{+0,03}$	3/8	3,17	11,1										
DNB	$11,11^{M7}$	7/16	2,4	12,5										
T	$12,69^{H7}$	1/2	4,75	14,6										
Ta	$12,7^{+0,03}$	1/2	3,17	14,3	●	●								
DNC	$13,45^{H7}$	17/32	3,17	14,9										
Do	$14,29^{+0,03}$	9/16	3,17	15,6										
E	$15,87^{+0,03}$	5/8	3,17	17,5										
Es	$15,88^{+0,03}$	5/8	4,00	17,7	●	●	●							
Ed	$15,87^{+0,03}$	5/8	4,75	18,1	●	●								
DNH	$17,465^{H7}$	11/16	4,75	19,6										
Ad	$19,02^{+0,03}$	3/4	3,17	20,7										
A	$19,05^{+0,03}$	3/4	4,78	21,3	●	●	●	●						
Gs	$22,22^{+0,03}$	7/8	4,78	24,4	●									
G	$22,22^{+0,03}$	7/8	4,75	24,7	●	●	●	●	●					
F	$22,22^{+0,03}$	7/8	6,38	25,2		●	●	●	●	●				
Gd	$22,225^{M7}$	7/8	4,76	24,7		●								
Gf	$23,80^{+0,03}$	15/16	6,35	26,8										
Bs	$25,38^{+0,03}$	1	6,37	28,3		●	●	●	●					
H	$25,40^{+0,03}$	1	4,78	27,8										
Hs	$25,40^{+0,03}$	1	6,35	28,7			●							
R	$26,95^{+0,03}$	1 1/16	4,78	29,3										
Sa	$28,575^{M7}$	1 1/8	6,35	31,7		●	●							
Sb	$28,58^{+0,03}$	1 1/8	6,35	31,5			●	●						
Sd	$28,58^{+0,03}$	1 1/8	7,93	32,1										
Js	$31,75^{+0,03}$	1 1/4	6,35	34,6										
K	$31,75^{K7}$	1 1/4	7,93	35,5			●	●	●	●	●	●		
Ma	$34,925^{M7}$	1 3/8	7,93	38,7			●							
RH1	$34,93^{M7}$	1 3/8	9,55	37,8										
Cb	$36,50^{+0,03}$	1 7/16	9,55	40,9										
Ca	$38,07^{+0,03}$	1 1/2	7,93	42,0										
C	$38,07^{+0,03}$	1 1/2	9,55	42,5			●	●	●	●	●	●	●	
Nb	$41,275^{M7}$	1 5/8	9,55	45,8				●	●					
Ls	$44,42^{+0,03}$	1 3/4	9,55	48,8										
L	$44,45^{K7}$	1 3/4	11,11	49,4						●	●			
Lu	$47,625^{M7}$	1 7/8	12,7	53,5					●					
Da	$49,20^{+0,03}$	1 15/16	12,7	55,0										
Ds	$50,77^{+0,03}$	2	12,7	56,4										
D	$50,80^{+0,03}$	2	12,7	55,1										
Pa	$53,975^{M7}$	2 1/8	12,7	60,0								●		
U	$57,10^{+0,03}$	2 1/4	12,7	62,9										
Ub	$60,325^{M7}$	2 3/8	15,875	67,6										
Wd	$85,725^{M7}$	3 3/8	22,225	95,8										
Wf	$92,075^{M7}$	3 5/8	22,225	101,9										



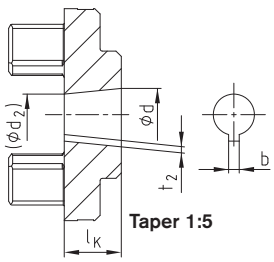
Basic programme taper 1:8

Code	$d^{+0,05}$	(d_2)	b^{JS9}	$t_2{}^{+0,1}$	l_K
...N.../ 1	9,7	7,575	2,4	10,85	17,0
...N.../ 1c	11,6	9,5375	3	12,90	16,5
...N.../ 1e	13,0	10,375	2,4	13,80	21,0
...N.../ 1d	14,0	11,813	3	15,50	17,5
...N.../ 1b	14,3	11,8625	3,2	15,65	19,5
...N.../ 2	17,287	14,287	3,2	18,24	24,0
...N.../ 2a	17,287	14,287	4	18,94	24,0
...N.../ 2b	17,287	14,287	3	18,34	24,0
...N.../ 3	22,002	18,6895	4	23,40	28,0
...N.../ 4	25,463	20,963	4,78	27,83	36,0
...N.../ 4b	25,463	20,963	5	28,23	36,0
...N.../ 4a	27,0	22,9375	4,78	28,80	32,5
...N.../ 4g	28,45	23,6375	6	29,32	38,5
...N.../ 5	33,176	27,676	6,38	35,39	44,0
...N.../ 5a	33,176	27,676	7	35,39	44,0
Basic programme taper 1:10					
CX	19,95	16,75	5	22,08	32
DX	24,95	20,45	6	26,68	45
EX	29,75	24,75	8	31,88	50

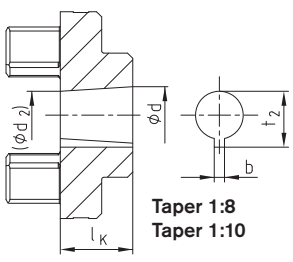
Basic programme taper 1:5

Code	$d^{+0,05}$	(d_2)	b^{JS9}	$t_2{}^{+0,1}$	l_K
A-10	9,85	7,55	2	1,0	11,5
B-17	16,85	13,15	3	1,8	18,5
C-20	19,85	15,55	4	2,2	21,5
Cs-22	21,95	17,65	3	1,8	21,5
D-25	24,85	19,821	5	2,9	26,5
E-30	29,85	23,55	6	2,6	31,5
F-35	34,85	27,55	6	2,6	36,5
G-40	39,85	32,85	6	2,6	35,0

With codes N.../6 and N.../6a parallel to taper the respective pump code should be started before ...N and the respective size of coupling before and behind ...N.../.



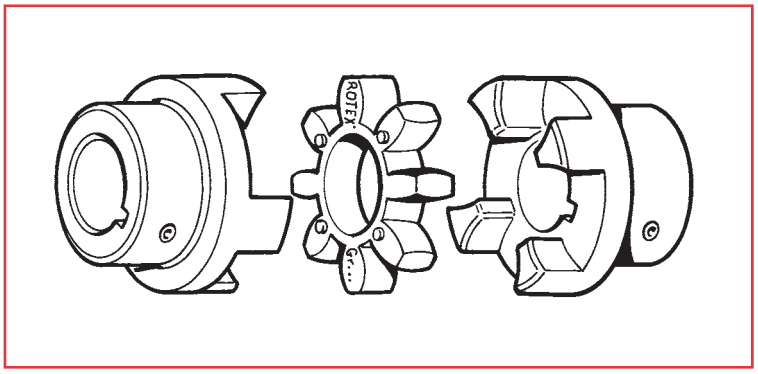
Taper 1:5



Taper 1:8
Taper 1:10

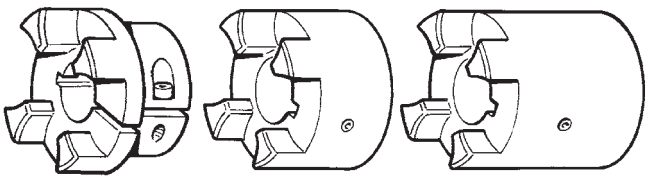
ROTEX® Coupling Features

For over 30 years, the **ROTEX®** curved jaw coupling has provided unmatched reliability and efficiency in the most demanding applications. The vast selection of hub and spider materials, combined with design features such as vibration damping, fail safe and lubrication free, makes the **ROTEX®** coupling an ideal choice for shaft connections.



Hub Materials, Sizes and Styles

- Four standard hub materials to suit every application
  - Cast Aluminum
  - Cast Iron
  - Nodular Iron
  - Steel
- Sixteen coupling sizes
- Bore sizes up to 7.875 inches
- Nominal torque up to 309,750 lb in
- Three hub designs to fit your requirements
  - Regular (low mass)
  - Large (larger bores)
  - Long (extended shaft gaps)



Regular Hub (Cross Clamped) | **Large Hub (Set Screw)** | **Long Hub (Set Screw)**

Lubrication Free

• The non-lubricated design simplifies every application and is ideal for clean environments or difficult access installations.

Fail Safe

• The interlocking jaw design will allow a controlled shutdown should a spider overload failure occur.

Maintenance Free

• The **ROTEX®** coupling does not require any periodic maintenance. Its open design allows a simple visual inspection.

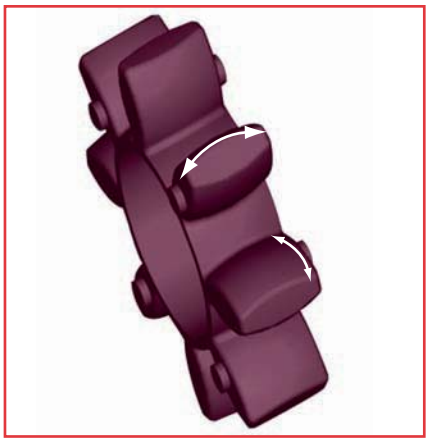
Hub-Shaft Connections

• **ROTEX®** hubs can be ordered in many configurations, such as
  - Straight bore and set screw,
  - Splined bore and cross clamp,
  - Tapered bore and set screw.

ROTEX® Special Spider Materials 1)

Spider Durometer	Spider Color	Spider Material	Admissible Temp. (F)		Material Characteristics
			Continuous	Intermittent	
94 Sh A-T	Blue (2)	Urethane	-60 to +230	-75 to +265	Moisture and hydrolysis resistant, high load damping effect.
64 Sh D-H	Green	Hytrel	-60 to +230	-75 to +265	High temperature resistant, high torsional stiffness.
PA	White	Polyamide	-4 to +230	-22 to +245	High temp. and chemical resistant, high torsional stiffness.

1) Please consult KTR for size availability on special spiders. 2) 94 Sh A-T (Blue) spiders have yellow dots on the end of spider legs.



ROTEX® Spider Design

ROTEX® double crowned spiders are made with high grade urethane or Hytrel® in several hardnesses to suit the vibration or shock absorption needs of your application. The spider materials offer excellent memory to regain shape maintaining the integrity of the coupling.
The double crowned leg design eliminates edge pressure normally caused by angular and parallel misalignments, allowing the spider to outlast the conventional flat design.

Misalignment

• Due to the double crowned spider and concave jaw design, the **ROTEX®** coupling allows angular misalignment without edge pressure.

Excellent Durability

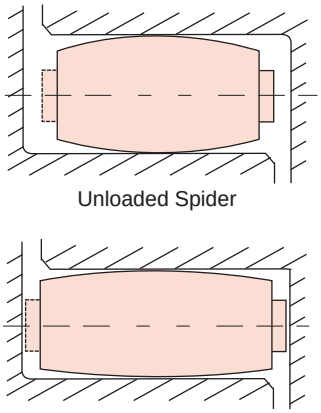
• Urethane and Hytrel® spiders are resistant to most chemicals and higher ambient temperatures for outdoor and industrial environments.

Long Life

• Spider low mass and special compounding dissipate heat and minimize hysteresis, giving the spider long life and superior performance.

Electrical Isolation

• Urethane spiders prevent electrical surges to be transmitted between driver and driven side.



Vibration Damping

• A progressive damping effect is accomplished through the **ROTEX®** double crowned design and materials. This design adjusts to the concave hub jaw providing a controlled expansion which absorbs shocks and reduces vibrations. The high grade molded urethane spider offers excellent memory to regain shape after absorbing high shocks.

ROTEX® Standard Spider Materials

Spider Durometer	Image	Spider Color / Material	Admissible Temp. [F] Continuous / Intermittent	Sizes Available
92 Sh A		Yellow / Urethane	-40 to 195 / -55 to 245	19 - 180
98 Sh A 2)		Red / Urethane	-20 to 195 / -40 to 245	19 -180
64 Sh D-F		White 2) / Urethane	-20 to 230 / -20 to 265	24 - 180

1) For sizes 65 and above the durometer is 95 Sh A.
2) White spiders have green dots at the end of spider legs.

• Special Spider materials are available on request.

The following information is required for the selection of a **ROTEX®** coupling;

- Drive power (HP) _____
- Drive speed (RPM) _____
- Driver component shaft size _____
- Driven component shaft size _____
- Ambient Temperature _____
- Starts per hour _____

Selection Procedure:

1) Calculate **Nominal system torque (T_N)**:
Using the formula below, calculate the **Nominal system torque (T_N)** for your application.

$T_N = 63000 \bullet HP / RPM$

2) Calculate **Total Service Factor (S)**:
Using safety factor tables select **application service factor (S_B), starts per hour (S_Z) and ambient temp. (S_t)**. Select multipliers which best fit your application. Using the formula below calculate **total service factor (S)**.

$S = S_B \bullet S_Z \bullet S_t$

3) Select a coupling:
Select the **ROTEX®** coupling which has a **nominal coupling torque (T_{KN})** equal to or greater than the **nominal system torque (T_N)** multiplied by the **total service factor (S)**.

$T_{KN} \geq T_N \bullet S$

4) Verifying maximum permissible torque:
Using the torque table on page 15, ensure the **rated maximum torque (T_{Kmax})** of the selected coupling is equal to or greater than **system peak torque (T_S)** multiplied by the **ambient temperature service factor (S_t)**.

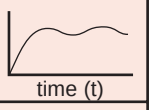
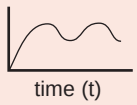
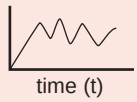
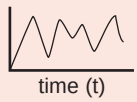
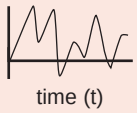
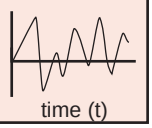
$T_{Kmax} \geq T_S \bullet S_t$

5) Verify maximum permissible speed:
Using the table on page 15, please verify the speed of your application does not exceed the maximum speed allowed.

6) Verify maximum permissible bore and dimensions:
Using tables on pages 16, 17 and 18, ensure the maximum bore of the coupling selected is not exceeded. Please, note that different materials may allow different maximum bores. Also, verify that length, diameter and mimimum shaft gap (E) recommended fit your application needs.

7) Verify maximum permissible misalignment:
Using the table on page 26, verify permissible misalignments for the coupling size selected. Please, note that max. angular and max. parallel misalignments are not to be used concurrently. For further information please consult KTR.

Application Service Factors:

Application Style	S_B	TorqueCurve
Uniform operation (small driven masses) Hydraulic-gear pumps, fans	1.0	
Uniform operation (medium driven masses) Axial piston pumps,machine tools, textile and mixing machines, metal bending machines, blowers, screw compressors	1.2	
Non-uniform operation (medium driven masses) Generators, freight elevators, winches belt conveyors	1.5	
Non-uniform operation (medium driven masses w/ shocks) Centrifuges, concrete mixers, chain conveyors, lifts, cement mills	1.6	
Non-uniform operation (heavy masses w/ large shocks) Hammer drills, piston pumps, forging presses, rubber rollers, rotary boring machines	1.8	
Non-uniform operation (heavy masses w/ extreme shocks) Piston compressors, stone crushers, brick presses, rolling mills	2.5	

Ambient Temperature Service Factors:

Temperature (F)	-20°/ 80°	100°	140°	175°
S_t	1.0	1.2	1.4	1.8

Starts per Hour Service Factors:

Starts per hour	100	200	400	800
S_Z	1.0	1.2	1.4	1.6

Table of Terms

Term	Abbreviation	Definition
Nominal system torque	T_N	Nominal torque of the system to be transmitted by the coupling
Peak torque of the system	T_S	Peak torque of the system to be transmitted by the coupling
Operating service factor	S_B	Service factor used to account for different types of driven machine
Temperature service factor	S_t	Service factor used to account for ambient temperatures
Start up service factor	S_Z	Service factor used to account for frequency of start ups
Nominal coupling torque	T_{KN}	Continuous torque to be transmitted throughout the entire coupling speed range
Maximum coupling torque	T_{Kmax}	Torque to be transmitted $1x10^5$ times as a peak load or $0.5x10^4$ times as an alternating load during the entire life of the coupling

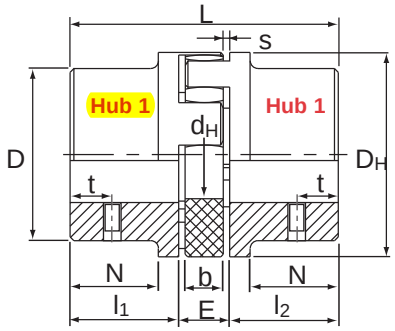
Size (for all hub materials)	Maximum speed [1] [RPM]	Wind-up Angle		Torque [3] [lb in]		Dynamic Torsional Stiffness [X10³ lb in / rad]				HP [RPM]		
		Nominal Torque	Maximum Torque	Nominal	Maximum	100% T_{KN}	75% T_{KN}	50% T_{KN}	25% T_{KN}	100	1200	1800
Urethane Spider - 92 Shore A (yellow)												
19	14000			88	177	11.3	9.3	7.1	4.2	0.1	1.7	2.5
24	10600			310	620	43.0	35.2	26.6	15.8	0.5	6.0	9.0
28	8500			840	1,680	96.5	79.1	59.8	35.5	1	16	24
38	7100			1,680	3,360	186.3	152.8	115.5	68.5	3	32	45
42	6000			2,345	4,690	210.1	172.3	130.3	77.3	4	45	67
48	5600			2,740	5,485	324.8	266.3	201.3	119.4	4	52	78
55	4750			3,625	7,255	448.9	368.1	278.3	165.0	6	69	104
65	4250	3.2°	5°	5,530	11,060	859.6	704.9	532.9	315.9	9	105	158
75	3550			11,325	22,655	1,002.9	822.3	621.8	368.6	18	216	324
90	2800			21,240	42,480	1,682.3	1,379.4	1,043.1	618.3	34	404	607
100	2500			29,205	58,410	2,239.8	1,836.6	1,388.7	823.1	46	556	834
110	2240			42,480	84,960	2,757.7	2,261.4	1,709.8	1,013.5	67	809	1213
125	2000			58,850	117,705	4,202.5	3,446.1	2,605.5	1,544.4	93	1121	1681
140	1800			75,665	151,335	5,845.3	4,793.2	3,624.1	2,148.2	120	1441	2161
160	1500			113,280	226,560	7,879.7	6,461.4	4,885.5	2,895.8	180	2157	3235
180	1400			165,050	330,105	22,731.8	18,640.0	14,093.7	8,354.0	262	3143	4714
Urethane Spider - 98 Shore A / 95 Shore A size 65 and above (red)												
19	14000			150	300	25.8	21.2	16.0	9.5	0.2	2.9	4.3
24	10600			530	1,060	87.9	72.0	54.5	32.3	0.8	10	15
28	8500			1,415	2,830	236.9	194.3	146.9	87.1	2	27	40
38	7100			2,875	5,750	429.8	352.5	266.5	158.0	5	55	82
42	6000			3,980	7,965	482.3	395.5	299.0	177.3	6	76	114
48	5600			4,645	9,290	577.8	473.8	358.2	212.4	7	88	133
55	4750			6,060	12,125	840.5	689.2	521.1	308.9	10	115	173
65	4250	3.2°	5°	8,320	16,635	1,146.2	939.9	710.7	421.3	13	158	238
75	3550			16,990	33,980	1,747.9	1,433.3	1,083.7	642.3	27	324	485
90	2800			31,860	63,720	2,763.0	2,265.6	1,713.0	1,015.4	51	607	910
100	2500			43,805	87,615	3,391.9	2,781.3	1,102.9	1,246.5	71	834	1251
110	2240			63,720	127,440	6,107.0	5,007.8	3,786.4	2,244.4	101	1213	1820
125	2000			88,500	177,000	11,891.2	9,750.8	7,372.6	4,370.0	140	1685	2528
140	1800			113,280	226,560	12,607.5	10,338.2	7,816.7	4,633.3	180	2157	3235
160	1500			169,920	339,840	21,967.7	18,013.6	13,620.0	8,073.1	270	3235	4853
180	1400			247,800	495,600	31,518.8	25,845.5	19,541.7	11,583.2	393	4718	7077
Urethane Spider of 64 Shore D-F (white w/ green dots on spider legs) [2]												
19	14000			185	370	47.3	38.9	29.4	17.4	0.3	3.5	5.3
24	10600			660	1,325	133.7	109.7	82.9	49.1	1	13	19
28	8500			1,770	3,540	243.6	199.7	151.0	89.6	3	34	51
38	7100			3,585	7,170	620.8	509.1	384.9	228.2	6	68	102
42	6000			4,955	9,910	706.8	579.6	438.3	259.7	8	94	142
48	5600			5,795	11,590	845.3	693.1	524.1	310.6	9	110	166
55	4750			7,300	14,600	955.1	783.2	592.2	351.0	12	139	209
65	4250	2.5°	3.6°	10,395	20,795	1,337.1	1,096.5	829.1	491.4	16	198	297
75	3550			21,240	42,480	2,196.7	1,801.3	1,362.0	807.3	34	404	607
90	2800			39,825	79,650	5,969.5	4,895.0	3,701.1	2,193.8	63	758	1137
100	2500			54,735	109,475	7,621.4	6,249.5	4,725.3	2,800.8	87	1042	1563
110	2240			79,650	159,300	10,076.5	8,262.7	6,247.4	3,703.1	126	1517	2275
125	2000			110,625	221,250	12,703.1	10,416.5	7,875.9	4,668.4	176	2106	3159
140	1800			141,600	283,200	15,759.5	12,922.8	9,770.8	5,791.6	225	2696	4044
160	1500			212,400	424,800	27,220.8	22,321.1	16,877.0	10,003.7	337	4044	6066
180	1400			309,750	619,500	53,200.0	43,624.0	32,984.0	19,551.0	491	5898	8846

1) For operating speeds above maximum use only steel or nodular iron hubs, dynamic balancing required.
2) KTR recommends using this spider hardness with steel and nodular iron hubs only.

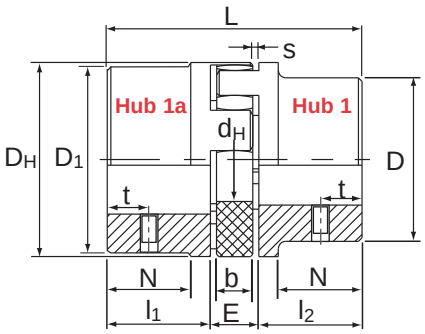
3) Alternating torque = 74% nominal torque

ROTEX® Curved Jaw **Standard Couplings**

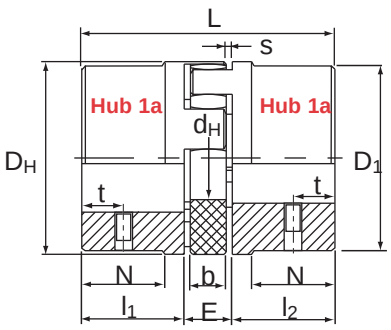
- Low mass cast aluminum hubs up to size 28
- Cast and nodular iron hubs from size 38 up to 180
- Inch bore sizes machined to AGMA 9002-A86 class 1 fit
  Inch key sizes machined to ANSI B17.1
- Metric bore sizes machined to ISO H7 fit
  Metric key sizes machined to DIN 6885 JS9



Coupling Style 01 - 2 hubs design 1



Coupling Style 02 - 1 hub design 1/
1 hub design 1a



Coupling Style 03 - 2 hubs design 1a

Cplg. Size	Hub Design	Cast Aluminum (AL-D) - Dimension [in] *Not recommended with cross clamp*												
		Bore min	Bore max	D; D1	L	l1; l2	E	b	s	DH	dH	N	Set Screw Size	Set Screw t
19	1	0.236	0.750	1.26	2.60	0.98	0.63	0.47	0.08	1.61	0.71	0.79	M5	0.39
	1a	0.750	0.938	1.61										
24	1	0.354	0.938	1.57	3.07	1.18	0.71	0.55	0.08	2.20	1.06	0.94	M5	0.39
	1a	0.866	1.125	2.20										
28	1	0.394	1.125	1.89	3.54	1.38	0.79	0.59	0.10	2.64	1.18	1.10	M8	0.59
	1a	1.102	1.500	2.64										

Cplg. Size	Hub Design	Cast Iron (GG25) - Dimension [in] *Not recommended with cross clamp*												
		Bore min	Bore max	D; D1	L	l1; l2	E	b	s	DH	dH	N	Set Screw Size	Set Screw t
38	1	0.472	1.500	2.60	4.49	1.77	0.94	0.71	0.12	3.15	1.50	1.46	M8	0.59
	1a	1.496	1.750	3.07										
	1b				6.46	2.76						2.44		
42	1	0.551	1.688	2.95	4.96	1.97	1.02	0.79	0.12	3.74	1.81	1.57	M8	0.79
	1a	1.654	2.156	3.70										
	1b				6.93	2.95						2.56		
48	1	0.591	1.875	3.35	5.51	2.20	1.10	0.83	0.14	4.13	2.01	1.77	M8	0.79
	1a	1.890	2.375	4.09										
	1b				7.40	3.15						2.72		
55	1	0.787	2.156	3.86	6.30	2.56	1.18	0.87	0.16	4.72	2.36	2.05	M10	0.79
	1a	2.165	2.750	4.65										
	1b				8.27	3.54								
65	1	0.866	2.500	4.53	7.28	2.95	1.38	1.02	0.18	5.31	2.68	2.40	M10	0.79
75	1	1.181	2.938	5.31	8.27	3.35	1.57	1.18	0.20	6.30	3.15	2.72	M10	0.98
90	1	1.575	3.500	6.30	9.65	3.94	1.77	1.34	0.22	7.87	3.94	3.19	M12	1.18

Note - 1b designates extended length hub

***See pages 30 and 31 for ROTEX® part numbers.**

Cplg. Size	Hub Design	Nodular Iron (GGG40) - Dimension [in] *Not recommended with cross clamp*												
		Bore min	Bore max	D; D1	L	l1; l2	E	b	s	DH	dH	N	Set Screw Size	Set Screw t
100	1	1.969	4.500	7.09	10.63	4.33	1.97	1.50	0.24	8.86	4.45	3.50	M12	1.18
110	1	2.362	4.875	7.87	11.61	4.72	2.17	1.65	0.26	10.04	5.00	3.78	M16	1.38
125	1	2.362	5.688	9.06	13.39	5.51	2.36	1.81	0.28	11.42	5.79	4.40	M16	1.57
140	1	2.362	6.250	10.04	14.76	6.10	2.56	1.97	0.30	12.60	6.50	4.88	M20	1.77
160	1	3.150	7.250	11.42	16.73	6.89	2.95	2.24	0.35	14.57	7.48	5.51	M20	1.97
180	1	3.346	7.875	12.80	18.70	7.68	3.35	2.52	0.41	16.54	8.66	6.14	M20	1.97

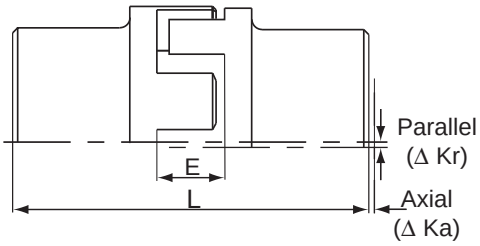
Misalignments

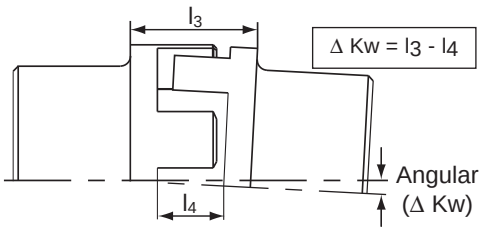
Axial Misalignment (Δ Ka):
Mount hubs on shafts to maintain the ''E'' dimension. If any one shaft must extend into the ''E'' dimension ensure that its maximum diameter is less than the ''d_W'' dimension. If axial travel of either shaft is expected, allow slightly larger gap between hub and spider. Spider pads should not be under axial compression when installed.

Parallel Misalignment (Δ Kr):
Use straight edge and feeler gage on top and sides of coupling without rotating it. A careful parallel alignment will extended the life of coupling and all other drive train components.

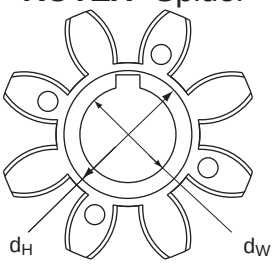
Angular Misalignment (Δ Kw) :
Ensure max. angular misalignment is not exceeded. If a manual calculation is needed please apply misalignment formula.

NOTE: For applications with larger parallel and angular misalignments please see **ROTEX®** style DKM on page22.

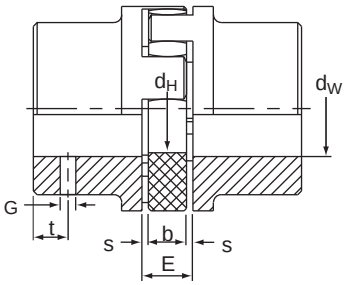




ROTEX® Spider



ROTEX® Assembly



Set-Screw Tightening TQ lb in	
M5	18
M6	42
M8	88
M10	150
M12	350
M16	710
M20	1240

Dimensions \ Coupling Size		19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
E (in)		0.63	0.71	0.79	0.94	1.02	1.10	1.18	1.38	1.57	1.77	1.97	2.17	2.36	2.56	2.95	3.35
s (in)		0.08	0.08	0.10	0.12	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.35	0.41
d_H (in) [1]		0.71	1.06	1.18	1.50	1.81	2.01	2.36	2.68	3.15	3.94	4.45	5.00	5.79	6.50	7.48	8.66
d_W (in) [2]		0.500	0.750	0.875	1.125	1.375	1.500	1.875	2.125	2.500	3.125	3.625	3.875	4.500	5.250	6.000	7.000
G [3]		M5	M5	M8	M8	M8	M8	M10	M10	M10	M12	M12	M16	M16	M20	M20	M20
t (in)		0.39	0.39	0.59	0.59	0.79	0.79	0.79	0.79	0.98	1.18	1.18	1.38	1.57	1.77	1.97	1.97
Max. Axial Misalignment Δ Ka	(in)	-0.02 +0.05	-0.02 +0.06	-0.03 +0.06	-0.03 +0.07	-0.04 +0.08	-0.04 +0.08	-0.04 +0.09	-0.04 +0.10	-0.06 +0.12	-0.06 +0.13	-0.06 +0.15	-0.08 +0.17	-0.08 +0.18	-0.08 +0.20	-0.10 +0.22	-0.12 +0.25
1500 rpm: Max. Parallel [4] Misalignment Δ Kr	(in)	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.018	0.019	0.020	0.021	0.024	0.024	0.025	0.027
1500 rpm: Max. Angular [4] Misalignment Δ Kw	(deg.)	1.2	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2
	(in)	0.03	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.13	0.17	0.19	0.22	0.25	0.26	0.30	0.35

1) Spider inside diameter is equal to d_H.
2) Maximum shaft size (including keyway) to extend into the spider.
3) Inch fasteners available upon request.
(See KTR assembly instructions at www.ktrcorp.com)
4) Maximum angular and maximum parallel misalignments are not to be used concurrently, for further information please consult KTR.

	Size		019		024		028		038	042	048	055	065	075	090
Spider	92 SA Yellow		1000001		1000001		1000001		1000001	1000001	1000001	1000001	1000001	1000001	1000001
	98 SA Red		1000002		1000002		1000002		1000002	1000002	1000002	1000002	1000002	1000002	1000002
	64 SD-H		1000025		1000025		1000025		1000025	1000025	1000025	1000025	1000025	1000025	1000015
	Hub Material		AL	ST	AL	ST	AL	ST	CI	CI	CI	CI	CI	CI	CI
Hub	Bore [in]	Key [in]	Stock Sizes Highlighted												
	1/4	No Key	6070611	5170611											
	5/16	No Key	6070711	5170711											
	3/8	3/32	6070902	5170902	6070902	5170902									
	3/8	1/8	6070903	5170903	6070903	5170903									
	7/16	No Key	6071111	5171111	6071111	5171111	6071111	5171111							
	7/16	3/32	6071101	5171101	6071101	5171101	6071101	5171101							
	7/16	1/8	6071102	5171102	6071102	5171102	6071102	5171102							
	1/2	No Key	6071211	5171211	6071211	5171211	6071211	5171211	3071211						
	1/2	1/8	6071200	5171200	6071200	5171200	6071200	5171200	3071200						
	9/16	No Key	6071411	5171411	6071411	5171411	6071411	5171411	3071411	3071411					
	9/16	1/8	6071400	5171400	6071400	5171400	6071400	5171400	3071400	3071400					
	5/8	No Key	6071511	5171511	6071511	5171511	6071511	5171511	3071511	3071511	3071511				
	5/8	3/32	6071501	5171501	6071501	5171501	6071501	5171501	3071501	3071501	3071501				
	5/8	5/32	6071503	5171503	6071503	5171503	6071503	5171503	3071503	3071503	3071503				
	5/8	3/16	6071500	5171500	6071500	5171500	6071500	5171500	3071500	3071500	3071500				
	11/16	3/16	6071700	5171700	6071700	5171700	6071700	5171700	3071700	3071700	3071700				
	3/4	No Key	6071911	5171911	6071911	5171911	6071911	5171911	3071911	3071911	3071911				
	3/4	1/8	6071901	5171901	6071901	5171901	6071901	5171901	3071901	3071901	3071901				
	3/4	3/16	6071900	5171900	6071900	5171900	6071900	5171900	3071900	3071900	3071900				
	13/16	3/16	6172000	5172000	6072000	5172000	6072000	5172000	3072000	3072000	3072000	3072000			
	7/8	No Key	6172211	5172211	6072211	5172211	6072211	5172211	3072211	3072211	3072211	3072211	3072211		
	7/8	3/16	6172200	5172200	6072200	5172200	6072200	5172200	3072200	3072200	3072200	3072200	3072200		
	7/8	1/4	6172202	5172202	6072202	5172202	6072202	5172202	3072202	3072202	3072202	3072202	3072202		
	15/16	1/4	6172300	5172300	6072300	5172300	6072300	5172300	3072300	3072300	3072300	3072300	3072300		
	1	1/4		5172500	6172500	5172500	6072500	5172500	3072500	3072500	3072500	3072500	3072500		
	1 1/16	1/4			6172600	5172600	6072600	5172600	3072600	3072600	3072600	3072600	3072600		
	1 1/8	1/4			6172800	5172800	6072800	5172800	3072800	3072800	3072800	3072800	3072800		
	1 3/16	1/4				5173000	6173000	5173000	3073000	3073000	3073000	3073000	3073000	3073000	
	1 1/4	1/4				5173100	6173100	5173100	3073100	3073100	3073100	3073100	3073100	3073100	
	1 1/4	5/16				5173102	6173102	5173102	3073102	3073102	3073102	3073102	3073102	3073102	
	1 5/16	5/16				5173300	6173300	5173300	3073300	3073300	3073300	3073300	3073300	3073300	
	1 3/8	5/16				5173400	6173400	5173400	3073400	3073400	3073400	3073400	3073400	3073400	
	1 3/8	3/8					6173401	5173401	3073401	3073401	3073401	3073401	3073401	3073401	
	1 7/16	3/8					6173600	5173600	3073600	3073600	3073600	3073600	3073600	3073600	
	1 1/2	5/16					6173802	5173802	3073802	3073802	3073802	3073802	3073802	3073802	
	1 1/2	3/8					6173800	5173800	3173800	3073800	3073800	3073800	3073800	3073800	
	1 9/16	3/8						5173900	3173900	3173900	3073900	3073900	3073900	3073900	
	1 5/8	3/8							3174100	3074100	3074100	3074100	3074100	3074100	3074100
	1 11/16	3/8							3174200	3174200	3074200	3074200	3074200	3074200	3074200
	1 3/4	3/8							3174400	3174400	3074400	3074400	3074400	3074000	3074000
	1 3/4	7/16							3174402	3174402	3074402	3074402	3074402	3074402	3074402
	1 13/16	1/2								3174600	3074600	3074600	3074600	3074600	3074600
	1 7/8	1/2								3174700	3074700	3074700	3074700	3074700	3074700
	1 15/16	1/2								3174900	3074900	3074900	3074900	3074900	3074900
	2	1/2								3175000	3175000	3075000	3075000	3075000	3075000
	2 1/16	1/2								3175200	3175200	3075200	3075200	3075200	3075200
	2 1/8	1/2								3175300	3175300	3075300	3075300	3075300	3075300
	2 3/16	1/2									3175500	3075500	3075500	3075500	3075500
	2 1/4	1/2									3175700	3075700	3075700	3075700	3075700
	2 3/8	5/8										3176000	3076000	3076000	3076000
	2 5/8	5/8										3176600		3076600	3076600
	2 7/8	3/4												3077300	3077300
	2 15/16	3/4												3077400	3077400
	3	3/4													3077600
	3 1/16	3/4													3077700
	3 1/8	3/4													3077900
	3 3/16	3/4													3077800
	3 1/4	3/4													3078200
	3 3/8	7/8													3078500
	3 7/16	7/8													3078700
	3 1/2	7/8													3078800

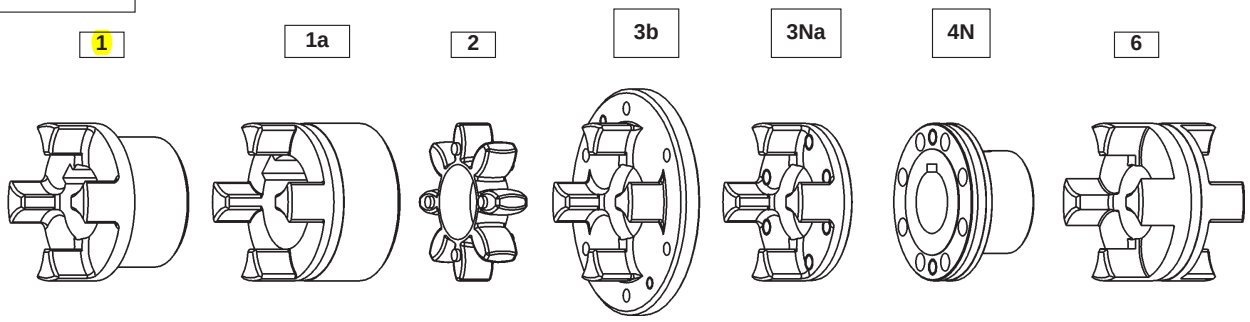
For ordering, select the product code, size, bore or **Spider** number above.

Product Code: **ROTEX®: BA02**

Product Code	Size	Part Number
BA02	**019**	**6071500**

Metric catalog available: web **www.ktrcorp.com**, call **(219) 872-9100** or fax **(219) 872-9150**

Components



ROTEX® components

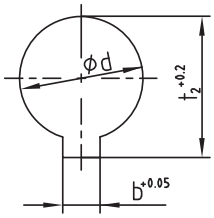
ROTEX® Size	Standard hub				Large hub			Spider	Driving flange			Coupling flange	DKM-spacer
	Part 1				Part 1a			Part 2	Part 3b	Part 3Na		Part 4N	Part 6
	Weight / Mass moment of inertia												
	Alu [lbs] [lbinsec²]	EN-GJL-250 [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	Alu [lbs] [lbinsec²]	EN-GJL-250 [lbs] [lbinsec²]	S [lbs] [lbinsec²]	Polyurethane [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	Alu [lbs] [lbinsec²]
14	–	–	–	–	0.04	–	–	0.01	–	–	–	–	–
	–	–	–	–	0.00003	–	–	–	–	–	–	–	–
19	0.12	–	–	–	0.15	–	0.40	0.02	–	–	–	–	–
	0.00009	–	–	–	0.00018	–	0.00044	0.00003	–	–	–	–	–
24	0.24	–	–	–	0.35	–	0.82	0.04	0.07	0.40	–	0.53	0.31
	0.00035	–	–	–	0.00080	–	0.00186	0.00009	0.00266	0.00080	–	0.00080	0.00053
28	0.40	–	–	–	0.56	–	1.41	0.07	1.28	0.66	–	0.86	0.49
	0.00080	–	–	–	0.00177	–	0.00425	0.00018	0.00708	0.00186	–	0.00177	0.00115
38	0.84	2.23	–	2.20	0.93	2.58	2.80	0.13	1.76	–	0.69	1.37	0.77
	0.00266	0.00797	–	0.00867	0.00389	0.01062	0.01239	0.00044	0.00885	–	0.00416	0.00443	0.00310
42	1.28	3.44	–	3.99	1.57	4.14	4.06	0.20	3.11	–	1.68	2.31	1.12
	0.00620	0.01770	–	0.02213	0.00974	0.02567	0.01505	0.00089	0.03540	–	0.01062	0.00974	0.00620
48	1.76	4.74	–	5.36	1.98	5.62	6.04	0.24	3.57	–	1.96	3.04	1.48
	0.00974	0.02655	–	0.03629	0.01416	0.04160	0.04602	0.00177	0.04425	–	0.01505	0.01593	0.00885
55	–	7.17	–	8.16	–	8.14	8.66	0.31	6.22	–	3.24	4.59	2.14
	–	0.05310	–	0.07257	–	0.07523	0.08850	0.00266	0.10620	–	0.03098	0.03098	0.01770
65	–	10.93	–	9.92	–	–	12.90	0.46	7.63	–	4.17	6.61	3.15
	–	0.10620	–	0.10620	–	–	0.16815	0.00443	0.15045	–	0.05222	0.05664	0.03540
75	–	17.24	–	15.83	–	–	19.97	0.86	11.09	–	6.61	10.71	4.85
	–	0.23010	–	0.23010	–	–	0.35400	0.01770	0.28320	–	0.11063	0.13275	0.07965
90	–	29.54	–	27.56	–	–	37.48	1.54	17.42	–	10.74	19.11	8.60
	–	0.59295	–	0.59295	–	–	1.03545	0.03540	0.64605	–	0.29205	0.37170	0.22125
100	–	–	37.04	–	–	–	–	1.98	–	–	16.64	27.78	–
	–	–	0.97350	–	–	–	–	0.06195	–	–	0.55755	0.68145	–
110	–	–	52.69	–	–	–	–	3.09	–	–	22.38	37.26	–
	–	–	1.77000	–	–	–	–	0.13275	–	–	0.97350	1.16820	–
125	–	–	78.48	–	–	–	–	4.19	–	–	32.85	57.32	–
	–	–	3.45150	–	–	–	–	0.22125	–	–	1.85850	2.38950	–
140	–	–	106.48	–	–	–	–	5.51	–	–	44.31	77.82	–
	–	–	5.75250	–	–	–	–	0.35400	–	–	3.00900	3.98250	–
160	–	–	154.98	–	–	–	–	8.60	–	–	67.02	117.07	–
	–	–	11.15100	–	–	–	–	0.70800	–	–	6.19500	7.87650	–
180	–	–	238.10	–	–	–	–	14.33	–	–	85.32	175.93	–
	–	–	20.79750	–	–	–	–	1.53105	–	–	10.08900	15.75300	–

Weight and mass moment of inertia each refer to the maximum finish bore without keyway.

Inch bores and taper bores

Stock programme inch bores

ROTEX® Size					19	24	28	38	42	48	55	65	75	90
Material					St	St	St	GG	GG	GG	GG	GG	GG	GG
Code	Ød	Ød Inch	$b^{+0,05}$	$t_2{}^{+0,2}$										
Tb	$9,5^{+0,03}$	3/8	3,17	11,1										
DNB	$11,11^{M7}$	7/16	2,4	12,5										
T	$12,69^{H7}$	1/2	4,75	14,6										
Ta	$12,7^{+0,03}$	1/2	3,17	14,3	●	●								
DNC	$13,45^{H7}$	17/32	3,17	14,9										
Do	$14,29^{+0,03}$	9/16	3,17	15,6										
E	$15,87^{+0,03}$	5/8	3,17	17,5										
Es	$15,88^{+0,03}$	5/8	4,00	17,7	●	●	●							
Ed	$15,87^{+0,03}$	5/8	4,75	18,1	●	●								
DNH	$17,465^{H7}$	11/16	4,75	19,6										
Ad	$19,02^{+0,03}$	3/4	3,17	20,7										
A	$19,05^{+0,03}$	3/4	4,78	21,3	●	●	●	●						
Gs	$22,22^{+0,03}$	7/8	4,78	24,4	●									
G	$22,22^{+0,03}$	7/8	4,75	24,7	●	●	●	●	●					
F	$22,22^{+0,03}$	7/8	6,38	25,2		●	●	●	●	●				
Gd	$22,225^{M7}$	7/8	4,76	24,7		●								
Gf	$23,80^{+0,03}$	15/16	6,35	26,8										
Bs	$25,38^{+0,03}$	1	6,37	28,3		●	●	●	●					
H	$25,40^{+0,03}$	1	4,78	27,8										
Hs	$25,40^{+0,03}$	1	6,35	28,7			●							
R	$26,95^{+0,03}$	1 1/16	4,78	29,3										
Sa	$28,575^{M7}$	1 1/8	6,35	31,7		●	●							
Sb	$28,58^{+0,03}$	1 1/8	6,35	31,5			●	●						
Sd	$28,58^{+0,03}$	1 1/8	7,93	32,1										
Js	$31,75^{+0,03}$	1 1/4	6,35	34,6										
K	$31,75^{K7}$	1 1/4	7,93	35,5			●	●	●	●	●	●		
Ma	$34,925^{M7}$	1 3/8	7,93	38,7			●							
RH1	$34,93^{M7}$	1 3/8	9,55	37,8										
Cb	$36,50^{+0,03}$	1 7/16	9,55	40,9										
Ca	$38,07^{+0,03}$	1 1/2	7,93	42,0										
C	$38,07^{+0,03}$	1 1/2	9,55	42,5			●	●	●	●	●	●	●	
Nb	$41,275^{M7}$	1 5/8	9,55	45,8				●	●					
Ls	$44,42^{+0,03}$	1 3/4	9,55	48,8										
L	$44,45^{K7}$	1 3/4	11,11	49,4						●	●			
Lu	$47,625^{M7}$	1 7/8	12,7	53,5					●					
Da	$49,20^{+0,03}$	1 15/16	12,7	55,0										
Ds	$50,77^{+0,03}$	2	12,7	56,4										
D	$50,80^{+0,03}$	2	12,7	55,1										
Pa	$53,975^{M7}$	2 1/8	12,7	60,0								●		
U	$57,10^{+0,03}$	2 1/4	12,7	62,9										
Ub	$60,325^{M7}$	2 3/8	15,875	67,6										
Wd	$85,725^{M7}$	3 3/8	22,225	95,8										
Wf	$92,075^{M7}$	3 5/8	22,225	101,9										



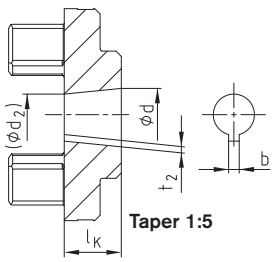
Basic programme taper 1:8

Code	$d^{+0,05}$	(d_2)	b^{JS9}	$t_2{}^{+0,1}$	l_K
...N.../ 1	9,7	7,575	2,4	10,85	17,0
...N.../ 1c	11,6	9,5375	3	12,90	16,5
...N.../ 1e	13,0	10,375	2,4	13,80	21,0
...N.../ 1d	14,0	11,813	3	15,50	17,5
...N.../ 1b	14,3	11,8625	3,2	15,65	19,5
...N.../ 2	17,287	14,287	3,2	18,24	24,0
...N.../ 2a	17,287	14,287	4	18,94	24,0
...N.../ 2b	17,287	14,287	3	18,34	24,0
...N.../ 3	22,002	18,6895	4	23,40	28,0
...N.../ 4	25,463	20,963	4,78	27,83	36,0
...N.../ 4b	25,463	20,963	5	28,23	36,0
...N.../ 4a	27,0	22,9375	4,78	28,80	32,5
...N.../ 4g	28,45	23,6375	6	29,32	38,5
...N.../ 5	33,176	27,676	6,38	35,39	44,0
...N.../ 5a	33,176	27,676	7	35,39	44,0
Basic programme taper 1:10					
CX	19,95	16,75	5	22,08	32
DX	24,95	20,45	6	26,68	45
EX	29,75	24,75	8	31,88	50

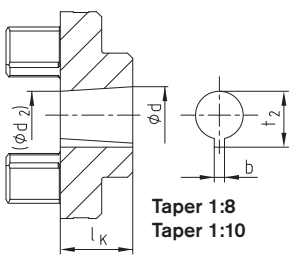
Basic programme taper 1:5

Code	$d^{+0,05}$	(d_2)	b^{JS9}	$t_2{}^{+0,1}$	l_K
A-10	9,85	7,55	2	1,0	11,5
B-17	16,85	13,15	3	1,8	18,5
C-20	19,85	15,55	4	2,2	21,5
Cs-22	21,95	17,65	3	1,8	21,5
D-25	24,85	19,821	5	2,9	26,5
E-30	29,85	23,55	6	2,6	31,5
F-35	34,85	27,55	6	2,6	36,5
G-40	39,85	32,85	6	2,6	35,0

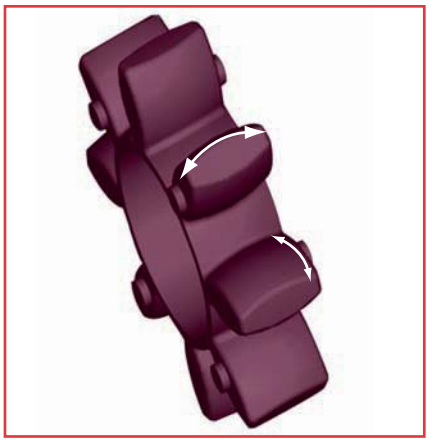
With codes N.../6 and N.../6a parallel to taper the respective pump code should be started before ...N and the respective size of coupling before and behind ...N.../.



Taper 1:5



Taper 1:8
Taper 1:10



ROTEX® Spider Design

ROTEX® double crowned spiders are made with high grade urethane or Hytrel® in several hardnesses to suit the vibration or shock absorption needs of your application. The spider materials offer excellent memory to regain shape maintaining the integrity of the coupling.
The double crowned leg design eliminates edge pressure normally caused by angular and parallel misalignments, allowing the spider to outlast the conventional flat design.

Misalignment

• Due to the double crowned spider and concave jaw design, the **ROTEX®** coupling allows angular misalignment without edge pressure.

Excellent Durability

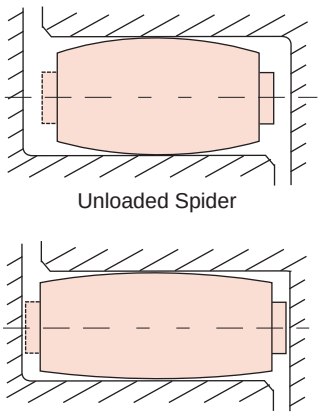
• Urethane and Hytrel® spiders are resistant to most chemicals and higher ambient temperatures for outdoor and industrial environments.

Long Life

• Spider low mass and special compounding dissipate heat and minimize hysteresis, giving the spider long life and superior performance.

Electrical Isolation

• Urethane spiders prevent electrical surges to be transmitted between driver and driven side.



Vibration Damping

• A progressive damping effect is accomplished through the **ROTEX®** double crowned design and materials. This design adjusts to the concave hub jaw providing a controlled expansion which absorbs shocks and reduces vibrations. The high grade molded urethane spider offers excellent memory to regain shape after absorbing high shocks.

ROTEX® Standard Spider Materials

Spider Durometer	Image	Spider Color / Material	Admissible Temp. [F] Continuous / Intermittent	Sizes Available
92 Sh A		Yellow / Urethane	-40 to 195 / -55 to 245	19 - 180
98 Sh A [2]		Red / Urethane	-20 to 195 / -40 to 245	19 -180
64 Sh D-F		White [2] / Urethane	-20 to 230 / -20 to 265	24 - 180

1) For sizes 65 and above the durometer is 95 Sh A.
2) White spiders have green dots at the end of spider legs.

• Special Spider materials are available on request.

Size (for all hub materials)	Maximum speed [1] [RPM]	Wind-up Angle		Torque [3] [lb in]		Dynamic Torsional Stiffness [X10³ lb in / rad]				HP [RPM]		
		Nominal Torque	Maximum Torque	Nominal	Maximum	100% T_{KN}	75% T_{KN}	50% T_{KN}	25% T_{KN}	100	1200	1800
Urethane Spider - 92 Shore A (yellow)												
19	14000			88	177	11.3	9.3	7.1	4.2	0.1	1.7	2.5
24	10600			310	620	43.0	35.2	26.6	15.8	0.5	6.0	9.0
28	8500			840	1,680	96.5	79.1	59.8	35.5	1	16	24
38	7100			1,680	3,360	186.3	152.8	115.5	68.5	3	32	45
42	6000			2,345	4,690	210.1	172.3	130.3	77.3	4	45	67
48	5600			2,740	5,485	324.8	266.3	201.3	119.4	4	52	78
55	4750			3,625	7,255	448.9	368.1	278.3	165.0	6	69	104
65	4250	3.2°	5°	5,530	11,060	859.6	704.9	532.9	315.9	9	105	158
75	3550			11,325	22,655	1,002.9	822.3	621.8	368.6	18	216	324
90	2800			21,240	42,480	1,682.3	1,379.4	1,043.1	618.3	34	404	607
100	2500			29,205	58,410	2,239.8	1,836.6	1,388.7	823.1	46	556	834
110	2240			42,480	84,960	2,757.7	2,261.4	1,709.8	1,013.5	67	809	1213
125	2000			58,850	117,705	4,202.5	3,446.1	2,605.5	1,544.4	93	1121	1681
140	1800			75,665	151,335	5,845.3	4,793.2	3,624.1	2,148.2	120	1441	2161
160	1500			113,280	226,560	7,879.7	6,461.4	4,885.5	2,895.8	180	2157	3235
180	1400			165,050	330,105	22,731.8	18,640.0	14,093.7	8,354.0	262	3143	4714
Urethane Spider - 98 Shore A / 95 Shore A size 65 and above (red)												
19	14000			150	300	25.8	21.2	16.0	9.5	0.2	2.9	4.3
24	10600			530	1,060	87.9	72.0	54.5	32.3	0.8	10	15
28	8500			1,415	2,830	236.9	194.3	146.9	87.1	2	27	40
38	7100			2,875	5,750	429.8	352.5	266.5	158.0	5	55	82
42	6000			3,980	7,965	482.3	395.5	299.0	177.3	6	76	114
48	5600			4,645	9,290	577.8	473.8	358.2	212.4	7	88	133
55	4750			6,060	12,125	840.5	689.2	521.1	308.9	10	115	173
65	4250	3.2°	5°	8,320	16,635	1,146.2	939.9	710.7	421.3	13	158	238
75	3550			16,990	33,980	1,747.9	1,433.3	1,083.7	642.3	27	324	485
90	2800			31,860	63,720	2,763.0	2,265.6	1,713.0	1,015.4	51	607	910
100	2500			43,805	87,615	3,391.9	2,781.3	1,102.9	1,246.5	71	834	1251
110	2240			63,720	127,440	6,107.0	5,007.8	3,786.4	2,244.4	101	1213	1820
125	2000			88,500	177,000	11,891.2	9,750.8	7,372.6	4,370.0	140	1685	2528
140	1800			113,280	226,560	12,607.5	10,338.2	7,816.7	4,633.3	180	2157	3235
160	1500			169,920	339,840	21,967.7	18,013.6	13,620.0	8,073.1	270	3235	4853
180	1400			247,800	495,600	31,518.8	25,845.5	19,541.7	11,583.2	393	4718	7077
Urethane Spider of 64 Shore D-F (white w/ green dots on spider legs) [2]												
19	14000			185	370	47.3	38.9	29.4	17.4	0.3	3.5	5.3
24	10600			660	1,325	133.7	109.7	82.9	49.1	1	13	19
28	8500			1,770	3,540	243.6	199.7	151.0	89.6	3	34	51
38	7100			3,585	7,170	620.8	509.1	384.9	228.2	6	68	102
42	6000			4,955	9,910	706.8	579.6	438.3	259.7	8	94	142
48	5600			5,795	11,590	845.3	693.1	524.1	310.6	9	110	166
55	4750			7,300	14,600	955.1	783.2	592.2	351.0	12	139	209
65	4250	2.5°	3.6°	10,395	20,795	1,337.1	1,096.5	829.1	491.4	16	198	297
75	3550			21,240	42,480	2,196.7	1,801.3	1,362.0	807.3	34	404	607
90	2800			39,825	79,650	5,969.5	4,895.0	3,701.1	2,193.8	63	758	1137
100	2500			54,735	109,475	7,621.4	6,249.5	4,725.3	2,800.8	87	1042	1563
110	2240			79,650	159,300	10,076.5	8,262.7	6,247.4	3,703.1	126	1517	2275
125	2000			110,625	221,250	12,703.1	10,416.5	7,875.9	4,668.4	176	2106	3159
140	1800			141,600	283,200	15,759.5	12,922.8	9,770.8	5,791.6	225	2696	4044
160	1500			212,400	424,800	27,220.8	22,321.1	16,877.0	10,003.7	337	4044	6066
180	1400			309,750	619,500	53,200.0	43,624.0	32,984.0	19,551.0	491	5898	8846

1) For operating speeds above maximum use only steel or nodular iron hubs, dynamic balancing required.
2) KTR recommends using this spider hardness with steel and nodular iron hubs only.

3) Alternating torque = 74% nominal torque

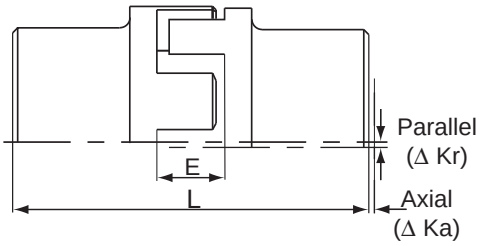
Misalignments

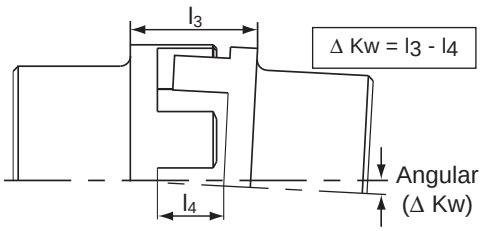
Axial Misalignment (Δ Ka):
Mount hubs on shafts to maintain the ''E'' dimension. If any one shaft must extend into the ''E'' dimension ensure that its maximum diameter is less than the ''d_W'' dimension. If axial travel of either shaft is expected, allow slightly larger gap between hub and spider. Spider pads should not be under axial compression when installed.

Parallel Misalignment (Δ Kr):
Use straight edge and feeler gage on top and sides of coupling without rotating it. A careful parallel alignment will extended the life of coupling and all other drive train components.

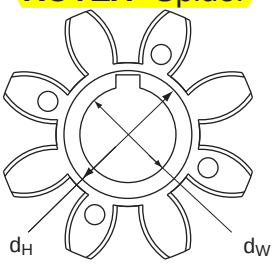
Angular Misalignment (Δ Kw) :
Ensure max. angular misalignment is not exceeded. If a manual calculation is needed please apply misalignment formula.

NOTE: For applications with larger parallel and angular misalignments please see **ROTEX®** style DKM on page22.

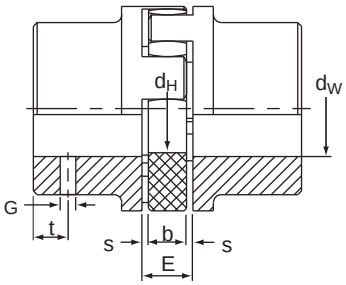




ROTEX® Spider



ROTEX® Assembly

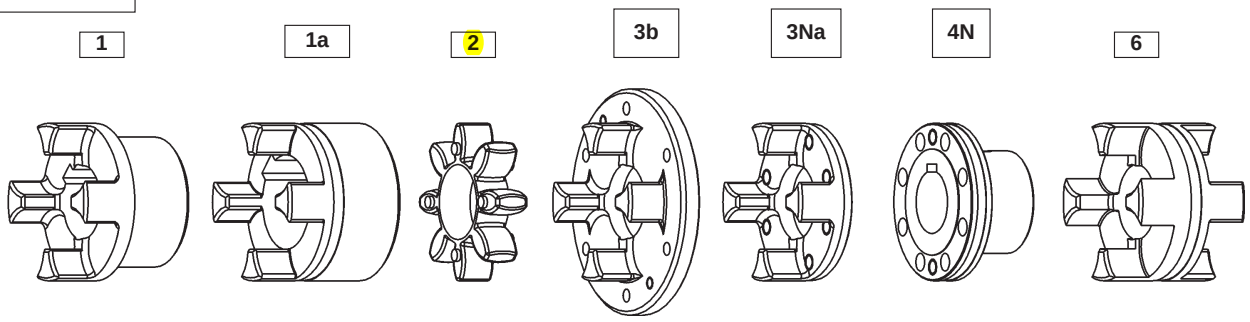


Set-Screw Tightening TQ lb in	
M5	18
M6	42
M8	88
M10	150
M12	350
M16	710
M20	1240

Dimensions \ Coupling Size		19	24	28	38	42	48	55	65	75	90	100	110	125	140	160	180
E (in)		0.63	0.71	0.79	0.94	1.02	1.10	1.18	1.38	1.57	1.77	1.97	2.17	2.36	2.56	2.95	3.35
s (in)		0.08	0.08	0.10	0.12	0.12	0.14	0.16	0.18	0.20	0.22	0.24	0.26	0.28	0.30	0.35	0.41
d_H (in) [1]		0.71	1.06	1.18	1.50	1.81	2.01	2.36	2.68	3.15	3.94	4.45	5.00	5.79	6.50	7.48	8.66
d_W (in) [2]		0.500	0.750	0.875	1.125	1.375	1.500	1.875	2.125	2.500	3.125	3.625	3.875	4.500	5.250	6.000	7.000
G [3]		M5	M5	M8	M8	M8	M8	M10	M10	M10	M12	M12	M16	M16	M20	M20	M20
t (in)		0.39	0.39	0.59	0.59	0.79	0.79	0.79	0.79	0.98	1.18	1.18	1.38	1.57	1.77	1.97	1.97
Max. Axial Misalignment Δ Ka	(in)	-0.02 +0.05	-0.02 +0.06	-0.03 +0.06	-0.03 +0.07	-0.04 +0.08	-0.04 +0.08	-0.04 +0.09	-0.04 +0.10	-0.06 +0.12	-0.06 +0.13	-0.06 +0.15	-0.08 +0.17	-0.08 +0.18	-0.08 +0.20	-0.10 +0.22	-0.12 +0.25
1500 rpm: Max. Parallel [4] Misalignment Δ Kr	(in)	0.008	0.009	0.010	0.011	0.012	0.014	0.015	0.016	0.018	0.019	0.020	0.021	0.024	0.024	0.025	0.027
1500 rpm: Max. Angular [4] Misalignment Δ Kw	(deg.)	1.2	0.9	0.9	1.0	1.0	1.1	1.1	1.2	1.2	1.2	1.2	1.3	1.3	1.2	1.2	1.2
	(in)	0.03	0.03	0.04	0.05	0.07	0.08	0.09	0.11	0.13	0.17	0.19	0.22	0.25	0.26	0.30	0.35

1) Spider inside diameter is equal to d_H.
2) Maximum shaft size (including keyway) to extend into the spider.
3) Inch fasteners available upon request.
(See KTR assembly instructions at www.ktrcorp.com)
4) Maximum angular and maximum parallel misalignments are not to be used concurrently, for further information please consult KTR.

Components



ROTEX® components

ROTEX® Size	Standard hub				Large hub			Spider	Driving flange			Coupling flange	DKM-spacer
	Part 1				Part 1a			Part 2	Part 3b	Part 3Na		Part 4N	Part 6
	Weight / Mass moment of inertia												
	Alu [lbs] [lbinsec²]	EN-GJL-250 [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	Alu [lbs] [lbinsec²]	EN-GJL-250 [lbs] [lbinsec²]	S [lbs] [lbinsec²]	Polyurethane [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	EN-GJS-400-15 [lbs] [lbinsec²]	St [lbs] [lbinsec²]	Alu [lbs] [lbinsec²]
14	–	–	–	–	0.04	–	–	0.01	–	–	–	–	–
	–	–	–	–	0.00003	–	–	–	–	–	–	–	–
19	0.12	–	–	–	0.15	–	0.40	0.02	–	–	–	–	–
	0.00009	–	–	–	0.00018	–	0.00044	0.00003	–	–	–	–	–
24	0.24	–	–	–	0.35	–	0.82	0.04	0.07	0.40	–	0.53	0.31
	0.00035	–	–	–	0.00080	–	0.00186	0.00009	0.00266	0.00080	–	0.00080	0.00053
28	0.40	–	–	–	0.56	–	1.41	0.07	1.28	0.66	–	0.86	0.49
	0.00080	–	–	–	0.00177	–	0.00425	0.00018	0.00708	0.00186	–	0.00177	0.00115
38	0.84	2.23	–	2.20	0.93	2.58	2.80	0.13	1.76	–	0.69	1.37	0.77
	0.00266	0.00797	–	0.00867	0.00389	0.01062	0.01239	0.00044	0.00885	–	0.00416	0.00443	0.00310
42	1.28	3.44	–	3.99	1.57	4.14	4.06	0.20	3.11	–	1.68	2.31	1.12
	0.00620	0.01770	–	0.02213	0.00974	0.02567	0.01505	0.00089	0.03540	–	0.01062	0.00974	0.00620
48	1.76	4.74	–	5.36	1.98	5.62	6.04	0.24	3.57	–	1.96	3.04	1.48
	0.00974	0.02655	–	0.03629	0.01416	0.04160	0.04602	0.00177	0.04425	–	0.01505	0.01593	0.00885
55	–	7.17	–	8.16	–	8.14	8.66	0.31	6.22	–	3.24	4.59	2.14
	–	0.05310	–	0.07257	–	0.07523	0.08850	0.00266	0.10620	–	0.03098	0.03098	0.01770
65	–	10.93	–	9.92	–	–	12.90	0.46	7.63	–	4.17	6.61	3.15
	–	0.10620	–	0.10620	–	–	0.16815	0.00443	0.15045	–	0.05222	0.05664	0.03540
75	–	17.24	–	15.83	–	–	19.97	0.86	11.09	–	6.61	10.71	4.85
	–	0.23010	–	0.23010	–	–	0.35400	0.01770	0.28320	–	0.11063	0.13275	0.07965
90	–	29.54	–	27.56	–	–	37.48	1.54	17.42	–	10.74	19.11	8.60
	–	0.59295	–	0.59295	–	–	1.03545	0.03540	0.64605	–	0.29205	0.37170	0.22125
100	–	–	37.04	–	–	–	–	1.98	–	–	16.64	27.78	–
	–	–	0.97350	–	–	–	–	0.06195	–	–	0.55755	0.68145	–
110	–	–	52.69	–	–	–	–	3.09	–	–	22.38	37.26	–
	–	–	1.77000	–	–	–	–	0.13275	–	–	0.97350	1.16820	–
125	–	–	78.48	–	–	–	–	4.19	–	–	32.85	57.32	–
	–	–	3.45150	–	–	–	–	0.22125	–	–	1.85850	2.38950	–
140	–	–	106.48	–	–	–	–	5.51	–	–	44.31	77.82	–
	–	–	5.75250	–	–	–	–	0.35400	–	–	3.00900	3.98250	–
160	–	–	154.98	–	–	–	–	8.60	–	–	67.02	117.07	–
	–	–	11.15100	–	–	–	–	0.70800	–	–	6.19500	7.87650	–
180	–	–	238.10	–	–	–	–	14.33	–	–	85.32	175.93	–
	–	–	20.79750	–	–	–	–	1.53105	–	–	10.08900	15.75300	–

Weight and mass moment of inertia each refer to the maximum finish bore without keyway.

	VJ Pamensky	No.:
		Date: 10-FEB-2014

Customer : Bosch-Rexroth

TECHNICAL PROPOSAL

Three-phase induction motor - Squirrel cage rotor

Product line : TEFC - W22 NEMA Premium Efficiency

Catalog Number :
List Price : $

Notes:
PART # CT015404NPW22
BOSCH #

Performed by:	Checked:

	VJ Pamensky	No.:
		Date: 10-FEB-2014

DATA SHEET
Three-phase induction motor - Squirrel cage rotor

Customer	: Bosch-Rexroth
Product line	: TEFC - W22 NEMA Premium Efficiency

Frame	: 254/6T
Output	: 15 HP
Frequency	: 60 Hz
Poles	: 4
Full load speed	: 1765
Slip	: 1.94 %
Voltage	: 208-230/460 V
Rated current	: 39.8-36.0/18.0 A
Locked rotor current	: 234/117 A
Locked rotor current (Il/In)	: 6.5
No-load current	: 16.0/8.00 A
Full load torque	: 44.0 lb.ft
Locked rotor torque	: 230 %
Breakdown torque	: 270 %
Design	: B
Insulation class	: F
Temperature rise	: 80 K
Locked rotor time	: 17 s (hot)
Service factor	: 1.25
Duty cycle	: S1
Ambient temperature	: -20°C - +40°C
Altitude	: 1000
Degree of Protection	: IP55
Approximate weight	: 251 lb
Moment of inertia	: 2.6198 sq.ft.lb
Noise level	: 64 dB(A)

	D.E.	N.D.E.
Bearings	NU-309 C3	6209 C3
Regreasing interval	20000 h	20000 h
Grease amount	13 g	9 g

Load	Power factor	Efficiency (%)
100%	0.83	92.4
75%	0.78	91.7
50%	0.68	91.0

Notes:
PART # CT015404NPW22
BOSCH #

Performed by	Checked

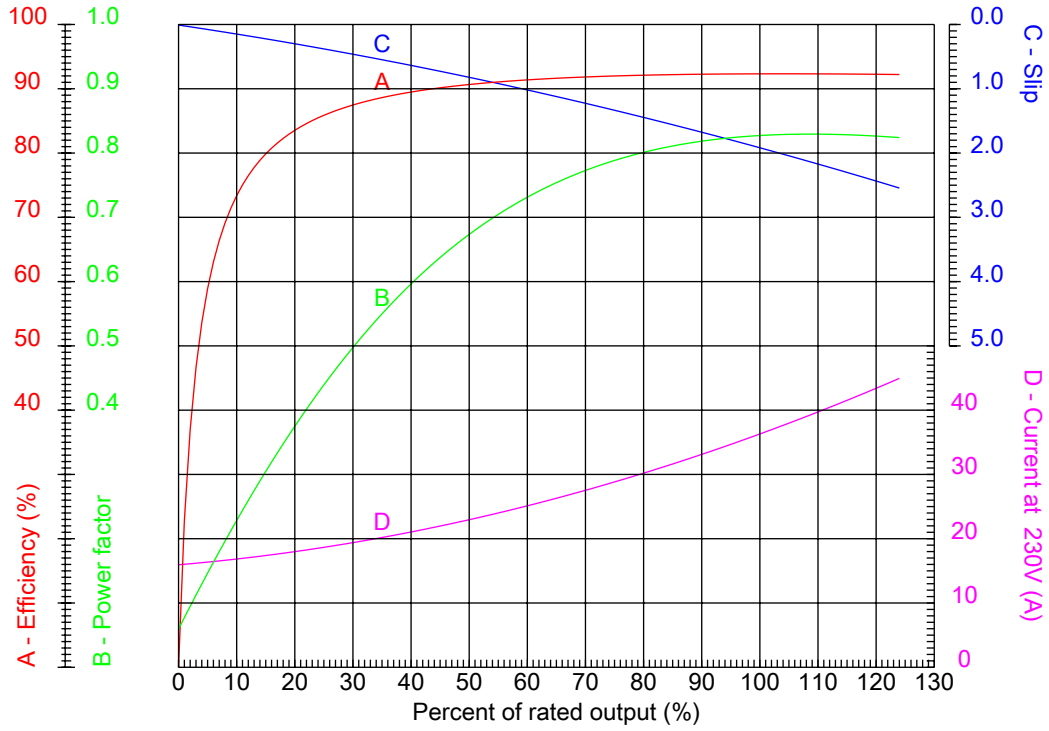
VJ Pamensky

No.:

Date: 10-FEB-2014

PERFORMANCE CURVES RELATED TO RATED OUTPUT

Three-phase induction motor - Squirrel cage rotor



Customer	: Bosch-Rexroth
Product line	: TEFC - W22 NEMA Premium Efficiency

Frame	: 254/6T	Locked rotor current (Il/In)	: 6.5
Output	: 15 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.25
Full load speed	: 1765	Design	: B
Voltage	: 208-230/460 V	Locked rotor torque	: 230 %
Rated current	: 39.8-36.0/18.0 A	Breakdown torque	: 270 %
Insulation class	: F		

Notes:
PART # CT015404NPW22
BOSCH #

Performed by	Checked

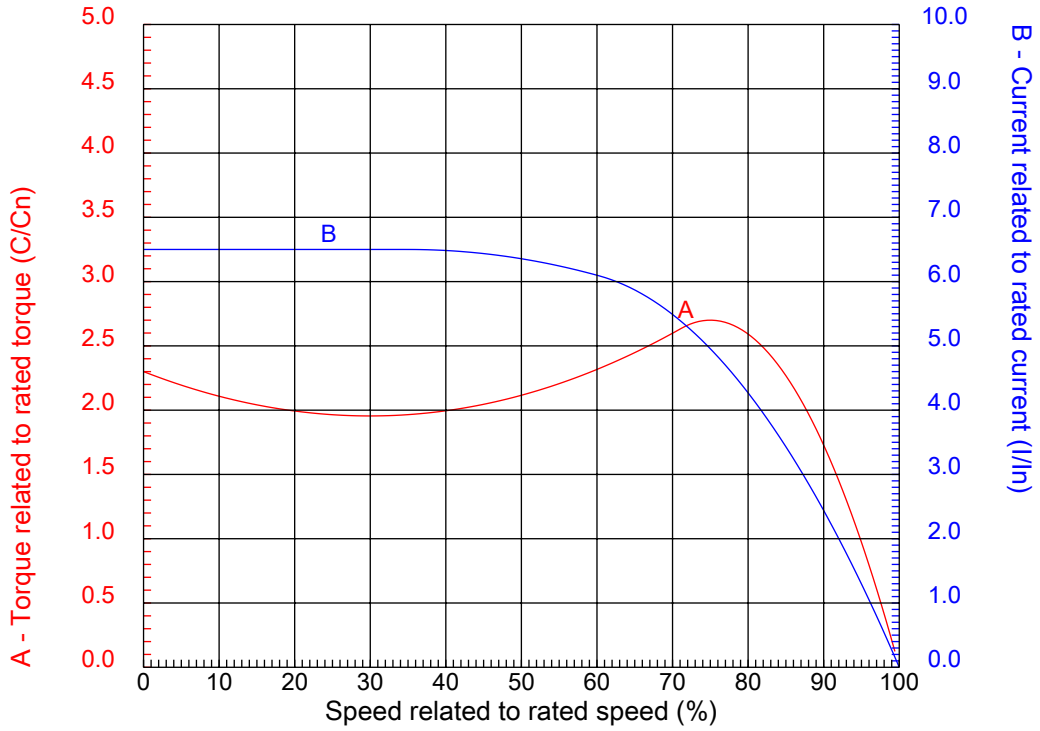
VJ Pamensky

No.:

Date: 10-FEB-2014

CHARACTERISTIC CURVES RELATED TO SPEED

Three-phase induction motor - Squirrel cage rotor

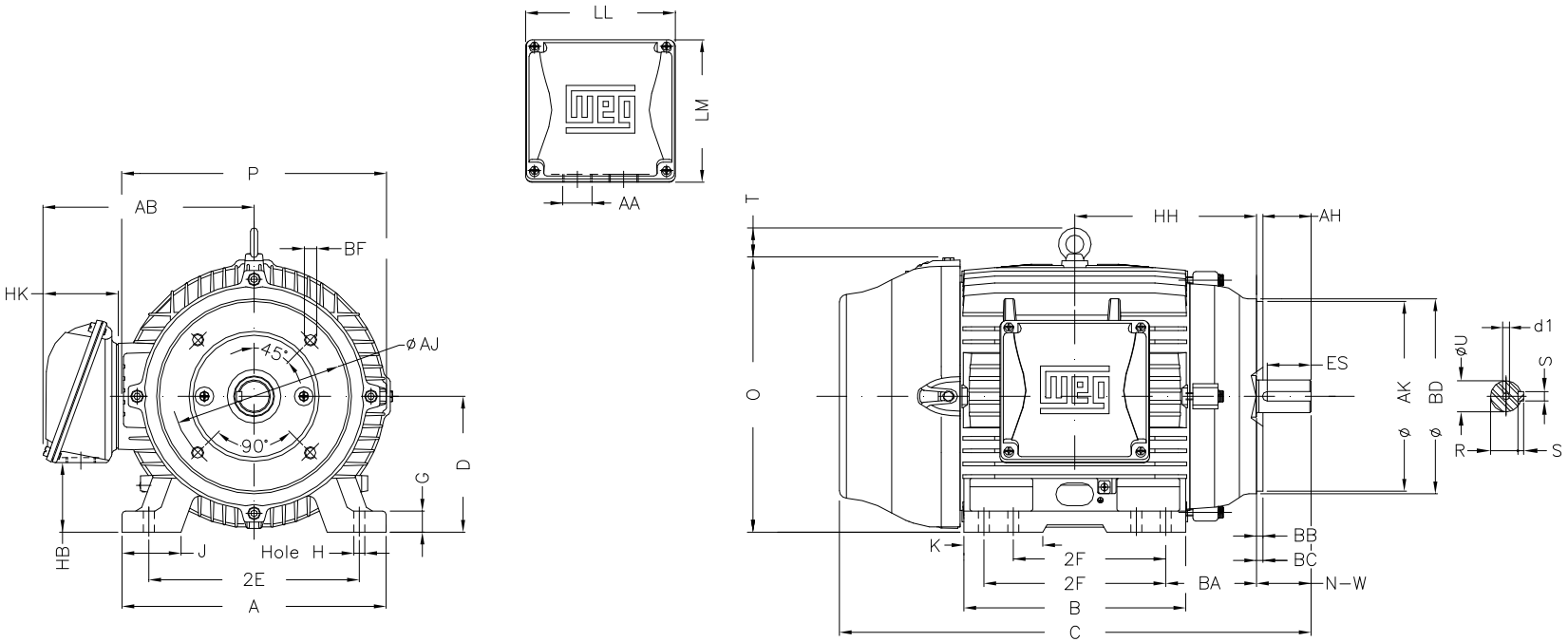


Customer	: Bosch-Rexroth
Product line	: TEFC - W22 NEMA Premium Efficiency

Frame	: 254/6T	Locked rotor current (Il/In)	: 6.5
Output	: 15 HP	Duty cycle	: S1
Frequency	: 60 Hz	Service factor	: 1.25
Full load speed	: 1765	Design	: B
Voltage	: 208-230/460 V	Locked rotor torque	: 230 %
Rated current	: 39.8-36.0/18.0 A	Breakdown torque	: 270 %
Insulation class	: F		

Notes:
PART # CT015404NPW22
BOSCH #

Performed by	Checked



2E 10.000	J 2.539	A 12.126	P 12.953	AB 10.483
2F 8.252/10.000	K 2.559	B 11.732	BA 4.250	U 1.625
N-W 4.000	ES 2.756	S 0.375	R 1.406	depth 0.375
D 6.250	G 0.827	HB 3.061	O 12.598	T 2.087
HF 6.565	HH 9.250	HK 3.976	H 0.531	C 24.945
LL 7.815	LM 7.480	AA NPT 1 1/2"	d1 A 4	Flange FC-184
AJ 7.250	AK 8.500	BD 8.875	BF UNC 1/2"x13	BB 0.250
BC 0.250	AH 3.750			

Notes: PART # CT015404NPW22
BOSCH #

Performed by:

Checked:

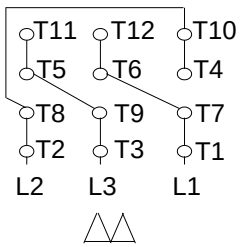
Customer: Bosch-Rexroth

TEFC - W22 NEMA Premium Efficiency

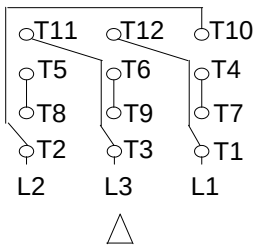
Three-phase induction motor
Frame 254/6T - IP55

10-FEB-2014

LOW VOLTAGE

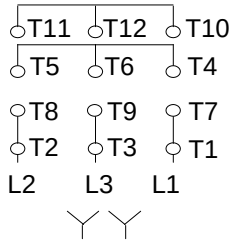


HIGH VOLTAGE

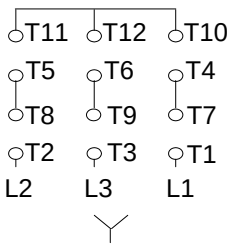


CONNECTIONS FOR STARTING ONLY:

LOW VOLTAGE



HIGH VOLTAGE

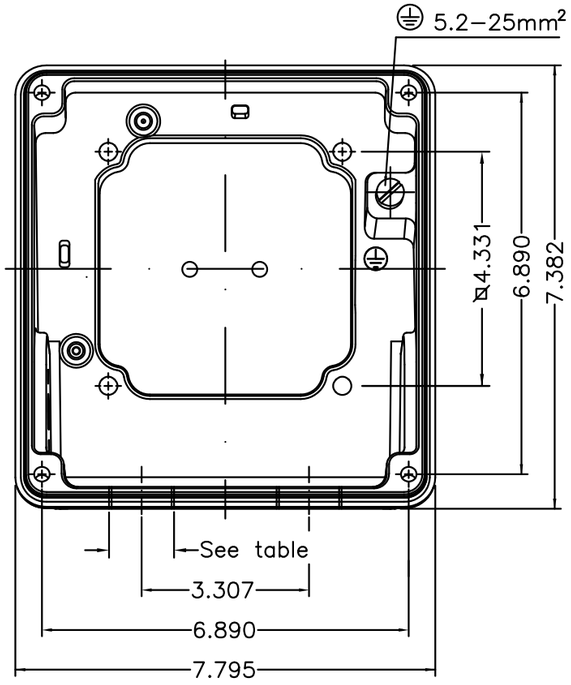


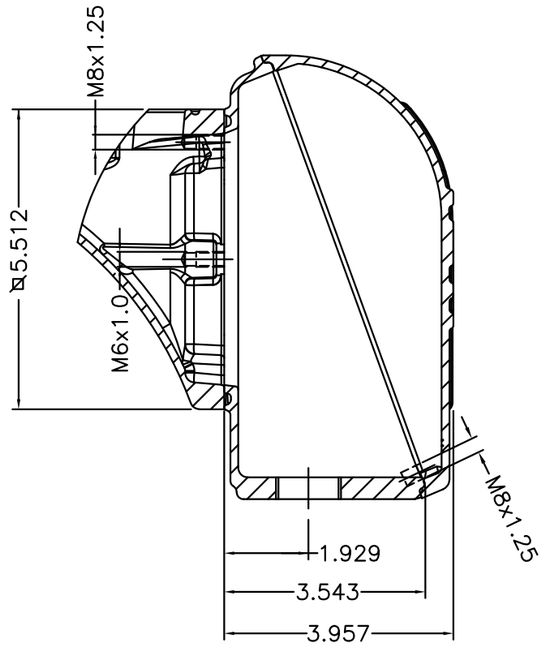
Notes: PART # CT015404NPW22 BOSCH #
Performed by:
Checked:
Customer: Bosch-Rexroth
TEFC - W22 NEMA Premium Efficiency

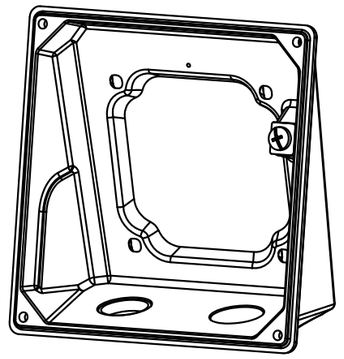
Three-phase induction motor Frame 254/6T - IP55	10-FEB-2014

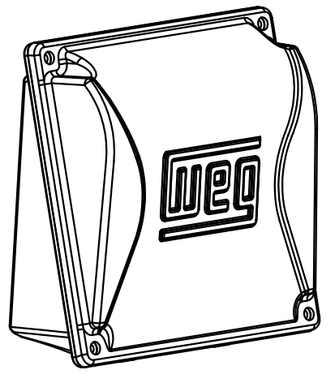
Dimensions in inches

THIS IS AN UPDATED REVISION, THE PREVIOUS ONE MUST BE DISREGARDED.









POWER CABLES ENTRY THREAD					
RWG (BRAZIL)	NPT (USA)	Metric (EUROPE) (LATIN AMER.)	Metric (AUSTRALIA)	Metric (AFRICA)	PG (OPTIONAL)
RWG 1 1/2"	NPT 1 1/2"	2xM40x1.5	2xM32x1.5	2xM25x1.5	2xPG29

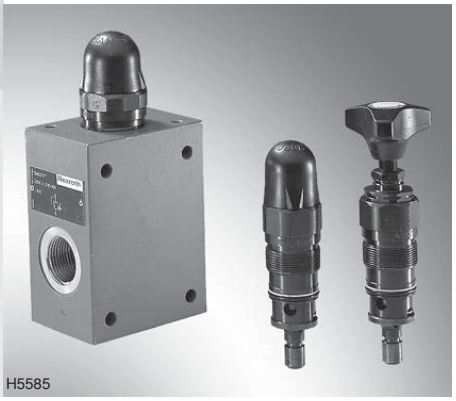
----------	--	ORIGINAL ISSUE	MARIA	ARTHUR	CASTELLA	17.05.2013	00
ECM *ECM*	LOC *LOC*	SUMMARY OF MODIFICATIONS *RESUMO MODIFICAÇÃO*	EXECUTED *EXECUTADO*	CHECKED *VERIFICADO*	RELEASED *LIBERADO*	DATE *DATA*	VER *VER*

EXECUTED/*EXEC*	MARIA	TERMINAL BOX FRAME 256T	CX-200256T	
CHECKED/*VERIF*	ARTHUR		ENG	00
RELEASED/*LIBER*	CASTELLA			
REL DT / *DATA LB*	17.05.2013	WMO JARAGUA DO SUL ENGENHARIA DE PRODUTO	SHEET / *FOLHA*	1 / 1

Pressure relief valve, direct operated

RE 25402/10.10 1/16
Replaces: 02.09

Type DBD



Sizes 6 to 30
Component series 1X
Maximum operating pressure 630 bar *[9150 psi]*
Maximum flow 330 l/min *[87 US gpm]*

Table of contents

Features

- As screw-in cartridge valve
- For threaded connection
- For subplate mounting
- Adjustment types for pressure adjustment, optional:
  - Sleeve with hexagon and protective cap
  - Rotary knob / hand wheel
  - Lockable rotary knob

Information on available spare parts:
www.boschrexroth.com/spc

Ordering code

								DBD				**1X/**
Pressure relief valve, direct operated												
Type of adjustment for pressure adjustment	Size 6	8	**10**	15	20	25	30					
Sleeve with hexagon and protective cap	●	●	●	●	●	●	●	**= S**				
Rotary knob [1]	●	●	●	●	●	–	–	**= H**				
Hand wheel [2]	–	–	–	–	–	●	●	**= H**				
Lockable rotary knob [1,3,5]	●	●	●	●	●	–	–	**= A**				
Size	**= 6**	**= 8**	**= 10**	**= 15**	**= 20**	**= 25**	**= 30**		E.g.			
(Port)	G1/4	G3/8	G1/2	G3/4	G1	G1 1/4	G1 1/2		**= 10**			
Type of connection												
As screw-in cartridge valve	●	–	●	–	●	–	●			**= K**		
For threaded connection [4]	●	●	●	●	●	●	●			**= G**		
For subplate mounting	●	–	●	–	●	–	●			**= P**		
Component series 10 to 1Z (10 to 1Z: unchanged installation and connection dimensions)											**= 1X**	
Pressure rating [6]												
Pressure setting up to 25 bar *[362 psi]*	●	●	●	●	●	●	●					**= 25**
Pressure setting up to 50 bar *[725 psi]*	●	●	●	●	●	●	●					**= 50**
Pressure setting up to 100 bar *[1450 psi]*	●	●	●	●	●	●	●					**= 100**
Pressure setting up to 200 bar *[2900 psi]*	●	●	●	●	●	●	●					**= 200**
Pressure setting up to 315 bar *[4568 psi]*	●	●	●	●	●	●	●					**= 315**
Pressure setting up to 400 bar *[5800 psi]*	●	●	●	●	●	–	–					**= 400**
Pressure setting up to 630 bar *[9150 psi]* [7]	–	–	●	–	–	–	–					**= 630**

● = Available

[1] With sizes 15 and 20, only available for pressure ratings 25, 50 or 100 bar.

[2] Only available for pressure ratings 25, 50 or 100 bar.

[3] Key with Material no. **R900008158** is included in the scope of supply.

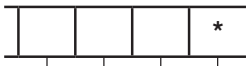
[4] Not available for type-tested safety valves of sizes 8, 15 and 25.

[5] Not available for type-tested safety valves.

[6] For the selection of the pressure rating, please observe the characteristic curves and notes on page 6!

[7] For versions “G“ and “P“, only available as “SO292“, see pages 7 and 10!

Standard types and components are shown in the EPS (standard price list).



Further details in clear text

PED

No code = Without type examination

E = Type-tested safety valve in accordance with PED 97/23/EC

Pipe connection

No code = Pipe thread to ISO 228/1

12 = SAE thread

Seal material

No code = NBR seals

V = FKM seals

(other seals on request)

Attention!

Observe compatibility of seals with hydraulic fluid used!

Function, section, symbol

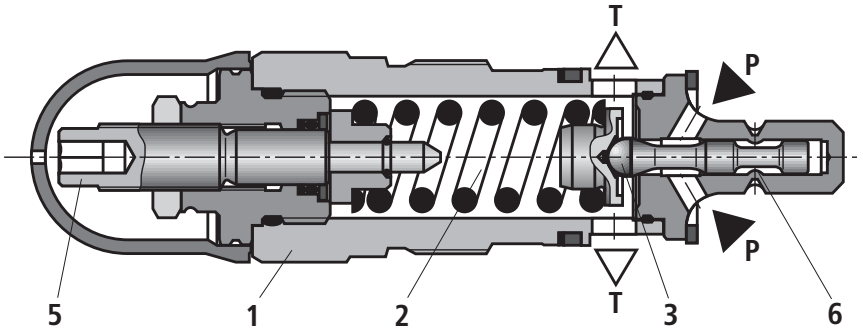
Pressure relief valves of type DBD are direct operated seat valves.

They serve to limit a system pressure.

These valves basically consist of sleeve (1), spring (2), poppet with damping piston (3) (pressure rating 25 to 400 bar) or ball (4) (pressure rating 630 bar) and adjustment element (5). The system pressure setting can be infinitely varied by means of adjustment element (5). Spring (2) presses poppet (3) or ball (4) onto its seat. Channel P is connected to the system. The pressure prevailing in the system acts on the poppet area (or ball).

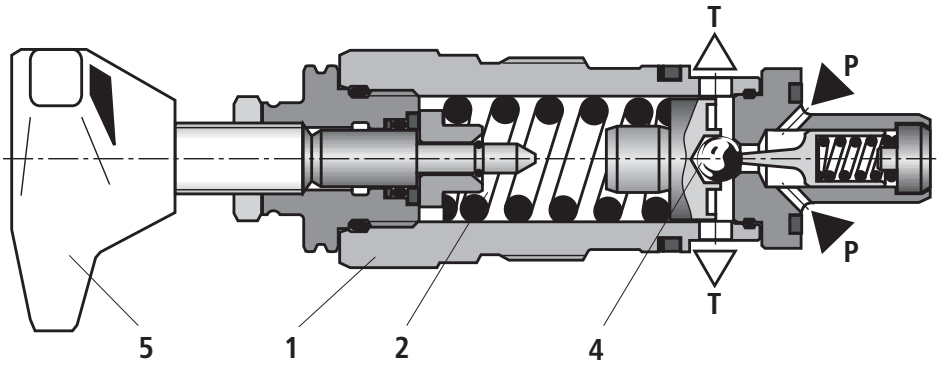
When the pressure in channel P rises above the value set on spring (2), poppet (3) or ball (4) opens against spring (2). Hydraulic fluid can now flow from channel P into channel T. The stroke of poppet (3) is limited by embossment (6).

To obtain good pressure settings over the entire pressure range, the entire pressure range was subdivided into 7 pressure ratings. A pressure rating corresponds to a certain spring, which can be used for setting a maximum operating pressure.



Type DBDS..K1X/...

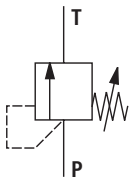
Version for pressure rating 25 to 400 bar (poppet seat valve)



Type DBDH 10 K1X/...

Version for pressure rating 630 bar (ball seat valve, NG10 only)

Symbol



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

General

Size	NG	6 and 8	10	15 and 20	25 and 30
Weight		See pages 7, 9 and 11			
Installation position		Optional			
Ambient temperature range	°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –15 to +80 *[5 to 176]* (FKM seals)			
Minimum strength of housing materials		Housing materials must be selected so that sufficient safety is provided under all conceivable operating conditions (e.g. with regard to compressive strength, thread stripping strength and tightening torques).			

Hydraulic

Maximum operating pressure	– Inlet	bar *[psi]*	400 *[5800]*	630 *[9150]*	400 *[5800]*	315 *[4568]*
	– Outlet	bar *[psi]*	315 *[4568]*	315 *[4568]*	315 *[4568]*	315 *[4568]*
Maximum flow (standard valves)			See characteristic curves on page 6			
Hydraulic fluid			Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also data sheet 90221); HETG (rape-seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on enquiry			
Hydraulic fluid temperature range		°C *[°F]*	–30 to +80 *[–22 to +176]* (NBR seals) –15 to +80 *[5 to 176]* (FKM seals)			
Viscosity range		mm^2/s *[SUS]*	10 to 800 *[60 to 3710]*			
Permissible max. degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)			Class 20/18/15 [3]			

[1] Suitable for NBR and FKM seals

[2] Suitable only for FKM seals

[3] The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of the filters see www.boschrexroth.com/filter.

For deviating technical data for type-tested safety valves, see page 13.

General notes

Hydraulic backpressures in port T add 1:1 to the response pressure of the valve set by means of the adjustment element.

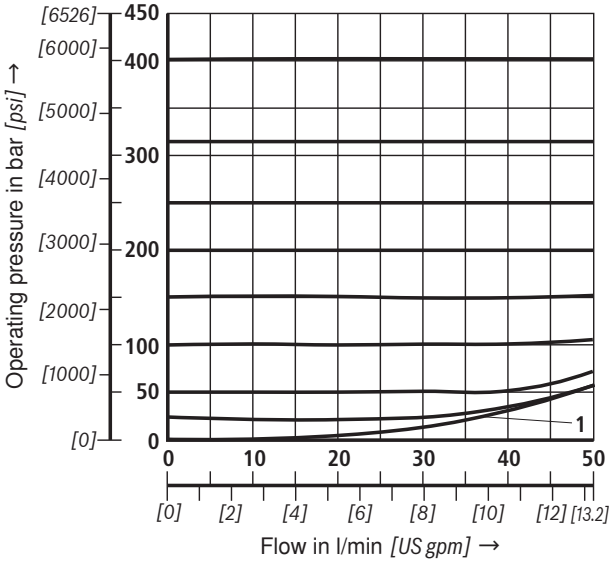
Example:

- Pressure adjustment of the valve by means of spring pretensioning (item 2 on page 4) p_{spring} **= 200 bar**
- Hydraulic backpressure in port T: $p_{hydraulic}$ **= 50 bar**

⇒ response pressure = $p_{spring} + p_{hydraulic}$ **= 250 bar**

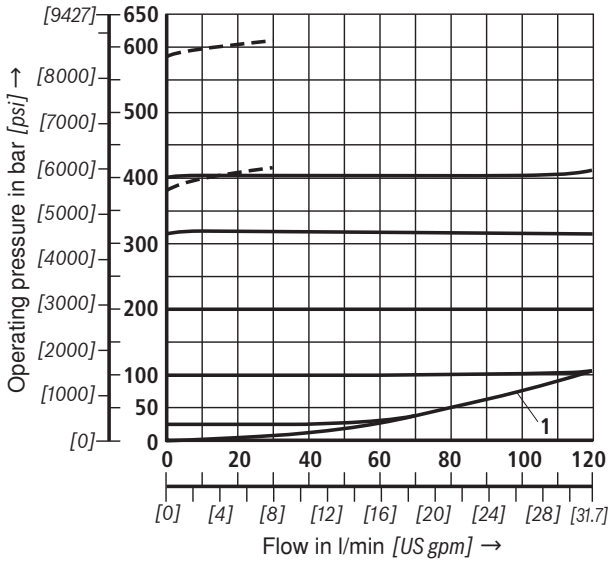
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ±5 °C *[104 °F ±9 °F]*)

NG6



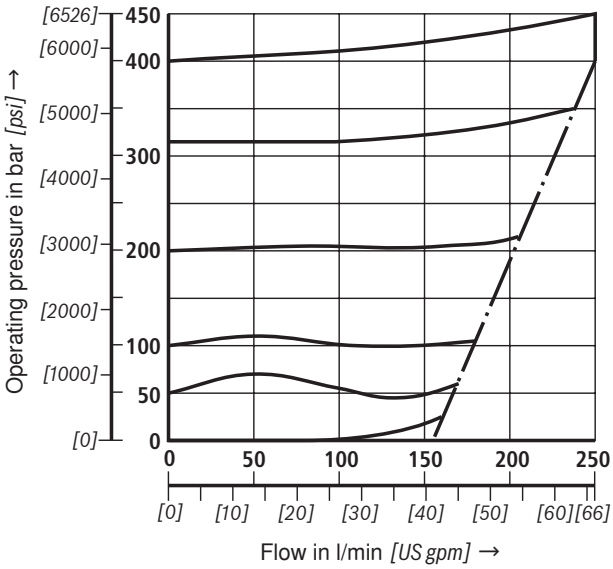
1 = lowest settable pressure

NG8 and 10

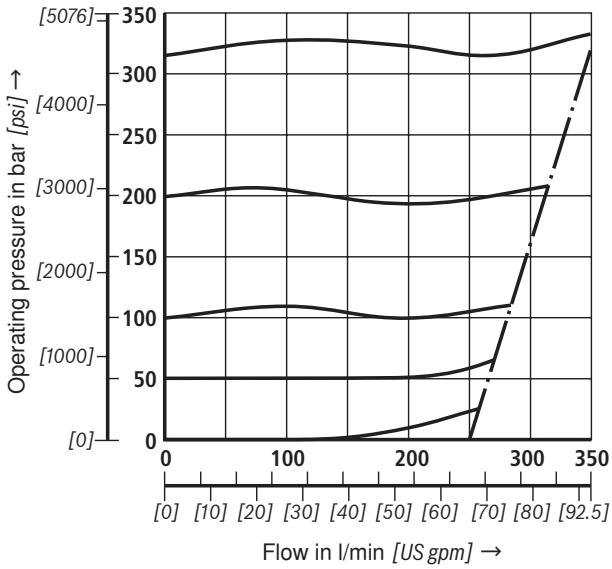


– – – – – = Pressure rating 630 bar *[9150 psi]* (NG10 only)

NG15 and 20



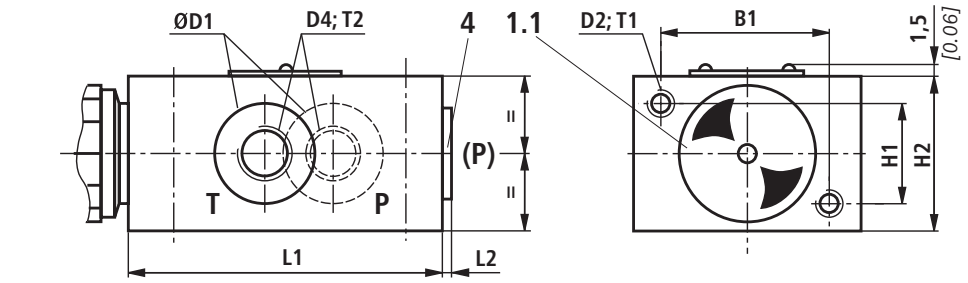
NG25 and 30

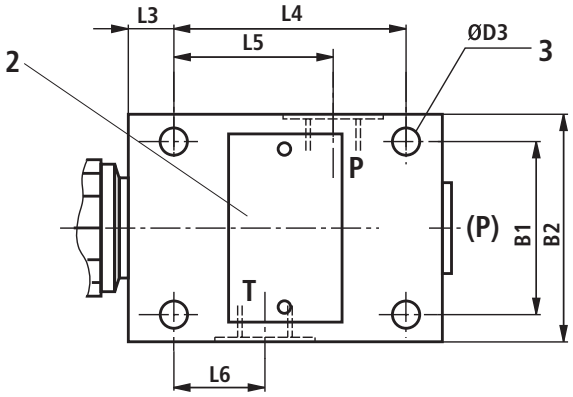


Attention!

- The characteristic curves are valid for output pressure = zero over the entire flow range and were measured without housing resistance!
- The characteristic curves are only valid under the specified ambient and temperature conditions. It must be noted that deviations in the boundary conditions have an influence on the characteristic curve!
- The characteristic curves refer to the given pressure ratings (e.g. 200 bar). The greater the difference between the set pressure value and the nominal pressure rating (e.g. < 200 bar), the greater is the pressure increase as the flow rises.

Unit dimensions: Threaded connection (dimensions in mm *[inch]*)





1.1 Adjustment element “S“ (example)
Set screw with hexagon and protective cap;
Hexagon socket (up to NG20)
Hexagon head (NG25 and 30)

2 Nameplate

3 4 valve mounting bores

4 Additional port (P), optional (e.g. for pressure measurement); not possible for NG10, pressure rating > 400 bar (= version “SO292“).
For dimensions, see D4, for tightening torques, see table below

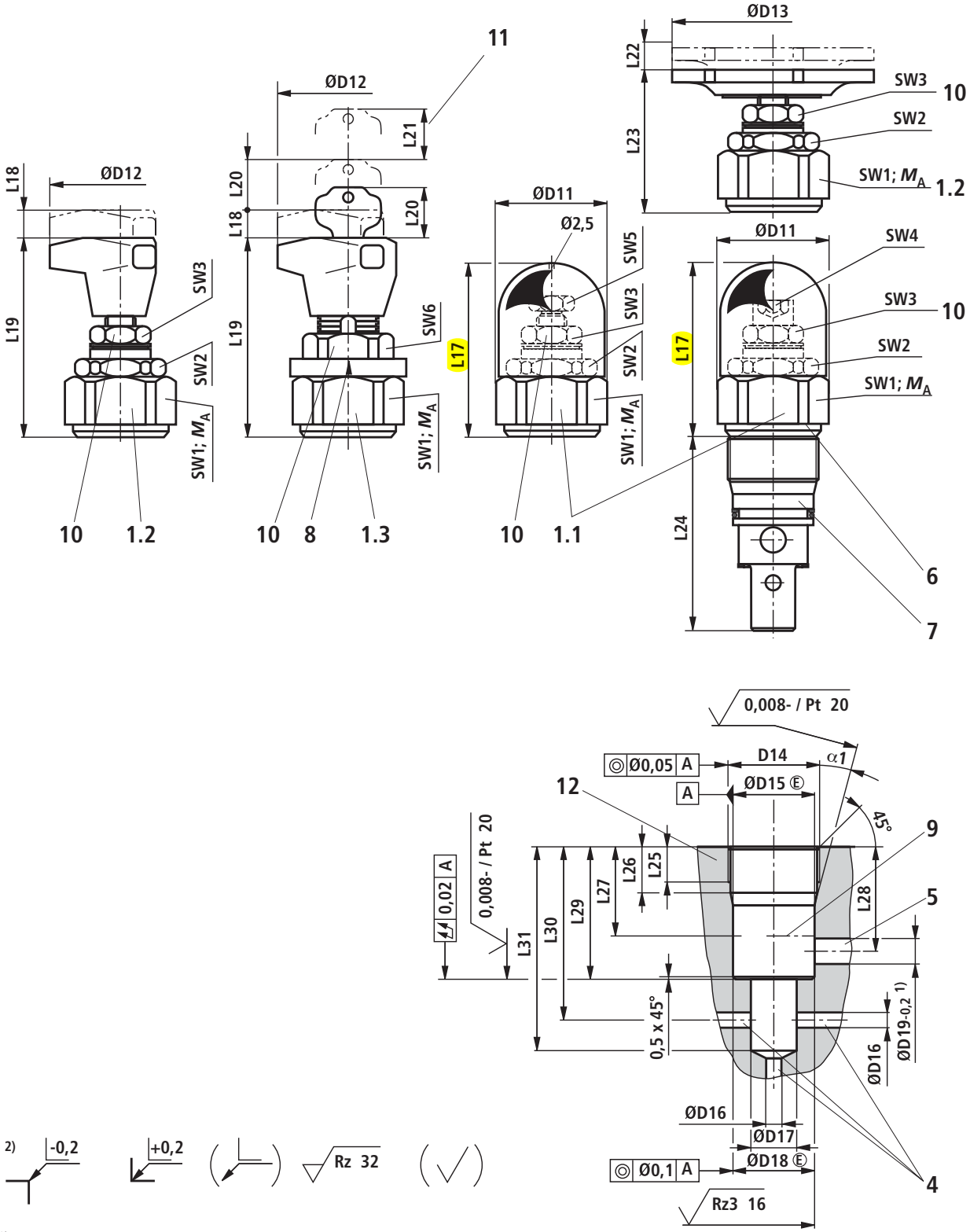
For versions and dimensions of the adjustment elements, see pages 8 and 9

NG	B1	B2	ØD1	D2	ØD3	D4	Tightening torques M_A in Nm *[ft-lbs]* for screws [1]	
							Plug screw (4)	Pipe fittings
6	45 *[1.77]*	60 *[2.36]*	25 *[0.98]*	M6	6,6 *[0.26]*	G1/4	30 *[22]*	60 *[44]*
8	60 *[2.36]*	80 *[3.15]*	28 *[1.10]*	M8	9 *[0.35]*	G3/8	40 *[29]*	90 *[66]*
10	60 *[2.36]*	80 *[3.15]*	34 *[1.34]*	M8	9 *[0.35]*	G1/2	60 *[44]*	130 *[95]*
15	70 *[2.76]*	100 *[3.94]*	42 *[1.65]*	M8	9 *[0.35]*	G3/4	80 *[59]*	200 *[147]*
20	70 *[2.76]*	100 *[3.94]*	47 *[1.85]*	M8	9 *[0.35]*	G1	135 *[99]*	380 *[280]*
25	100 *[3.94]*	130 *[5.12]*	56 *[2.21]*	M10	11 *[0.43]*	G1 1/4	480 *[354]*	500 *[368]*
30	100 *[3.94]*	130 *[5.12]*	65 *[2.56]*	M10	11 *[0.43]*	G1 1/2	560 *[413]*	600 *[442]*

NG	H1	H2	L1	L2	L3	L4	L5	L6	T1	T2	**Weight,** ca. in kg *[lbs]*
6	25 *[0.98]*	40 *[1.57]*	80 *[3.15]*	4 *[0.16]*	15 *[0.59]*	55 *[2.17]*	40 *[1.57]*	20 *[0.79]*	10 *[0.39]*	12 *[0.47]*	1.5 *[3.3]*
8	40 *[1.57]*	60 *[2.36]*	100 *[3.94]*	4 *[0.16]*	20 *[0.79]*	70 *[2.76]*	48 *[1.89]*	21 *[0.83]*	15 *[0.59]*	12 *[0.47]*	3.7 *[8.2]*
10	40 *[1.57]*	60 *[2.36]*	100 *[3.94]*	4 *[0.16]*	20 *[0.79]*	70 *[2.76]*	48 *[1.89]*	21 *[0.83]*	15 *[0.59]*	14 *[0.55]*	3.7 *[8.2]*
15	50 *[1.97]*	70 *[2.76]*	135 *[5.32]*	4 *[0.16]*	20 *[0.79]*	100 *[3.94]*	65 *[2.56]*	34 *[1.34]*	18 *[0.71]*	16 *[0.63]*	6.4 *[14.1]*
20	50 *[1.97]*	70 *[2.76]*	135 *[5.32]*	5.5 *[0.22]*	20 *[0.79]*	100 *[3.94]*	65 *[2.56]*	34 *[1.34]*	18 *[0.71]*	18 *[0.71]*	6.4 *[14.1]*
25	60 *[2.36]*	90 *[3.54]*	180 *[7.09]*	5.5 *[0.22]*	25 *[0.98]*	130 *[5.12]*	85 *[3.35]*	35 *[1.38]*	20 *[0.79]*	20 *[0.79]*	13.9 *[30.6]*
30	60 *[2.36]*	90 *[3.54]*	180 *[7.09]*	5.5 *[0.22]*	25 *[0.98]*	130 *[5.12]*	85 *[3.35]*	35 *[1.38]*	20 *[0.79]*	22 *[0.87]*	13.9 *[30.6]*

[1] The tightening torques are standard values, referred to the maximum operating pressure and under the assumption that a torque wrench is used (tolerance ≤ ±10%).

Unit dimensions: Cartridge valve (dimensions in mm *[inch]*)



1) Maximum dimensions

2) All seal ring insertion faces are rounded and free from burrs

Tolerance for all angles ±0.5°

For dimensional tables and explanations of items, see page 9.

Unit dimensions: Cartridge valve (dimensions in mm *[inch]*)

Cartridge valve

NG	ØD11	ØD12	ØD13	L17	L18	L19	L20	L21	L22	L23	L24
6	34 *[1.34]*	60 *[2.36]*	–	72 *[2.83]*	11 *[0.43]*	83 *[3.26]*	28 *[1.10]*	20 *[0.79]*	–	–	64.5 *[2.54]*
10	38 *[1.50]*	60 *[2.36]*	–	68 *[2.68]*	11 *[0.43]*	79 *[3.11]*	28 *[1.10]*	20 *[0.79]*	–	–	77 *[3.03]*
20	48 *[1.89]*	60 *[2.36]*	–	65 *[2.56]*	11 *[0.43]*	77 *[3.03]*	28 *[1.10]*	20 *[0.79]*	–	–	106 *[4.17]*
30	63 *[2.48]*	–	80 *[3.15]*	83 *[3.26]*	–	–	–	–	11 *[0.43]*	56 *[2.21]*	131 *[5.16]*

NG	SW1	SW2	SW3	SW4	SW5	SW6	Tightening torques M_A in Nm *[ft-lbs]* for cartridge valves [2] Pressure rating in bar *[psi]* up to 200 *[2900]*	up to 400 *[5800]*	up to 630 *[9150]*	Weight, ca. in kg *[lbs]*
6	32	30	19	6	–	30	50±5 *[37±3.7]*	80±5 *[59±4]*	–	0.4 *[0.88]*
10	36	30	19	6	–	30	100±5 *[74±3.5]*	150±10 *[110±3.5]*	200±10 *[148±7.5]*	0.5 *[1.10]*
20	46	36	19	6	–	30	150±10 *[111±7.5]*	300±15 *[221±11]*	–	1 *[2.21]*
30	60	46	19	–	13	–	350±20 *[258±19.5]*	500±30 *[369±22]*	–	2.2 *[4.85]*

[2] The tightening torques are recommended values assuming a friction coefficient of ca. 0.12 and the use of a torque wrench.

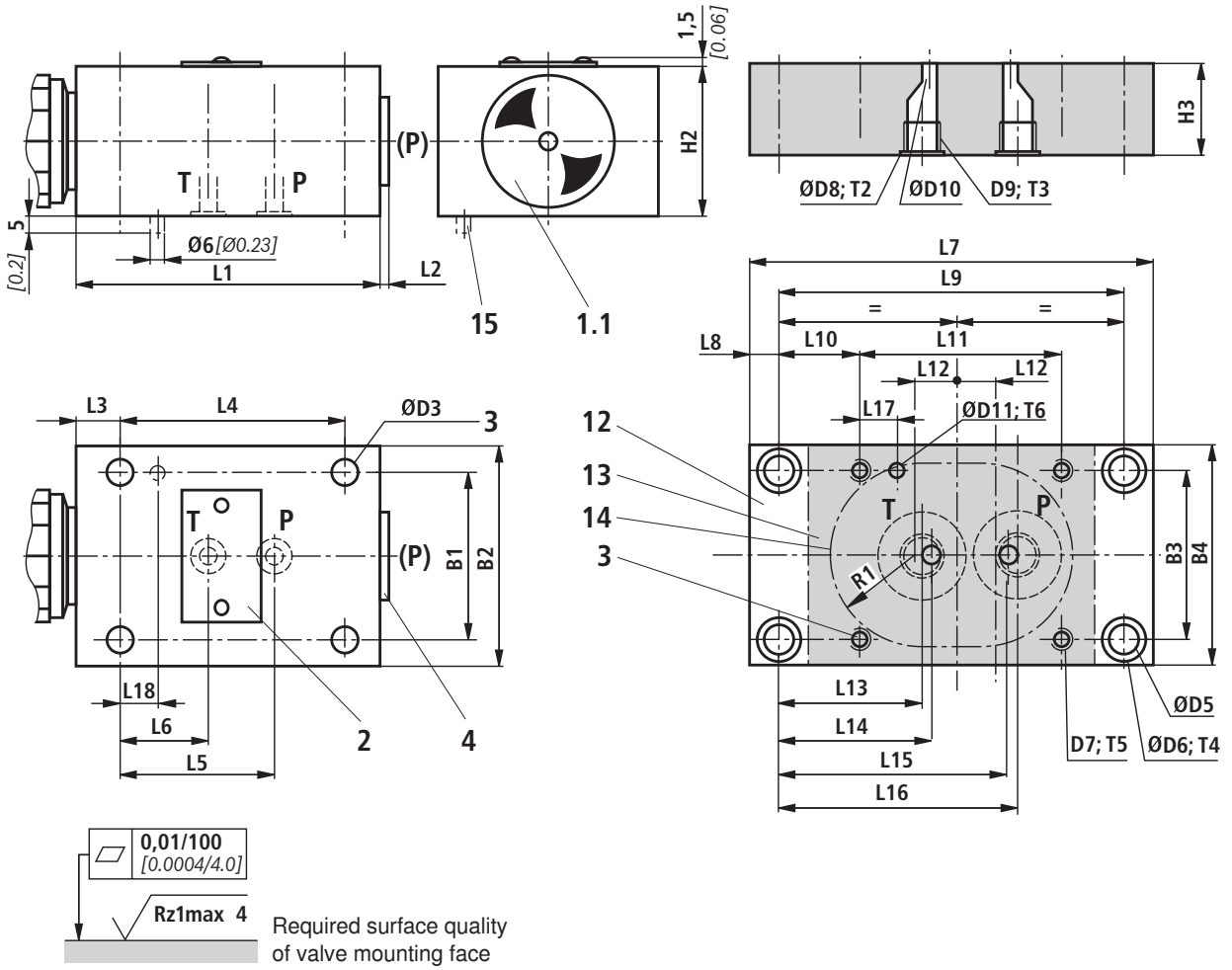
Mounting cavity

NG	D14	ØD15	ØD16	ØD17	ØD18	ØD19
6	M28 x 1.5	25H9 *[0.9843$^{+0.002}$]*	6 *[0.24]*	15 *[0.59]*	$24.9^{+0.152}_{-0.2}$ *[0.9803]* $^{[+0.006]}_{[-0.00786]}$	12 *[0.47]*
10	M35 x 1.5	32H9 *[1.2598$^{+0.0024}$]*	10 *[0.39]*	18.5 *[0.73]*	$31.9^{+0.162}_{-0.2}$ *[1.2559]* $^{[+0.0064]}_{[-0.0079]}$	15 *[0.59]*
20	M45 x 1.5	40H9 *[1.5748$^{+0.0024}$]*	20 *[0.79]*	24 *[0.95]*	$39.9^{+0.162}_{-0.2}$ *[1.5709]* $^{[+0.0063]}_{[-0.0079]}$	22 *[0.87]*
30	M60 x 2	55H9 *[2.1654$^{+0.0029}$]*	30 *[1.18]*	38.75 *[1.53]*	$54.9^{+0.174}_{-0.2}$ *[2.1614]* $^{[+0.0069]}_{[-0.0079]}$	34 *[1.34]*

NG	L25	L26	L27	L28	L29	L30	L31	α1
6	15 *[0.59]*	19 *[0.75]*	30 *[1.18]*	36 *[1.42]*	45 *[1.77]*	56.5±5.5 *[2.22±0.217]*	65 *[2.56]*	15°
10	18 *[0.71]*	23 *[0.91]*	35 *[1.38]*	41.5 *[1.63]*	52 *[2.05]*	67.5±7.5 *[2.66±0.295]*	80 *[3.15]*	15°
20	21 *[0.83]*	27 *[1.06]*	45 *[1.77]*	55 *[2.17]*	70 *[2.76]*	91.5±8.5 *[3.60±0.335]*	110 *[4.33]*	20°
30	23 *[0.91]*	29 *[1.14]*	45 *[1.77]*	63 *[2.48]*	84 *[3.31]*	113.5±11.5 *[4.47±0.453]*	140 *[5.51]*	20°

1.1 Adjustment element “S“ – set screw with hexagon and protective cap; hexagon socket (up to NG20), hexagon head (NG30)
1.2 Adjustment element “H“ – rotary knob (up to NG20), hand wheel (NG30)
1.3 Adjustment element “A“ – lockable rotary knob up to NG10 (NG20 to 100 bar *[1450 psi]*)
4 Port P, optional, on the circumference or front face
5 Port T, optional, on the circumference
6 Type designation
7 Pressure rating (impressed)
8 Marking (adjustment of the zero position after the valve was screwed in; then securing of the ring by shifting it horizontally until the plug screw locks into position on the 6 A/F plug screw)
9 Depth of fit
10 Locknut, tightening torque $M_T = 10^{+5}$ Nm *[7.4$^{+3.7}$ ft-lbs]*
11 Space required to remove key
12 Minimum strength of housing materials, see Technical data on page 5

Unit dimensions: Subplate mounting (dimensions in mm *[inch]*)



For versions and dimensions of the adjustment elements, see pages 8 and 9.

1.1 Adjustment element “S“ (example)
Set screw with hexagon and protective cap; hexagon socket (up to NG20), hexagon head (NG30)

2 Nameplate

3 4 valve mounting bores

4 Additional port (P), optional (e.g. for pressure measurement); not possible for NG10, pressure rating > 400 bar (= version “SO292“). For tightening torques, see table of dimensions on page 7)

12 Subplate (for type designation, see table on page 11)

13 Valve mounting face

14 Front panel cutout

15 Locating pin (only on type-tested safety valves)

For strength reasons, use exclusively the following valve mounting screws (separate order):

4 hexagon socket head cap screws ISO 4762 - flZn-240h-L [1)]
(friction coefficient μ_{total} = 0.09 to 0.14)

NG	Dimension	Strength class	M_T in Nm *[ft-lbs]* [2)]	Material number
6	M6 x 50	10.9	12,5 *[9.2]*	R913000151
10	M8 x 70	10.9	28 *[20.7]*	R913000149
20	M8 x 90	12.9	28 *[20.7]*	R913000150
30	M10 x 110	12.9	56 *[41.3]*	R913000148

4 hexagon socket head cap screws UNC on request

[1)] Alternatively, bolts appropriately specified in accordance with DIN 912 can be used.

[2)] For tightening, use a torque wrench having a tolerance of ≤10%.

Unit dimensions: Subplate mounting (dimensions in mm *[inch]*)

Pressure relief valve

NG	B1	B2	ØD3	H2	L1	L2	L3
6	45 *[1.77]*	60 *[2.36]*	6.6 *[0.26]*	40 *[1.57]*	80 *[3.15]*	4 *[0.16]*	15 *[0.59]*
10	60 *[2.36]*	80 *[3.15]*	9 *[0.35]*	60 *[2.36]*	100 *[3.94]*	4 *[0.16]*	20 *[0.79]*
20	70 *[2.76]*	100 *[3.94]*	9 *[0.35]*	70 *[2.76]*	135 *[5.32]*	5.5 *[0.22]*	20 *[0.79]*
30	100 *[3.94]*	130 *[5.12]*	11 *[0.43]*	90 *[3.54]*	180 *[7.09]*	5.5 *[0.22]*	25 *[0.98]*

NG	L4	L5	L6	L18	Port (P)	**Weight,** ca. in kg *[lbs]*
6	55 *[2.17]*	40 *[1.57]*	20 *[0.79]*	15 *[0.59]*	G1/4	1.5 *[3.3]*
10	70 *[2.76]*	45 *[1.77]*	21 *[0.83]*	15 *[0.59]*	G1/2	3.7 *[8.2]*
20	100 *[3.94]*	65 *[2.56]*	34 *[1.34]*	15 *[0.59]*	G3/4	6.4 *[14.1]*
30	130 *[5.12]*	85 *[3.35]*	35 *[1.37]*	15 *[0.59]*	G1 1/4	13.9 *[30.6]*

Subplates [3)]

NG	Type	B3	B4	ØD5	ØD6	D7	ØD8	D9
6	G300/01 *[G300/12]*	45 *[1.77]*	60 *[2.36]*	6.6 *[0.26]*	11 *[0.43]*	M6 *[1/4-20 UNC]*	25 *[0.98]*	G1/4 *[SAE 4; 7/16-20]*
10	G661//01	60 *[2.36]*	80 *[3.15]*	6.6 *[0.26]*	11 *[0.43]*	M8	25 *[0.98]*	G3/8
	G662/01	60 *[2.36]*	80 *[3.15]*	6.6 *[0.26]*	11 *[0.43]*	M8	34 *[1.34]*	G1/2
20	G303/01	70 *[2.76]*	100 *[3.94]*	11 *[0.43]*	18 *[0.71]*	M8	42 *[1.65]*	G3/4
	G304/01	70 *[2.76]*	100 *[3.94]*	11 *[0.43]*	18 *[0.71]*	M8	47 *[1.85]*	G1
30	G305/01	100 *[3.94]*	130 *[5.12]*	11 *[0.43]*	18 *[0.71]*	M10	56 *[2.20]*	G1 1/4
	G306/01	100 *[3.94]*	130 *[5.12]*	11 *[0.43]*	18 *[0.71]*	M10	65 *[2.56]*	G1 1/2

NG	ØD10	ØD11	H3	L7	L8	L9	L10	L11	L12
6	6 *[0.24]*	8 *[0.32]*	25 *[0.98]*	110 *[4.33]*	8 *[0.32]*	94 *[3.70]*	22 *[0.87]*	55 *[2.17]*	10 *[0.39]*
10	10 *[0.39]*	8 *[0.32]*	25 *[0.98]*	135 *[5.32]*	10 *[0.39]*	115 *[4.53]*	27.5 *[1.08]*	70 *[2.76]*	12.5 *[0.49]*
	10 *[0.39]*	8 *[0.32]*	25 *[0.98]*	135 *[5.32]*	10 *[0.39]*	115 *[4.53]*	27.5 *[1.08]*	70 *[2.76]*	12.5 *[0.49]*
20	15 *[0.59]*	8 *[0.32]*	40 *[1.57]*	170 *[6.69]*	15 *[0.59]*	140 *[5.51]*	20 *[0.79]*	100 *[3.94]*	20 *[0.79]*
	20 *[0.79]*	8 *[0.32]*	40 *[1.57]*	170 *[6.69]*	15 *[0.59]*	140 *[5.51]*	20 *[0.79]*	100 *[3.94]*	20 *[0.79]*
30	30 *[1.18]*	8 *[0.32]*	40 *[1.57]*	190 *[7.48]*	12.5 *[0.49]*	165 *[6.50]*	17.5 *[0.67]*	130 *[5.12]*	22.5 *[0.89]*

NG	L13	L14	L15	L16	L17	T2	T3	T4	T5
6	39 *[1.54]*	42 *[1.65]*	62 *[2.44]*	65 *[2.56]*	15 *[0.59]*	1 *[0.039]*	15 *[0.59]*	9 *[0.35]*	15 *[0.59]*
10	40.5 *[1.59]*	48.5 *[1.91]*	72.5 *[2.85]*	80.5 *[3.17]*	15 *[0.59]*	1 *[0.039]*	15 *[0.59]*	9 *[0.35]*	12 *[0.47]*
	40.5 *[1.59]*	48.5 *[1.91]*	72.5 *[2.85]*	80.5 *[3.17]*	15 *[0.59]*	1 *[0.039]*	16 *[0.63]*	9 *[0.35]*	15 *[0.59]*
20	45 *[1.77]*	54 *[2.13]*	85 *[3.35]*	94 *[3.70]*	15 *[0.59]*	1 *[0.039]*	20 *[0.79]*	13 *[0.51]*	22 *[0.87]*
	42 *[1.65]*	54 *[2.13]*	85 *[3.35]*	97 *[3.82]*	15 *[0.59]*	1 *[0.039]*	20 *[0.79]*	13 *[0.51]*	22 *[0.87]*
30	42 *[1.65]*	52.5 *[2.07]*	102.5 *[4.04]*	113 *[4.45]*	15 *[0.59]*	1 *[0.039]*	24 *[0.95]*	11.5 *[0.45]*	22 *[0.87]*

NG	T6	R1	**Weight,** ca. in kg *[lbs]*
6	6 *[0.24]*	25^{+2} *[$0.98^{+0.079}$]*	1.5 *[3.3]*
10	6 *[0.24]*	30^{+5} *[$1.18^{+0.197}$]*	2 *[4.4]*
20	6 *[0.24]*	40^{+3} *[$1.57^{+0.118}$]*	5.5 *[12.1]*
30	6 *[0.24]*	55^{+4} *[$2.16^{+0.157}$]*	8 *[17.6]*

[3)] **Attention!**
The subplates listed are **not** approved for use with type-tested safety valves according to Pressure Equipment Directive 97/23/EC!

Ordering code: Type-tested safety valves of type DBD [1)]

NG	Type designation	Component code
6	DBDS 6K1X/ ☐ E	TÜV.SV.■–849.5.F. $\alpha_{w\,G}$ .p.
	DBDH 6K1X/ ☐ E	
	DBDS 6G1X/ ☐ E	
	DBDH 6G1X/ ☐ E	
	DBDS 6P1X/ ☐ E	
	DBDH 6P1X/ ☐ E	
10	DBDS 10K1X/ ☐ E	TÜV.SV.■–850.6.F. $\alpha_{w\,G}$ .p. TÜV.SV.■–390.4,5.F.30.p. [2)]
	DBDH 10K1X/ ☐ E	
	DBDS 10G1X/ ☐ E	
	DBDH 10G1X/ ☐ E	
	DBDS 10P1X/ ☐ E	
	DBDH 10P1X/ ☐ E	

NG	Type designation	Component code
20	DBDS 20K1X/ ☐ E	TÜV.SV.■–361.10.F.α_w.p.
	DBDH 20K1X/ ☐ E	
	DBDS 20G1X/ ☐ E	
	DBDH 20G1X/ ☐ E	
	DBDS 20P1X/ ☐ E	
	DBDH 20P1X/ ☐ E	
	DBDS 30K1X/ ☐ E	
	DBDH 30K1X/ ☐ E	
	DBDS 30G1X/ ☐ E	
	DBDH 30G1X/☐ E	
	DBDS 30P1X/ ☐ E	
	DBDH 30P1X/ ☐ E	

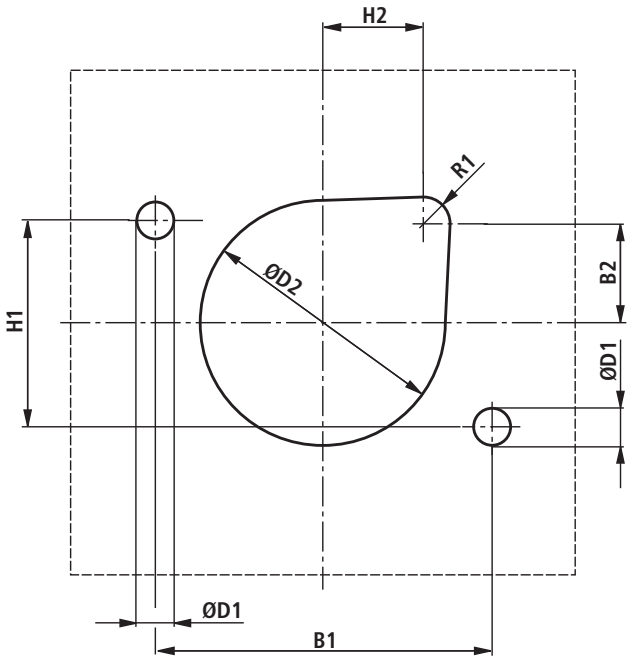
☐ The customer must enter the pressure in the type designation; pressure settings are possible ≥ 30 bar *[435 psi]* and in 5-bar *[72 psi]* increments.

■ Details are entered in the factory

[1)] Component series 1X, to Pressure Equipment Directive 97/23/EC

[2)] Component code for DBD. 10.1X/...;
400 bar *[5801 psi]* < ***p*** ≤ 630 bar *[9150 psi]*

Unit dimensions: Sheet metal cutout for front panel installation of type-tested safety valves of type DBD [1)] (dimensions in mm *[inch]*)



NG	B1	B2	H1	H2
6	45 *[1.77]*	12.5 *[0.49]*	25 *[0.98]*	22.5 *[0.89]*
10	60 *[2.36]*	20.5 *[0.81]*	40 *[1.57]*	20.5 *[0.81]*
20	70 *[2.76]*	24 *[0.94]*	50 *[1.97]*	24 *[0.94]*
30	100 *[3.94]*	29.5 *[1.16]*	60 *[2.36]*	29.5 *[1.16]*

NG	ØD1H13	ØD2H13	R1
6	7 *[0.27]*	40 *[1.57]*	8 *[0.32]*
10	9 *[0.35]*	44 *[1.73]*	8 *[0.32]*
20	9 *[0.35]*	55 *[2.17]*	8 *[0.32]*
30	11 *[0.43]*	73 *[2.87]*	8 *[0.32]*

☞ **Note!**

For valves of type DBDH.K..1X/..E the hand wheel must be removed and then refitted before the cartridge valve can be mounted on the valve panel.

[1)] Component series 1X, to Pressure Equipment Directive 97/23/EC

Deviating technical data: Type-tested safety valves of type DBD [1)]

Hydraulic

Maximum flow		See characteristic curves on pages 13 to 16
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524-1 and DIN 51524-2
Hydraulic fluid temperature range	°C *[°F]*	–20 to +60 *[–4 to +140]* (NBR seals) –15 to +60 *[5 to 140]* (FKM seals)
Viscosity range	mm^2/s *[SUS]*	12 to 230 *[55 to 1066]*

[1)] Component series 1X, to Pressure Equipment Directive 97/23/EC (for applications outside these parameters, please consult us!)

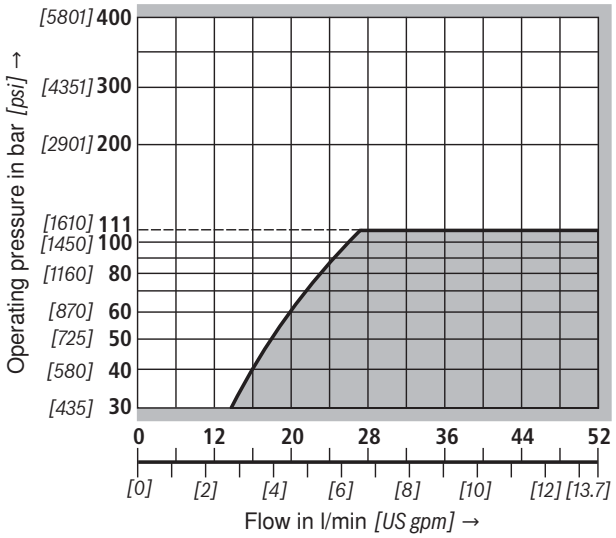
Characteristic curves: Type-tested safety valves of type DBD [1)]

[1)] Component series 1X, according to Pressure Equipment Directive 97/23/EC

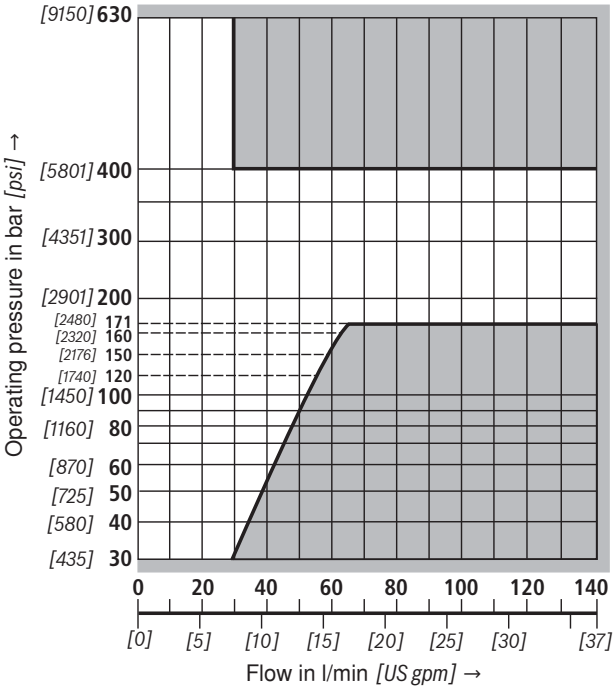
Note!

Values within the gray-shaded sections of the characteristic curves can**not** be achieved with this valve!

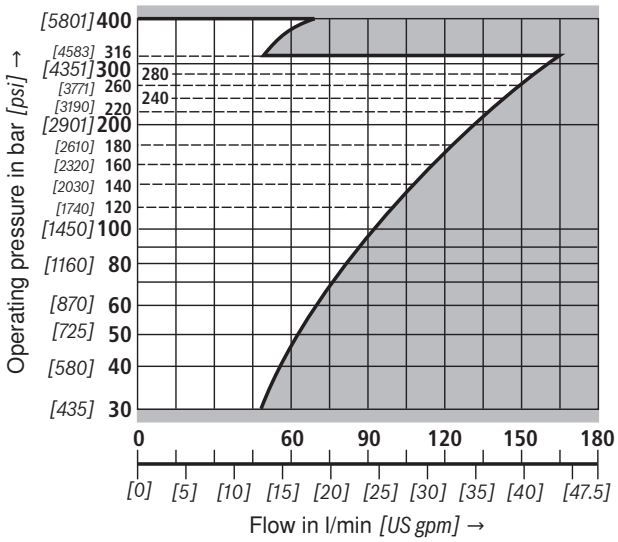
Size 6



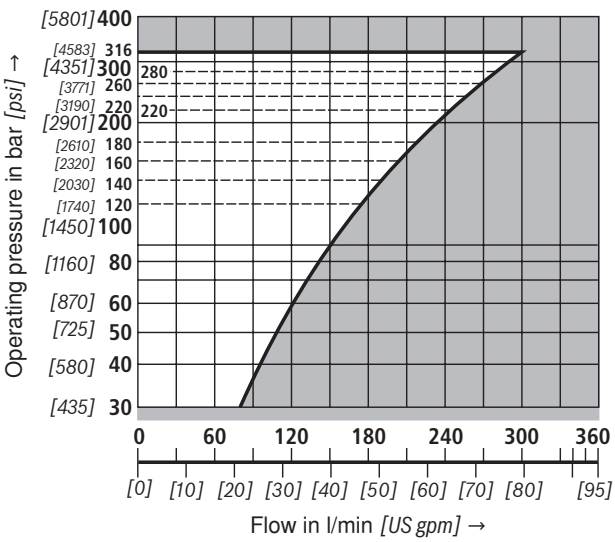
Size 10



Size 20



Size 30



Safety notes: Type-tested safety valves of type DBD [1)]

– Before ordering a type-tested safety valve, please note that at the desired **response pressure *p*** the permissible maximum **flow q_{Vmax}** of the safety valve is greater than the permissible maximum flow of the system / accumulator to be protected.

  The relevant regulations must be observed!

– According to **PED 97/23/EC** the increase in the system pressure caused by the flow must not exceed 10 % of the set response pressure (see component code).

  The permissible maximum flow q_{Vmax} specified in the component code must not be exceeded.

  Drain lines of safety valves must terminate without any risks. **No** fluid may accumulate in the drain system (see AD2000 - sheet A2).

☞ **Strictly observe notes on the operation!**

– The response pressure specified in the component code is factory-set at a flow of 2 l/min *[0.53 US gpm]*.

– The permissible maximum flow specified in the component code is valid for applications without backpressure in the drain line (port T).

– When the lead-seal is removed from the safety valve, the approval in accordance with PED becomes void!

– Generally, the requirements laid down in the Pressure Equipment Directive and in AD2000 sheet A2 must be observed!

– It is recommended that type-tested safety valves be secured against unauthorized removal from the housing/block by means of wires and lead-sealing (a bore is provided in the adjustment element).

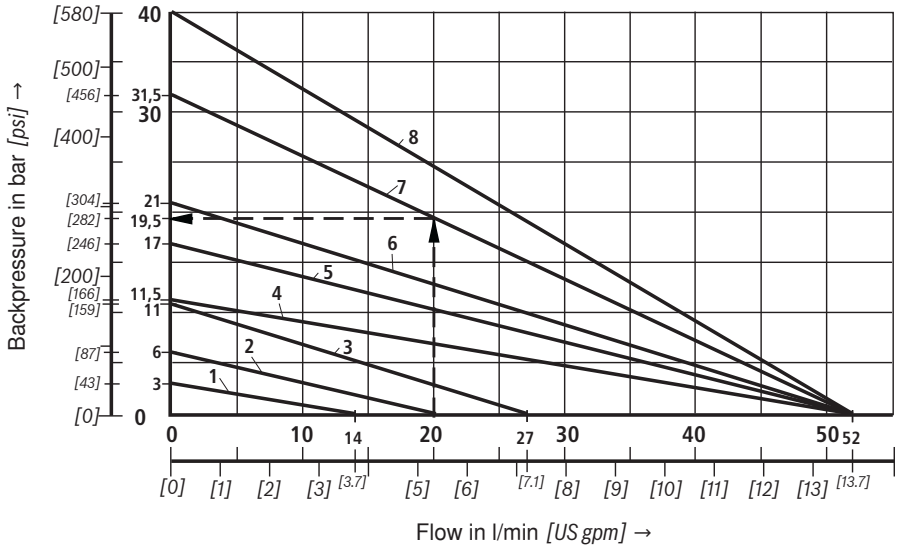
Attention!

As the flow rises, the system pressure increases by the backpressure in the drain line (port T). (Observe AD2000 - sheet A2, section 6.3!)

In order that this increase in the system pressure caused by the flow will not exceed 10 % of the set response pressure, the permissible flow must be reduced in dependence upon the backpressure in the drain line (port T) (see diagrams on pages 14 to 16).

Permissible maximum flow q_{Vmax} in dependence upon backpressure p_T in the drain line

Type DBD. 6 .1X/...E



Characteristic curves	Response pressure p_A in bar *[psi]*
1	30 *[435]*
2	60 *[870]*
3	110 *[1595]*
4	115 *[1668]*
5	170 *[2465]*
6	210 *[3046]*
7	315 *[4568]*
8	400 *[5800]*

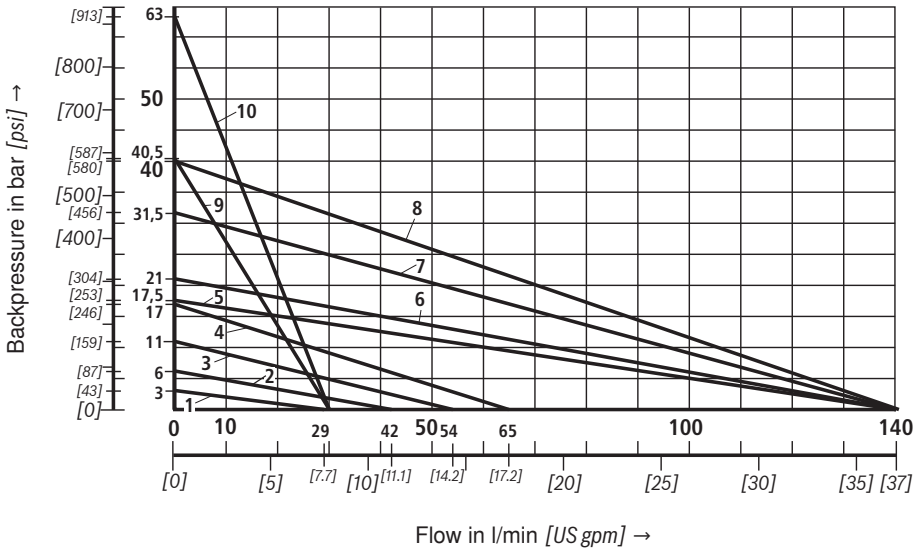
Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 16.

[1)] Component series 1X, to Pressure Equipment Directive 97/23/EC

Safety notes: Type-tested safety valves of type DBD [1)]

Permissible maximum flow q_{Vmax} in dependence upon backpressure p_T in the drain line

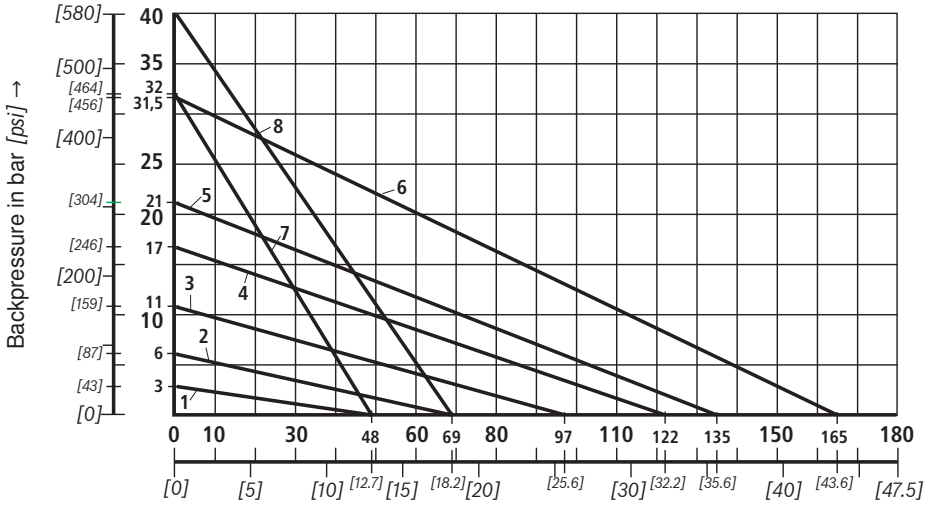
Type DBD. 10 .1X/...E



Characteristic curves	Response pressure p_A in bar [psi]
1	30 [435]
2	60 [870]
3	110 [1595]
4	170 [2465]
5	175 [2538]
6	210 [3046]
7	315 [4568]
8	400 [5800]
9	405 [5874]
10	630 [9150]

Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 16.

Type DBD. 20 .1X/...E



Characteristic curves	Response pressure p_A in bar [psi]
1	30 [435]
2	60 [870]
3	110 [1595]
4	170 [2465]
5	210 [3046]
6	315 [4568]
7	320 [4641]
8	400 [5800]

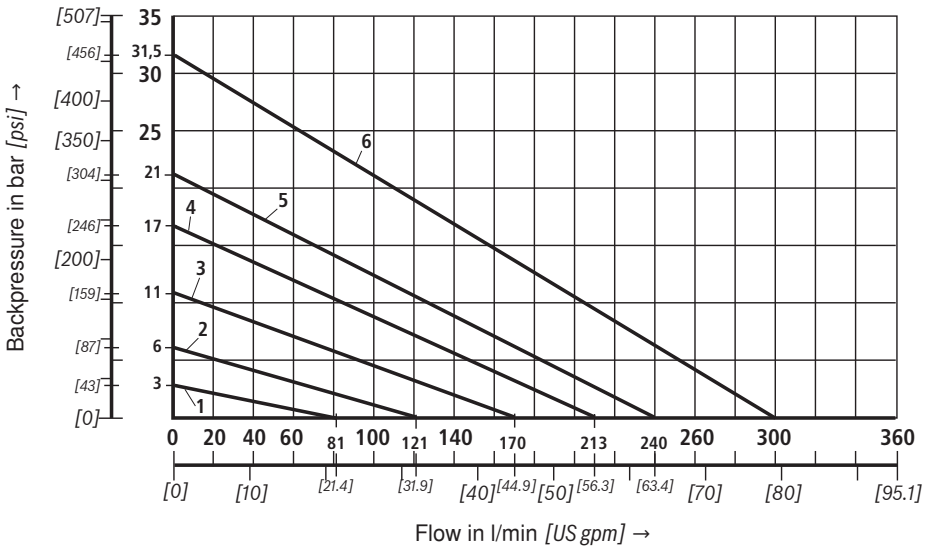
Characteristic curves for intermediate values can be generated by interpolation. Further explanations can be found on page 16.

1) Component series 1X, to Pressure Equipment Directive 97/23/EC

Safety notes: Type-tested safety valves of type DBD [1)]

Permissible maximum flow q_{Vmax} in dependence upon backpressure p_T in the drain line

Type DBD. 30 .1X/...E



Characteristic curves	Response pressure p_A in bar [psi]
1	30 [435]
2	60 [870]
3	110 [1595]
4	170 [2465]
5	220 [3191]
6	315 [4568]

Characteristic curves for intermediate values can be generated by interpolation. For further explanations, see below.

p_A = response pressure in bar

p_T = permissible maximum backpressure in bar (sum of all tank pressures; see also AD2000 - sheet A2)

$q_{V\,max}$ = permissible maximum flow in l/min

PED: $p_{T\,max}$ = 10 % x p_A (at q_V = 0)

Explanation of diagrams (Example: type DBD 6 …E, page 14):

Given: – flow of the system/accumulator to be protected q_{Vmax} = 20 l/min
– set response pressure of the safety valve p_A = 315 bar

Sought: $p_{T\,permissible}$

Solution: See arrows in the diagram on page 14 (type DBD 6 …E)
$p_{T\,permissible}$ (20 l/min; 315 bar) = 19.5 bar

[1)] Component series 1X, to Pressure Equipment Directive 97/23/EC

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Rexroth
Bosch Group

Pressure relief valve, direct operated

Type DBD, DBD...-E according to RE 25402

RE 25402-EVT/12.10

Material no.: R901292431

Setting instructions

Size 6 to 30
Component series 1X
Maximum operating pressure 630 bar *[9150 psi]*
Maximum flow 330 l/min *[87 US gpm]*

The data specified above only serve to describe the product. No statements concerning a certain condition or suitability for a certain application can be derived from our information. The information given does not release the user from the obligation of own judgment and verification. It must be remembered that our products are subject to a natural process of wear and aging.

The cover shows an example configuration. The product supplied may therefore differ from the photo shown.

Content

1 About this documentation

1.1 Validity of the documentation

These setting instructions apply to the pressure relief valve type DBD, component series 1X, sizes 6 to 30.

This documentation aims at commissioning personnel and service engineers.

This documentation contains important information for the safe and appropriate setting of the pressure relief valve type DBD.

1.2 Necessary and amending documentation

- The pressure setting at the pressure relief valve must not be changed until you have been provided with the documentation marked with the book symbol 🕮 and you have understood and observed it.

Table 1: Necessary and amending documentation

	Title	Document number	Document type
🕮	Pressure relief valve, direct operated	RE 25402	Data sheet
🕮	Safety valves direct operated	RE 25010-B	Operating instructions
🕮	General Operating Instructions for Hydraulic Power Units and Assemblies	RE 07009-B	Operating instructions
🕮	Installation, commissioning and maintenance of industrial valves	RE 07300	Data sheet

1.3 Illustration of information

Consistent safety instructions, symbols, terms and abbreviations are used so that you can quickly and safely work with your product using this documentation. For a better understanding, they are explained in the following sections.

1.3.1 Safety instructions

In this documentation, safety instructions are indicated whenever sequences of operations are explained which bear the risk of personal injury or damage to property. The measures described for preventing these dangers must be observed.

Safety instructions are set out as follows:

⚠ SIGNAL WORD

Type and source of danger

Consequences in case of non-compliance

- Measures for the prevention of dangers
- <Enumeration>

- **Warning sign:** Draws attention to the danger
- **Signal word:** Identifies the degree of danger
- **Type and source of danger:** Specifies the type or source of danger
- **Consequences:** Describes the consequences of non-compliance
- **Precautions:** Specifies how the danger can be prevented

Table 2: Risk classes according to ANSI Z535.6-2006

Warning sign, signal word	Meaning
⚠ DANGER	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided.
⚠ WARNING	Indicates a dangerous situation which may cause death or severe personal injuries if not avoided.
⚠ CAUTION	Indicates a dangerous situation which may cause minor or medium personal injuries if not avoided.
NOTE	Damage to property: The product or the environment could be damaged.

1.3.2 Symbols

The following symbols indicate notes which are not safety-relevant but increase the understanding of the documentation.

Table 3: Meaning of the symbols

Symbol	Meaning
	If this information is not observed, the product cannot be used and/ or operated optimally.
▶	individual, self-dependent step
1. 2. 3.	Numbered instruction: The numbers indicate that the steps must be carried out one after the other.

1.3.3 Abbreviations

The following abbreviations are used in this documentation:

Table 4: Abbreviations

Abbreviation	Meaning
DBD	Pressure relief valve, direct operated
DBD...E	Type-tested pressure relief valve, direct operated

2 Setting the pressure relief valve

For setting the system pressure in your hydraulic system, safe procedures are necessary. You must therefore follow the instructions in the following sections.

2.1 Prerequisites for the safe pressure setting

Before starting settings at the pressure valve, the following prerequisites have to be satisfied:

- The valid hydraulic scheme must be available. The scheme must contain information on the setting of the system pressure.
- The system pressure at port "P" of the pressure relief valve must be permanently measured during the pressure setting.
- At port "T" of the pressure relief valve, free discharge of the entire oil volume must be guaranteed.
- During setting, the pressure change must be monitored.
- Familiarize with the scheme and check whether:
  - There is a pressure gauge or pressure measurement directly at port "P".
  - Free discharge is guaranteed at port "T".
  - Values for the pressure setting have been specified.
- Keep the necessary tools and measuring equipment (e.g. pressure gauge) ready.

How to proceed

1. Determine the admissible pressure settings.
2. Check the pressure setting at the valve.
3. Set the pressure at the valve.

2.2 Determining the admissible pressure settings

The admissible values for the pressure setting can be seen from the type designation. The type designation is impressed into the valve. The following figure shows the information relevant for the pressure setting. For a detailed explanation of the type designation refer to "Ordering code" in the data sheet RE 25402. Upon delivery, the pressure relief valve is either preset to 0 bar or to a certain pressure (pressure setting)

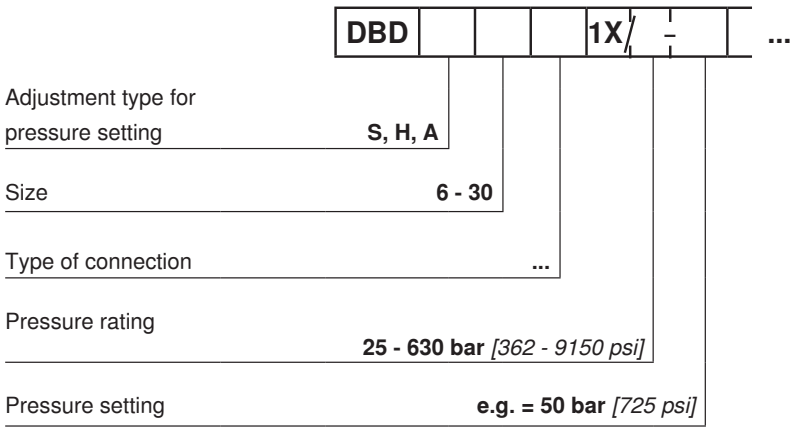


Fig. 1: Type designation - information on the pressure setting

Setting the pressure relief valve

Pressure rating The pressure rating specifies the maximum pressure that can be set. The pressure adjustment range is 0 bar to the specified pressure rating value.

Pressure setting If a value is specified for the pressure setting, the pressure relief valve has been "preset" upon delivery. The pressure relief valve is set to the specified value.

2.2.1 Pressure relief valves at manifolds or power units

Pressure relief valves mounted at manifolds or power units may have a preset pressure. In this case, the pressure setting can not be seen from the type designation but from the hydraulic scheme and the setting spindle position.

Observe the following to check whether a pressure setting has been made:

- Apart from the DBD symbol, the hydraulic scheme also contains the following information: "Set to".
- Check the position of the setting spindle according to table 6 "Pressure relief valve - Depressurized setting":
  If dimension "L" is less than specified in the table, the valve has already been preset to a certain pressure.

2.2.2 Type tested safety valves, type DBD...1X/...E

Type tested safety valves according to PED 97/23/EC have a tested pressure setting. With the correct design, they hold the system pressure at the set value. The pressure setting can be seen from the type designation.

Using the following figure, you can identify the set pressure. A detailed explanation of the type designation is contained in the "Ordering code": Type tested safety valves type DBD" in data sheet RE 25402.

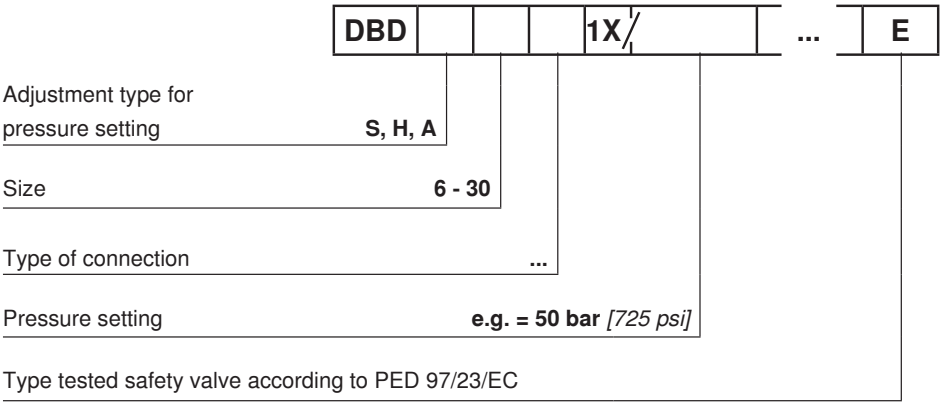


Fig. 2: Type designation - information on the pressure setting of type tested safety valves

Pressure setting The specified value is the tested pressure setting. In case of safety valves with adjustment type "H" (manual), this value must not be exceeded.

Safety valve Type DBDS … 1X/ .. E

Safety valves with adjustment type "S" are set to a fixed system pressure. They are protected against adjustment by means of lead seal and non-removable protective cap. At these valves, no pressure setting must be made.

If the protective cap is destroyed or the lead seal is removed, the warranty for the safety function will become void.

Safety valve Type DBDH … 1X/ .. E

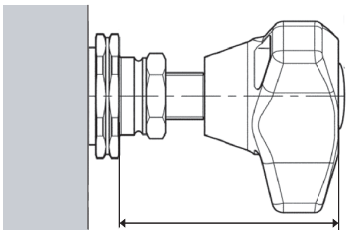
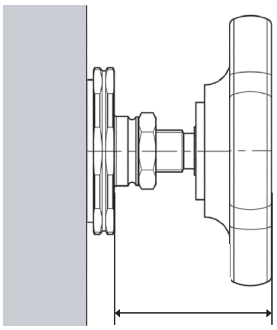
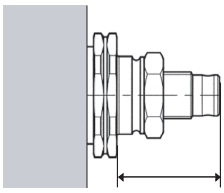
Safety valves with adjustment type "H" are set to the maximum system pressure. In case of adjustment, you may only set a lower pressure.

2.3 Checking the pressure setting at the valve

The pressure setting can be checked using the adjustment position. The following table shows the pressure relief valve with the different adjustment types with pressure setting 0 bar. The valve is in a depressurized condition.

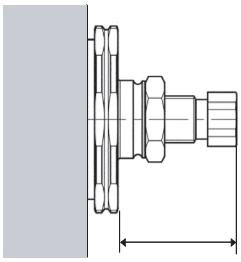
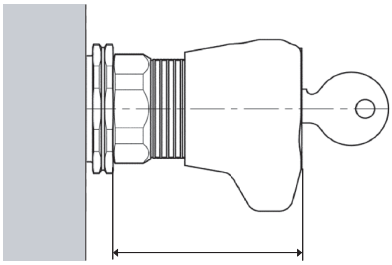
- Check the "L" dimension at your pressure relief valve. If the value is lower than specified in the table, a certain pressure has already been set at the valve.

Table 5: Pressure relief valve - Depressurized setting

Pressure relief valve, direct operated	Dimension "L" max. in mm *[inch]*	Type
	**57** *[2.24]*	**DBD H with rotary knob, sizes 6 - 25**
	**47** *[1.85]*	**DBD H with hand wheel, size 30**
	**30** *[1.18]*	**DBD S with internal hexagon and protective cap, sizes 6 - 20**

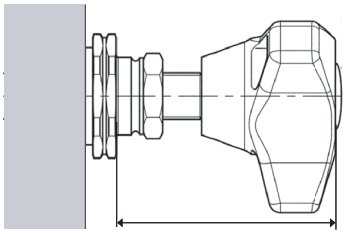
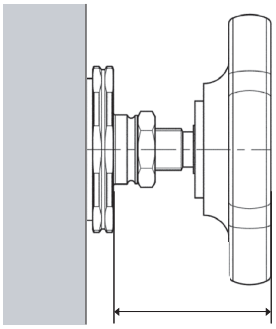
Setting the pressure relief valve

Table 5: Pressure relief valve - Depressurized setting

Pressure relief valve, direct operated	Dimension "L" max. in mm *[inch]*	Type
	**32** *[1.26]*	**DBD S with external hexagon and protective cap, sizes 25 and 30**
	**To the end of the scale ring**	**DBD A with lockable rotary knob, sizes 6 - 20**

2.3.1 Safety valve type DBDH ... 1X/ .. E

Table 6: Safety valve - Depressurized setting

Pressure relief valve, direct operated	Dimension "L" max. in mm *[inch]*	Type
	**63** *[2.48]*	**DBDH … 1X/ .. E with rotary knob, sizes 6, 10, 20**
	**54** *[2.13]*	**DBDH … 1X/ .. E with hand wheel, size 30**

2.4 Setting the pressure

The pressure is set by turning the setting spindle. The setting elements are shown under "Unit dimensions: screw-in valve" in the data sheet RE 25402.

2.4.1 Tools, tightening torque lock nut

Only use manual tools without extension for the pressure setting. Electrically or pneumatically driven tools must not be used!

Depending on the adjustment type and size, you need the following tools:

- Torque power screwdriver
- Open-end wrench SW 19
- Allen wrench SW 6
- Open-end wrench SW 13
- Open-end wrench SW 30

Tightening torque lock nut

The lock nut must be tightened applying a tightening torque of $M_A = 10^{+5}$ Nm with all adjustment types and sizes.

2.4.2 Increasing the pressure

The pressure at the pressure relief valve is increased by clockwise rotation.

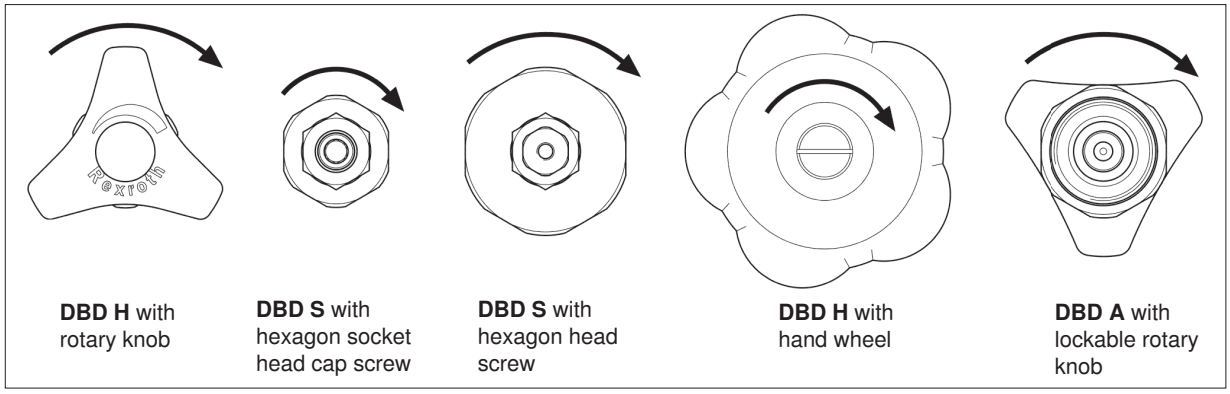


Fig. 3: Direction of rotation for pressure increase

DBD H - Valve with hand wheel or rotary knob without locking function

1. Loosen the lock nut at the pressure relief valve.

WARNING! Pressurized valve!!

Risk of injury from leaking oil or components.

- ► Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ► Secure external loads.
- ► Find the fault and replace the leaking valve by a new one, if necessary.

Setting the pressure relief valve

2. Slowly turn the hand wheel clockwise until the pressure has been increased to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
3. Fix the setting by tightening the lock nut by means of a torque power screwdriver.

   The pressure has been set.

DBD S - Valve with hexagon head or hexagon socket head cap screw

1. Loosen the lock nut at the pressure relief valve.

WARNING! Pressurized valve!!

Risk of injury from leaking oil or components.

- ► Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ► Secure external loads.
- ► Find the fault and replace the leaking valve by a new one, if necessary.

2. Slowly turn the hexagon head and/or the hexagon socket head cap screw clockwise, using a suitable wrench, until the pressure increases to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
3. Fix the setting by tightening the lock nut by means of a torque power screwdriver.

   The pressure has been set.

DBD A - Valve with lockable rotary knob

1. Loosen the lock nut at the pressure relief valve.
2. Firstly turn the key at the rotary knob of the pressure relief valve clockwise in order to enable the adjustment of the pressure setting.

WARNING! Pressurized valve!!

Risk of injury from leaking oil or components.

- ► Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ► Secure external loads.
- ► Find the fault and replace the leaking valve by a new one, if necessary.

3. Slowly turn the rotary knob clockwise until the pressure has been increased to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
4. Turn the key at the pressure relief valve counterclockwise again.
5. Remove the key from the rotary knob of the pressure relief valve and keep it in a safe place.

   The pressure has been set.

2.4.3 Reducing the pressure

Setting a lower pressure

The system pressure may in any case only be set in the pressure increase direction. When setting a lower pressure, you must first of all reduce the pressure to a value just under the system pressure to be set.

How to proceed

1. Reduce the pressure to a value just under the setting.
2. Increase the pressure to the necessary value.

The pressure at the pressure relief valve is reduced by counterclockwise rotation.

Please note that in the pressure reduction, the adjustment device may maximally be screwed out to the dimension "L". For the value of dimension "L", please refer to table 6 in chapter 2.3 "Checking the pressure setting at the valve".

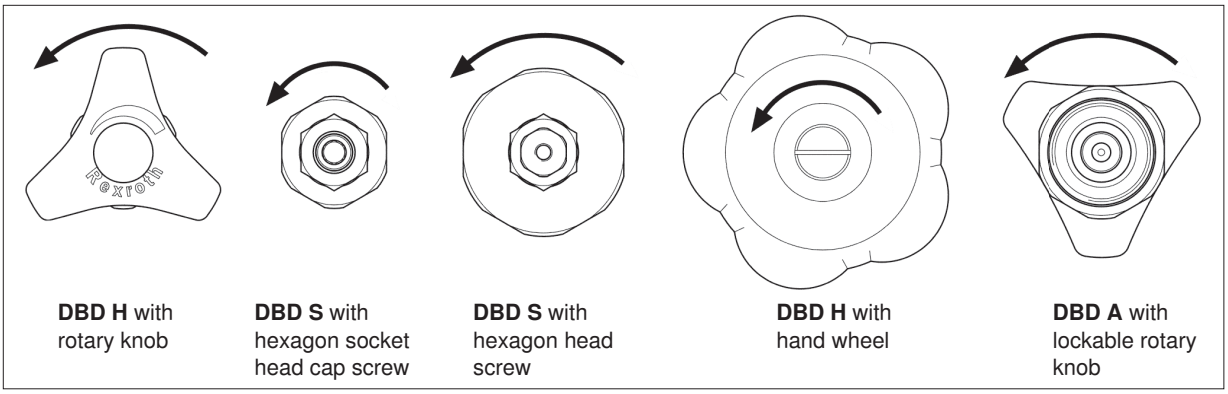


Fig. 4: Direction of rotation for pressure reduction

DBD H - Valve with hand wheel or rotary knob without locking function

WARNING

Pressurized valve! Risk of injury in case of incorrect setting if the adjustment type is screwed out against the internal stop!

Risk of injury from leaking oil or components.

- ▶ It must be possible to rotate the adjustment type smoothly.
- ▶ Only screw the adjustment device out of the valve to the maximum value of dimension "L". For the maximum value, please refer to table 6 in chapter 2.3 "Checking the pressure setting at the valve".

Pressurized valve!!

Risk of injury from leaking oil or components.

- ▶ Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ▶ Secure external loads.
- ▶ Find the fault and replace the leaking valve by a new one, if necessary.

1. Loosen the lock nut at the pressure relief valve.

Setting the pressure relief valve

2. Slowly turn out the hand wheel counterclockwise until the pressure has been reduced to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
3. If necessary, slowly turn the hand wheel in the opposite direction until the pressure has been increased to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
4. Fix the setting by tightening the lock nut by means of a torque power screwdriver.

   The pressure has been set.

DBD S - Valve with hexagon head or hexagon socket head cap screw

WARNING

Pressurized valve! Risk of injury in case of incorrect setting if the adjustment type is screwed out against the internal stop!

Risk of injury from leaking oil or components.

- ▶ It must be possible to rotate the adjustment type smoothly.
- ▶ Only screw the adjustment device out of the valve to the maximum value of dimension "L". For the maximum value, please refer to table 6 in chapter 2.3 "Checking the pressure setting at the valve".

Pressurized valve!

Risk of injury from leaking oil or components.

- ▶ Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ▶ Secure external loads.
- ▶ Find the fault and replace the leaking valve by a new one, if necessary.

1. Loosen the lock nut at the pressure relief valve.
2. Slowly turn the hexagon head and/or the hexagon socket head cap screw counterclockwise, using a suitable wrench, until the pressure is reduced to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
3. Slowly turn the hexagon head and/or the hexagon socket head cap screw in the opposite direction, using a suitable wrench, until the pressure increases to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
4. Fix the setting by tightening the lock nut by means of a torque power screwdriver.

   The pressure has been set.

Setting the pressure relief valve

DBD A - Valve with lockable rotary knob

WARNING

Pressurized valve! Risk of injury in case of incorrect setting if the adjustment type is screwed out against the internal stop!

Risk of injury from leaking oil or components.

- ▶ It must be possible to rotate the adjustment type smoothly.
- ▶ Only screw the adjustment device out of the valve to the maximum value of dimension "L". For the maximum value, please refer to table 6 in chapter 2.3 "Checking the pressure setting at the valve".

Pressurized valve!!

Risk of injury from leaking oil or components.

- ▶ Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ▶ Secure external loads.
- ▶ Find the fault and replace the leaking valve by a new one, if necessary.

1. Loosen the lock nut at the pressure relief valve.
2. If necessary, turn the key at the rotary knob of the pressure relief valve counterclockwise first in order to enable the adjustment of the pressure setting.
3. Slowly turn out the rotary knob counterclockwise until the pressure has been reduced to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
4. Slowly turn the rotary knob in the opposite direction until the pressure has been increased to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
5. Fix the setting by tightening the lock nut by means of a torque power screwdriver.
6. Turn the key at the pressure relief valve counterclockwise again.
7. Remove the key from the rotary knob of the pressure relief valve and keep it in a safe place.

The pressure has been set.

2.5 Reducing the pressure at type tested safety valves

The pressure setting at type tested safety valves of type "H" may only be reduced.

DBDH...E - Valve with hand wheel or rotary knob

WARNING

Pressurized valve! Risk of injury in case of incorrect setting if the adjustment type is screwed out against the internal stop!

Risk of injury from leaking oil or components.

- ▶ It must be possible to rotate the adjustment type smoothly.
- ▶ Only screw the adjustment device out of the valve to the maximum value of dimension "L". For the maximum value, please refer to table 6 in chapter 2.3 "Checking the pressure setting at the valve".

Pressurized valve!!

Risk of injury from leaking oil or components.

- ▶ Stop the setting works immediately and depressurize the system
  - – if the valve does not behave as expected or
  - – if there is any leakage.
- ▶ Secure external loads.
- ▶ Find the fault and replace the leaking valve by a new one, if necessary.

1. Loosen the lock nut at the safety valve.
2. Slowly turn out the hand wheel counterclockwise until the pressure has been reduced to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
3. If necessary, slowly turn the hand wheel in the opposite direction until the pressure has been increased to the desired value. While doing so, observe the pressure gauge at the measuring device in the "P" line.
4. Fix the setting by tightening the lock nut by means of a torque power screwdriver.

   The pressure has been set.

Rexroth
Bosch Group

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Material no.: R901292431

Bourdon Tube Pressure Gauges
Dry or Liquid Filled Gauge with SAE Connection
Type 212.53S - Dry Case
Type 213.53S - Liquid-filled Case

Applications

- Intended for adverse service conditions where pulsating or vibration exists (with liquid filling)
- Hydraulics & compressors
- Suitable for gaseous or liquid media that will not obstruct the pressure system

Special features

- Vibration and shock resistant (with liquid filling)
- 7/16" -20 SAE connection
- Pressure ranges up to 15,000 psi

Bourdon Tube Pressure Gauge Model 213.53S

Description

Design
ASME B40.100 & EN 837-1

Sizes
2½" (63 mm)

Accuracy class
± 2/1/2% of span (ASME B40.100 Grade A)

Ranges
Vacuum / Compound to 200 psi
Pressure from 15 psi to 15,000 psi
or other equivalent units of pressure or vacuum

Working pressure
Steady: 3/4 scale value
Fluctuating: 2/3 full scale value
Short time: full scale value

Operating temperature
Ambient: -40°F to +140°F (-40°C to +60°C) - dry
-4°F to +140°F (-20°C to +60°C) - glycerine filled
-40°F to +140°F (-40°C to +60°C) - silicone filled
Medium: +140°F (+60°C) maximum

Temperature error
Additional error when temperature changes from reference temperature of 68°F (20°C) ±0.4% for every 18°F (10°C) rising or falling. Percentage of span.

Weather protection
Weather tight (NEMA 4X / IP 65)

Pressure connection
Material: copper alloy
Lower mount (LM)
7/16" - 20 SAE with o-ring, washer and lock nut

Bourdon tube
Material: copper alloy
≤ 1,000 PSI: C-type
≥ 1,500 PSI: helical type

Movement
Copper alloy

Dial
White ABS with stop pin and with black lettering

Pointer
Black aluminum

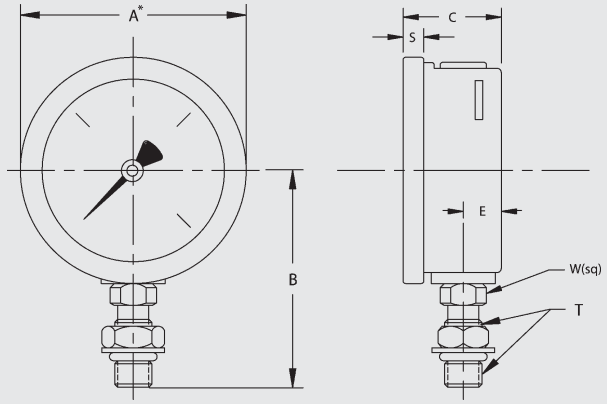
Case
304 stainless steel with vent plug and stainless steel crimp ring. Suitable for liquid filling. Case connection sealed with EPDM o-ring (glycerine filled) or Viton o-ring (dry or silicone filled).

Window
Polycarbonate with Buna-N gasket

Case fill
Glycerine 99.7% - Type 213.53S

Optional extras
- Brass restrictor
- External zero adjustment (2½" only)
- Red drag pointer or mark pointer
- Silicone or Fluorolube case filling
- Custom dial layout
- Other pressure scales available
  bar, kPa, MPa, kg/cm² and dual scales

Dimensions



Size		A	B	C	E	S	T	W	Weight
2.5"	mm	69	61.2	31	13	6		14	0.38 lb. dry
	in	2.69	2.41	1.23	0.51	0.24	7/16-20	0.55	0.46 lb. filled

Ordering information
Pressure gauge model / Nominal size / Scale range / Size of connection / Optional extras required
Specifications and dimensions given in this leaflet represent the state of engineering at the time of printing.
Modifications may take place and materials specified may be replaced by others without prior notice.

WIKA Instrument Corporation
1000 Wiegand Boulevard
Lawrenceville, GA 30045
Tel (770) 513-8200 Toll-free 1-888-WIKA-USA
Fax (770) 338-5118
E-Mail info@wika.com
www.wika.com

Rexroth
Bosch Group

Tank mounted return line filter

RE 51424/06.11 1/26
Replaces: 11.09

Type 10TEN0040 to 1000; 10TE2000/2500


H7855_d

Size according to **DIN 24550**: 0040 to 1000
Additional sizes: 2000, 2500
Nominal pressure 10 bar *[145 psi]*
Connection up to G 1 1/2; to SAE 4"; to SAE 24

Table of contents

Features

The tank mounted return line filters are designed for installation on fluid tanks. They serve the separation of solid materials from the whole fluid flowing back to the tanks.

They distinguish themselves by the following:

- Adsorption of very fine particles across a broad pressure differential range
- High dirt holding capacity thanks to large specific filter area
- Good chemical resistance of the filter elements
- High collapse resistance of the filter elements (e.g. in case of cold start)
- Filter ratings: 3…100 µm
- By default, the filters are equipped with a bypass valve
- Broad range of accessories, e.g. different maintenance indicators, outlet pipes, ...

Ordering code

of the filters of sizes 0040 to 0100

10	TEN	–	A	00	–	–	–

Pressure
10 bar *[145 psi]* **= 10**

Design
Return line filter, simple, with filter element according to DIN 24550 **= TEN**

Size
0040 **= 0040**
0063 **= 0063**
0100 **= 0100**

Filter rating in µm

nominal
Stainless steel wire mesh, cleanable
G10, G25, G40, G60, G100 **= G…**
Paper, non-cleanable
P10, P25 **= P…**

absolute (ISO 16889)
Micro glass, non-cleanable
H3XL, H6XL, H10XL, H20XL **= H…XL**

Pressure differential
Max. admissible pressure differential of the filter element 30 bar *[435 psi]* with bypass valve (cracking pressure 3.5 bar *[51 psi]*) **= A**

Element model
Standard adhesive T = 100 °C *[212 °F]* **= 0…**
Standard material **= …0**

Maintenance indicator
Without **= 0**
Mechanical optical (polyamide, switching pressure 2.2 bar *[32 psi]*) **= P2,2**
Mechanical optical (aluminum, switching pressure 2.2 bar *[32 psi]*) **= V2,2**
Mechanical optical (aluminum, switching pressure 1.5 bar *[22 psi]*) **= V1,5**
Mechanical optical (aluminum, switching pressure 0.8 bar *[12 psi]*) **= V0.8**
Pressure gauge 0...6 bar *[0…87 psi]* right **= MR**
Mechanical optical + pressure gauge right **= MRV2,2**

Complementary details (if necessary)
NB = Without bypass
F = Ventilation filter
FN = Ventilation filter with surge protection
M = Minimess connection (not possible with pressure gauge)
R110 = Outlet pipe 110 mm *[4.3"]*
R150 = Outlet pipe 150 mm *[5.9"]*
R250 = Outlet pipe 250 mm *[9.8"]*
S = Filling port (not possible with mech.-opt. maintenance indicator)

Main inlet

	Port	Frame size 0040	Frame size 0063-0100
R3 =	G3/4	●	x
R4 =	G1	x	●
U4 =	1 1/16-12 UN-2B *[SAE 12]*	x	x
U9 =	1 5/16-12 UN-2B *[SAE 16]*	x	x

● = Standard port
x = Alternative port

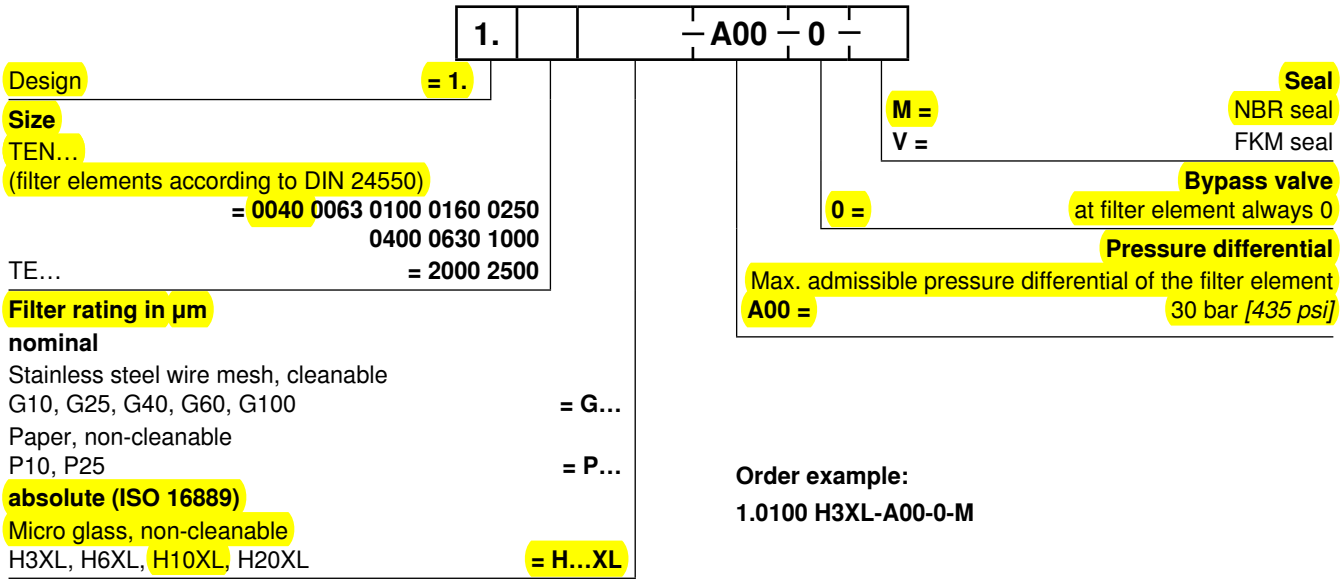
Seal
M = NBR seal
V = FKM seal

Example: **10TEN0040-H10XLA00-P2,2-M-R3**
10TEN0100-H10XLA00-MR-M-R4

Further models, e.g. filter media, connections, are available at request.

Ordering code

of the filter element



Order example:

1.0100 H3XL-A00-0-M

For detailed information on Rexroth filter elements please refer to data sheet 51420.

Standard types

Tank mounted return line filter, filter rating 3 µm, 10 µm and 20 µm

Filter type	Flow in l/min *[gpm]* with ν = 30 mm²/s *[142 SUS]* and Δp = 0.5 bar *[7.25 psi]*	Port/Material no.			
10TEN0040-H20XLA00-P2,2-M-…	62 *[16.4]*	..R3	**R928041199**	..U4	**R928041200**
10TEN0063-H20XLA00-P2,2-M-…	80 *[21.1]*	..R4	**R928041201**	..U9	**R928041202**
10TEN0100-H20XLA00-P2,2-M-…	95 *[25.1]*	..R4	**R928041203**	..U9	**R928041204**
10TEN0160-H20XLA00-P2,2-M-…	260 *[68.7]*	..R5	**R928041205**	..S5	**R928041206**
10TEN0250-H20XLA00-P2,2-M-…	320 *[84.5]*	..R6	**R928041208**	..S6	**R928041209**
10TEN0400-H20XLA00-P2,2-M-…	560 *[147.9]*	..S8	**R928041210**	..S9	**R928041211**
10TEN0630-H20XLA00-P2,2-M-…	630 *[166.4]*	..S9	**R928041223**	..S8	**R928041224**
10TEN1000-H20XLA00-P2,2-M-…	1270 *[335.5]*	..S10	**R928041225**	..S12	**R928041226**
10TE2000-H20XLA00-P2,2-M-…	1600 *[422.7]*	..S12	**R928041228**	..S10	**R928041229**
10TE2500-H20XLA00-P2,2-M-…	1680 *[443.8]*	..S12	**R928041230**	..S10	**R928041231**
10TEN0040-H10XLA00-P2,2-M-…	43 *[11.3]*	..R3	**R928041271**	..U4	**R928041272**
10TEN0063-H10XLA00-P2,2-M-…	62 *[16.4]*	..R4	**R928041273**	..U9	**R928041274**
10TEN0100-H10XLA00-P2,2-M-…	80 *[21.1]*	..R4	**R928041275**	..U9	**R928041276**
10TEN0160-H10XLA00-P2,2-M-…	190 *[50.2]*	..R5	**R928041277**	..S5	**R928041278**
10TEN0250-H10XLA00-P2,2-M-…	260 *[68.7]*	..R6	**R928041279**	..S6	**R928041280**
10TEN0400-H10XLA00-P2,2-M-…	460 *[121.5]*	..S8	**R928041281**	..S9	**R928041282**
10TEN0630-H10XLA00-P2,2-M-…	560 *[147.9]*	..S9	**R928041283**	..S8	**R928041284**
10TEN1000-H10XLA00-P2,2-M-…	970 *[256.2]*	..S10	**R928041285**	..S12	**R928041286**
10TE2000-H10XLA00-P2,2-M-…	1350 *[356.6]*	..S12	**R928041288**	..S10	**R928041289**
10TE2500-H10XLA00-P2,2-M-…	1450 *[383.0]*	..S12	**R928041290**	..S10	**R928041291**
10TEN0040-H3XLA00-P2,2-M-…	23 *[6.1]*	..R3	**R928041292**	..U4	**R928041293**
10TEN0063-H3XLA00-P2,2-M-…	35 *[9.2]*	..R4	**R928041294**	..U9	**R928041295**
10TEN0100-H3XLA00-P2,2-M-…	52 *[13.7]*	..R4	**R928041296**	..U9	**R928041297**
10TEN0160-H3XLA00-P2,2-M-…	105 *[27.7]*	..R5	**R928041298**	..S5	**R928041299**
10TEN0250-H3XLA00-P2,2-M-…	160 *[42.3]*	..R6	**R928041300**	..S6	**R928041301**
10TEN0400-H3XLA00-P2,2-M-…	290 *[76.6]*	..S8	**R928041302**	..S9	**R928041303**
10TEN0630-H3XLA00-P2,2-M-…	410 *[108.3]*	..S9	**R928041304**	..S8	**R928041305**
10TEN1000-H3XLA00-P2,2-M-…	560 *[147.9]*	..S10	**R928041306**	..S12	**R928041307**
10TE2000-H3XLA00-P2,2-M-…	900 *[237.7]*	..S12	**R928041308**	..S10	**R928041309**
10TE2500-H3XLA00-P2,2-M-…	1100 *[290.6]*	..S12	**R928041310**	..S10	**R928041311**

Standard types

Element type	Filter material/Material no.		
	H3XL	H10XL	H20XL
1.0040 …A00-0-M	**R928005835**	**R928005837**	**R928005838**
1.0063 …A00-0-M	**R928005853**	**R928005855**	**R928005856**
1.0100 …A00-0-M	**R928005871**	**R928005873**	**R928005874**
1.0160 …A00-0-M	**R928005889**	**R928005891**	**R928005892**
1.0250 …A00-0-M	**R928005925**	**R928005927**	**R928005928**
1.0400 …A00-0-M	**R928005961**	**R928005963**	**R928005964**
1.0630 …A00-0-M	**R928005997**	**R928005999**	**R928006000**
1.1000 …A00-0-M	**R928006033**	**R928006035**	**R928006036**
1.2000 …A00-0-M	**R928041312**	**R928040797**	**R928041313**
1.2500 …A00-0-M	**R928041314**	**R928040800**	**R928041315**

Ordering code, standard types: Electronic switching element for maintenance indicator

If an electric switching element with signal suppression up to 30 °C is used (WE-2SPSU-M12X1, **R928028411**), it has to be ensured that the aluminum version of the mechanical-optical maintenance indicator must be used. In the filter type key, these maintenance indicators are referred to as "V2,2", "V1,5" or "V0,8". Also refer to the chapter "Spare parts and accessories".

The temperature-controlled signal processing does not work with mechanical-optical maintenance indicators made of polyamide.

WE — —

Maintenance indicator
Electronic switching element **= WE**

Type of signal
1 switching point **= 1SP**
2 switching points, 3 LED **= 2SP**
2 switching points, 3 LED and signal suppression up to 30 °C *[86 °F]* **= 2SPSU**

Connector
M12x1 = Round plug-in connection M12x1, 4-pin
EN 175301-803 = Rectangular plug-in connector, 2-pin design A according to EN-175301-803

Material numbers of the mechanical optical maintenance indicators

Material no.	Type	Signal	Switching points	Connector	LED
R928028409	WE-1SP-M12x1	Changeover	1	M12x1	No
R928028410	WE-2SP-M12x1	Normally open (at 75 %)/ normally closed contact (at 100 %)	2		3 pieces
R928028411	WE-2SPSU-M12x1				
R928036318	WE-1SP-EN175301-803	Normally closed contact	1	EN 175301-803	No

Order example:

Tank mounted return line filter with mechanical-optical maintenance indicator for $p_{nom.}$ = 10 bar *[145 psi]*, size 0100, with filter element 10 µm and electronic switching element M12x1 with 1 switching point for hydraulic fluid mineral oil HLP according to DIN 51524.

Filter: **10TEN0100-H10XLA00-P2,2-M-R4** **Material no.: R928041275**
El. maintenance indicator: **WE-1SP-M12x1** **Material no.: R928028409**

For round plug-in connections refer to data sheet 08006.

Function, section

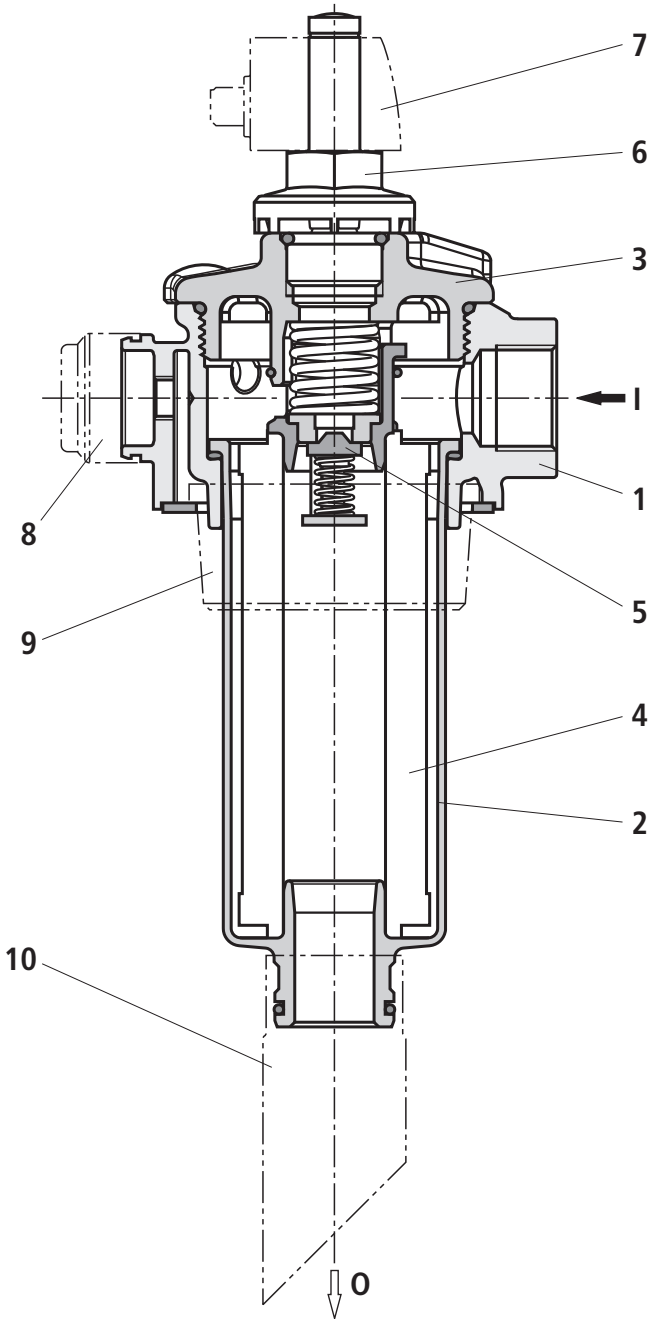
The tank mounted return line filters are designed for direct attachment to the fluid tank.

They basically consist of filter head (1), filter bowl (2), cover (3), filter element (4) as well as a serial bypass valve (5).

The filters can be configured with different maintenance indicators - here, you are shown a mechanical-optical maintenance indicator (6) in connection with an electronic switching element (7).

Depending on the filter size, more additional functions are available - e.g. a ventilation filter (8), surge protection (9) or return pipes in different lengths (10) – in this connection, also refer to the chapter "Spare parts and accessories".

During operation, the hydraulic fluid reaches the filter housing via port I, here flows through the filter element (4) in the flow direction from outside to inside and is cleaned according to the filter rating. The dirt particles filtered out settle in the filter element. Via the outlet opening 0, the filtered hydraulic fluid enters the tank.



Sample presentation using a 10TEN0063 filter.

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

general

Installation position			Vertical				
Ambient temperature range		°C *[°F]*	–10…+100 *[14…+212]* (shortly to –30 *[–22]*)				
Size		Size	0040	0063	0100	0160	0250
Weight		kg *[lbs]*	1.4 *[3.09]*	1.6 *[3.53]*	1.8 *[3.97]*	4.5 *[9.92]*	5.0 *[11.03]*
Size		Size	0400	0630	1000	2000	2500
Weight		kg *[lbs]*	8.0 *[17.64]*	10.0 *[22.05]*	18 *[39.7]*	21.5 *[47.42]*	27 *[59.55]*
Material	Filter cover		Carbon fiber reinforced plastic (sizes 0040...0100) Aluminum (sizes 0160...2500)				
	Filter head		Aluminum				
	Filter bowl		Carbon fiber reinforced plastic (sizes 0040...0630) Coated steel (sizes 1000...2500)				
	Optical maintenance indicator	(P2,2)	Plastic PA6				
		(V…)	Aluminum				
	Electronic switching element		Plastic PA6				
	Pressure gauge		Plastic				

hydraulic

Maximum operating pressure	bar *[psi]*	10 *[145]*
Hydraulic fluid temperature range	°C *[°F]*	–10…+100 *[+14…+212]*
Minimum conductivity of the medium	pS/m	300
Fatigue strength according to ISO 10771	Load cycles	> 10^5 with max. operating pressure
Cracking pressure of the bypass valve	bar *[psi]*	3.5 ± 0.35 *[50.7 ± 5]*
Type of pressure measurement of the maintenance indicator		Backpressure
Response pressure of the P2,2 maintenance indicator	bar *[psi]*	2.2 (+0.45/–0.25) *[31.9 (+6.4/–3.6)]*
Response pressure of the V... maintenance indicator	bar *[psi]*	2.2 ± 0.25 *[31.9 ± 3.6]*, 1.5 ± 0.2 *[21.8 ± 2.9]*, 0.8 ± 0.15 *[11. 6 ± 2.2]*

electrical (electronic switching element)

Electrical connection			Round plug-in connection M12x1, 4-pin			Standard connection EN 175301-803
		Version	1SP-M12x1	2SP-M12x1	2SP-M12x1	1SP-EN175301-803
Contact load, direct voltage		$A_{max.}$	1			
Voltage range		$V_{max.}$	150 (AC/DC)	10-30 (DC)		250 (AC) / 200 (DC)
Max. switching power with resistive load		W	20			70
Switching type	75 % signal		–	Normally open contact		–
	100 % signal		Change-over	Normally closed contact		Normally closed contact
	2SPSU				Signal switching through at 30 °C *[86 °F]*, Return switching at 20 °C *[68 °F]*	
Display via LEDs in the electronic switching element 2SP...				Stand-by (LED green); 75 % switching point (LED yellow) 100 % switching point (LED red)		
Protection class according to EN 60529			IP 67			IP 65
Ambient temperature range		°C *[°F]*	–25…+85 *[–13…+185]*			
For direct voltage above 24 V, spark extinguishing is to be provided for protecting the switching contacts.						
Weight	Electronic switching element: – with round plug-in connection M12x1	kg *[lbs]*	0.1 *[0.22]*			

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

Filter element

Glass fiber paper H..XL		Single-use element on the basis of inorganic fiber	
		Filtration ratio according to ISO 16889 up to Δp = 5 bar *[72.5 psi]*	Achievable oil cleanliness according to ISO 4406 (SAE-AS 4059)
Particle separation	H20XL	$\beta_{20(c)} \geq 200$	19/16/12 … 22/17/14
	H10XL	$\beta_{10(c)} \geq 200$	17/14/10 … 21/16/13
	H6XL	$\beta_{6(c)} \geq 200$	15/12/10 … 19/14/11
	H3XL	$\beta_{5(c)} \geq 200$	13/10/8 … 17/13/10

Admissible pressure differential	bar *[psi]*	30 *[435]*				
Size	Size	0040	0063	0100	0160	0250
Weight	kg *[lbs]*	0.20 *[0.44]*	0.30 *[0.66]*	0.35 *[0.77]*	0.8 *[1.76]*	1.1 *[2.42]*
Size	Size	0400	0630	1000	2000	2500
Weight	kg *[lbs]*	2.0 *[4.41]*	2.3 *[5.07]*	3.0 *[6.62]*	3.5 *[7.72]*	5.0 *[11.03]*

Seal material for hydraulic fluids

Mineral oils			Ordering code
Mineral oil	HLP	according to DIN 51524	M

Flame-resistant hydraulic fluids			Ordering code
Emulsions	HFA-E	according to DIN 24320	M
Synthetic water solutions	HFA-S	according to DIN 24320	M
Water solutions	HFC	according to VDMA 24317	M
Phosphoric acid esters	HFD-R	according to VDMA 24317	V
Organic esters	HFD-U	according to VDMA 24317	V

Fast biodegradable hydraulic fluids			Ordering code
Triglycerides (rape seed oil)	HETG	according to VDMA 24568	M
Synthetic esters	HEES	according to VDMA 24568	V
Polyglycols	HEPG	according to VDMA 24568	V

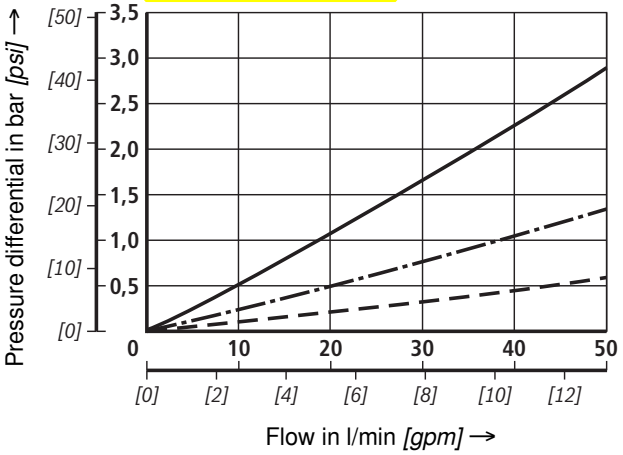
Characteristic curves (measured with mineral oil HLP46 according to DIN 51524 at T = 40 °C) *[104 °F]* **H10XL**

An optimal filter design and the design with other filter media and filtration ratings are enabled by our computer program "BR Filter Select".

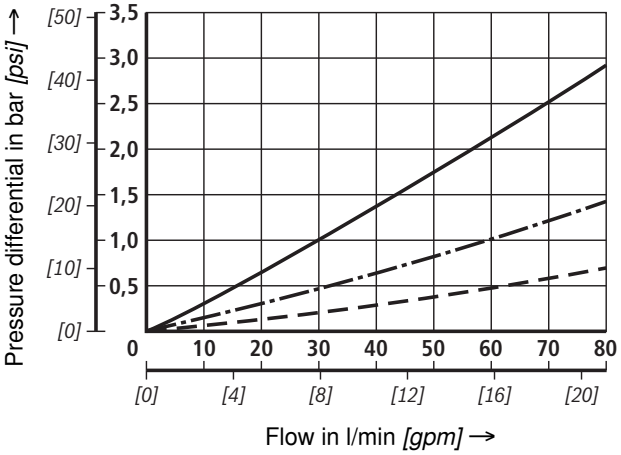
Oil viscosity:

- 140 mm²/s *[649 SUS]*
- 68 mm²/s *[315 SUS]*
- 30 mm²/s *[142 SUS]*

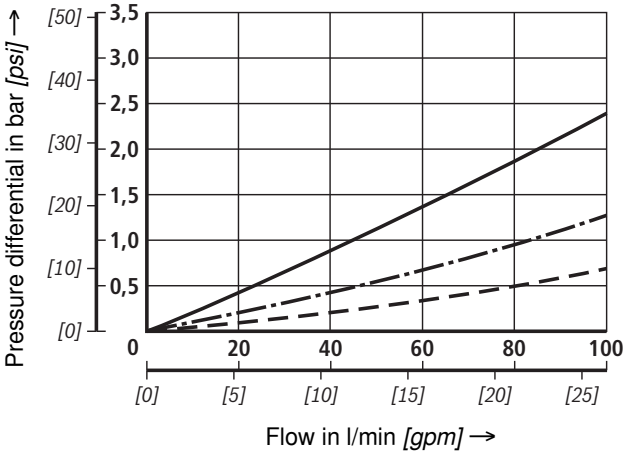
10TEN0040-H10XLA00...R3



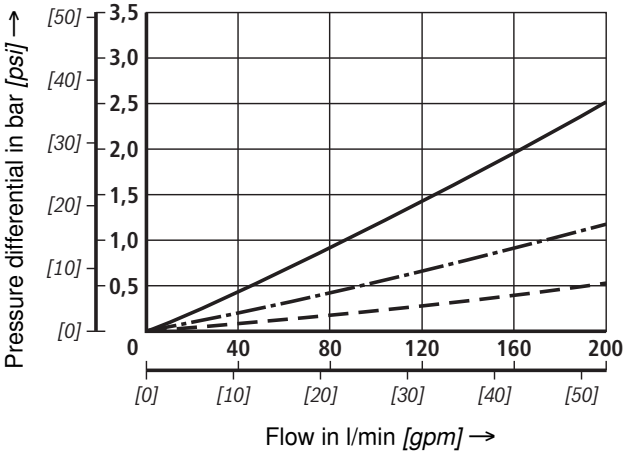
10TEN0063-H10XLA00...R4



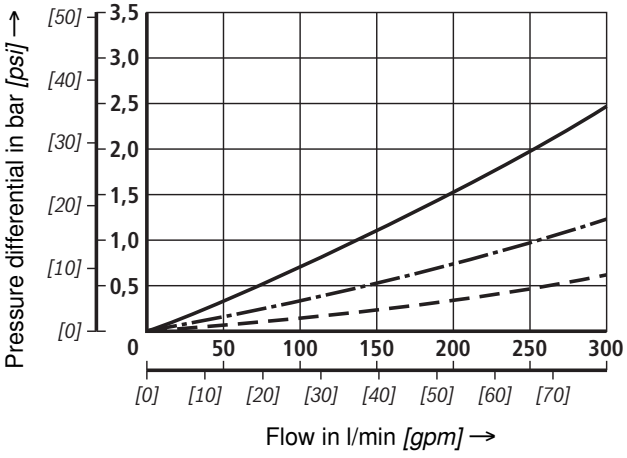
10TEN0100-H10XLA00...R4



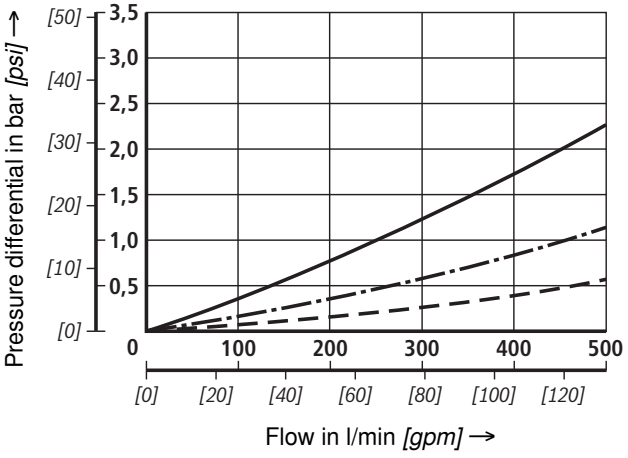
10TEN0160-H10XLA00...R5



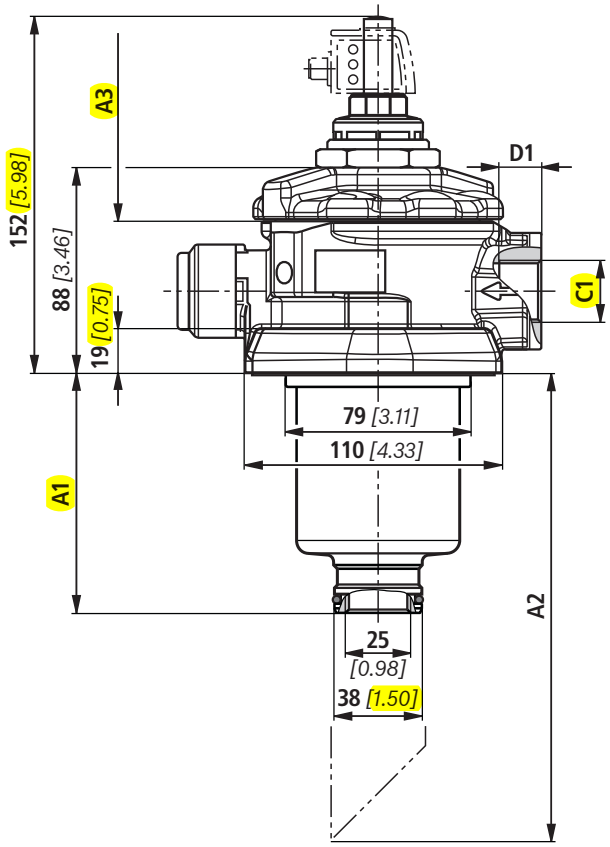
10TEN0250-H10XLA00...R6

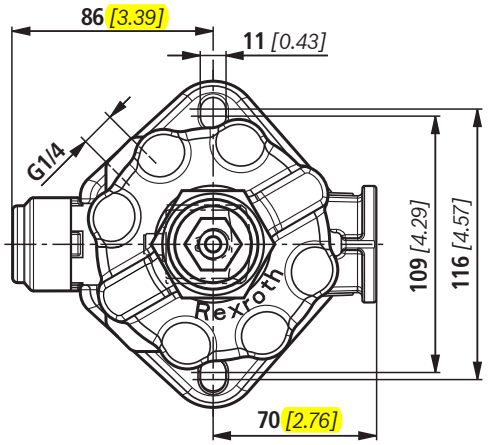


10TEN0400-H10XLA00...S8

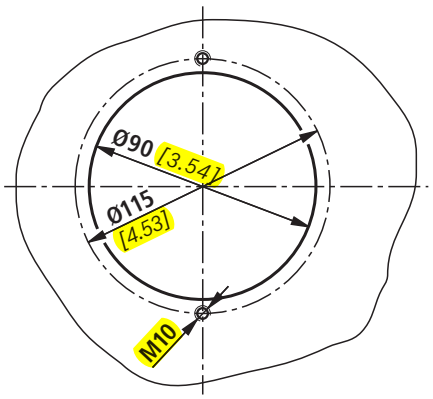


Unit dimensions size 0040...0100 (dimensions in mm *[inch]*)





Tank connection diagram:



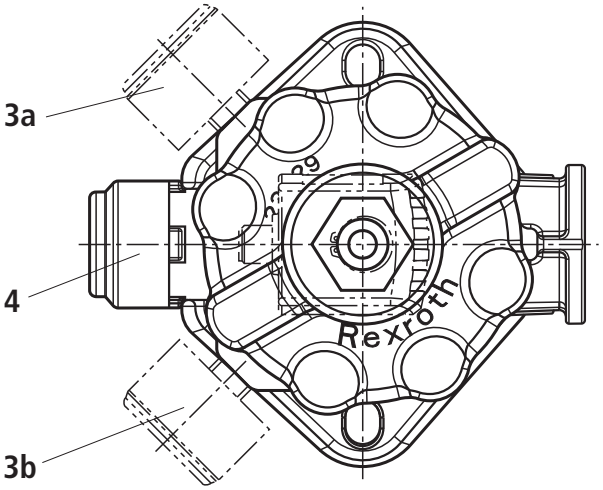
Filter housing for filter elements in accordance with DIN 24550

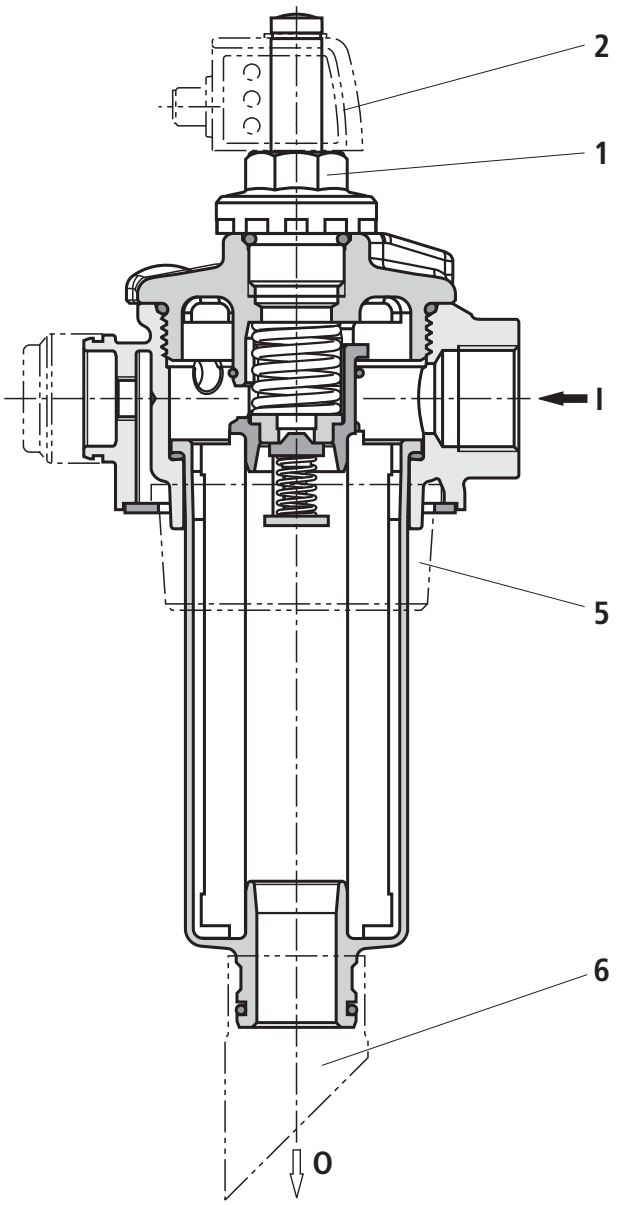
Type 10 TEN	Content in l *[gal]*	A1	A2 [1)]	A3 [2)]	C1 Standard	C1 Optional	D1
					Pipe thread according to ISO 228	Pipe thread according to SAE J1926	
0040	0.6 *[0.16]*	103 *[4.06]*	230 *[9.06]*	100 *[3.94]*	G3/4	SAE 12 1 1/16-12 UN-2B	16 *[0.63]*
0063	0.8 *[0.21]*	163 *[6.42]*	290 *[11.42]*	160 *[6.30]*	G1	SAE 16 1 5/16-12 UN-2B	18 *[0.71]*
0100	1.2 *[0.32]*	253 *[9.96]*	380 *[14.96]*	250 *[9.84]*			

1) With outlet pipe 150 mm *[5.9"]*

2) Servicing height for filter elements

Options





Sample presentation using a 10TEN0063 filter.

Options	Item	Ordering code	Filter size 0040…0100	0160…0630	1000…2500
Mechanical optical indicator	1	P2,2; V0,8; V1,5; V2,2	●	●	●
Pressure gauge right	3.a	MR	●	-	-
Pressure gauge left	3.b	ML	-	●	●
Mechanical optical + pressure gauge right	1 + 3.b	MRV2,2	●	●	●
Minimess connection	3.a or 3.b	M	●	●	●
Filling port (without maintenance indicator)	1	S	●	●	●
Outlet pipe [1)]	6	R	●	See chapter "Spare parts and accessories"	
Ventilation filter	4	F	●	-	-
Ventilation filter + surge protection	4 + 5	FN	●	-	-
Electronic switching element	2	See chapter "Ordering code, standard types"			

[1)] Outlet pipe for sizes 0040…0100 are only available pre-assembled through the complete filter.

Outlet pipes for other sizes must be ordered separately and are not pre-assembled.

For the ordering code refer to "Spare parts and accessories".

Spare parts and accessories

Mechanical optical maintenance indicator

W | O – S01 – – – 10 |

Maintenance indicator = W

Mechanical optical indicator = O

Design

Backpressure M30x1.5 = S01

Switching pressure

0.8 bar (not possible with PA version) = 0.8
1.5 bar (not possible with PA version) = 1.5
2.2 bar = 2.2

M = **Seal** NBR seal
V = FKM seal

10 = **Max. nominal pressure** 10 bar

PA = **Housing material** Plastic
no code = Aluminum

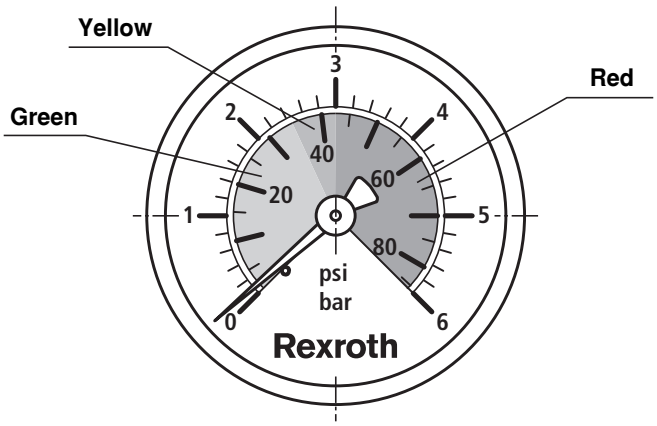
Mechanical optical maintenance indicator	Material no.
WO-S01-2,2-M-10	R901025310
WO-S01-2,2-V-10	R901066232
WO-S01-1,5-M-10	R928038776
WO-S01-1,5-V-10	R928038774
WO-S01-0,8-M-10	R928038773
WO-S01-0,8-V-10	R928038772
WO-S01-2,2-M-10-PA	R928038771
WO-S01-2,2-V-10-PA	R928038769

Ventilation filter element (only for 10TEN0040-0100)

Type	Material no.
71.001 P5-S00-0-0	R928019705

Pressure gauge

Type	Material no.
M010 0-6 bar	R928019224



Seal kit

D | 10TE | – |

Seal kit

Series 10 TE

Size

0040-0100	N0040-0100
0160-0250	N0160-0250
0400-0630	N0400-0630
1000	N1000
2000-2500	2000-2500

Seal

NBR seal = M
FKM seal = V

Seal kit	Material no.
D10TEN0040-0100-M	R928028013
D10TEN0160-0250-M	R928028014
D10TEN0400-0630-M	R928028015
D10TEN1000-M	R928039806
D10TE2000-2500-M	R928039807

Installation, commissioning and maintenance

Installation of the filter

When installing the filter make sure that

a) the required servicing height for removing the filter element and the filter bowl is available,

b) the installation opening for mounting the filter in the tank is not too large so that unobjectionable sealing is guaranteed,

c) the filter is assembled on the tank cover without tension stress, and

d) the filter housing is grounded.

The filter is designed with a two-part housing. It is to be installed into the tank with the filter bowl downward. It is recommended to lead drain pipes as of a length of 500 mm in a bracket in order to avoid oscillations caused by the fluid flow in the tank. It is to be ensured that in case of maintenance works, the filter bowl and the drain pipe are pulled out of the filter head together.

Connection of the electrical maintenance indicator

The electrical maintenance indicator is connected via the electrical switching element with 1 or 2 switching points, which is attached to the mechanical optical maintenance indicator and held by means of the locking ring.

When must the filter element be exchanged or cleaned respectively?

- After initial start-up of the system, the filter element is to be exchanged.
- Upon start-up in cold condition, the red pushbutton of the optical maintenance indicator may jump out and an electrical signal is output via the switching element. Only push the red pushbutton in again after the operating temperature has been reached. If it jumps out again immediately or if the electrical signal has not gone out at operating temperature, the filter element must be exchanged or cleaned respectively after the end of the shift.
- The filter element should be replaced or cleaned after max. 6 months.

Element exchange

- Switch off the system, discharge the filter on the pressure side.
- Remove the screws at the filter cover, loosen the filter cover and remove it upwards.
- Remove the filter element from the lower spigot in the filter bowl by turning it slightly.
- Check the seal rings at the filter cover and at the filter bowl for damage. If necessary, renew them. Also refer to seal kits in the "Spare parts and accessories" section.
- Renew filter element, filter elements made of wire mesh can be cleaned. The efficiency of the cleaning process depends on the type of dirt and the amount of the pressure differential before the filter element exchange. If the pressure differential after the filter element exchange exceeds 150 % of the value of a brand-new filter element, the G… element also needs to be replaced.
- Check whether the type designation or material number on the replacement element corresponds to the type designation/material number on the name plate of the filter.
- Install the new or cleaned filter element on the spigot again by slightly turning it.
- Reassemble the filter in reverse order.

Classification according to pressure equipment directive 97/23/EC

The tank mounted return line filters according to 51425 are pressure holding equipment according to article 1, section 2.1.4 of the Pressure Equipment Directive 97/23/EC (PED). As the maximum operating pressure does not exceed 10 bar, they are - according to annex II diagram 4 of the PED - produced according to article 3 and not provided with a CE mark.

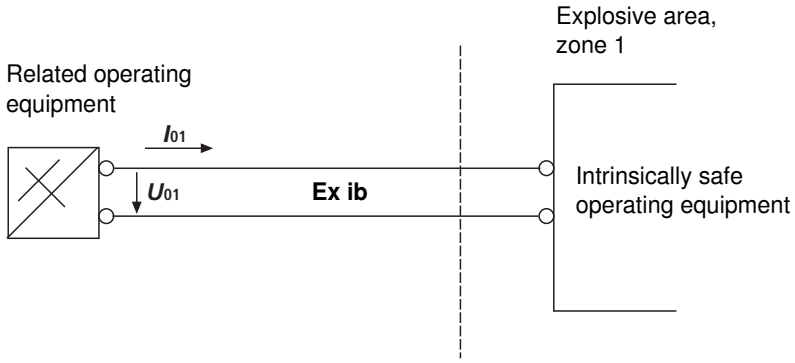
Use in explosive areas according to directive 94/9/EC (ATEX)

The tank mounted return line filters according to 51424 are no equipment or components in the sense of directive 94/9/EC and are not provided with a CE mark.

According to DIN EN 60079-11, the electronic maintenance indicators WE-1SP-M12x1 are simple, electronic operating equipment not having an own voltage source. This simple, electronic operating equipment may - according to DIN EN 60079-14 - in intrinsically safe electrical circuits (EEx ib) be used in systems for device group II, category 2G (zone 1) and category 3G (zone 2) without marking and certification. The operating equipment is assigned to explosion group II B and temperature class T5.

When using Rexroth filters in explosive areas, potential equalization must always be ensured.

Possible circuit according to DIN EN 60079-14



The manufacturer's declaration according to DIN EN 13463 is available for this filter separately, with Material no. R928028899.

Notes

Bosch Rexroth Filtration Systems GmbH
Hardtwaldstraße 43, 68775 Ketsch, Germany
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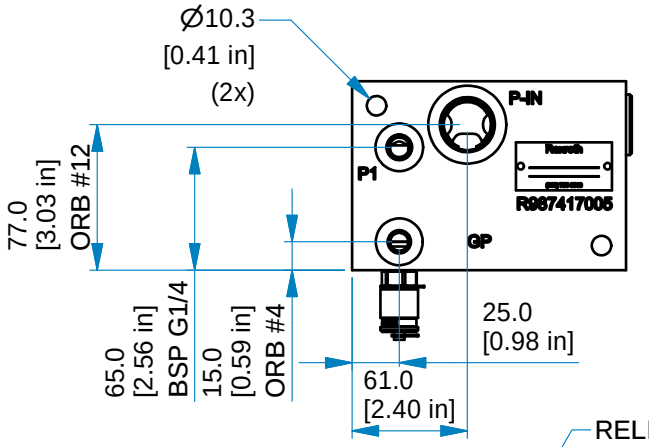
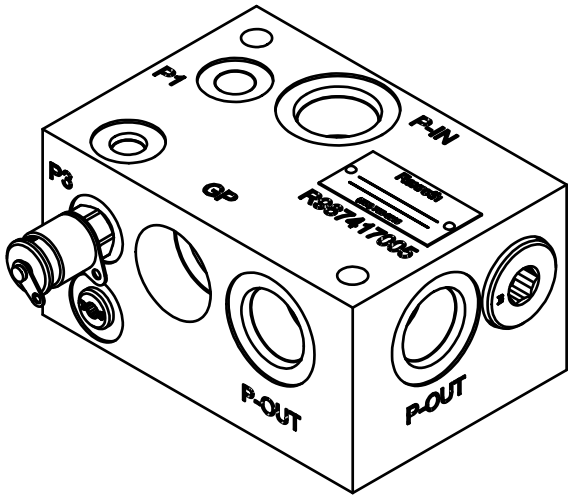
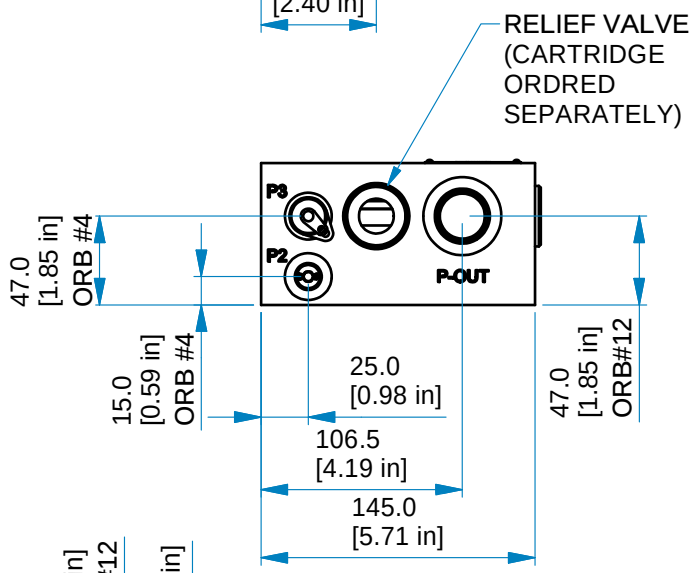
Phone +49 (0) 62 02 / 6 03-0
Fax +49 (0) 62 02 / 6 03-1 99
brfs-support@boschrexroth.de
www.eppensteiner.de

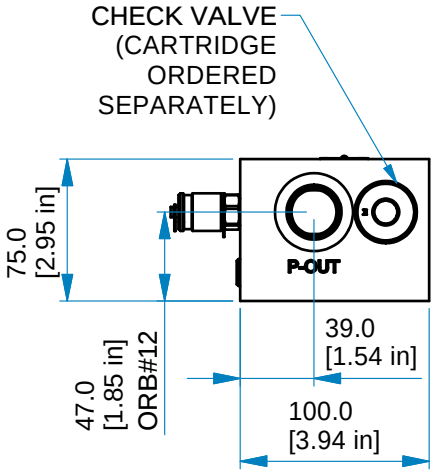
RexPak - Relief and Check Valve block (1 : 4)

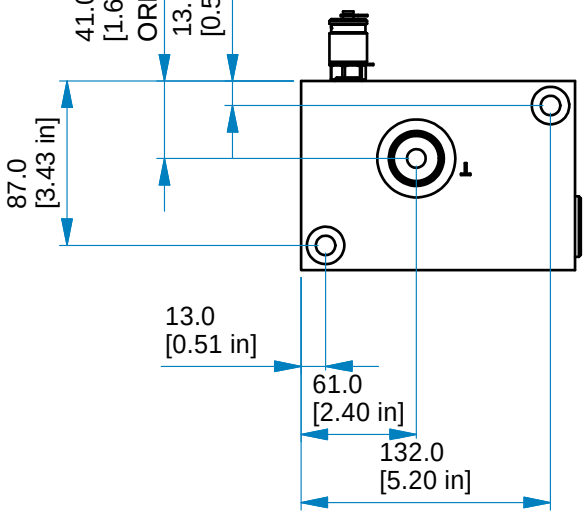
R987417005 (ELECTROLESS NICKEL COATING)

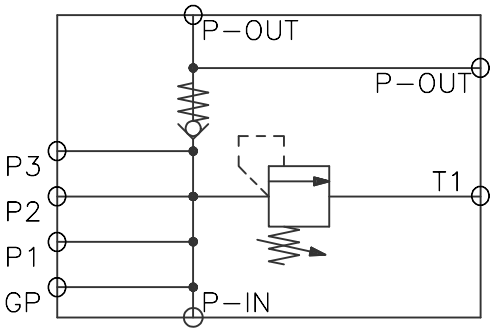








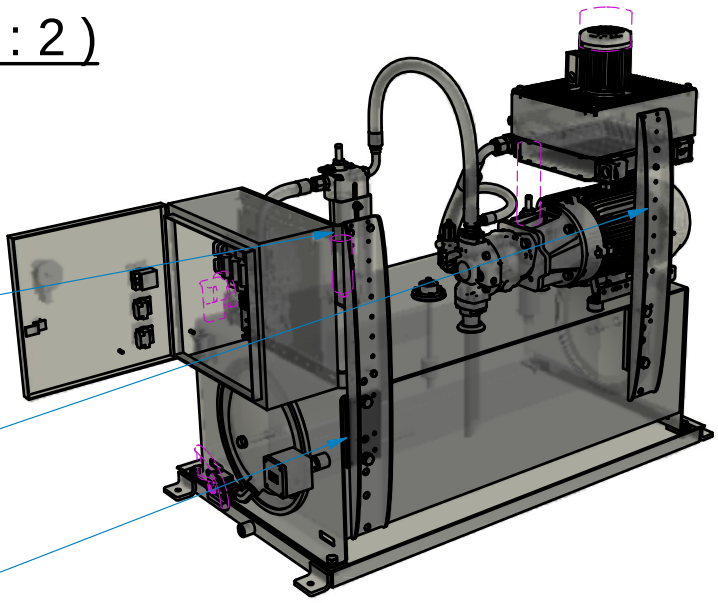


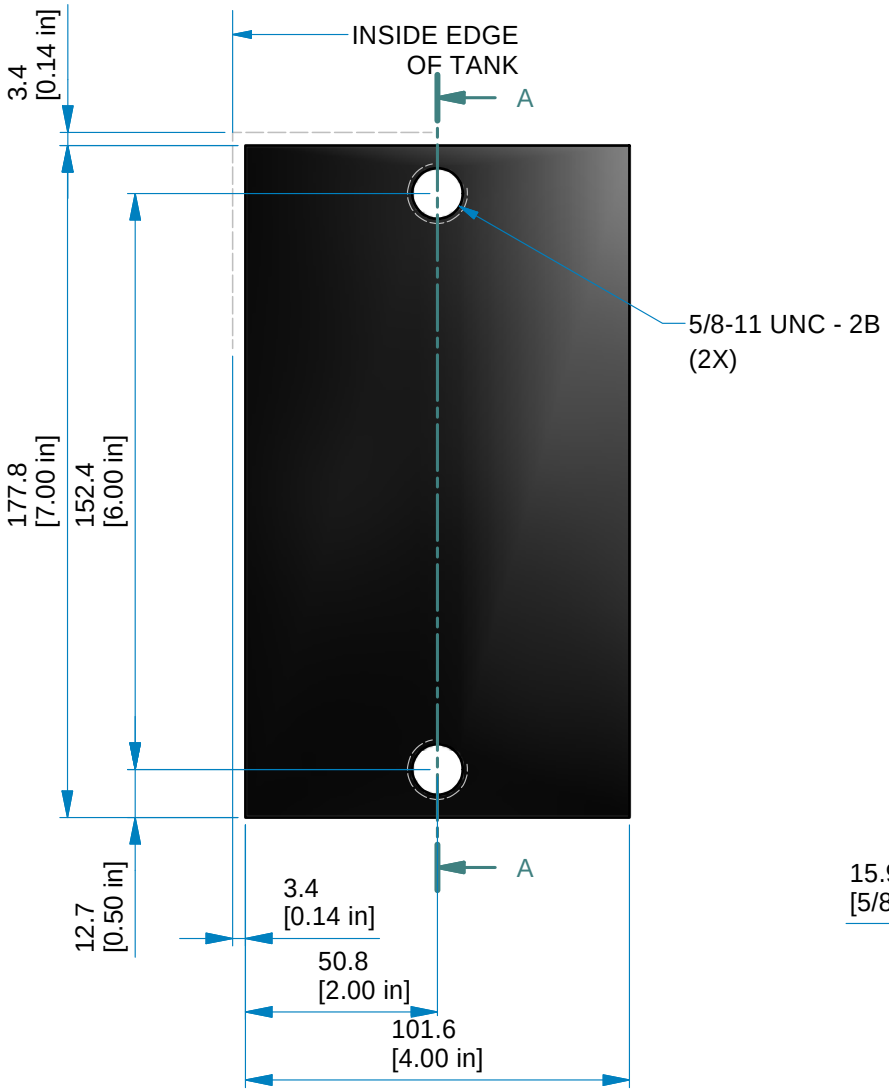


Flow	Pressure	Relief Valve	Check Valve	Weight
32 GPM	3500 PSI	DBD10K...	M-SR15KE...	16 lbs

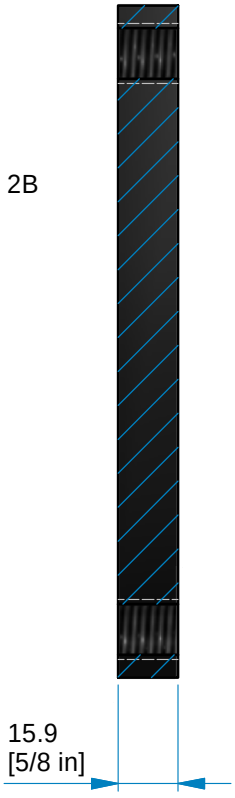
RexPak Mtg. Plate (1 : 2)

BRCA PN: R987380496





A-A (1 : 2)



Rexroth
Bosch Group

Check valve, cartridge type

RE 20380/03.11
Replaces: 11.10

Type M-SR

Sizes 6 to 30
Component series 1X
Maximum operating pressure 315 bar
Maximum flow 400 l/min

Table of contents

Information on available spare parts:
www.boschrexroth.com/spc

Features

- For installation in manifold blocks
  - as angle valve
  - as straight valve
- Leak-free closure in one direction
- Various cracking pressures, optional (see ordering code)

Ordering code

M-SR			– 1X /	*

Check valve, cartridge design = **M-SR**

Size 6 (not as angle valve) = **6**
Size 8 = **8**
Size 10 = **10**
Size 15 = **15**
Size 20 = **20**
Size 25 = **25**
Size 30 = **30**

Component design
Angle valve = **KE**
Straight valve = **KD**

Cracking pressure (see characteristic curves on pages 4 and 5)
00 = Without spring (not for straight valve)
02 =
05 = (Standard)
15 =
30 =
50 =

1X = Component series 10 to 19
(10 to 19: unchanged installation and connection dimensions)

Seal material
No code = NBR seals
V = FKM seals (with angle valve only)
Important!
Observe compatibility of seals with hydraulic fluid used!

Further details in clear text

Standard types

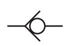
Type	Material number
M-SR 6 KD05-1X/	R900301889
M-SR 8 KE02-1X/	R900357438
M-SR 8 KE05-1X/	R900346083
M-SR 10 KE05-1X/	R900344549
M-SR 15 KE02-1X/	R900348943
M-SR 15 KE05-1X/	R900345372

Type	Material number
M-SR 20 KE02-1X/	R900345744
M-SR 20 KE05-1X/	R900340979
M-SR 25 KE05-1X/	R900344778
M-SR 30 KE05-1X/	R900344919

Further standard types and components can be found in the EPS (standard price list).

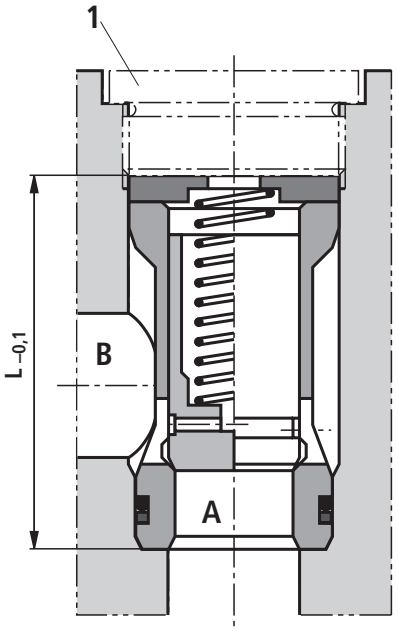
Symbols


With spring

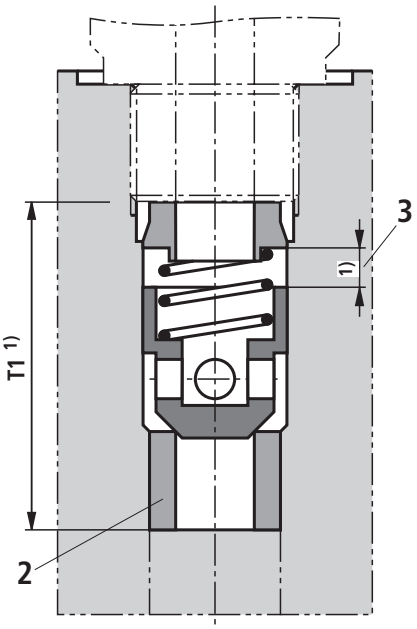

Without spring

Sections

Angle valve



Straight valve



Size	$L_{-0,1}$
8	36,3
10	39,3
15	45,8
20	55,3
25	74,3
30	83,3

1 Plug screws, separate order, see page 6 and 7

2 Seat, shrink-fit at –60 °C

3 Poppet stroke

1) For dimensions, see installation drawing

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

General

Sizes	Size	6	8	10	15	20	25	30
Weight – Angle valve	kg	–	0.03	0.05	0.08	0.14	0.32	0.47
– Straight valve	kg	0.05	0.05	0.05	0.1	0.2	0.25	0.3
Installation orientation		Optional						
Ambeint temperature range	°C	–20 to +80 (NBR seals) –20 to +80 (FKM seals)						

Hydraulic

Maximum operating pressure	bar	315
Cracking pressure	bar	See characteristic curves on pages 4 and 5
Maximum flow	l/min	See characteristic curves on pages 4 and 5
Hydraulic fluid		Mineral oil (HL, HLP) to DIN 51524 [1]; fast bio-degradable hydraulic fluids to VDMA 24568 (see also data sheet 90221); HETG (rape seed oil) [1]; HEPG (polyglycols) [2]; HEES (synthetic esters) [2]; other hydraulic fluids on enquiry
Hydraulic fluid temperature range	°C	–30 to +80 (for NBR seals) –20 to +80 (for FKM seals)
Viscosity range	mm^2/s	2.8 to 500
Max. permissible degree of contamination of the hydraulic fluid - cleanliness class to ISO 4406 (c)		Class 20/18/15 [3]

1) Suitable for NBR and FKM seals

2) Suitable only for FKM seals

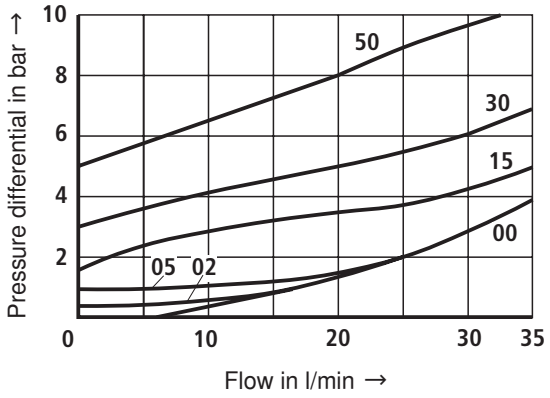
3) The cleanliness class stated for the components must be adhered too in hydraulic systems. Effective filtration prevents faults from occurring and at the same time increases the component service life.

For the selection of the filters see www.boschrexroth.com/filter.

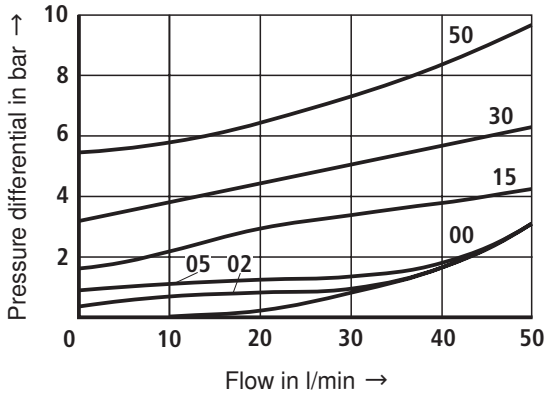
Characteristic curves (measured with HLP46, ϑ_{oil} = 40 °C ± 5 °C) – angle valve

Pressure differential Δp in dependence upon flow q_V at cracking pressure

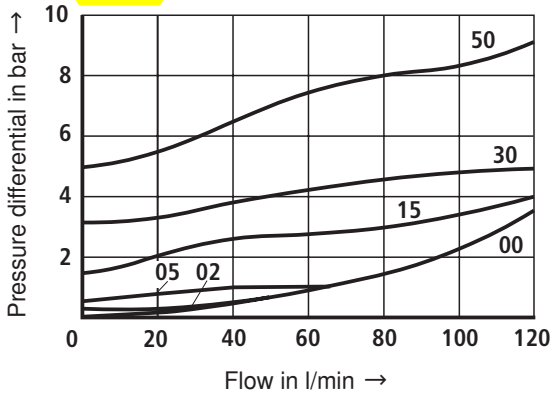
Size 8



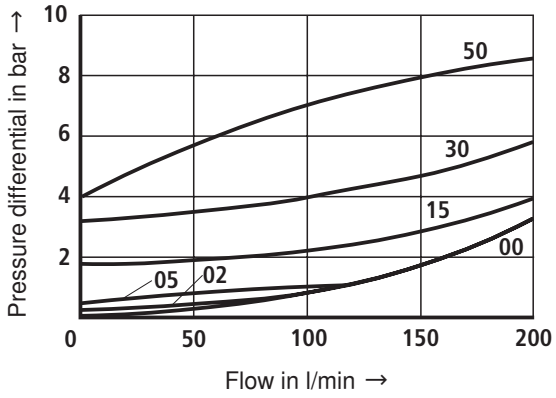
Size 10



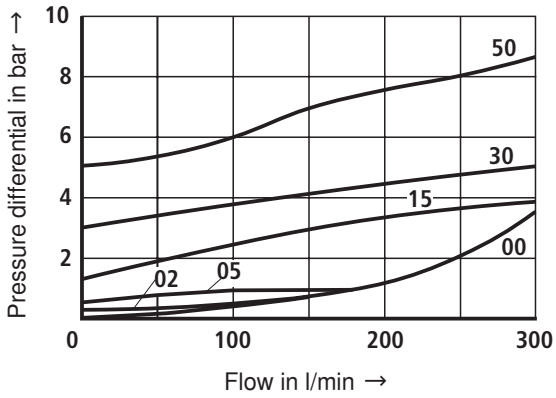
Size 15



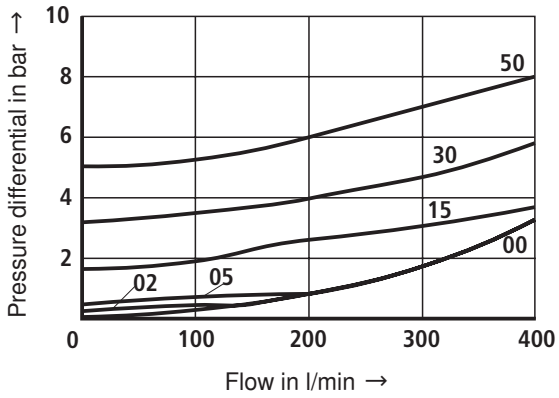
Size 20



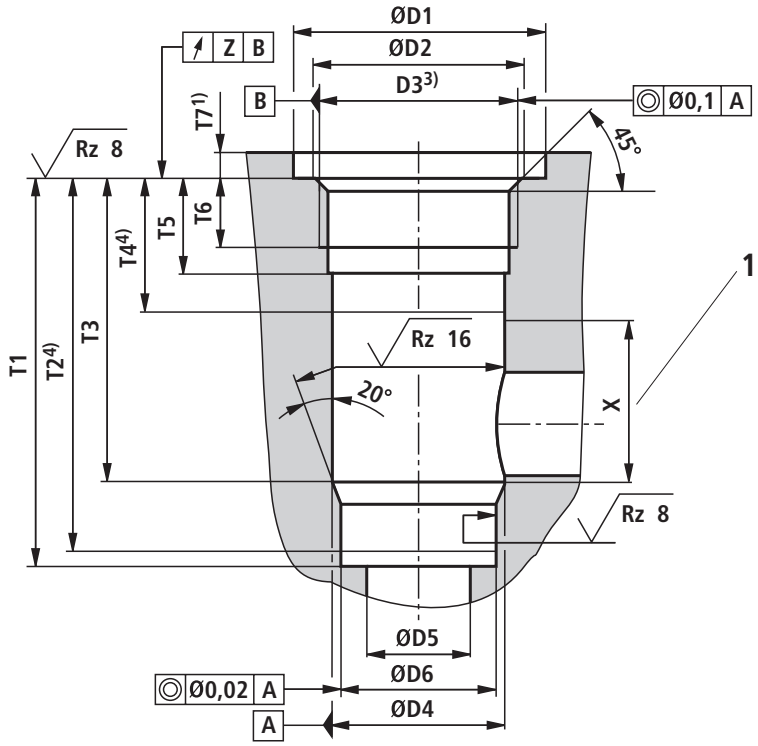
Size 25



Size 30



Mounting cavity: Angle valve **for plug screw to RN 143.21** (dimensions in mm)



1 Area for drain bore

Size	Plug screws 2) Material no.	p_N in bar	ØD1	ØD2	D3	ØD4H8	ØD5	ØD6H7
8	R900002423	315	23	17.1	G3/8 3)	14	8	13
10	R900002422	315	28	21.4	G1/2 3)	18	10	17
15	R900012091	315	33	26.8	G3/4 3)	24	15	22
20	R900002424	315	41	33.8	G1 3)	30	20	28
25	R900012411	250	51	42.5	G1 1/4 3)	38	25	36
30	R900012412	250	56	48.5	G1 1/2 3)	44	30	42

Size	T1 +0.1	T2	T3	T4	T5	T6	T7 +0.5	T8 +0.2	X	Z
8	48.5	47.5	38.5	20	15	12	6	–	18	0.05
10	53.5	52.5	43.5	24	18	14	6	–	19	0.05
15	62	60.5	50	26	20.5	16	6	–	24	0.05
20	71.5	70	56.5	26	20.5	16	7	–	30	0.05
25	90.5	88	72.5	28	22	16	7	–	43	0.1
30	99.5	96.5	79.5	31	22	16	7	–	48	0.1

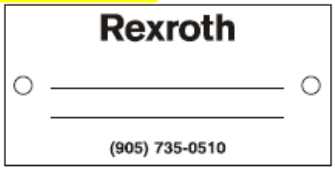
1) Dimension for countersinking the screw head. When installing the cartridge more deeply, extend dimension T7 accordingly.

2) Order separately, with NBR seal

3) Pipe thread "G…" to ISO 228/1

4) Depth of fit

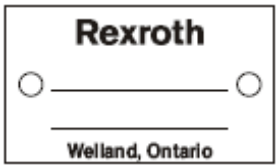
2.3 Nameplate for Standard Manifold Assemblies



Part Number: 219176
Model Code: NAMEPLATE - REXROTH - ALUM - 51mmx25mm
Material: Aluminum with two rivet holes

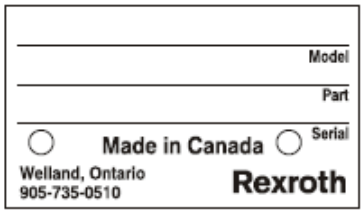
Part Number: 219182
Model Code: NAMEPLATE - REXROTH - 304SS - 51mmx25mm
Material: 304 Stainless Steel with two rivet holes

2.4 Nameplate for Small Manifold Assemblies



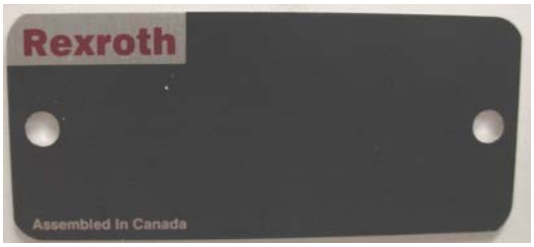
Part Number: 219178
Model Code: NAMEPLATE - REXROTH - ALUM - 32mmx19mm
Material: Aluminum with two rivet holes

2.5 Nameplate for MP18 Valve Assemblies - Used for sander control boxes and dual conveyor boxes



Part Number: 219181
Model Code: NAMEPLATE - REXROTH - SS - MP18 VALVE
Material: Stainless Steel, 2B finish with two rivet holes

2.6 Nameplate for M4 Valve Assemblies



Part Number: 216028
Model Code: NAMEPLATE - REXROTH -ALUM- M4 22mmX50mm
Material: Aluminum with two rivet holes

Screw plugs

analog ISO 11926, with hexagon socket, UNF-, UN- threads and O-ring

Edition: 2014-08-01
Editor: DC/ESP1
Reference: -
Ref.-Edition: -

Mechanical systems and Components

Replacement for
ZN 10007 : 2012-01-11

Table of contents

Amendments

Compared to ZN 10007 : 2012-01-11 following essential modifications were carried out:

a) Section 5 Introduced marking thread
Footnote 4 and 6 supplemented
Radius of the undercut 0.3 +0.2 changed in to 0.5

b) Section 5.1 table 1: dimensions d_4 and t_3 to size 1 3/16-12 UN deleted
dimensions d_4 adjusted to RNM 02106
dimensions t_1 adjusted to RNM 02106
dimensions s adjusted to RNM 02106
Material number R902650717 supplemented

c) Section 5.2 coating system in the procedure corrected

d) Technical specification supplemented

e) Normative references updated

f) Editorial changes

Document language: en Translation: de → en Dept.: DC/ESP1
Original language: de Date: 2014-08-01 Name: -
In case of doubt the original language edition of this standard applies.

Bosch Rexroth AG
P.O. Box
97814 Lohr a. Main
Germany

	created	*checked*	*approved*
Dept.:	DC/ESP11	DC/ESP11	DC-MA/ENP
Name:	M. Hascher	M. Langer	Dr. B. Menz (per e-mail)
BWN:	718	718	CN3

Former editions

Table 1

RNM 02106-000 : 2005-04-14 ▷	**ZN 10007-000 : 2011-05-20** ▷	**ZN 10007-000 : 2012-01-11**

1 Aim

This standard describes screw plugs with screwed ends analog ISO 11926-4 for sealing of thread holes according to ISO 11926 UNF-, UN- thread according to ANSI/ASME B 1.1.

The pressures and tightening torques in table 2 are based on a minimum tensile strength of $R_{m\,min}$ = 250 MPa for the steel/cast steel material of the screw plug hole.
The screw plugs are sealed by a O-ring according to N 02.079.

2 Scope

This standards applies within Bosch Rexroth AG (including indirect assigned companies), its subsidiaries and regional subsidiary for the product area of following Business unit:

- Mobile Applications
  - Pumps and Motors

For affiliated companies it is recommended to adopt the directive by own resolution correspondingly.

3 Terminology and abbreviations

Terminology database
You will find DC-comprehensive abbreviations, terms and their definitions in the terminology database:
https://rb-wam.bosch.com/socos-dc/TERMOS/START_EN

Abbreviations

BNR	= Term code (*according to ZN 01210*)

DC organizational units

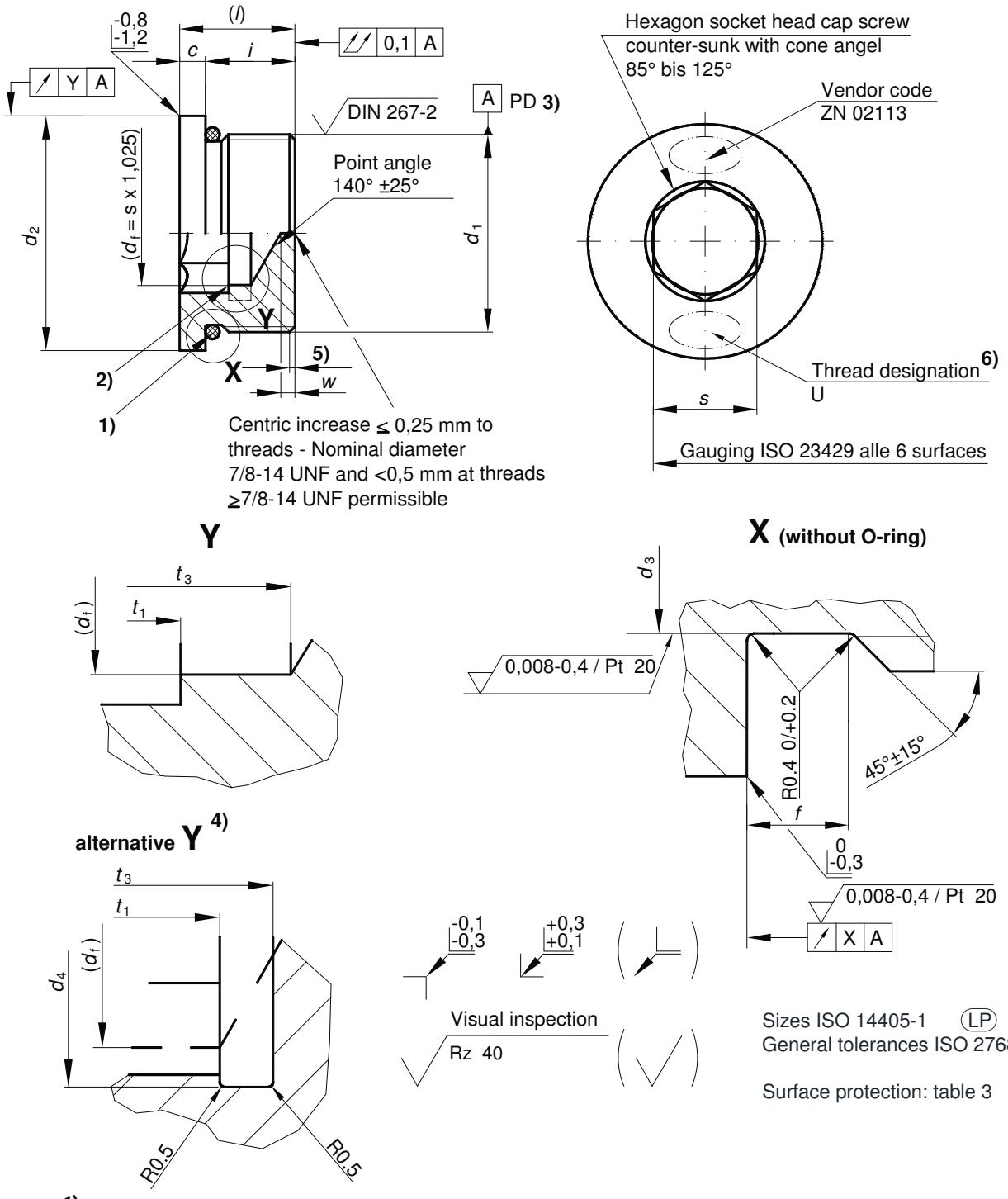
DC	= Drive and Control Technology
DC/ESP1	= Engineering Standards and Processes, Organization and Company Standards
DC/ESP2	= Engineering Standards and Processes, Material Master and Classification
DC-MA	= Business Unit Mobile Applications
DC-MA/NE1	= Vice President Engineering Pumps and Motors

4 Responsibilities

- **DC-MA/NE1** is responsible for the content of this standard.
- **DC/ESP1** is responsible for preparation and the care of this standard. A change/extension of this standard is allowed only in arrangement with DC/ESP1.
  mailto:br.normenstelle@boschrexroth.de
- **DC/ESP2** is responsible for setting up and the care of the DC-uniform material numbers.

5 Dimensions

Note: all data in the drawing and tables in mm



1) Dimensions for O-rings N 02.079
2) Hexagon socket and -basement freely of loose and firm borings
3) PD = Thread effective diameter
4) Backing off with the measures of t_3 and d_4, with the sizes 1 5/16-12 UN, 1 5/8-12 UN and 1 7/8-12 UN allowed. To manufacture the hexagonal without span the passage from pilot hole to undercut can be performed by a 30 ° slope. In this case the hexagonal depth t_1 and the measure t_3 is to comply.
5) up to core diameter with 45° chamfered
6) Alternative "un" at still existing tool allowed

Figure 1

5.1 Screw plugs with hexagon socket

Table 2

d_1 Tol.-Klasse 2A according to ANSI B 1.1 in	d_1 mm	c -0,25	d_2 ±0,15	d_3 +0,05 -0,08	d_4 +0,5	f ±0,15	l basic dimen-sion	i ±0,2	t_1 min.	t_3 max.	s +0,13mm in	s mm	w min.	X	Y	PN in MPa	M_A in Nm ±10%	Material number NBR 90	Material number FKM 90
5/16-24 UNF	7,94	2,75	11,1	6,35	-	1,60	10,25	7,5	4	-	1/8	3,18	2	0,04	0,1	40	7	R909154938	R902601300
3/8-24 UNF	9,53	2,75	12,7	7,95	-	1,75	10,25	7,5	5	-	5/32	3,96	2	0,04	0,1	53,2	10	R902600247	R902650717
7/16-20 UNF	11,112	2,9	14,3	9,25	-	2,05	12	9,1	5,5	-	3/16	4,78	2	0,04	0,1	63	18	R909154478	R910764647
1/2-20 UNF[a)]	12,7	2,9	15,85	10,85	-	2,05	12	9,1	6	-	7/32	5,56	2	0,04	0,1	63	27	R909153368	R902650493
9/16-18 UNF	14,288	2,9	17,45	12,24	-	2,05	12,9	10	6	-	1/4	6,35	2,5	0,04	0,1	63	35	R909153371	R909157039
3/4-16 UNF	19,05	3,75	22,2	16,76	-	2,25	14,85	11,1	6,5	-	5/16	7,94	3	0,04	0,1	63	70	R909153338	R910901969
7/8-14 UNF	22,225	3,95	25,4	19,63	-	2,85	16,65	12,7	6,5	-	3/8	9,52	3	0,04	0,1	63	110	R909153339	R910967343
1 1/16-12 UN	26,988	4,6	31,75	24	-	3,35	19,7	15,1	8	-	9/16	14,3	3,8	0,08	0,2	40	170	R909154480	R910967351
1 3/16-12 UN	30,162	4,6	34,9	27,18	-	3,35	19,7	15,1	8	-	9/16	14,3	3,8	0,08	0,2	40	215	R909157170	-
1 5/16-12 UN	33,338	4,6	38,1	30,35	18,8	3,35	19,7	15,1	9,5	12,7	5/8	15,88	4,8	0,08	0,2	40	270	R909153378	R902601857
1 5/8-12 UN	41,275	4,6	47,6	38,28	22,2	3,35	19,7	15,1	9,5	12,7	3/4	19,05	4,8	0,08	0,2	40	320	R909153418	R910903872
1 7/8-12 UN	47,625	4,6	53,95	44,6	22,2	3,35	19,7	15,1	9,5	12,7	3/4	19,05	6,4	0,08	0,2	40	390	R909157392	R902650452

[a)] This size is blocked for new applications

5.2 Technical delivery terms

Table 3

Material[a]		11SMnPb30+C (1.0718) alternative 11SMnPb37+C (1.0737) according to DIN EN 10087 and DIN EN 10277-3
		Type 12L14 according to ASTM-A 108
		Y12 (U71122) e.g. Y12Pb (U72122) according to GB T 8731
General requirements		ISO 8992 (DIN ISO 8992)
Surface protection	General requirements	according to N38A SR1.1 Without sliding coating, $\mu_{ges.}$ 0,14 – 0,22
	coating system in the procedure	CM-FE-ZN-8-CN-T0-L-B (Bosch part number 5 001 100 016) according to N67F CM-ZN
		CM-FE-ZN-8-CN-T0-L-R (Bosch part number 5 001 100 018) (preferable from 7/8-14 UNF) according to N67F CM-ZN
Acceptance inspection		Acceptance inspection according to ISO 3269 (DIN EN ISO 3269)
Thread		ANSI/ASME B1.1 (2003) Unified Inch Screw Threads, UN and UNR Thread Form
Vendors code[b]		According to ZN 02113

[a] The materials opposite are exchangeable under one material number
[b] permanent marking

6 Technical specification *(SAP material description)*

6.1 BNR- Short text

BNR-Short text	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8
Example:	S	C	R	E	W	•	P	L	U	G								

Subject
Screw plug *(BNR: 109606)*

6.2 Type short description

Type short description	1	2	3	4	5	6	7	8	9	10	1	2	3	4	5	6	7	8	9	20	1	2	3	4	5	6	7	8	9	30	1	2	3	4	5	6	7	8	9	40
Example:	Z	N	1	0	0	7	-	1	•	1	/	6	-	1	2	-	N	B	R																						

Standard reference
ZN 10007..... = ZN10007

Nominal size (*according to Table 2*)
e. g. 1 1/6-12 UN ..... = 1 1/6-12

Material of the O-ring
Acrylnitril-Butadien-Kautschuk -NBR.....=NBR
Fluorkautschuk with Fluor - FKM.....=FKM

Note:
„•“ = blank

6.3 SAP-material classification

Material class *R0M_2-11* according to ZN 04000-2

7 Normative references

Column „Note“: - = please consider document

Publication	Edition	Title	Note
Central standards			
N 02.079	-	O-rings for general application - Dimensions, material and pressure assignment	-
ZN 01210	-	Term code - Definition and handling	-
ZN 02113	-	Vendor's code - Short term of vendor´s number	-
ZN 04000-2	-	Screws and Nuts - Classes and characteristics	-
Bosch Standards			
N38A SR1.1	2006-12	Parts order specification; Thread parts with Cr(VI)-free coatings	-
N67F CM-ZN	2011-05	Surface finishing; Coatings of zinc and zinc alloys; Structure of the Bosch designation	-
Standards			
DIN EN 10088-2	2005-09	Stainless steels - Part 2: Technical delivery conditions for sheet/plate and strip of corrosion resisting steels for general purposes; German version EN 10088-2:2005	-
DIN EN 10277-3	2008-06	Bright steel products - Technical delivery conditions - Part 3: Free-cutting steels; German version EN 10277-3:2008	-
DIN EN ISO 3269	2000-11	Fasteners - Acceptance inspection (ISO 3269:2000); German version EN ISO 3269:2000	-
DIN EN ISO 14405-1	2011-06	Geometrical product specifications (GPS) - Fundamentals - Concepts, principles and rules	-
DIN EN ISO 23429	2004-05	Gauging of hexagon sockets (ISO 23429:2004); German version EN ISO 23429:2004	-
DIN ISO 8992	2005-09	Fasteners - General requirements for bolts, screws, studs and nuts (ISO 8992:2005)	-
DIN ISO 2768-1	1991-06	General tolerances; tolerances for linear and angular dimensions without individual tolerance indications; identical with ISO 2768-1:1989	-
DIN ISO 2768-2	1991-04	General tolerances; geometrical tolerances for features without individual tolerances indications; identical with ISO 2768-2:1989	-
ISO 11926-ff.	-	Connections for general use and fluid power - Ports and stud ends with ISO 725 threads and O-ring sealing	-
ASME B1.1	2003	Unified Inch Screw Threads, UN and UNR Thread Form	-

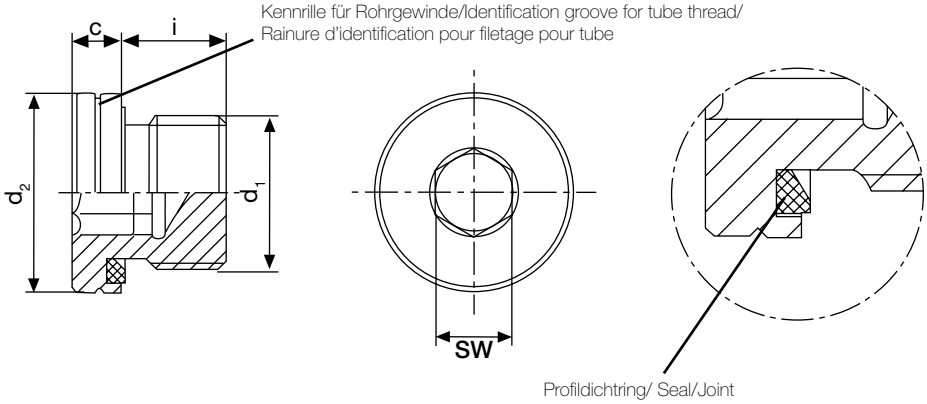
Via the Quick search in the DC area “Guidelines & Standards” the documents can be searched. You will find external standards and Bosch standards in the NormMaster.

HN8-WD

Verschlussschraube
mit elastischer Dichtung

Plug
with sealing formring

Bouchon
avec joint d'étanchéité



Einsatzbereich/using/utilisation: Maschinen-, Getriebe-, Motorenbau/machine-, gear-, motor construction/ construction de machines, engrenages, moteurs

Profildichtring/seal/joint DIN 3869
Einsatztemperatur/temperature:
- NBR 85 Shore -30° C – +100° C/-22 F – +210 F
- FKM 80 Shore -20° C – +200° C/-4 F – +390 F
- andere Temperaturbereiche auf Anfrage/ others on demand/ autres sur demande

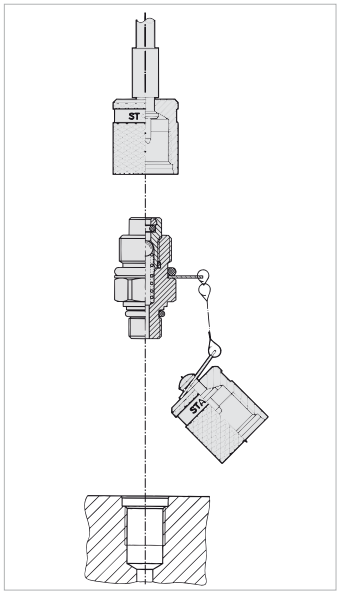
Werkstoff/material/matériau:
- Stahl/steel/acier 11SMnPb(Te)30+C DIN/ EN10277-3 ultraschall- und riss-geprüft/ ultrasonic tested/contrôlé
- andere Werkstoffe auf Anfrage/ others on demand/autres sur demande

Beschichtung/coating/revêtement:
- Cr-(VI)-frei/Cr-(VI)-free/sans Cr-(VI): nanopassiviert A3K/Zn Nano (ISO 4042)
- verzinkt gelb chromatiert (A3L ISO4042)/ yellow zinc chromate plating/zingué jaune chromaté
- andere Beschichtungen auf Anfrage/ others on demand/autres sur demande

Betriebsdruck Pressure Pression	d_1		d_2	c	i	SW	Anziehdrehmo-ment Prevailing torque Couple de serrage	Gewicht Weight Poids
	Metrisches Feingewinde Fine pitch thread Filetage à pas fin	Rohrgewinde Tube thread Filetage pour tube						
	DIN 13	DIN ISO 228	h14	±0,3	±0,2	D12	Nm*	kg per 100 St/pcs (7,85 kg/dm³)
400 bar / 5.800 psi	M 8 x 1	—	12	4	8	4	8	0,50
	M 10 x 1	G 1/8" A	14	4	8	5	12	0,68
	M 12 x 1,5	—	17	5	12	6	25	1,33
	—	G 1/4" A	18,9	5	12	6	30	1,82
	M 14 x 1,5	—	19	5	12	6	35	1,90
	M 16 x 1,5	—	21,9	5	12	8	50	2,20
	—	G 3/8" A	22	5	12	8	55	2,63
	M 18 x 1,5	—	23,9	5	12	8	60	3,13
	M 20 x 1,5	—	25,9	5	14	10	70	4,02
	—	G 1/2" A	26,9	5	14	10	80	4,43
	M 22 x 1,5	—	27	5	14	10	80	5,00
	M 24 x 1,5	—	29,9	5	14	12	95	5,80
	M 26 x 1,5	—	31,9	5	16	12	120	7,52
	M 27 x 2	G 3/4" A	32	5	16	12	135	7,65
	M 30 x 1,5	—	36,9	6,5	16	17	190	10,80
	M 33 x 2	G 1" A	39,9	6,5	16	17	225	12,60
315 bar / 4.500 psi	M 42 x 2	G 1 1/4" A	49,9	6,5	16	22	360	20,00
	M 48 x 2	G 1 1/2" A	55	6,5	16	24	400	25,00
400 bar / 5.800 psi	M 42 x 2	G 1 1/4" A	49,9	8	20	22	360	26,00
	M 48 x 2	G 1 1/2" A	55	8	22	24	400	33,00

Nm* = Richtwert, Verhalten abhängig von Material, Beschichtung und Beschaffenheit des Gegenstücks/ guidance level/ valeur indicative

Test Coupling with Ball Check



Fast Coupling for

- Monitoring and control of pressure
- Venting
- Sampling in high- and low-pressure systems

Advantages

- Test system at working pressure
- Leak proof connection before **ball check** is open
- Simple connection to measurement, control and switching devices
- Self locking metal protective cap

Working Pressure

- Max. working pressure 630 bar / 9137 PSI
  For SMK Type G and K the recommended working pressure of fitting manufacturer should be noted.
- Connection under pressure up to 400 bar / 5801 PSI max.

Materials

- **Metal Parts:**
  Standard material: Steel, zinc/nickel-plated = **C6F (CrVI-free)**
  Optional:
  Stainless Steel **V2A** (1.4305 / AISI 303) on request
  Stainless Steel **V4A** (1.4571 / AISI 316Ti) on request

  For ordering "V2A" or "V4A" please replace "C6F" with "V2A" or "V4A".

- **Ball:** Stainless Steel

- **Sealings:**
  P = NBR (Buna-N®)
  (Temperature range -20 °C ... +100 °C / -4 °F ... +212 °F)
  Note: Internal sealings made of FPM, even for standard NBR-type.

  V = FPM (Viton®)*
  (Temperature range -20 °C ... +200 °C / -4 °F ... +392 °F)

  ***** Standard option for North America is FPM (Viton®)**

  E = EPDM Ethylene Propylene Diene Monomer Rubber
  (for Brake fluid,
  Temperature range -40 °C ... +150 °C / -40 °F ... +302 °F)

  For ordering NBR or EPDM sealings please replace "V" with "P" or "E".

  Vibration safety O-ring made of NBR (Buna-N®) (standard).

Media

- Suitable for hydraulic oils and other Mineral oil based fluids
  (Check compatibility of sealing material)
- For use with other liquid media please consult STAUFF

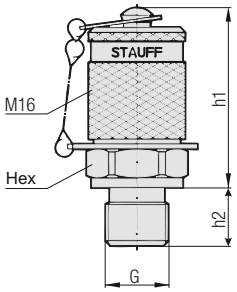
Protection Cap

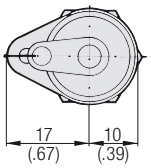
- The complete STAUFF-Test-20-type-SMK range is also available with a hexagonal protection cap made of steel or plastic protection cap.

  For ordering the hexagonal protection cap version please add "-SK" to the order code.
  (e.g. SMK20-M10x1-VA-**SK**-C6F)
  For ordering the plastic protection cap version please add "-KK" to the order code.
  (e.g. SMK20-M10x1-VA-**KK**-C6F)

SMK20 Test Coupling with Port Connection	**SMK20 Type G** Test Coupling complete with Straight Fitting	**SMK20 Type K** Test Coupling for 24° Cone Fittings	**SMK20-JIC** Test Coupling SMK-JIC Connection (to SAE J514)	**SSK20** Bulkhead
				

Test Coupling with Port Connection SMK20





Thread G	Sealing	Working Pressure (bar/PSI)	Dimensions (mm/in) h1	h2	Hex	Order Codes NBR	FPM* (Standard Option-North America)
M8 x 1	Type A	250	38	8,5	17	SMK20-M8x1-PA-C6F	SMK20-M8x1-VA-C6F
		3625	1.50	.33	.67		
M10 x 1		630	38	9,8	17	SMK20-M10x1-PA-C6F	SMK20-M10x1-VA-C6F
		9137	1.50	.39	.67		
M10 x 1	Type B	400	37	8	17	SMK20-M10x1-PB-C6F	SMK20-M10x1-VB-C6F
		5801	1.46	.31	.67		
M12 x 1,5		630	37	12	17	SMK20-M12x1,5-PB-C6F	SMK20-M12x1,5-VB-C6F
		9137	1.46	.47	.67		
M14 x 1,5		630	37	12	19	SMK20-M14x1,5-PB-C6F	SMK20-M14x1,5-VB-C6F
		9137	1.46	.47	.75		
M16 x 1,5		630	37	12	22	SMK20-M16x1,5-PB-C6F	SMK20-M16x1,5-VB-C6F
		9137	1.46	.47	.87		
G1/8		400	39	8	17	SMK20-G1/8-PB-C6F	SMK20-G1/8-VB-C6F
		5801	1.54	.31	.67		
G1/4		630	37	12	19	SMK20-G1/4-PB-C6F	SMK20-G1/4-VB-C6F
		9137	1.46	.47	.75		
G3/8		630	37	12	22	SMK20-G3/8-PB-C6F	SMK20-G3/8-VB-C6F
		9137	1.46	.47	.87		
M10 x 1	Type C	400	39	8	17	SMK20-M10x1-PC-C6F	SMK20-M10x1-VC-C6F
		5801	1.54	.31	.67		
M12 x 1,5		630	37	12	17	SMK20-M12x1,5-PC-C6F	SMK20-M12x1,5-VC-C6F
		9137	1.46	.47	.67		
M14 x 1,5		630	37	12	19	SMK20-M14x1,5-PC-C6F	SMK20-M14x1,5-VC-C6F
		9137	1.46	.47	.75		
M16 x 1,5		630	37	12	22	SMK20-M16x1,5-PC-C6F	SMK20-M16x1,5-VC-C6F
		9137	1.46	.47	.87		
G1/8		400	39	8	17	SMK20-G1/8-PC-C6F	SMK20-G1/8-VC-C6F
		5801	1.54	.31	.67		
G1/4		630	37	12	19	SMK20-G1/4-PC-C6F	SMK20-G1/4-VC-C6F
		9137	1.46	.47	.75		
G3/8		630	37	12	22	SMK20-G3/8-PC-C6F	SMK20-G3/8-VC-C6F
		9137	1.46	.47	.87		
G1/2		630	39	14	27	SMK20-G1/2-PC-C6F	SMK20-G1/2-VC-C6F
		9137	1.54	.55	1.06		
R1/8 K	Type D	400	37	8	17	SMK20-R1/8K-PD-C6F	SMK20-R1/8K-VD-C6F
		5801	1.46	.31	.67		
R1/4 K		630	35	12	17	SMK20-R1/4K-PD-C6F	SMK20-R1/4K-VD-C6F
		9137	1.38	.47	.67		
1/8 NPT		400	36	10	17	SMK20-1/8NPT-PD-C6F	SMK20-1/8NPT-VD-C6F
		5801	1.42	.39	.67		
1/4 NPT		630	35	15	17	SMK20-1/4NPT-PD-C6F	SMK20-1/4NPT-VD-C6F
		9137	1.38	.59	.67		
5/16–24 UNF	Type E	400	38	7,5	17	SMK20-5/16UNF-PE-C6F	SMK20-5/16UNF-VE-C6F
		5.801	1.50	.30	.67		
7/16–20 UNF		630	38	9,1	17	SMK20-7/16UNF-PE-C6F	SMK20-7/16UNF-VE-C6F
		9137	1.50	.36	.67		
1/2–20 UNF		630	38	9,2	17	SMK20-1/2UNF-PE-C6F	SMK20-1/2UNF-VE-C6F
		9137	1.50	.36	.67		
9/16–18 UNF		630	37	10	19	SMK20-9/16UNF-PE-C6F	SMK20-9/16UNF-VE-C6F
		9137	1.46	.39	.75		
3/4–16 UNF		630	37	11.1	19	SMK20-3/4UNF-PE-C6F	SMK20-3/4UNF-VE-C6F
		9137	1.46	.44	.75		
M10 x 1		630	38	9,5	17	SMK20-M10x1-PE-C6F	SMK20-M10x1-VE-C6F
		9137	1.50	.37	.67		
M12 x1,5		630	37	11	17	SMK20-M12x1,5-PE-C6F	SMK20-M12x1,5-VE-C6F
		9137	1.46	.43	.67		
M14 x 1,5		630	38	11	19	SMK20-M14x1,5-PE-C6F	SMK20-M14x1,5-VE-C6F
		9137	1.50	.43	.75		

Metal Parts

Standard material: Steel, zinc/nickel-plated = **C6F (CrVI-free)**
For ordering V2A (1.4305 / AISI 303) replace "C6F" with "V2A".
For ordering V4A (1.4571 / AISI 316Ti) replace "C6F" with "V4A".

Sealings

For ordering NBR sealings replace "V" with "P".
For ordering EPDM sealings replace "V" with "E".

*** Standard option for North America is FPM (Viton®).**

Sealing Details


O-ring Type A


Metal Joint Type B


Elastomeric Sealing Type C


Taper Type D
(suitable sealant required)


O-ring Type E

Protection Cap

Standard material: Steel
For ordering the hexagonal protection cap version please add "-SK" to the order code. (e.g. SMK20-M10x1-VA-SK-C6F)
For ordering the plastic protection cap version please add "-KK" to the order code. (e.g. SMK20-M10x1-VA-KK-C6F)

For further information on materials, sealings or protection caps, please see page B4.

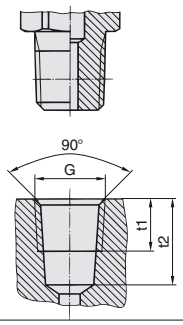
Other port connections and sealings on request.
Please consult STAUFF for further information.

Dimensional drawings: All dimensions in mm (in).

Port Connections and Sealing Details

Type D

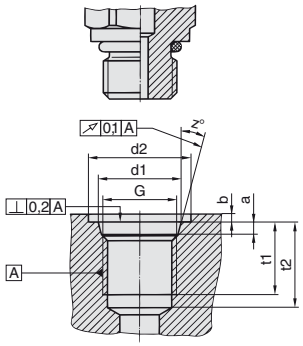
Type D - Taper threaded port according to ANSI/ASME B1.20.1-1983 (NPT)
Sealing: Taper Type D suitable sealant required



Thread	Dimensions (mm/in)	
G	t1 min.	t2 min.
1/8–27 NPT	6,9	11,6
	.27	.46
1/4–18 NPT	10	16,4
	.39	.65
1/2–14 NPT	13,6	22,6
	.54	.89

Type E

Type E - Threaded port according to ISO 6149-1 (metric); ISO 11926-1 (UNF)
Sealing: O-ring Type E



Thread	Dimensions (mm/in)						
G	d1 +0,1	d2 min.	t1 min.	t2 min.	a +0,4	b max.	z° ±1°
M10 x 1	11,1	16	10	11,5	1,6	1	12°
	.44	.63	.39	.45	.06	.04	
M12 x 1,5	13,8	19	11,5	14	2,4	1,5	15°
	.54	.75	.45	.55	.09	.06	
M14 x 1,5	15,8	21	11,5	14	2,4	1,5	15°
	.62	.83	.45	.55	.09	.06	
M16 x 1,5	17,8	24	13	15,5	2,4	1,5	15°
	.70	.94	.51	.61	.09	.06	
M22 x 1,5	23,8	29	15,5	18	2,4	2	15°
	.94	1.14	.61	.71	.09	.08	
M27 x 2	29,4	34	19	22	3,1	2	15°
	1.16	1.34	.75	.87	.91	.08	
5/16–24 UNF	9,1	17	10	12	1,9	1,6	12°
	.36	.67	.39	.47	.07	.06	
7/16–24 UNF	12,4	21	11,5	14	2,4	1,6	12°
	.49	.83	.45	.55	.09	.06	
1/2–20 UNF	14	23	11,5	14	2,4	1,6	12°
	.55	.91	.45	.55	.09	.06	
9/16–18 UNF	15,65	25	12,7	15,5	2,5	1,6	12°
	.62	.98	.50	.61	.10	.06	
7/8–14 UNF	23,95	34	16,7	20	2,5	2,4	15°
	.94	1.34	.66	.79	.10	.09	

Dimensional drawings: All dimensions in mm (in).