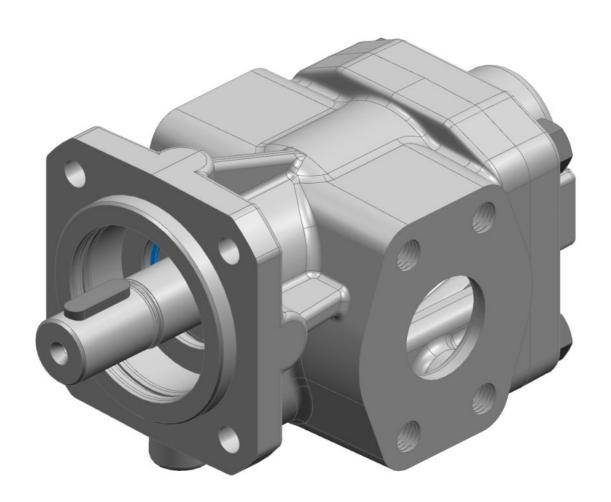
# **KRACHT**

D.0024710002Operating instructions (Translation)



Gear pump 2.5-630 English

# Table of content

1	Gen	neral	5
	1.1	About the documentation	5
	1.2	Manufacturer address	5
	1.3	Applicable documents	5
	1.4	Symbols	6
2	Safe	ety	7
	2.1	Intended use	7
	2.2	Foreseeable misuse	7
	2.3	Personnel qualification and training	7
	2.4	Basic safety instructions	8
	2.5	Fundamental hazards	8
3	Dev	vice description	10
	3.1	Functional principle	10
	3.2	Possible versions	11
	3.3	Type key	14
	3.4	Rotation and delivery direction	15
	3.5	Type of seals	16
	3.6	Special number	18
	3.7	Free shaft end	25
	3.8	Quench	26
4	Tec	chnical data	27
	4.1	General	27
	4.2	Nominal sizes	29
	4.3	Viscosity - Rotation speed assignment	30
	4.4	1 3	
		4.4.1 Operating pressure of suction side and pressure side	
		4.4.2 Max. suction side operating pressure for sealing type 1, 2, 7 and 19	
	4.5	Differential pressure - viscosity assignment	
	4.6	Permissible temperature range	33
	4.7	Material data	34
		4.7.1 Compressor applications	35
	4.8	Weight	36
	4.9	Dimensions	36

5	Trai	nsport a	nd storage	37
	5.1	Gener	ral	37
	5.2	Transı	port	37
	5.3	Storac	ge	37
	5.4			
c		•	ge conditions	
0	6.1		/ instructions for installation	
		,		
	6.2		reduction	
	6.3		anical installation	
		6.3.1	Preparation	
		6.3.2	Gear Pump with free shaft end	
	6.4		ection lines	
		6.4.1 6.4.2	General Suction line	
		6.4.3	Pressure line	
		6.4.4	Tank line T-valve	
		6.4.5	Mounting Connection lines	
	6.5		ge of the direction of rotation	
	0.5	Chang	ge of the direction of rotation	43
7	Ope	ration s	start-up	46
	7.1	Safety	y instructions for start-up	46
	7.2	Prepa	ration	46
	7.3	Filling	the quench chamber	47
	7.4	J	ure relief valve adjustment	
		7.4.1	Pressure relief valve	
	7.5	Furthe	er operation start-up	49
8	Ren	noval		50
•	8.1		/ instructions for removal	
	8.2	,	val	
9	Mai		ce	
	9.1	Impor	rtant notes about explosion protection	52
	9.2	Maint	enance work	53
	9.3	Maint	enance instructions	53
	9.4	Maint	renance table	54
			Maintenance table	54
		9.4.1	Inspection: Discharge flow	55
		9.4.2	Inspection: Operating pressure	
		9.4.3	Inspection: Media temperature	
		9.4.4	Inspection: Device temperature	
		9.4.5	Inspection: Add-on valve function (if existing)	
		9.4.6	Inspection: Check the potential compensation (if existing)	
		9.4.7 9.4.8	Inspection: Condition of operating fluidAudiometric monitoring: Unusual noise	
		9.4.8 9.4.9	Cleaning	
		9.4.10	Visual inspection: Leakages	
			- · ·	

	g	9.4.11	Visual inspection: Filling level of liquid seal (if existing)	56
	g	9.4.12	Visual inspection: Condition gears	56
		9.4.13	Visual inspection: Condition of housing parts	56
	Ç		Visual inspection: Condition of plain bearings	
	Ç		Visual inspection: Condition of shaft seal	
	Ç	9.4.16	Visual inspection: Condition of outboard bearings	57
	Ç	9.4.17	Replacing: Outboard bearings	
	g	9.4.18	Replacing: Plain bearings (only by manufacturer)	57
	Ç	9.4.19	Replacing: Shaft seal	57
	g	9.4.20	Replacing: Other seals	57
10 F	Repai	irs		58
1	10.1	Safety	instructions for repair	58
1	10.2	Genera	al	59
1	.0.3 Detecting and eliminating failures			

Kracht GmbH General | 1

### 1 General

### 1.1 About the documentation

These operating instructions describe the installation, operation and maintenance of the following device:

#### Gear pump KF 2.5-630

These operating instructions are a component of the device and must be kept accessible for the personnel near the device at all times.

The device is manufactured in different versions. Information about the version concerned in the individual case can be found on the device's type plate.

If you have any questions about these operating instructions, please contact the manufacturer.

### 1.2 Manufacturer address

**KRACHT GmbH** 

Gewerbestraße 20

DE 58791 Werdohl

Tel: +49 2392 935-0

Fax: +49 2392 935-209 E-Mail: info@kracht.eu Web: www.kracht.eu

### 1.3 Applicable documents

In addition to these instructions, also observe the corresponding instructions for the existing or planned systems or system parts.

88024710002-29 5 / 63

1 | General Kracht GmbH

### 1.4 Symbols



### **A** DANGER

Identification of an immediate hazard, which would result in death or severe bodily injury if not avoided.



#### **MARNING**

Identification of a potential medium risk hazard, which would lead to death or severe bodily injury if not avoided.



### **A** CAUTION

Identification of a low risk hazard, which could lead to minor or medium bodily injury if not avoided.

### **ATTENTION**

Flagging of notices to prevent property damage.



### **NOTICE**

Identification of basic safety instructions.

Non-compliance can lead to hazards for people and the device.



#### **TIPP**

Flagging of special user tips and other especially useful or important information.

Kracht GmbH Safety | 2

# 2 Safety

### 2.1 Intended use

- 1. The device has been designed for operation with fluid. Dry operation is not permitted.
- 2. The product may only be operated when completely filled.
- 3. The fluid must be compatible with the materials used in the product. Chemical expertise is required for that. Be careful with ethylene oxide or other catalytically or exothermically reacting or self-decomposing substances. Please consult the manufacturer in cases of doubt.
- 4. The product may only be used in normal industrial atmospheres.

  If there are any aggressive substances in the air, always consult the manufacturer.
- 5. The product may only be operated in compliance with these operating instructions and the applicable documents.
  - Deviating operating conditions require the express approval of the manufacturer.
- 6. Use of the product for purposes other than those for which it is intended invalidates any warranty.

### 2.2 Foreseeable misuse

The manufacturer is not liable for damage resulting from non-intended or improper use.

### 2.3 Personnel qualification and training

The personnel designated to assemble, operate and service the device must be properly qualified.

This can be through training or specific instruction.

Personnel must be familiar with the contents of this operating instructions.



#### **NOTICE**

Read the operating instructions thoroughly before use.

88024710002-29 7 / 63

2 | Safety Kracht GmbH

### 2.4 Basic safety instructions



#### **NOTICE**

#### **Basic safety instructions**

Non-compliance can lead to hazards for people and the unit.

- a) Follow existing regulations for accident prevention and safety at work as well as the internal regulations of the operating company.
- b) Ensure the greatest possible cleanliness.
- c) Wear suitable personal protective equipment.
- d) Do not remove type plates or other information or make them illegible or unrecognisable.
- e) Do not make any technical modifications.
- f) Comply with maintenance intervals.
- g) Only use spare parts approved by the manufacturer.

### 2.5 Fundamental hazards



#### **▲** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



#### **A** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Defective components and connection lines must be replaced or fixed without delay.
- b) Use only components and connection lines approved for the expected pressure range.



#### **⚠** DANGER

#### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.

Kracht GmbH Safety | 2



### **A** DANGER

#### **Rotating parts**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

a) Take measures against accidental touching of rotating parts.



#### **MARNING**

#### **Rotating parts!**

Danger of injury from flying parts.

a) Enclose rotating parts so as to avoid any danger from flying parts in the event of breakage or malfunction.



#### **⚠ WARNING**

#### Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to splashing fluids.

- a) Depressurize the system before all work.
- b) Securely prevent the pressure from being restored during work.



#### **MARNING**

#### Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to fluid spurting out.

- a) Use only connections and lines approved for the expected pressure range.
- b) Securely prevent the permissible pressures from being exceeded, e.g. by using pressure relief valves or bursting discs.
- c) Pipelines must be designed in such a way that no tension e.g. caused by changes in length due to fluctuations in temperature can be transferred to the product.



#### **MARNING**

#### Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to fluid spurting out.

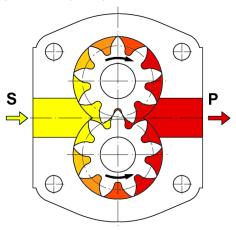
- a) Do not operate the product with shut-off devices closed.
- b) Securely prevent the restoration of pressure while working on the device.

88024710002-29 9 / 63

# 3 Device description

# 3.1 Functional principle

Pumps of this series are external gear pump types that work according to the positive displacement principle.



- S Suction connection
- P Pressure connection

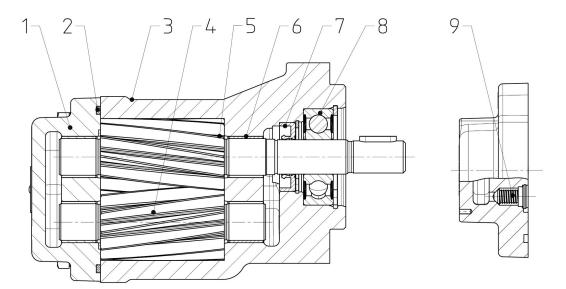
When rotated, two gearwheels meshing together produce a volume enlargement as a result of the opening of the tooth spaces on the suction side (S), so that medium can flow in and so that a corresponding volume is displaced simultaneously by immersion of the teeth into the filled tooth spaces on the pressure side (P). Fluid transport takes place through entrainment in the tooth gaps along the wall of the wheel chamber. The so-called geometric flow rate  $V_g$  is being displaced per wheel rotation. A value that is stated in technical documents as rated volume  $V_{gn}$  to specify the pump size.

The displacement cycle describe initially takes place without exhibiting appreciable pressure build-up. Only after setting external loads, for example, through delivery heights, flow resistances, line elements, etc. will the required working pressure arise to overcome these resistances.

The pressure occurring at the shaft seal therefore corresponds to the pressure at the suction connection of the device. The permissible pressure is determined by the type of sealing.

### 3.2 Possible versions

#### **Gear pump**

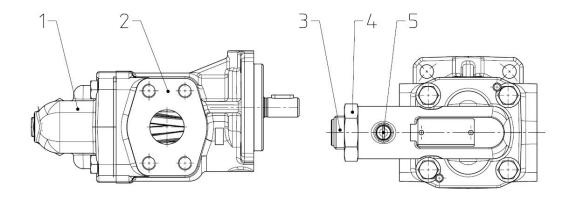


- 1 End cover
- 3 Housing
- 5 Driving shaft
- 7 Shaft seal
  - (**Type of seals [**▶ 16])
- 9 Valve
  - (only Direction of rotation : B)

- 2 O-ring
- 4 Driven shaft
- 6 Plain bearing bush
- 8 Outbord bearing (Fixing type : G; X)

88024710002-29 11 / 63

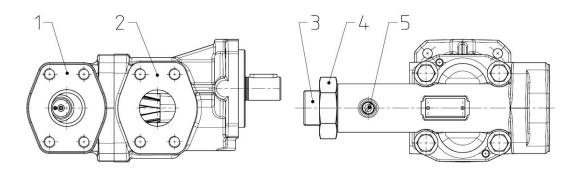
#### Gear pump with pressure relief valve



- 1 Pressure relief valve
- 3 Adjustment screw
- 5 Retaining screw

- 2 Gear pump
- 4 Hexagonal nut

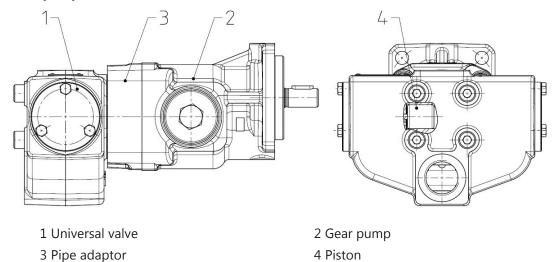
#### Gear pump KF 32-80 with pressure relief valve (T-valve)

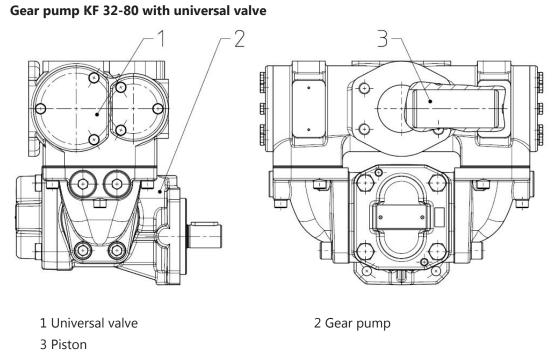


- 1 Pressure relief valve with Tank connection
- 3 Adjustment screw
- 5 Retaining screw

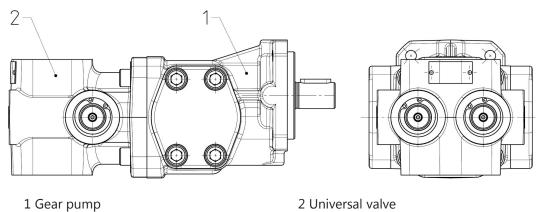
- 2 Gear pump
- 4 Hexagonal nut

#### Gear pump KF 2.5-25 with universal valve





### Gear pump KF 32-112 with universal valve U2



88024710002-29 13 / 63

# 3.3 Type key

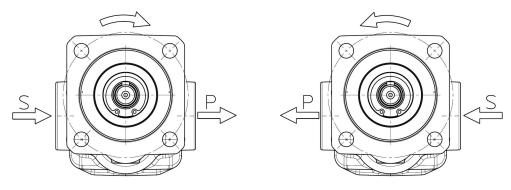
Orderi	Ordering example											
KF		40		R	F		1	/	-	D15	-	•••
1.		2.		3.	4.		5.	6.		7.		8.

Explan	Explanation of type key								
1. Proc	luct name								
2. Non	2. Nominal size								
	Size 1: 2.5; 4; 5; 6; 8; 10; 12; 16; 2	0; 25							
.,	Size 2: 32; 40; 50; 63; 80								
<b>V</b> <sub>gn</sub>	Size 3: 100,112; 125; 150; 180; 200								
	Size 4: 250; 315; 400; 500; 630								
3. Dire	ction of rotation								
D	Clockwise	В	Clockwise and counterclockwise						
R	Ciockwise	D	Flow direction alternating						
	Counterclockwise	- 11	Clockwise and counterclockwise						
L	Counterclockwise	U	Flow direction consistent						
4. Fixir	ng type								
F	DIN flange without outboard bearing	W	Mounting angle without outboard bearing						
G	DIN flange with outboard bearing	X	Mounting angle with outboard bearing						
5. Seal	type								
1	Rotary shaft seal NBR (BABSL)	23	Rotary shaft seal FKM (MSS1) (Low temperature)						
2	Rotary shaft seal FKM (BABSL)	30	Without shaft seal O-ring FKM						
3	Rotary shaft seal PTFE	31	Rotary shaft seal FKM (BABSL) (Low temperature)						
	(HN2390)		(KF 32-200)						
4	Double rotary shaft seal PTFE (HN2390)	32	Double rotary shaft seal EPDM (R02-R) (not resistant to mineral oil)						
	Mechanical seal witht FKM secondary seals (AX15)		Mechanical seal CR secondary seals						
5	C2S2V1G3G1 (KF 2.5-200)	33	Q3ANFE (KF 32-630)						
	B10SV1G3G1 (KF 250-630)		(For compressor applications)						
_	Mechanical seal with FFKM secondary seals (AX30)	_	Mechanical seal with HNBR secondary seals						
6	Q2Q2K1G3 (KF 2.5-80)	34	Q3AP1FE (KF 32-630)						
	Q2B2K1G3 (KF 32-200)		(For compressor applications)						
			Mechanical seal witht FKM secondary seals						
7	Double rotary shaft seal FKM (BABSL)	35	Q3AVFE (KF 32-630)						
	(DADSL)		(For compressor applications)						

Explana	Explanation of type key						
9	Rotary shaft seal EPDM (R02-R) (not resistant to mineral oil)		36	Without shaft seal O-ring NBR			
18	Rotary shaft seal FKM (BAUMX7)		37	Rotary shaft seal FKM (BABSL) O-ring FKM (Low temperature) (KF 100-112)			
Double rotary shaft seal NBR (BABSL)		40	Mechanical seal witht FKM secondary seals (L4) AQ2VFF				
6. Spec	ial numbe	r					
Special	number [	18]					
7. Valve	e option						
Pressur	e relief va	lve					
Pressure setting ranges 0 – 15 bar		setting ranges 0 – 15	D25	Pressure setting ranges 15 – 25 bar			
D30	Pressure s bar	setting ranges 15 – 30					
Univers	sal valve						
U2	new type						
Pressur	e relief va	lve with Tank connec	tion				
T15 Pressure setting ranges 0 – 15 bar		T25	Pressure setting ranges 15 – 25 bar				
Viscosi	Viscosity range Pressure relief valve with Tank connection [mm²/s]						
No spe	cification	12 - 300	В	1000 - 5000			
	Α	300 - 1000					
8. Hous	sing and c	over material					
No spe	cification	EN-GJL-250 (GG-25)	GJS	EN-GJS-400-15 (GGG-40)			

# 3.4 Rotation and delivery direction

The direction of rotation is indicated by the bent arrow, Looking at the end of drive shaft. The flow direction is indicated by the straight arrows.

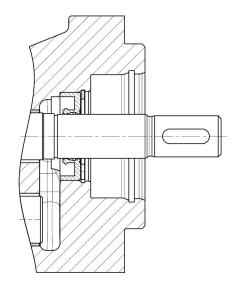


S = Suction connection

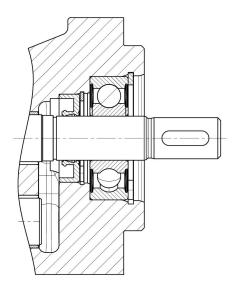
P = Pressure connection

88024710002-29 15 / 63

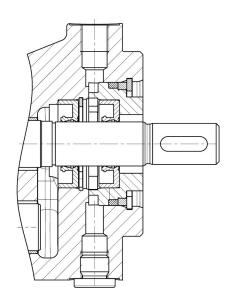
# 3.5 Type of seals



Rotary shaft seal Seal type: 1; 2; 3; 9; 18; 23; 31

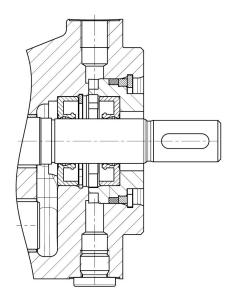


Rotary shaft seal with Outbord bearing Seal type: 1; 2; 3; 9; 18; 31; 37



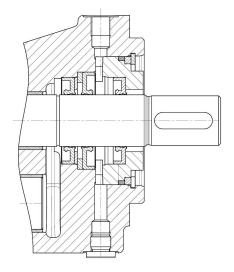
Double rotary shaft seal Connection borehole G1/8 (for fluid buffer)

Seal type: 4; 7; 19; 32



Double rotary shaft seal (for vacuum operation) Connection borehole G1/8 (for fluid buffer)

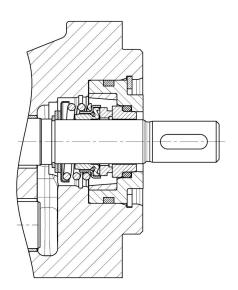
Seal type: 4; 7; 19; 32 Special number: 74



Triple rotary shaft seal (for vacuum operation + for normal operation) Connection borehole G1/8 (for fluid buffer)

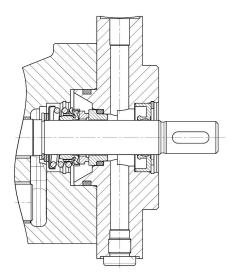
Seal type: 7

Special number: 322 (KF 100-112)



Mechanical seal

Seal type: 5; 6; 33; 34; 35; 40



Mechanical seal with fluid buffer

KF 2.5-25: Connection borehole G1/8

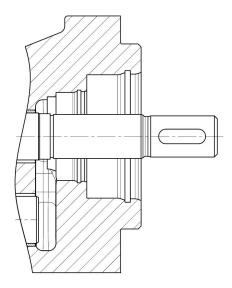
(for fluid buffer)

KF 32-80 : Connection borehole G1/4

(for fluid buffer) Seal type : 5

Special number: 198

88024710002-29 17 / 63



Without shaft seal

(Leak oil drain through shaft sealing chamber)

Seal type: 30; 36

# 3.6 Special number

Special number	Description
45	Driving shaft cylindrical - with centre bore
45	DIN 332-2 Typ D
51	Driving shaft cylindrical - with centre bore
21	DIN 332-2 Typ D
74	Double rotary shaft seal for vacuum operation
	For compressor applications
156	O-ring CR
	Plastic plain bearings (non-ferrous metal-free)
	Housing connection
158	KF 2.5-12 : Flange connection SAE 3/4"
	KF 16-25 : Flange connection SAE 1"
	Without shaft seal
166	O-ring CR
	Plastic plain bearings (non-ferrous metal-free)
	Without shaft seal
100	With outboard bearing and additional outboard flange
168	Flat plug with coupling
	Driving shaft with fine screw thread M12x1,25
	Housing connection
173	KF 2.5-12: Flange connection 3/4-14 NPT
	KF 16-25: Flange connection 1-11-1/2 NPT

Special number	Description
175	Valve is flowed through the other way round
182	Mechanical seal and additional rotary shaft seal
191	Rotary shaft seal for vacuum operation
191	+ Special number 197
197	Noise-optimized version for aerated oils
	Special number 182
198	KF 100-150 Mechanical seal : AX 15 S-015 Q2Q2V1G3G1 (5)
198	KF 100-150 Mechanical seal : L4BD015DINA10Q20VFF-B4CC (40)
	KF 100-112 Mechanical seal : AX 15 SL025 Q2Q2V1G3G1 (5)
	For compressor applications
206	Special number 156
	O-ring HNBR
	Housing connection
	KF 50-80 Flange connection SAE 2"
	KF 100-112 Flange connection SAE 2 ½"
232	KF 125-150 Flange connection SAE 3"
	KF 180-200 Flange connection SAE 3 1/2"
	KF 250-315 Flange connection SAE 3 1/2"
	KF 400-630 Flange connection SAE 5"
	Special number 168
236	Without outboard flange
	Flat plug
245	Double rotary shaft seal BAUMX7 with grease filling
0.74	Special number 166
251	O-ring FKM
252	Special number 166
252	Housing/End cover nitrocarburized
	Use under water
255	Double rotary shaft seal BABSL + Grease filling
255	Fastening screws: Stainless steel (A4)
	+ Special number 197
	Special number 74
271	O-ring CR
	Plastic plain bearings (non-ferrous metal-free)
289	Rotary shaft seal BAUM X

88024710002-29 19 / 63

Special number	Description
291	stainless steel type plate and rivet
	Inner rotary shaft seal Turcon Roto Variseal (p <sub>max</sub> =10 bar at 700 1/min)
297	external rotary shaft seal BABSL
	Plastic plain bearings (non-ferrous metal-free)
	Hennecke – Type plate
304	Plastic plain bearings (non-ferrous metal-free)
	Plastic plain bearings (non-ferrous metal-free)
306	Hennecke – Type plate
	+ Special number 197
	Without shaft seal
307	wihtout rinsing
	Cover with suction bore
309	Combination of Special number 74 + 197
	Without shaft seal
	O-ring CR
313	Plastic plain bearings (non-ferrous metal-free)
	Housing/End cover nitrocarburized
	Driving shaft with flat plug
216	Combination of Special number 197 + 232
316	Driving shaft with gear shaft profile
317	Combination of Special number 197 + 304
210	Driving shaft mit gear shaft profile
318	+ Special number 197
	Triple rotary shaft seal
322	Plastic plain bearings (non-ferrous metal-free)
	+ Special number 232
226	Combination of Special number 45 + 197
326	KF 150 + KF 200: Driving shaft bore M8 / 19 mm deep.
221	Special number 198
331	Housing with suction hole to suction side
332	Special number 304
	with universal valve
242	Gear pump mounted in position "0 degrees" between connection flange and universal valve.
343	For the version with universal valve U2, the pump is mounted rotated 180.
	(Gear pump horizontal, shaft end below the connections!)

Special number	Description
344	Driving shaft with gear shaft profile
344	+ Special number 197
	Without shaft seal
345	O-ring CR
	Plastic plain bearings (non-ferrous metal-free)
353	Multi layer friction bearings non-ferrous metal-free
	+ Special number 197
358	Special number 297
	without customized type plate
359	Combination of Special number 158 + 197
363	Plastic plain bearings (non-ferrous metal-free)
	+ Special number 158
	For compressor applications
375	Plastic plain bearings (non-ferrous metal-free)
373	special shaft
	special flange
	For compressor applications
376	Special number 375
	End cover as suction connection with adapter plate
380	Fastening screws: Stainless steel
387	With Universal valve
	Suction connection at the bottom of the valve housing
391	Combination of <b>Special number 197 + 232</b>
	Use under water
397	with universal valve
	Fastening screws: Stainless steel
	Use under water
398	Fastening screws: Stainless steel
	+ Special number 197
	With SAE-B-2-hole flange
401	Driving shaft with gear shaft profile
	Plastic plain bearings (non-ferrous metal-free)
	+ Special number 197
402	Combination of Special number 74 + 158 bzw. 232
408	Special grooves in the housing (KF 2.5)

88024710002-29 21 / 63

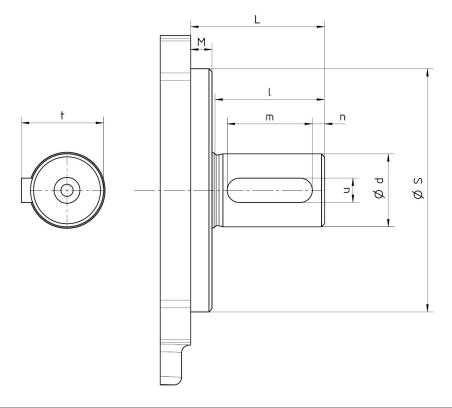
Special number	Description
	Additional adapter flange
409	Driving shaft cylindrical - with centre bore
	DIN 332-2 Typ D
	Without shaft seal
414	+ Special number 197
	With stated preferred direction of rotation
424	Gear pump with polierten Lagerstellen
424	Housing material: EN-GJS-400-15 (GGG-40)
429	Snap ring on the shaft end
430	Driving shaft with gear shaft profile
422	Driving shaft with plug M25x1,5
433	+ Special number 197
	For compressor applications
437	O-ring FKM
	Plastic plain bearings (non-ferrous metal-free)
441	Special number 424
441	Plastic plain bearings (non-ferrous metal-free)
442	With SAE-B-2-hole flange
442	Driving shaft with gear shaft profile
443	Combination of <b>Special number 156 + 158</b>
	With SAE-B-2-hole flange
444	Driving shaft with gear shaft profile
	+ Special number 197
450	Driving shaft with bore for fitted pin
	Thread holes 4x M8 / 16 deep in the housing
	KF 125-150 : Suction connection 3" und Pressure connection 2 1/2"
452	KF 180-200 : Suction connection 3 1/2" und Pressure connection 3"
	+ Special number 197
452	Plastic plain bearings (non-ferrous metal-free)
453	+ Special number 158
450	Standard KF 12
458	With special dimensions and special driving shaft
459	Combination of Special number 74 + 197 158 bzw. 232
460	Combination of Special number 206 + 158
464	Combination of Special number 401 + 232

Special number	Description
466	Housing deburred
	Without shaft seal
468	Driving shaft with nozzle
	+ Special number 197
	B-Cover
471	+ Special number 197
	stated preferred direction of rotation
473	Special paint
475	Combination of Special number 401 + 232
477	Driving shaft with gear shaft profile
	With SAE-D-2-hole flange
478	Driving shaft with gear shaft profile
	+ Special number 197
481	Housing with screw-mounted lubrication bore and lubrication
401	hole
482	Special number 481
	+ Special number 158
483	Special number 481
	KF 32-80: Standardmäßig Schmierölbohrung
	Special number 444
485	Outer rotary shaft seal mounted with sealing lip to the shaft end + retainer ring
400	With SAE-C-2-hole flange
488	Driving shaft with gear shaft profile
492	With SAE-B-2-hole flange installed rotated 90°
492	Driving shaft with gear shaft profile
496	Combination of Special number 444 + 232
497	Combination of Special number 477 + 197
	With forced feed lubrication
503	Plain bearings 3/4 grooved
	+ Special number 197
505	See <b>Special number 444</b>
<u> </u>	Without Special number 197
E06	With SAE-A-4-hole flange
506	Driving shaft with gear shaft profile
	O-ring CR
510	White metal bearing
	+ Special number 158

88024710002-29 23 / 63

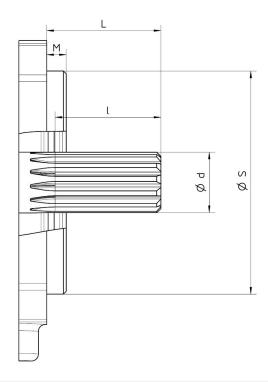
Special number	Description				
	Universal valve				
511	+ Special number 197				
	Preferential direction of rotation Clockwise				
512	Special number 511				
512	Preferential direction of rotation Counterclockwise				
513	Special number 511				
313	Driving shaft with stuck in nozzle				
	Special number 391				
514	Thread holes M6 / 15 mm deep in the Housing (for heating system) ${\sf T}$				
515	With SAE-B-2-hole flange				
212	Driving shaft with gear shaft profile				
517	Combination of Special number 255 + 391				
518	Rotary shaft seal for vacuum operation				
310	+ Special number 158				
521	Combination of <b>Special number 391 + 503</b>				
523	Special number 468				
323	Fastening screws: Stainless steel				
526	With SAE-B-2-hole flange				
320	Driving shaft with gear shaft profile				
	Double rotary shaft seal				
	Outer rotary shaft seal mounted with sealing lip to the shaft end!				
529	Leak oil hole open from below				
323	With SAE-C-2-hole flange				
	Driving shaft with gear shaft profile				
	+ Special number 197				

# 3.7 Free shaft end



Nominal size	Special number	L	S <sub>h8</sub>	M	d <sub>j6</sub>	I	m	n	t	u
KF 2.5-25	-	33	63		14	25	16	4	16	5
KF 2.5-25	156/206/437	33	05		14	25	10	4	10	5
	-	11		7	24	36	28	4	27	8
KF 32-80	156/206	44	80		24	30	20	4	21	0
	375	40			20	30	20	5	22.5	6
KF 100-200	-				20	F0	40	_	21	0
KF 125-200	375	60			28	50	40	5	31	8
KF 100-112	375		110		24	50	40	5	27	8
KF 100-150	-				- 1	2.6			0.7	
Seal number: 31		46		8	24	36	28	4	27	8
KF 250-630	-				20				4.1	
KF 400-630	375	90	160		38	80	63	8	41	10
KF 250-315	375				32				35	

88024710002-29 25 / 63



Nominal size	Special number	L	S <sub>h8</sub>	М	Profil	Diametral pitch (DP)	Number of teeth	d <sub>h11</sub>	I
KF 32	506	31.75	82.17		SAE A		9	15.26	16
KF 32-80	401/464/475 /526/515	41.2	101.6						38
KF 32-50	442/492	46		7					45
KF 63-80	316/318/477	41	80						38
KF 63-150	444/505/485 /496	41.15	101.6		SAE B	16/32	13	21.81	33.3
KF 100-112	344	41	110						38
KF 112	430	73	110						16
KF 200	442	41.15	101.6			15			
KF 200	477/497	41	110	8					38
KF 100 ; KF 200	488	46	127	O	SAE B-B		15	24.98	20
KF 250-630	477/497	55	160		SAE C-C	12/24	17	37.58	38
KF 250	478/529	55.4	152.4		SAE C	12/24	14	31.23	47.5

# 3.8 Quench

Versions with quench are used when absolute leak tightness is required on the shaft seal, e.g. when pumping media

- which cures upon contact with air.
- which crystallises upon contact with air humidity.
- the leakage of which must not be released into the environment.
- are under vacuum and their seal shall be gastight.

Select the mounting position so that the connection for the quench faces up.

Kracht GmbH Technical data | 4

# 4 Technical data

### 4.1 General

KF 2.5-12   Whitworth pipe thread G 3/4	General information					
KF 16-25   Whitworth pipe thread G 1			KF 2.5-12	Whitworth pipe thread G 3/4		
KF 16-25/158			KF 2.5-12/158	Flange connection SAE 3/4"		
KF 32-80 KF 32-80 KF 32-80 KF 50-80/232 KF 100-112 KF 50-80/232 KF 100-112 KF 50-80/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 Flange connection SAE 2 1/2" Flange connection SAE 3 1/2" Flange connection SAE 3" Flange connection SAE 3" KF 180-200 KF 180-200/232 Flange connection SAE 3" KF 250-315 Flange connection SAE 3" KF 400-630 Flange connection SAE 4" Suction connection : Whitworth pipe thread G 3/4 Pressure connection : Whitworth pipe thread G 1/2 Suction connection : Whitworth pipe thread G 1/2 Suction connection : Flange connection SAE 2" Pressure connection SAE 3" Pressure connection SAE 4" Pressure connection SAE 4" Pressure connection SAE 4" Pressure			KF 16-25	Whitworth pipe thread G 1		
KF 32-80  KF 50-80/232  KF 100-112  KF 50-80/232  KF 100-112/232  KF 100-112/232  KF 100-112/232  KF 100-112/232  KF 125-150  KF 125-150/232  KF 180-200  KF 180-200  KF 180-200/232  Flange connection SAE 3 1/2"  KF 250-315  Flange connection SAE 3 1/2"  KF 20-630  Flange connection SAE 3"  KF 400-630  Flange connection SAE 4"  Suction connection:  Whitworth pipe thread G 3/4  Pressure connection:  Whitworth pipe thread G 1/2  Suction connection:  Whitworth pipe thread G 1/2  Suction connection:  Flange connection SAE 2"  Pressure connection:  Flange connection SAE 2"  Pressure connection:  Flange connection SAE 2"  Pressure connection SAE 3"  Pressure connection SAE 3"  Suction connection SAE 3"  Suctio			KF 16-25/158	Flange connection SAE 1"		
Housing connection (1)  KF 125-150  KF 180-200  KF 180-200  KF 180-200  KF 180-200  KF 180-200  KF 180-200  KF 250-315  Flange connection SAE 3 1/2"  KF 250-315  Flange connection SAE 3"  KF 400-630  Flange connection SAE 4"  Suction connection:  Whitworth pipe thread G 3/4  Pressure connection:  Whitworth pipe thread G 1/2  Suction connection:  Flange connection SAE 2"  Pressure connection:  Flange connection SAE 2"  Any  KF.R/L/B, U2  Without fluid buffer  KF.R/L/B, U2 with fluid buffer on buffer connection top  KF.U  Fractial  Fractial  Fractial  Axial forces are not permissible.  Nominal sizes [* 29]			KF 32-80	Flange connection SAE 1 1/2"		
Housing connection (1)  Housing connection (1)  Housing connection (1)  Housing connection (1)  KF 100-112/232 KF 100-112/232 KF 125-150 KF 125-150 KF 125-150/232 KF 180-200 KF 180-200 KF 180-200/232 Flange connection SAE 3 1/2" KF 250-315 Flange connection SAE 3 1/2" KF 250-315 Flange connection SAE 3" KF 400-630 Flange connection SAE 4" Suction connection: Whitworth pipe thread G 3/4 Pressure connection: Whitworth pipe thread G 1/2 Suction connection: Flange connection SAE 2" Pressure connection: Flange connection SAE 2" Any KF.R/L/B, U2 Without fluid buffer KF.R/L/B, U2 with fluid buffer buffer connection top  KF.U  Flande connection SAE 3" Flange connection SAE 4" Suction connection: Flange connection SAE 2" Pressure connection SAE 2" Any KF.R/L/B, U2 with fluid buffer KF.U  Flange connection on top  KF.U  Any  KF.R/L/B, U2 with fluid buffer connection top  KF.U  Piston horizontal, Pressure connection on top  KF.U  Radial forces are not permissible. Nominal sizes [* 29]  Nominal sizes [* 29]  Nominal sizes [* 29]  Nominal sizes [* 29]			KF 32-80	Tank connection SAE 1 1/2"		
Housing connection (1)  Housing connection (2)  KF 50-80/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 KF 100-112/232 KF 125-150/232 KF 180-200 KF 180-200 KF 180-200/232 Flange connection SAE 3 " Flange connection SAE 3 " Flange connection SAE 3" KF 400-630 Flange connection SAE 4" Suction connection: Whitworth pipe thread G 3/4 Pressure connection: Whitworth pipe thread G 1/2 Suction connection: Flange connection SAE 2" Pressure connection SAE 3" Pressure connection SAE 4" Pressure con			KF 50-80/232			
Housing connection (1)    KF 100-112/232   Flange connection SAE 2 1/2"   Flange connection SAE 3 1/2"   Flange connection SAE 4 1"   Suction connection : Whitworth pipe thread G 3/4   Pressure connection : Whitworth pipe thread G 1/2   Suction connection : Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Pressure connection SAE 2"   Pressure connection in the fluid buffer   Shaft end horizontal , fluid buffer   Piston horizontal , Pressure connection on top   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection in the fluid buffer   Piston horizontal , Pressure connection			KF 100-112	riange connection SAE 2		
Housing connection (1)    KF 125-150   KF 125-150   KF 125-150/232   Flange connection SAE 3 "     KF 180-200   KF 180-200/232   Flange connection SAE 3 1/2"     KF 250-315   Flange connection SAE 3 "     KF 400-630   Flange connection SAE 4"     Suction connection : Whitworth pipe thread G 3/4     Pressure connection : Whitworth pipe thread G 1/2     Suction connection : Flange connection SAE 2"     Pressure connection : Whitworth pipe thread G 3/4     Pressure connection : Whitworth pipe thread G 1/2     Shaft end horizontal , fluid buffer     Pressure connection : Whitworth pipe thread G 1/2     Pressure connection : Whitworth p			KF 50-80/232	Tank connection SAE 1 1/2"		
Housing connection (1)    KF 125-150/232   KF 180-200   Flange connection SAE 3"   KF 180-200/232   Flange connection SAE 3 1/2"   KF 250-315   Flange connection SAE 3"   KF 400-630   Flange connection SAE 4"   Suction connection : Whitworth pipe thread G 3/4   Pressure connection : Whitworth pipe thread G 1/2   Suction connection : Flange connection : Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection SAE 2"   Pressure connection SAE 2"   Shaft end horizontal , fluid buffer connection top   Flange Connection in top   Piston horizontal , Pressure connection on to			KF 100-112/232	- Flange connection SAE 2.1/2"		
KF 180-200			KF 125-150	liange connection SAL 2 1/2		
KF 180-200   KF 180-200/232   Flange connection SAE 3 1/2"   KF 250-315   Flange connection SAE 3"   KF 400-630   Flange connection SAE 4"   Suction connection : Whitworth pipe thread G 3/4   Pressure connection : Whitworth pipe thread G 1/2   Suction connection : Flange connection SAE 2"   Pressure connection SAE 2"   Pressure connection : Flange connection SAE 2"   Flange connection SAE 2"   Pressure connection	(1)		KF 125-150/232	Flange connection SAF 3"		
KF 250-315 Flange connection SAE 3"  KF 400-630 Flange connection SAE 4"  Suction connection: Whitworth pipe thread G 3/4 Pressure connection: Whitworth pipe thread G 1/2 Suction connection: Flange connection: Flange connection SAE 2" Pressure connection: Flange connection SAE 2" Pressure connection: Flange connection SAE 2" Pressure connection SAE 2"  KF.R/L/B, U2 Without fluid buffer  KF.R/L/B, U2 with fluid buffer  KF.R/L/B, U2 with fluid buffer  KF.U Piston horizontal, Pressure connection on top  Faxial Axial forces are not permissible.  Radial forces are not permissible.  Nominal sizes [* 29]  Nominal sizes [* 29] + Viscosity - Rotation speed	Housing connection (4)		KF 180-200	liange connection SAL 3		
KF 400-630 Flange connection SAE 4"  Suction connection: Whitworth pipe thread G 3/4 Pressure connection: Whitworth pipe thread G 1/2 Suction connection: Whitworth pipe thread G 1/2 Suction connection: Flange connection SAE 2" Pressure connection: Flange connection SAE 2" Pressure connection: Flange connection SAE 2" Flange connection SAE 2" Flange connection SAE 2" Pressure connection: Flange connection SAE 2" Flange connection SAE 2" Pressure connection SAE 2" Flange connection SAE 2" Pressure connection SAE 2" Flange connection SAE 2" Pressure connect			KF 180-200/232	Flange connection SAE 3 1/2"		
Suction connection : Whitworth pipe thread G 3/4			KF 250-315	Flange connection SAE 3"		
KF 2.5-25 U   Whitworth pipe thread G 3/4   Pressure connection: Whitworth pipe thread G 1/2   Suction connection:   Flange connection SAE 2"   Pressure connection:   Flange connection SAE 2"   Pressure connection:   Flange connection SAE 2"   Pressure connection SAE 2"   P			KF 400-630			
KF 2.5-25 U   Pressure connection : Whitworth pipe thread G 1/2				Suction connection :		
Pressure connection :   Whitworth pipe thread G 1/2			KE 2 5-25 II	Whitworth pipe thread G 3/4		
Suction connection :   Flange connection SAE 2"   Pressure connection SAE 2"     Pressure connection SAE 2"       Pressure connection SAE 2"			KI 2.5-25 0	Pressure connection :		
KF 32-80 U   Flange connection SAE 2"   Pressure connection :   Flange connection SAE 2"				Whitworth pipe thread G 1/2		
Mounting position  KF 32-80 U  Pressure connection: Flange connection SAE 2"  KF.R/L/B , U2 Without fluid buffer  KF.R/L/B , U2 with fluid buffer  KF.R/L/B , U2 with fluid buffer connection top  KF.U  Piston horizontal , Pressure connection on top  Faxial  Axial forces are not permissible.  Radial forces are not permissible.  Nominal sizes [▶ 29]  Nominal sizes [▶ 29] + Viscosity - Rotation speed				Suction connection :		
Pressure connection :   Flange connection SAE 2"			NE 33 80 II	Flange connection SAE 2"		
Mounting position  KF.R/L/B , U2 Without fluid buffer  KF.R/L/B , U2 with fluid buffer  KF.R/L/B , U2 with fluid buffer connection top  Piston horizontal , Pressure connection on top  Axial forces are not permissible.  Fadial  Radial forces are not permissible.  Nominal sizes [▶ 29]  Nominal sizes [▶ 29] + Viscosity - Rotation speed			KF 32-00 U	Pressure connection :		
Mounting position       Without fluid buffer       Any         KF.R/L/B , U2 with fluid buffer       Shaft end horizontal , fluid buffer connection top         KF.U       Piston horizontal , Pressure connection on top         External loads on shaft end       Axial forces are not permissible.         Radial forces are not permissible.         Nominal sizes [▶ 29]         Nominal sizes [▶ 29] + Viscosity - Rotation speed				Flange connection SAE 2"		
fluid buffer   buffer connection top				Any		
External loads on shaft end  F <sub>axial</sub> F <sub>axial</sub> Axial forces are not permissible.  Radial forces are not permissible.  Nominal sizes [▶ 29]  Nominal sizes [▶ 29] + Viscosity - Rotation speed	Mounting position		1			
External loads on shaft end  Fradial  Radial forces are not permissible.  Nominal sizes [> 29]  Nominal sizes [> 29] + Viscosity - Rotation speed			KF.U	· · · · · · · · · · · · · · · · · · ·		
External loads on shaft end  Fradial  Radial forces are not permissible.  Nominal sizes [> 29]  Nominal sizes [> 29] + Viscosity - Rotation speed	External loads on shaft end					
Nominal sizes [ 29]  Nominal sizes [ 29] + Viscosity - Rotation speed			Radial forces are not permissible.			
Sheed n		Fradial	Nominal sizes [> 29]	Nominal sizes [▶ 29]		
	Speed	n				
One wating processing	One wating must are	<b>p</b> <sub>e</sub>				
Operating pressure   Permissible pressure range [▶ 31]	Operating pressure		Permissible pressure range [> 31]			

88024710002-29 27 / 63

4 | Technical data Kracht GmbH

General information					
Viscosity	ν <sub>min</sub>	Differential pressure - viscosity assignment [▶ 32]			
	$\mathbf{v}_{max}$	Consult the manufacturer			
Fluid temperature	<b>ϑ</b> <sub>m</sub>	Permissible temperature range [▶ 33]			
Ambient temperature	<b>ئ</b> u	Permissible temperature range [▶ 33]			
Filtering	β	≤ 60 µm			
Material	·	Material data [▶ 34]			
		Lubricating fluids without abrasive components			
D : 111 P		(Petrols, solvents, etc. are not permissible)			
Permissible media		For compressor applications :			
		Refrigerator oil ; Hydraulic oil ; Mineral oil			
(1)Pipe thread : ISO 228-1; FI	ange conr	nection : ISO 6162-1 (SAE J518)			



### **TIPP**

A reduced service life must be expected for the shaft seal in the case of vertical installation (shaft end top).

Kracht GmbH Technical data | 4

# 4.2 Nominal sizes

Nominal .	Geom. dis-	Spe	ed n	perm. radial	•	Mass inertia x	
size	placement	n <sub>min</sub>	n <sub>max</sub>	force	sure level	<b>10</b> <sup>-6</sup>	
$V_{gn}$	V <sub>g</sub> [cm³/rev.]	[rpm]	[rpm]	F <sub>radial</sub> [N]	L <sub>pA</sub> [dBA]	J [kg m²]	
				(n =1500 rpm]			
2.5	2.55					14.0	
4	4.03					15.9	
5	5.05					17.8	
6	6.38					20.5	
8	8.05			700	≤ 67	24.0	
10	10.11			700	≥ 07	28.4	
12	12.58		3600			33.7	
16	16.09		3000			42.3	
20	20.1					50.8	
25	25.1					61.7	
32	32.12				≤ 68	217	
40	40.21					254	
50	50.2					299	
63	63.18					368	
80	80.5					443	
100	101.5				1500	< 60	741
112	113.5	200	3000		≤ 69	806	
125	129.4				≤ 65	1418	
150	155.6					1637	
180	186.6					1911	
200	206.2		2500			2072	
250	245.1				. 75	4133	
315	312.9				≤ 75	5011	
400	399.5		2000	2500	. 77	6618	
500	496.5				≤ 77	7830	
630	622.5				≤ 80	9591	
32 U2	32.12					217	
40 U2	40.21	3000	3000			254	
50 U2	50.2				≤ 68	299	
63 U2	63.18			1500		368	
80 U2	80.5		2200			443	
100 U2	101.5		2200		≤ 69	741	
112 U2	113.5					806	

88024710002-29 29 / 63

4 | Technical data Kracht GmbH

# 4.3 Viscosity - Rotation speed assignment

Kinematic viscosity ν [mm²/s]	Recommended rpm n [rpm]
100	3600
200	2900
300	2300
500	1800
1000	1200
2000	800
3000	650
6000	450
10000	300
20000	200



### **TIPP**

Select the speed of rotation so that complete filling of the pump is ensured. This is given if the pressure on the suction side does not fall below the permissible pressure  $p_{e\,\text{min.}}$ 

Kracht GmbH Technical data | 4

# 4.4 Permissible pressure range

### 4.4.1 Operating pressure of suction side and pressure side

Seal type	Special	Operating pressure					
	number	suctio	n side	pressu	re side		
		p <sub>e min</sub> [bar abs.] <sup>(1)</sup>	P <sub>e max</sub> [bar rel.]	p <sub>b</sub> [bar rel.] (perm. continous pressure)	p <sub>b</sub> [bar rel.] (Pressure peaks )		
2	-	0.6 (2)	Max. suction side operating pressure for sealing type 1, 2, 7 and 19 [▶ 32]	25	40		
3	-		2	23	40		
4	-		2				
4	74	0.1	0.2				
5	-		10				
6	-		25	35	-		
7	-	0.6 (2)	Max. suction side operating pressure for sealing type 1, 2, 7 and 19 [▶ 32]				
	74	0.1	0.2				
9	-		0.5	25	40		
18	-			-	-		
19	-	0.6 (2)	Max. suction side operating pressure for sealing type 1, 2, 7 and 19 [▶ 32]				
	74	0.1	0.2				
23	-		0.5	25 <sup>(3)</sup>	-		
30	-	_	25	25	40		
31	-	_	0.5	25 <sup>(3)</sup>	-		
32	74	0.6 (2)	0.5	25	40		
36	-		25	25			
37	_		0.5	16 (4)	40		
40	-		10	25			

<sup>&</sup>lt;sup>(1)</sup> KF . U:  $p_{e min} = 0.65$  bar abs.

88024710002-29 31 / 63

<sup>(2)</sup> Start-up condition: 0.4 bar absolute (max. 30 minutes)

 $<sup>^{(3)} \</sup>vartheta_{\rm m}$  < -20°C; Housing material GJL: 16 bar

<sup>(4)</sup> Housing material GJS: 25 bar

Kracht GmbH 4 | Technical data

### 4.4.2 Max. suction side operating pressure for sealing type 1, 2, 7 and 19

	p <sub>e max</sub> [bar]					
Speed n	KF 2.5-63	KF 80	KF 100-180	KF 200	KF 250-315	KF 400-630
[rpm]						
≤ 750	6	6	6	6	5.5	5
≤ 1000	5	5	5	5	4.5	4
≤ 1500	4	4	3.5	3.5	3	2.5
≤ 2000	3	3	2.5	2.5	2	1.5
≤ 2500	2.5	2.5	2	2	-	-
≤ 3000	2	2	1.5	-	-	-
≤ 3600	1.5	-	-	-	-	-

### 4.4.3 Compressor applications

Seal type	Special	Operating pressure					
	number	suctio	n side	pressure side			
		p <sub>e min</sub> [bar abs.]	P <sub>e max</sub> [bar rel.]	p <sub>b</sub> [bar rel.] (perm. continous pressure)	p <sub>b</sub> [bar rel.] (Pressure peaks )		
	156						
6	206		10	25	40		
	437	0.6 (1)					
33		0.6					
34	375		25	35	-		
35							
(1) Start-up condition: 0.4 bar absolute (max. 30 minutes)							

# 4.5 Differential pressure - viscosity assignment

Bearing	Δp <sub>max</sub> {bar]					
	$v = 1.4 \text{ mm}^2/\text{s}$	$v = 6 \text{ mm}^2/\text{s}$	$v = 12 \text{ mm}^2/\text{s}$			
Multi layer friction bearings contains lead (Standard)						
DU , P10	3	12	25			
Multi layer friction bearings non- ferrous metal-free	3	12	25			
DP4						
Plastic plain bearings						
Iglidur® G ; Iglidur® X ; H370		6	10 (1)			
White metal bearing	_	0	10 **			
TEGO® V738						
(1) For compressor applications ≥ 7 mm <sup>2</sup>	(1) For compressor applications ≥ 7 mm <sup>2</sup> /s					

Kracht GmbH Technical data | 4

# 4.6 Permissible temperature range

Sealing material	Fluid temperature ϑ <sub>m</sub>				
	ϑ <sub>m min</sub> [°C]	ϑ <sub>m max</sub> [°C]			
CR		100			
EPDM		120			
FEP with FKM-core		200			
FFKM / FEP with FKM-core	20	200			
FKM	-20	150			
HNBR		150			
NBR		90			
PTFE / FEP with FKM-core		200			
FKM (Low temperature )	-30	150			

Sealing material	Ambient temperature ປ <sub>ື</sub>				
	ဗီ <sub>u min</sub> [°C]	ဗီ <sub>u max</sub> [°C]			
CR					
EPDM					
FEP with FKM-core					
FFKM / FEP with FKM-core	20				
FKM	- 20	60			
HNBR					
NBR					
PTFE / FEP with FKM-core					
FKM (Low temperature )	-30				



### **NOTICE**

Comply with media-specific properties

88024710002-29 33 / 63

4 | Technical data Kracht GmbH

# 4.7 Material data

Seal type	Material						
	Shaft seal	O-ring	Housing/End	Gears	Bearing		
			cover				
1	NBR	NBR					
2	FKM	FKM		Multi layer fric-			
3	PTFE	FEP with FKM- core			tion bearings contains lead (Standard)		
4	PTFE	FEP with FKM- core			DU , P10		
	C2S2V1G3G1				(Steel , CuSn , PTFE , Pb )		
5	(KF 2.5-200)	FKM			1112,10)		
3	B10SV1G3G1	FRIVI			Diantia alaia		
	(KF 250-630)				Plastic plain bearings non-		
	Q2Q2K1G3	FEP with FKM-		Case-hardened steel (Steel 1.7139)	ferrous metal-		
6	(KF 2.5-25)	core			free		
0	Q2B2K1G3	FEP with FKM-	EN-GJL-250 (GG-25)		Iglidur® X		
	(KF 32-200)	core	 EN-GJS-400-15				
7	FKM	FKM			Multi layer fric-		
9	EPDM	EPDM	(GGG-40)		tion bearings		
18	FKM	FKM	( = = = ,		non-ferrous metal-free		
19	NBR	NBR			DP4		
	FKM	FKM			(Steel , CuSn ,		
23	(Low temperat- ure )	(Low temperat- ure )			PTFE )		
30	-	FKM					
	FKM	FKM			White metal bearing		
31	(Low temperat-				TEGO® V738		
	ure )	ure )			(Steel , Cu , Sn ,		
32	EPDM	EPDM			Sb , Cd , Ni ,		
36	-	NBR			As )		
40	AQ2VFF	FKM					

Kracht GmbH Technical data | 4

### 4.7.1 Compressor applications

Seal	eal Material							
type	Shaft seal	O-ring	Housing/End	Gears	Bearing			
6	Q2Q2K1G3	Special number 156: CR Special number 206: HNBR Special number 437: FKM	EN-GJL-250 (GG-25)  EN-GJS-400-15 (GGG-40)	Case-hardened	Plastic plain bearings non- ferrous metal-			
33	Q3AVFE	Special number 375: FKM		steel (Steel 1.7139)	free Iglidur® X			
34	Q3AP1FE	Special number 375: FKM			J			
35	Q3AVFE	Special number 375: FKM						

Refrigerant		Oil							
		M	M*	M* - PAO	АВ	E	PAO	AB – PAO	PAG
R717 (NH3)	Ammonia	CR / HNBR	CR / HNBR	CR / HNBR	CR	-	CR <sup>(1)</sup> / HNBR	CR	CR / HNBR
R290 (C3H8)	Propane	-	-	-	-	-	HNBR	-	HNBR
R1270 (C3H6)	Propylene	-	-	-	-	-	HNBR	-	HNBR
R744 (CO2)	Carbon dioxide	-	-	-	-	CR	HNBR	-	CR
R22	HCFCs	CR	-	-	CR	CR	-	CR	-
R134a, R404a, R407C, R410A, R507, R23	HPFCs	-	-	-	-	HNBR	-	-	-

(1) only for oils: Fuchs Reniso Synth 68, Klüber Summit R100/R150/R200

M = Mineral oil

M\* = Mineral oil with special treatment (hydrocracked oil)

AB = Alkylbenzene

E = Polyester

PAO = Polyalphaolefin

PAG = Polyalkylglycol

88024710002-29 35 / 63

4 | Technical data Kracht GmbH

# 4.8 Weight

Nominal		Added					
size	with end				weight		
$V_{gn}$	cover	valve	valve	versal valve	versal valve	Mounting	
					U2	angle	
2.5						[kg]	
4							
5							
6	2.9 <sup>(1)</sup>	3.7 (1)	_	6.9	_		
8	2.3	3.7		0.5			
10						1.3	
12							
16							
20	3.5 <sup>(1)</sup>	4.3 <sup>(1)</sup>	_	7.5	-		
25							
32							
40	7.7	9.5	12.4	27.5	15.5		
50	•					1.6	
63	0.4	44.0	112	20.5	47.5		
80	9.4	11.2	14.3	29.5	17.5		
100	16.0	10.7			21.6		
112	16.0	18.7			21.6		
125	22.2	26.5				3.3	
150	22.2	26.5				3.3	
180	24.8	29.1					
200	24.0	∠ J. ⊥	-	-			
250	44.2	47.2			-		
315	1 7,2	17,4					
400	54.7	57.9				-	
500		37.3					
630	60.8	64.0					
<sup>(1)</sup> Special number 158: +1.3 kg							

# 4.9 Dimensions

Dimensions of the device can be found in the relevant technical data sheets.

# 5 Transport and storage

## 5.1 General

- a) After receipt, check the device for transport damages.
- b) If transport damage is noticed, report this immediately to the manufacturer and the carrier. The device must then be replaced or repaired.
- c) Dispose of packing material and used parts in accordance with the local stipulations.

# 5.2 Transport



#### **↑** WARNING

### Falling or overturning loads!

Danger of injury while transporting large and heavy loads.

- a) Use only suitable means of conveyance and lifting tackle with sufficient load-bearing capacity.
- b) Attach lifting tackle only to suitable load points.
- c) Attach the lifting tackle in such a manner that it cannot slip.
- d) Pay attention to the load balance point.
- e) Always avoid jerks, impacts and strong vibrations during transportation.
- f) Never walk under suspended loads, never work under suspended loads.



## **NOTICE**

To transport the device, eyebolts can be screwed into the flange connections..

# 5.3 Storage

The device's function is tested in the plant with mineral hydraulic oil. Then all connections are closed. The remaining residual oil preserves the interior parts for up to 6 months.

Metallic exposed exterior parts are protected against corrosion by suitable conservation measures, also up to 6 months.

In case of storage, a dry, dust-free and low-vibration environment is to be ensured. The device is to be protected against influences from weather, moisture and strong fluctuations of temperature. The recommended storage conditions are to be adhered to.

Below the permissible ambient temperature  $\vartheta_U$  elastomer seals lose their elasticity and mechanical loading capacity, since the glass transition temperature is fallen below. This procedure is reversible. A force action on the device is to be avoided in case of storage below the permissible ambient temperature  $\vartheta_U$ .

88024710002-29 37 / 63

5 | Transport and storage Kracht GmbH

Devices with EPDM seals are not mineral-oil resistant and are not tested for their function. There is no preservation of the interior parts. If the device is not taken into operation immediately, all corrosion-prone surfaces are to be protected by suitable conservation measures. The same applies for devices which are not tested for other reasons

When storing for a long period of time (> 6 months), treat all surfaces at risk of corrosion again with suitable preserving agents.

If high air humidity or aggressive atmospheres are expected, take additional corrosion-preventing measures.



## **NOTICE**

Storage in corrosion protection bags (VCI) maximum of 6 months.



### Corrosion/chemical impact

Improper storage can render the device useless.

- a) Protect endangered surfaces by means of suitable conservation measures.
- b) Comply with recommended storage conditions.

# 5.4 Storage conditions



## **TIPP**

### **Recommended storage conditions**

- a) Storage temperature: 5 °C 25 °C
- b) Relative air humidity: < 70 %
- c) Protect elastomer parts from light, especially direct sunlight.
- d) Protect elastomer parts from oxygen and ozone.
- e) Comply with maximum storage times of elastomeric parts:
  - ⇒ 5 Jahre: AU (Polyurethan-Kautschuk)
  - ⇒ 7 Jahre: NBR, HNBR, CR
  - ⇒ 10 Years: EPM, EPDM, FEP/PFTE, FEPM, FKM, FFKM, VMQ, FVMQ

Kracht GmbH Installation | 6

# 6 Installation

# 6.1 Safety instructions for installation



# **A** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



## **A** DANGER

### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



## **A** DANGER

### **Rotating parts**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

a) Take measures against accidental touching of rotating parts.



## **MARNING**

## **Rotating parts!**

Danger of injury from flying parts.

a) Enclose rotating parts so as to avoid any danger from flying parts in the event of breakage or malfunction.



## **MARNING**

### **Unshielded gearwheels**

Gearwheels can trap and crush fingers and hands.

a) Do not engage gearwheels.

88024710002-29 39 / 63

6 | Installation Kracht GmbH



## **MARNING**

## Failure of load-carrying parts due to overload!

Danger of injury from flying parts. Danger of injury from spurting fluids.

- a) Depressurise the device and all connection lines before doing any work.
- b) Securely prevent the restoration of pressure while working on the device.



## **MARNING**

### Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to fluid spurting out.

- a) Use only connections and lines approved for the expected pressure range.
- b) Securely prevent the permissible pressures from being exceeded, e.g. by using pressure relief valves or bursting discs.
- c) Pipelines must be designed in such a way that no tension e.g. caused by changes in length due to fluctuations in temperature can be transferred to the product.

# 6.2 Noise reduction



## **TIPP**

## Measures for noise reduction

- a) Use suction and pressure hoses.
- b) Use bell housings with high damping properties (plastic or cast iron).
- c) Use of damping rings and damping rods for separation of structureborne noise.

Kracht GmbH Installation | 6

# 6.3 Mechanical installation

## 6.3.1 Preparation

- a) Check the device for transport damage and dirt.
- b) Check the device for freedom of movement.
- c) Remove existing preservatives.
  - ⇒ Use only those cleaning agents that are compatible with the materials used in the device.
  - ⇒ Do not use cleaning wool.
- d) Compare the environmental and ambient conditions at the place of installation to the permissible conditions.
  - ⇒ Ensure a sufficiently stable and level foundation.
  - ⇒ Expose the device only to small vibrations, see IEC 60034-14.
  - ⇒ Secure sufficient access for maintenance and repair.
- e) Position the product and secure them against slipping.
  - ⇒ Comply with the manufacturer's information.
  - ⇒ Do not use any sealing materials such as hemp, Teflon tape or putty.

# 6.3.2 Gear Pump with free shaft end

The prerequisite for trouble-free operation is suitable load transmission between the pump and the drive.

By default a torsionally flexible claw coupling is used for this.

- a) Pre-mount coupling parts as per manufacturer's specifications.
- b) Position the pumps and the drive with respect to each other.
  - ⇒ Comply with the permissible mounting position.
  - ⇒ Comply with the permissible direction of rotation.
- c) Tighten all fastening screws with the specified torque.



## **▲** DANGER

#### **Rotating parts**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

a) Take measures against accidental touching of rotating parts.

88024710002-29 41 / 63

6 | Installation Kracht GmbH



## **A** CAUTION

#### **Hot surfaces**

Burn injury to skin if touched.

a) Wear protective gloves at temperatures ≥ 48°C.

Tightening torques [Nm]							
Thread size	М6	M8	M10	M12	M16	M20	M24
Counter-thread Alu- minium	4.6	11	22	39	95	184	315
Counter-thread Cast iron / Steel	10	25	49	85	210	425	730
(1) Screws/Nuts with min. strenath class 8.8/8							



## **TIPP**

- a) Keep to the permissible displacement values of the coupling.
- b) Rule out any distortion of the device.
- c) Pay attention to sufficient screw-in depth of the fastening screws.



## **NOTICE**

- a) For devices without shaft seals, ensure that the leak oil from the shaft sealing chamber is specifically drained off and cannot get into the environment.
- b) Make sure no foreign bodies can get into the device.
- c) On devices with quench, mount a tank for the liquid seal.
  - ⇒ Mount the tank above the device.
  - ⇒ The connection on the device must point upward.
  - ⇒ Checking the fluid level must be possible at any time.

Kracht GmbH Installation | 6

# 6.4 Connection lines

## 6.4.1 General



#### **⚠ WARNING**

## Failure of load-carrying parts due to overload

Danger of injury from flying parts..

Danger of injury from spurting fluids.

- a) Use only connections and lines approved for the expected pressure range.
- b) Securely prevent exceeding the permissible pressure, e.g. by using pressure relief valves or rupture discs.
- c) Design pipework so that no tensions, e.g. caused by changes in length due to fluctuations in temperature, are transmitted to the device.



## **NOTICE**

#### **Additional connections**

- a) Provide measurement connections for pressure and temperature as close as possible to device.
- b) If necessary, provide a facility to fill or empty the device and the line system.
- c) If necessary, provide a facility to vent the device and the line system.

## 6.4.2 Suction line

A less than optimally planned suction line can lead to increased noise emission, cavitation as well as reduction of the delivery rate (caused by not complete filling of the pump).

When designing the line, take the following points into consideration:

The suction line must be piped as short as possible and in a straight line.

- Stipulate the nominal width of the suction line so that the permissible operating pressure  $p_{e \, min}$  is not exceeded on the suction side.
- Avoid large suction heights.
- Avoid additional pressure loss through line resistances such as fittings, screwed connections, formed parts or suction filters/suction baskets. Ensure that all technically required suction filters/suction baskets are appropriately dimensioned.
- Make sure there is sufficient clearance of the suction port to the bottom and walls of the media container.
- Make sure that the suction opening lies underneath the lowest fluid level in all operating situations.
- When hose lines are used, ensure sufficient stability of the hoses so that they cannot become constricted through the sucking action.
- Comply with the recommended flow velocity in the suction line (max. 1.5 m/s).

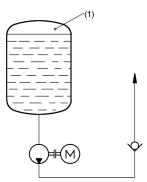
88024710002-29 43 / 63

6 | Installation Kracht GmbH

## Suction line at vacuum operation

If suction from a tank under vacuum is desired, the pump must be arranged approx. 1 m below the tank. The suction line must run in a straight line and without any resistances.

The tank may be subjected to vacuum only then when the pipework and the pump have been filled with liquid. For this application, only pumps suitable for vacuum operation may be used.





## **NOTICE**

### **Cavitation damage**

Undercutting the permissible suction port pressure results in cavitation.

- a) Design the suction line so that the pressure arising in operation on the suction side is always higher than the vapour pressure of the pumped medium. At the same time, comply with the installation altitude of the device above mean sea level.
- b) For aqueous fluids, mount the device underneath the fluid level, set the operating temperature to 50 °C and limit the speed to 1500 rpm.

#### **Prevention of suction problems**

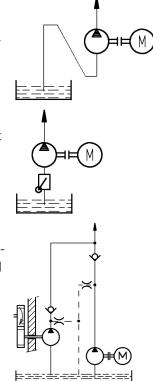
If there is a possibility that the suction line can run dry if the pump stops, piping the suction line as siphon is an option to avoid suction problems. This way, the pump will remain permanently filled after initial commissioning.

It is appropriate to employ a foot valve or a non-return valve in case of longer suction lines that can run dry while the pump is at rest. These must have been designed for use in suction lines and should offer as low a flow resistance as possible.

During operation of a pump that has to pump media via a non-return valve in a pressurized circuit (e.g. reserve pump in a lubricant circuit), suction problems can occur if the suction line is filled with air.

In this case the pressure pipe must be bled directly upstream of the non-return valve.

If no vent nozzle is used, the volume of the pressure pipe between the pump and the non-return valve must be at least 75 % of the suction line volume.



44 / 63

Kracht GmbH Installation | 6

## 6.4.3 Pressure line

When designing the line, take the following points into consideration:

Select the nominal width of the pressure line so that the maximum permissible pressures are not exceeded.

- If necessary, provide a vent nozzle to prevent suction problems.

## 6.4.4 Tank line T-valve

Specify the nominal width of the tank line so that the delivery volume can be discharged at low or no pressure. The tank line must be passed directly into the supply tank.

# 6.4.5 Mounting Connection lines

- a) Clean all lines.
  - ⇒ Do not use cleaning wool.
  - ⇒ Pickle and flush welded pipes.
- b) Remove the protective plugs.
- c) Mount the lines.
  - ⇒ Comply with the manufacturer's information.
  - ⇒ Do not use any sealing materials such as hemp, Teflon tape or putty.



#### **TIPP**

Position of the device connections: **Rotation and delivery direction** [▶ 15]

# 6.5 Change of the direction of rotation

Depending on the version a change in the direction of rotation is possible.

The manufacturer normally carries out the conversion work and the customer should do this only in exceptional cases.



## **TIPP**

Gear pumps in noise-optimized version cannot be converted.

88024710002-29 45 / 63

7 | Operation start-up Kracht GmbH

# 7 Operation start-up

# 7.1 Safety instructions for start-up



## **⚠** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



## **MARNING**

## Failure of load-carrying parts due to overload

Danger of injury from flying parts.

Danger of injury from spurting fluids.

- a) Do not operate the device against closed shut-off devices.
- b) Do not operate the device in the false direction of rotation.



## **A** CAUTION

## **Hot surfaces**

Burn injury to skin if touched.

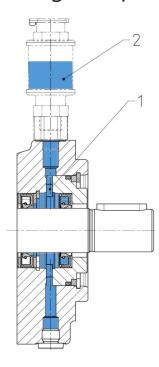
a) Wear protective gloves at temperatures ≥ 48°C.

# 7.2 Preparation

- a) Before starting the product, make sure that a sufficient quantity of the service fluid is extant to avoid dry running. This must be taken into account especially with large line volumes.
- b) Check all fastening screws on the product.
- c) Fill pump and the suction line with medium.

Kracht GmbH Operation start-up | 7

# 7.3 Filling the quench chamber



- 1 Quench chamber
- 2 Container for quench-liquid
- a) For versions with quench, fill the quench chamber with a suitable quench liquid.
  - ⇒ The filling is implemented through the tank provided for that.
  - ⇒ Fill fluid until the quench chamber is completely full and the tank is half full.



# **NOTICE**

## Seal failure due to dry run

A lack of quench liquid can lead to a failure of the seal.

a) Do not put pumps without quench liquid into operation.



## **TIPP**

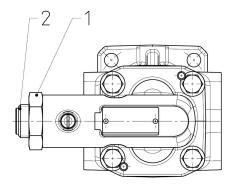
A second port on the unit enables purging of the quench chamber and draining of the liquid seal.

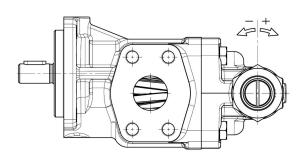
88024710002-29 47 / 63

7 | Operation start-up Kracht GmbH

# 7.4 Pressure relief valve adjustment

The valves are factory set to the rated pressure of each pressure stage. Setting pressures that deviate from this are stated on the rating plate.





- response pressure lower
- + response pressure higher
- 1 Hexagonal nut
- 2 Adjustment screw

- a) Remove hexagon nut.
- b) Set the response pressure using the adjusting screw.
- c) Secure the adjusting screw with hexagon nut.



## **MARNING**

#### Failure of load-carrying parts due to overload

Danger of injury from flying parts.

Danger of injury from spurting fluids.

- a) Consider the permissible pressure setting range of the valve.
- b) Check the pressure setting (the valve must not block).

## 7.4.1 Pressure relief valve

Directly attached pressure relief valves of the series "D" are used exclusively for protection of the gear pumps and may respond on a short-term basis only.



## **NOTICE**

#### Failure of the pump

Long triggering of the valve can cause the pump to overheat.

a) Only allow intermittent triggering of the valve.

Kracht GmbH Operation start-up | 7

Directly attached pressure relief valves of the series "T" are used exclusively for protection of the gear pump. The valve can also be used to control the pressure of the gear pump thus allowing to keep the system pressure constant.



## **NOTICE**

#### Overheating of the gear pump

A direct return flow into the suction line may increase the temperature at the gear pump beyond the permissible level.

a) For heat disspation, the pumping medium passing through the T-valve must be discharged directly into the storage tank.

# 7.5 Further operation start-up

- a) Open existing shut-off elements upstream and downstream of the device.
- b) Adjust pressure relief valves in the system installed for lowest opening pressure.
- c) Allow the device start without or with a low pressure load (jog mode).
  - ⇒ Flow should have developed after 30 s at the latest.
- d) Run the device for a few minutes depressurised or with low pressure.
- e) Vent the system at the highest possible point.
- f) Gradually increase the pressure load up to the desired operating pressure.
- g) Operate the system for so long until the final operating state is achieved.
- h) Check the operating data.
  - **⇒ Maintenance table [**▶ 54]
- i) Document the operating data of the initial start-up for later comparison.
- j) Check the level of the operating medium in the system.
- k) Check the filling level of the liquid seal (if existing).
- I) Check the device for leaks.
- m) Check all threaded connections for leaks and retighten if necessary.



### **TIPP**

In order to ensure a constant and reliable function of the product, an initial maintenance of the product is recommended after several hours warm-up time (max. 24 h). This allows faults to be detected at an early stage.

88024710002-29 49 / 63

8 | Removal Kracht GmbH

# 8 Removal

# 8.1 Safety instructions for removal



## **⚠** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



## **A** DANGER

### **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



## **MARNING**

### **Unshielded gearwheels**

Gearwheels can trap and crush fingers and hands.

a) Do not engage gearwheels.



## **MARNING**

### Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

- a) Depressurise the device and all connection lines before doing any work.
- b) Securely prevent the restoration of pressure while working on the device.



## **A** CAUTION

#### **Hot surfaces**

Burns of the skin on contact.

a) At temperatures ≥48°C the product must be allowed to cool down first.

Kracht GmbH Removal | 8

# **ATTENTION**

## Blocking of the product due to curing media

Curing media can mechanically block the product and make it unusable.

a) Clean the product immediately after operation with curing media.

## 8.2 Removal

- a) Depressurise and de-energize the system.
- b) Close existing shut-off elements upstream and downstream of the device.
- c) Open existing drain elements and loosen connection lines. Collect and dispose of discharging medium so that no hazard arises for persons or environment.
- d) Dismantle the device.
- e) Clean the device
- f) Close the device connections and lines to prevent dirt penetration.



## **NOTICE**

The concrete procedure for cleaning depends on the media being used.

a) See the safety data sheet of the media in use.

88024710002-29 51 / 63

9 | Maintenance Kracht GmbH

# 9 Maintenance

# 9.1 Important notes about explosion protection



## **⚠** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



## **A** DANGER

## **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



## **MARNING**

## Failure of load-carrying parts due to overload!

Danger of injury from flying parts.

Danger of injury from spurting fluids.

- a) Depressurise the device and all connection lines before doing any work.
- b) Securely prevent the restoration of pressure while working on the device.



## **A** CAUTION

#### **Hot surfaces**

Burns of the skin on contact.

a) At temperatures ≥48°C the product must be allowed to cool down first.

Kracht GmbH Maintenance | 9

## 9.2 Maintenance work



#### **TIPP**

### Checking and documentation of the operating data

Regular checking and documentation of all operating data helps to detect faults at an early stage.

- Perform maintenance according to specification.
- Replace defective and worn components.
- If required, request spare parts lists and assembly drawings from the manufacturer.
- Document the type and scope of the maintenance work along with the operating data.
- Compare the operating data with the values of the first commissioning. Determine the cause in case of major non-compliances (> 10 %).
- Dispose of packing material and used parts in accordance with the local stipulations.



## **NOTICE**

#### **Protective equipment and notices**

After maintenance and/or repair, reattach all protective devices and notices removed in the process to their original position.

## 9.3 Maintenance instructions

The following information provides recommendations for maintenance work and maintenance intervals for the product in use.

Depending on the actual loads occurring during operation, the type, scope and interval of the maintenance work may deviate from the recommendations. A mandatory maintenance plan must be drawn up by the installer/operating company.



#### **TIPP**

In the course of preventive maintenance, it is advisable to replace wearing parts before the wear limit is reached.

With the appropriate expertise and sufficient equipment, the repair can also be carried out by the installer/operating company.

If necessary, request spare parts lists and assembly drawings from the manufacturer. Please consult the manufacturer for this purpose.



## **NOTICE**

#### Warranty

Any warranty will be void if not executed properly.

88024710002-29 53 / 63

9 | Maintenance Kracht GmbH

# 9.4 Maintenance table

# Maintenance table

		Firstly:after max. 24 h	Daily	3000 Operating hours	6000 Operating hours	As required	Additional information
9.4.1	Inspection: Discharge flow	2					
9.4.2	Inspection: Operating pressure	2					
9.4.3	Inspection: Media temperature	2					
9.4.5	Inspection: Add-on valve function (if existing)	2					
9.4.6	Inspection: Check the potential compensation (if existing)	2					
9.4.7	Inspection: Condition of operating fluid	2					
9.4.8	Audiometric monitoring: Unusual noise		1				
9.4.9	Cleaning		1				
9.4.10	Visual inspection: Leakages		1				
9.4.11	Visual inspection: Filling level of liquid seal (if existing)		2				
9.4.1	Inspection: Discharge flow			2			
9.4.2	Inspection: Operating pressure			2			
9.4.3	Inspection: Media temperature			2			
9.4.4	Inspection: Device temperature			2			
9.4.5	Inspection: Add-on valve function (if existing)			2			
9.4.6	Inspection: Check the potential compensation (if existing)			2			
9.4.7	Inspection: Condition of operating fluid			2			
9.4.12	Visual inspection: Condition gears				3		
9.4.13	Visual inspection: Condition of housing parts				3		
9.4.14	Visual inspection: Condition of plain bearings				3		
9.4.15	Visual inspection: Condition of shaft seal				3		
9.4.16	Visual inspection: Condition of outboard bearings				3		
9.4.17	Replacing: Outboard bearings					3	
9.4.19	Replacing: Shaft seal					3	
9.4.20	Replacing: Other seals					3	

<sup>1 - 0,1</sup> h; 2 - 0,2 h; 3 - 0,75 h

Kracht GmbH Maintenance | 9

# 9.4.1 Inspection: Discharge flow

The discharge flow is measured via the flow rate volume counters.

The values are displayed by the built-in controller in the electrical control system.

- If there is no discharge flow, check the individual components of the product.
- Comply with the product-specific data sheets/operating instructions.

# 9.4.2 Inspection: Operating pressure

The operating pressure is indicated by the pressure gauges

- If there is no operating pressure, check the individual components of the product
- Comply with the product-specific data sheets/operating instructions.

# 9.4.3 Inspection: Media temperature

The media temperature is measured through the temperature sensor.

The values are displayed by the built-in controller in the electrical control system.

- If the media temperature is too high or too low, check the product components.
- Comply with the product-specific data sheets/operating instructions.

## 9.4.4 Inspection: Device temperature

Measure the surface temperature in the area of the bearings.

# 9.4.5 Inspection: Add-on valve function (if existing)

Pressure relief valves must be actuated at regular intervals. This is the only way to ensure proper functioning.

# 9.4.6 Inspection: Check the potential compensation (if existing)

Check potential equalization for tight fit and function.

# 9.4.7 Inspection: Condition of operating fluid

Pay attention to colour (dark colouring), odour and milky turbidity.

Replace operating fluid if necessary.

# 9.4.8 Audiometric monitoring: Unusual noise

In this case, attention must be paid to increased noise or uneven operation (pump unit).

- In case of unusual noises, check the individual components of the product, line attachments and the operating media for foam formation.
- Comply with the product-specific data sheets/operating instructions.

88024710002-29 55 / 63

9 | Maintenance Kracht GmbH

# 9.4.9 Cleaning

Remove dust deposits and dirt with a damp, clean cloth.

## 9.4.10 Visual inspection: Leakages

Care must be taken here to ensure that there is no leakage from the connections.

In the event of leaks in the connections, the glands must be tightened and, if necessary, the seals replaced.

# 9.4.11 Visual inspection: Filling level of liquid seal (if existing)

Checking the confining fluid filling level is mandatory for safe pump operation. Top up the confining fluid as required.

If there is no automatic monitoring, the filling level must be checked at least before each shift begins.

If the filling level drops unusually fast within a short period of time, the outer but also the inner shaft seal could be leaking.

If the filling level should rise, the inner shaft seal may probably be leaking and the confining fluid is begin mixed with the pressurised medium.

- Stop plant operation immediately in both cases.

## 9.4.12 Visual inspection: Condition gears

Like shaft gear are wear items. In the event of excessive wear, the parts or the pump must be replaced.

Important control points are the mating surfaces of the shaft sealing ring and bearing bushes, the end faces of the shaft and pin wheels and the tooth flanks.

# 9.4.13 Visual inspection: Condition of housing parts

Like shaft gear are wear items. In the event of excessive wear, the parts or the pump must be replaced.

Important control points are the mating surfaces of the shaft sealing ring and bearing bushes, the end faces of the shaft and pin wheels and the tooth flanks.

# 9.4.14 Visual inspection: Condition of plain bearings

Like plain bearings are wear items. In the event of excessive wear, the parts or the pump must be replaced..

The wear limit of multi-layer plain bearings is reached when the bronze layer of the bearings is exposed to 50-70%.

The drive shaft and driven shaft are supported on the suction side under load in the bearings, so that the wear can be seen there first.

Kracht GmbH Maintenance | 9

# 9.4.15 Visual inspection: Condition of shaft seal

Check on increased and impermissible temperature rises

- Small amounts of leakage, however, are indispensable for function.
- If there are excessive amounts of leakage, stop pump operation immediately.
   Replace: Shaft seal.

# 9.4.16 Visual inspection: Condition of outboard bearings

Like outboard bearings are wear items.

The service life of the bearings depends primarily on the operating conditions.

The bearing should therefore be checked for damage after 4,000 hours at the latest. If the wear is unacceptable, the bearing must be replaced.

The beginning of wear or an imminent failure can become noticeable through increasing heating of the bearing, increased power consumption, imperfect running behavior or the development of noise.

# 9.4.17 Replacing: Outboard bearings

With corresponding expertise and sufficient equipment, the replacement can be carried out by the equipment builder/operator.

If required, request spare parts lists and assembly drawings from the manufacturer.

Use spare parts approved by the manufacturer only.

# 9.4.18 Replacing: Plain bearings (only by manufacturer)

The replacement is carried out only by the manufacturer.

Consult the manufacturer

# 9.4.19 Replacing: Shaft seal

With corresponding expertise and sufficient equipment, the replacement can be carried out by the equipment builder/operator.

If required, request spare parts lists and assembly drawings from the manufacturer.

Use spare parts approved by the manufacturer only.

# 9.4.20 Replacing: Other seals

With corresponding expertise and sufficient equipment, the replacement can be carried out by the equipment builder/operator.

If required, request spare parts lists and assembly drawings from the manufacturer.

Use spare parts approved by the manufacturer only.

88024710002-29 57 / 63

10 | Repairs Kracht GmbH

# 10 Repairs

# 10.1 Safety instructions for repair



## **A** DANGER

#### **Hazardous fluids**

Danger to life when handling hazardous fluids.

- a) Comply with the safety data sheets and regulations on handling the hazardous fluids.
- b) Collect and dispose of hazardous fluids so that no hazard is created for persons or the environment.



## **A** DANGER

## **Rotating parts!**

Danger of death due to body parts, hair or clothing getting trapped or entangled.

- a) Before all work, ensure that existing drives are voltage-free and pressure-free.
- b) Securely prevent restarting during all work.



## **MARNING**

## Failure of pressure bearing parts due to overload

Risk of injury from flying parts.

Risk of injury due to splashing fluids.

- a) Depressurize the system before all work.
- b) Securely prevent the pressure from being restored during work.



## **A** CAUTION

#### **Hot surfaces**

Burns of the skin on contact.

a) At temperatures ≥48°C the product must be allowed to cool down first.

Kracht GmbH Repairs | 10

## 10.2 General

The repairs covers:

Troubleshooting
 Determination of damage, pinpointing and localisation of the damage cause.

Elimination of damage
 Elimination of the primary causes and replacement or repair of defective components.
 The repair is generally made by the manufacturer.

#### Repairs by manufacturer

Before returning the device, fill in the return notification form. The form can be filled in online and is available as a pdf file download.



### **NOTICE**

#### **Device contains hazardous material**

If the device was operated with dangerous liquids, it must be cleaned before the return. If this should not be possible, the safety data sheet of the hazardous material is to be provided beforehand.

#### Repair by equipment builder/operator

If corresponding expertise and sufficient equipment is available, the equipment builder/operator can also make the repairs. Please consult the manufacturer about this.

- a) If required, request spare parts lists and assembly drawings from the manufacturer.
- b) Use spare parts approved by the manufacturer only
- c) Dispose of packing material and used parts in accordance with the local stipulations.



## **NOTICE**

#### Warranty

Any warranty will be void if not executed properly.



## **NOTICE**

#### **Protective equipment and notices**

After maintenance and/or repair, reattach all protective devices and notices removed in the process to their original position.

88024710002-29 59 / 63

10 | Repairs Kracht GmbH

# 10.3 Detecting and eliminating failures

Fault	Potential causes	Possible measures		
Increased noise				
Pump cavitation	Excessive negative pressure (not	Check suction line design		
	complete filling of the pump)	Use noise-optimised pump		
	Suction line clogged	Clean the suction line		
	Suction filter plugged or too	Clean suction filter or use a larger filter		
amp cavitation	Silidii	Replace filter element		
	Suction bascet plugged or too small	Clean intake strainer or dimension larger		
	Fluid temperature too low	Adjust the temperature of medium		
		Check the oil level in the tank		
	Pump does not suck	Check suction line		
		Check the shaft seal		
Foaming or air in media	Shaft seal defective	Replace seals		
	Suction connection leaking	Tighten or replace the screw connections		
Toanning of all in media		Replace seals		
	System not vented	Vent the system		
	Return line ends above the fluid level	Extend return line		
	Heavy foaming in the system, e.g. in gears	Use noise-optimised pump		
Mechanical vibrations	Incorrectly aligned and/or loose coupling	Correct the alignment of the coupling and secure the coupling halves		
	Incorrectly and/or insufficient line fastening	Fixate lines with suitable fastening material (e.g. pipe clamps)		
	Wobbling pressure relief valve	Increase valve opening pressure		
	Not a noise-reducing setup	Use dampers		

Kracht GmbH Repairs | 10

Pump does not suck				
	Dry run	Fill pump and the suction line with medium		
	Minimum filling level in the reservoir tank undercut	Refill media		
	Wrong direction of rotation	Correct the direction of rotation		
	Throttled/closed shut-off element in the suction line	Open the shut-off element		
	Suction line clogged	Clean the suction line		
		Reduce the start-up pressure		
	The air in the suction line can- not be compressed in the pres-	Vent the pressure line		
	sure line	Increase volume of the pressure line		
		Check the pump design		
	Speed of the pump is too low	During frequency inverter operation: Check the operation/line frequency		
		Check installation location		
	Geodetic suction head too high	Provide pre-filling pump		
Insufficient pressure				
Insufficient pumping flo	w rate			
	Excessive negative pressure (not complete filling of the pump)	Check suction line design		
	Too high media viscosity	Provide pre-filling pump		
		Check the pump design		
	Speed of the pump is too low	During frequency inverter operation: Check the operation/line frequency		
	Throttled/closed shut-off ele- ment in the suction line	Open the shut-off element		
	Suction line clogged	Clean the suction line		
	Suction filter plugged or too	Clean suction filter or use a larger filter		
	Silidii	Replace filter element		
	Suction bascet plugged or too small	Clean intake strainer or dimension larger		
	No response of a pressure relief valve	Increase valve opening pressure		
		Check the oil level in the tank		
	Pump does not suck	Check suction line		
		Check the shaft seal		
	Wear	Replace the device		

88024710002-29 61 / 63

10 | Repairs Kracht GmbH

<b>Excessive operating ter</b>	nperature			
	Cooling and heat dissipation insufficient	Increase the cooling capacity		
	Not sufficient oil in the system	Check the container layout		
	Excess fluid is being delivered into the supply tank via pressure relief valve under load	Check the pump design		
Impermissible pump he	eating			
	No response of a pressure relief valve	Increase valve opening pressure		
	Pressure too high in association with a media viscosity that is too low	Check the system design		
	Speed too fast in connection with media viscosity that is too high	Check the system design		
	Gland lid overtightened (for gland seal)	Unscrew gland lid and readjust leakage		
	Suction pressure too high	Reduce the pressure		
	Wear	Replace the device		
Leakage				
	Lack of maintenance	Comply with maintenance intervals		
		Replace seals		
	Mechanical damage	Replace seals		
	Thermal overload	Check operating data		
	Thermal overload	Replace seals		
	Pressure too high	Check operating data		
	Tressure too mgn	Replace seals		
	Gas content in media too high	Check operating data		
Seal failure	das content in media too nign	Replace seals		
Jean randre	Corrosion/chemical degradation	Check material compatibility		
	Corrosion/chemical degradation	Replace seals		
	Wrong direction of rotation	Correct the direction of rotation		
	Wrong direction of rotation	Replace seals		
	Contaminated medium	Provide filtration		
		Replace seals		
	Gland lid not sufficiently tightened (for gland seal)	Retighten gland lid		
	Loose screw connection	Tighten or replace the screw connections		

Kracht GmbH Repairs | 10

Coupling				
Coupling wear	Alignment error	Correct the alignment of the coupling and secure the coupling halves		
	Spider overloaded	Check operating data		
Cam break	Spider wear Torque transmission due to metal contact	Use harder spider  Adapt maintenance intervals  Replace coupling		
Premature spider wear	Alignment error	Correct the alignment of the coupling and secure the coupling halves		
		Replace spider		
	Spider failure due to chemical	Check material compatibility		
	corrosion	Replace spider		
Motor protection switch tripped				
	Driving power too low	Check the drive design		
	Motor incorrectly connected	Check motor connection		
	Phase failure	Check feed/supply		
		Check operating data		
	Current consumption too high	Check direction of rotation		
	Motor circuit breaker incorrectly designed	Check operating data		
Consult the manufacturer	in the event of unidentifiable faul	ts		

88024710002-29 63 / 63