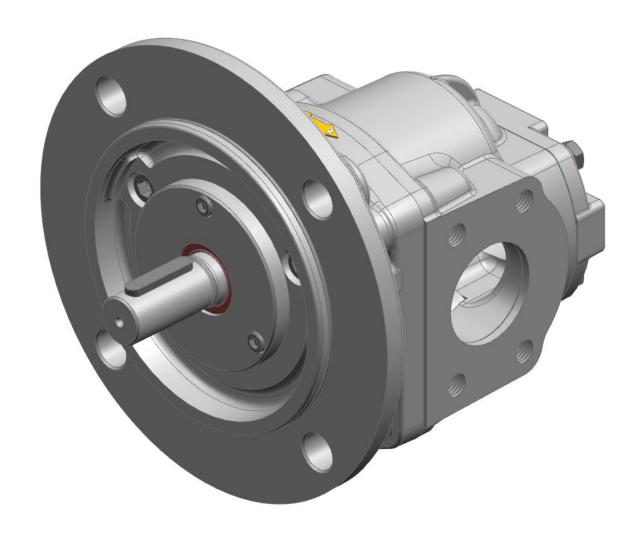
KRACHT

D.0024860002Operating instructions (Translation)



Gear pump KF 3/. - KF 6/. English

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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 3/. - KF 6/.

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.

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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

- 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.
- 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.

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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



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

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.



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.



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.

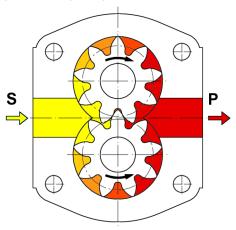
- a) Do not operate the product with shut-off devices closed.
- b) Securely prevent the restoration of pressure while working on the device.

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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

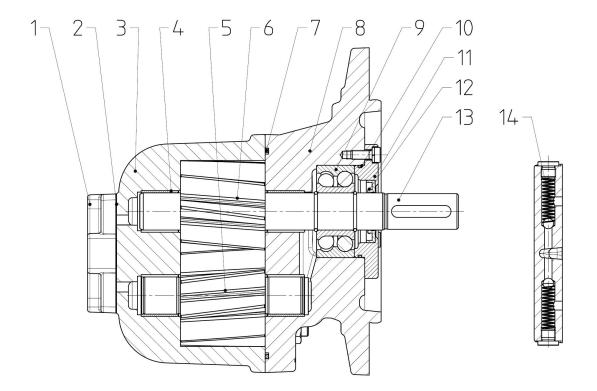
When rotated, two gearwheels meshing together produce a volume enlargement as a result of the opening of the tooth spaces on the suction side (S), so that medium can flow in and so that a corresponding volume is displaced simultaneously by immersion of the teeth into the filled tooth spaces on the pressure 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 Driven shaft
- 7 O-ring
- 9 Outbord bearing

(only Driving shaft: N; M; R)

- 11 Seal retainer
- 13 End of drive shaft

- 2 Seal
- 4 Plain bearing bush
- 6 Gears
- 8 Flange cover
- 10 O-ring
- 12 Shaft seal

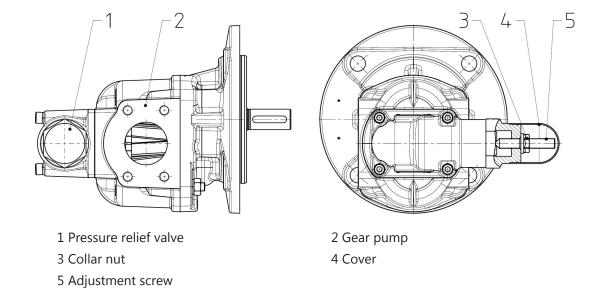
(**Type of seals [**▶ 17])

14 Valve

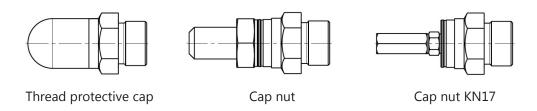
(only Direction of rotation: 3)

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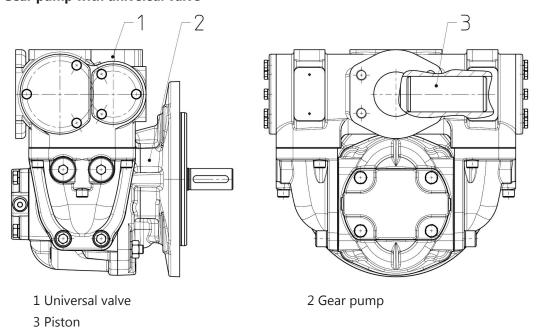
Gear pump with pressure relief valve



Version cover



Gear pump with universal valve



3.3 Type key

Ore	dering	ј еха	mple	•												
KF	:	3/	63		F	1	0	В	P	0	0	7	D	P	2	/
1.		2.	3.		4.	5.	6.	7.	8.	9.	10.	11.	12.	13.	14.	15.

Ordering e	Ordering example					
+	DKF 3	D	04			
	16.	17.	18.			
+		KF 4 U 04				
		19.				

	19.					
Explanation o	f type key					
1. Product na	me					
2. Size						
3	4	5	6			
3. Nominal si	ze					
	KF 3/. : 63; 80; 100; 112					
V	KF 4/. : 125; 150; 180					
V _{gn}	KF 5/. : 200; 250; 315					
	KF 6/. : 400; 500; 630; 730					
4. Flange mo	unting cover					
	KF 3/.		KF 5/ KF 6/.			
F	A-Ø= 180; Z-Ø= 130; LK- Ø= 150	Н	A-Ø= 250; Z-Ø= 180; LK-Ø= 215			
	KF 4/.					
G	A-Ø= 220; Z-Ø= 150; LK- Ø= 185					
A= Outer diam	neter; Z= Centering diameter ;	LK= Bolt circ	cle;			
5. Direction of	of rotation					
1	Clockwise	3	Clockwise or counterclockwise			
2	Counterclockwise		Flow direction alternating			
6. Outboard	flange					
Х	Mounting angle	0	Without Outboard flange			
7. Construction	on of housing					
В	B Housing with flange connection					
8. Driving sha	aft					
	Cylindrical shaft end		Cylindrical shaft end			
Р	Without Outbord bearing	M	with outboard bearing (Reinforced)			
			Cylindrical shaft end			
N	Cylindrical shaft end with outboard bearing	R	with outboard bearing (Reinforced),			
	3		Shaft end shortened			

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Explanation	of type key		
9. 2nd shaf	•••		
0	Without 2nd shaft end		
10. End cov	/er		
A	only for direction of rotation 1 or 2	0	Without End cover
В	only for Direction of rotation 3	0	(for valve installation)
11. Design	serial number (specified by man	ufacturer)	
12. Housing	g material and plain bearing		
	EN-GJL-250 (GG-25)		EN-GJS-400-15 (GGG-40)
D	Multi layer friction bear- ings contains lead	V	Multi layer friction bearings contains lead
13. Gears v	ersion		
P	Helical gear		
14. Seal typ	pe		
_			Mechanical seal CR secondary seals
1	Rotary shaft seal NBR	74	Q3ANFE (KF 3/.)
			(For compressor applications)
			Mechanical seal with HNBR secondary seals
2	Rotary shaft seal FKM	75	Q3AVFE (KF 3/.)
			(For compressor applications)
	Mechanical seal witht FKM		Mechanical seal witht FKM secondary seals
29	secondary seals SAVGG	77	Q3AVFE (KF 3/.)
			(For compressor applications)
			Rotary shaft seal
30	Mechanical sealt PTFE secondary seals SATGG	79	FKM (Low temperature)
	officially seals salide		(gilt nur für KF 4/.)
			Mechanical seal CR secondary seals (AX20)
32	Rotary shaft seal PTFE	87	Q2B2K1G3 (KF 4/ KF 6/.)
			(For compressor applications)
	Rotary shaft seal FKM		Mechanical seal with HNBR sec- ondary seals
37	(Low temperature)	88	(AX20)
	(gilt nur für KF 3/.)		Q2B2K1G3 (KF 4/ KF 6/.)
			(For compressor applications)

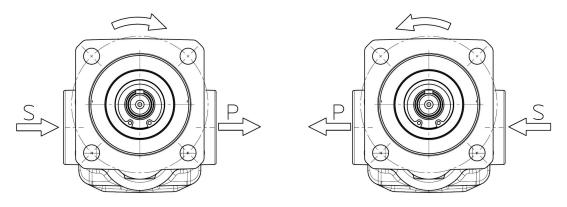
_				
Ехр	lanation of	type key		
		Mechanical seal witht FKM secondary seals		Mechanical seal witht FKM secondary seals
	39	SAVGG	89	(AX20)
				Q2B2K1G3 (KF 4/ KF 6/.)
		(with fluid buffer)		(For compressor applications)
		Mechanical sealt PTFE sec-		
	40	ondary seals		
	40	QQTGG		
		(with fluid buffer)		
15 .	Special nu	mber		
Spe	cial numbe	r [▶ 20]		
16.	Pressure re	elief valve		
	DKF 3	for KF 3/.	DKF 5	for KF 5/.
	DKF 4	for KF 4/.	DKF 6	for KF 6/.
17.	Version DI	KF-valve		
		Housing material:		Housing material:
	Α	EN-GJL-250 (GG-25)		EN-GJS-400-15 (GGG-40)
		Pump side seal :	1	Pump side seal :
		Other seals O-ring NBR	-	Other seals O-ring FKM
		Cover:		Cover:
		Thread protective cap		Cap nut KN17
		Housing material:	N	Housing material:
		EN-GJL-250 (GG-25)		EN-GJS-400-15 (GGG-40)
	С	Pump side seal :		Pump side seal :
	C	Other seals O-ring Copper		Other seals O-ring Copper
		Cover:		Cover:
		Cap nut KN17		Cap nut KN17
		Housing material:		Housing material:
		EN-GJL-250 (GG-25)		EN-GJL-250 (GG-25)
	D	Pump side seal :	U	O-ring :
	D	Other seals O-ring FKM	U	Materia
		Cover:		Cover:
		Thread protective cap		Thread protective cap
		Housing material :		Housing material :
		EN-GJS-400-15 (GGG-40)		EN-GJS-400-15 (GGG-40)
	6	Pump side seal :	W	O-ring:
	G	Other seals O-ring NBR	V	Materia
		Cover :		Cover :
		Cap nut KN17		Cap nut KN17

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Explanation of	Explanation of type key				
	Housing material:		Housing material :		
	EN-GJL-250 (GG-25)		EN-GJL-250 (GG-25)		
н	Pump side seal :	w	O-ring:		
	Other seals O-ring NBR	VV	Materia		
	Cover:		Cover:		
	Cap nut KN17		Cap nut KN17		
	Housing material:				
	EN-GJL-250 (GG-25)				
K	Pump side seal :				
K	Other seals O-ring FKM				
	Cover:				
	Cap nut KN17				
18. Pressure s	etting ranges				
04	2 – 4 bar	16	8 – 16 bar		
08	4 – 8 bar	25	16 – 25 bar		
19. Universal valve					
KF 4 U 04	for KF 3/.	KF 5 U 07	for KF 5/250		
KF 4 U 05	for KF 4/.	KF 3 U U/	for KF 5/315		
KF 5 U 06	for KF 5/200	KF 6 U 08	for KF 6/.		

3.4 Rotation and delivery direction

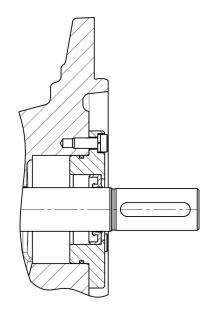
The direction of rotation is indicated by the bent arrow, Looking at the end of drive shaft. The flow direction is indicated by the straight arrows.



S = Suction connection

P = Pressure connection

3.5 Type of seals



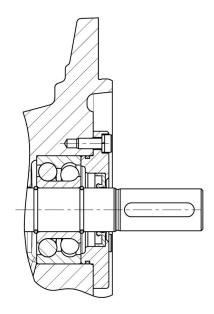
Rotary shaft seal

Driving shaft: P; U

Seal type: 1; 2; 32; 37; 79

Special number 155; 197; 250; 291; 304; 317;

332; 344; 353; 370; 398; 454; 472



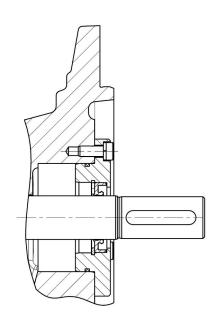
Rotary shaft seal with outboard bearing

Driving shaft: K; M; N; R

Seal type: 1; 2; 32

Special number: 18; 20; 24; 45; 51; 61; 70; 79; 89; 104; 122; 149; 196; 197; 221; 222; 260; 265; 266; 304; 326; 336; 352; 378; 397; 398;

427

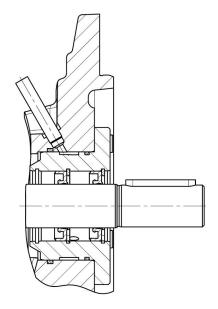


Rotary shaft seal (for vacuum operation)

Driving shaft : P Seal type : 1; 2

Special number 191

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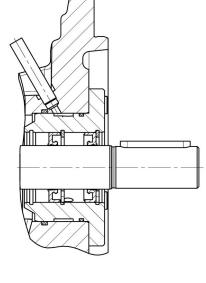


Double rotary shaft seal

Connecting pipe 8x1 (for fluid buffer)

Driving shaft: P Seal type: 1; 2; 32

Special number: 44; 261; 297; 306; 440



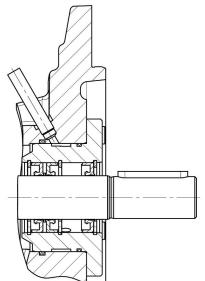
Double rotary shaft seal (for vacuum opera-

tion)

Connecting pipe 8x1 (for fluid buffer)

Driving shaft: P Seal type: 1; 2

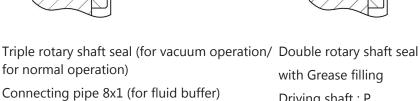
Special number 74; 309



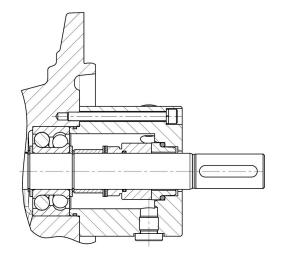
with Grease filling

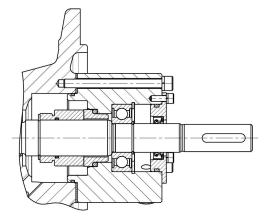
Driving shaft: P Seal type: 1; 2

Special number: 255



Driving shaft: P Seal type: 1; 2 Special number: 94





Mechanical seal

with outboard bearing

Driving shaft : N

Seal type: 29; 30; 87; 88; 89

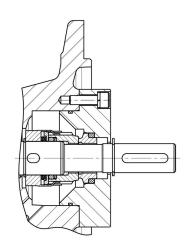
Special number: 304; 317; 332;445; 446; 447;

531

Mechanical seal

Connection borehole G 1/4 (for fluid buffer)

Driving shaft: N Seal type: 39; 40



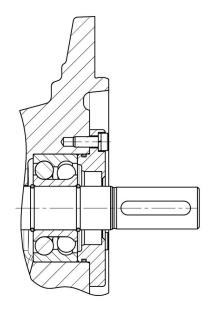
Mechanical seal Driving shaft : N

Seal type: 43; 55; 56;74; 75; 77

Special number: 153; 172; 177; 216; 379; 393;

415; 438

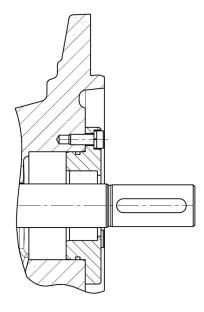
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Without shaft seal Driving shaft : N; R

Seal type: 1; 2

Special number: 95; 104; 196; 296; 308; 369



Without shaft seal

Without outboard bearing

Driving shaft : P

Special number: 104; 196; 266; 301; 498

Seal type: 1; 2

3.6 Special number

Special number	Description	
18	Strengthened shaft execution (M-Shaft)	
20 Strengthened shaft execution (M-Shaft)		
24	6-hole mounting flange	
44	Double rotary shaft seal	
45	Driving shaft cylindrical - with centre bore	
45	DIN 332-2 Typ D	
F1	Driving shaft cylindrical - with centre bore	
51	DIN 332-2 Typ D	
61	Tapered shaft end	
70	Pipe adaptor ; 2nd shaft end	
70	Customized type plate	
74	Double rotary shaft seal for vacuum operation	
70	Drive shaft bored through	
79	End cover with Connection M22x1,5	
89	Flange cover with sidwise recess	
94	Triple rotary shaft seal	
0.5	Without shaft seal	
95	Lubricating oil bore in flange cover	
104	Without shaft seal	

Special number	Description
122	See Special number 79
122	End cover with G ½ Connection
149	2nd shaft end
	For compressor applications
153	O-ring CR
	Plastic plain bearings (non-ferrous metal-free)
155	Driving shaft with gear shaft profile
155	Leak oil drain through nozzle in end of drive shaft
	For compressor applications
172	See Special number 153
	O-ring HNBR
	For compressor applications
177	See Special number 153
	End cover als Suction connection with adapter plate
101	Rotary shaft seal for vacuum operation
191	+ Special number 197
100	Without shaft seal
196	+ Special number 197
197	Noise-optimized version for aerated oils
	For compressor applications
216	See Special number 177
	O-ring HNBR
221	Combination of Special number 122 + 197
222	Combination of Special number 79 + 197
250	Combination of Special number 155 + 197
	Use under water
255	Double rotary shaft seal BABSL + Grease filling
255	Fastening screws: Stainless steel (A4)
	+ Special number 197
260	with universal valve
200	Gears cut to sub-standard size (used as noise reduction)
261	Combination of Special number 44 + 197
	Use under water
265	See Special number 260
	I and the second
	Sealing faces are additional seald
	Sealing faces are additional seald Without shaft seal
266	
266	Without shaft seal

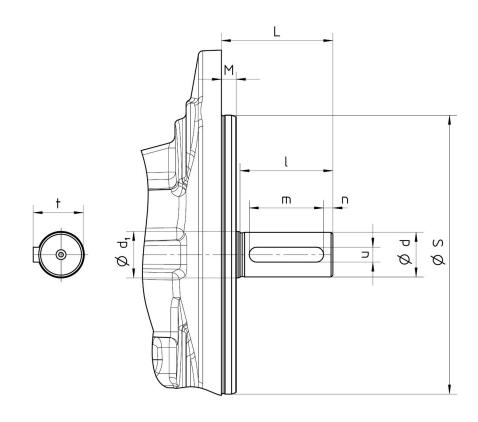
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Special number	Description		
	with universal valve		
296	Without shaft seal		
	Noise reduction		
	Inner rotary shaft seal Turcon Roto Variseal		
	(p _{max} =10 bar at 700 1/min)		
297	external rotary shaft seal BABSL		
	Plastic plain bearings (non-ferrous metal-free)		
	Hennecke – Type plate		
301	O1 Combination of Special number 196 + 282		
304	Plastic plain bearings (non-ferrous metal-free)		
	Double rotary shaft seal		
306	Plastic plain bearings (non-ferrous metal-free)		
500	Hennecke – Type plate		
	+ Special number 197		
309	Combination of Special number 74 + 197		
317	Combination of Special number 197 + 304		
326	Combination of Special number 45 + 197		
320	KF 150 + KF 200: Driving shaft bore M8 / 19 mm deep.		
332	Special number 304		
336	Without shaft seal		
	with outboard bearing		
344	Driving shaft with gear shaft profile		
J++	+ Special number 197		
	with universal valve		
352	O-ring FKM - Low temperature		
	+ Special number 197		
252	Multi layer friction bearings non-ferrous metal-free		
353	+ Special number 197		
369	Combination of Special number 45 + 196		
	Driving shaft with gear shaft profile		
370	With SAE-B-2-hole flange		
	Plastic plain bearings (non-ferrous metal-free)		
378	O-ring sealing at flange cover centring		
	For compressor applications		
379	O-ring CR		
	Plastic plain bearings (non-ferrous metal-free)		
	For compressor applications		
393	See Special number 153		
	O-ring FKM		

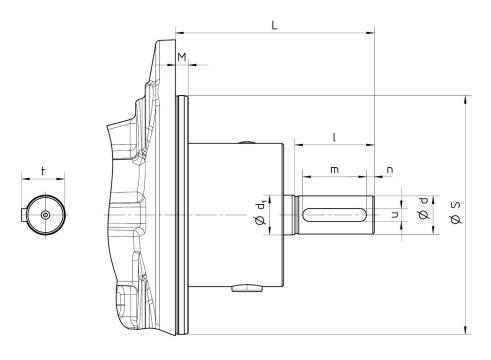
Special number	Description					
	Use under water					
397	with universal valve					
	Fastening screws: Stainless steel					
	Use under water					
398	Fastening screws: Stainless steel					
	+ Special number 197					
	For compressor applications					
415	See Special number 379					
	O-ring HNBR					
427	See Special number 197					
427	Sonderwellenende					
	For compressor applications					
438	See Special number 379					
	O-ring FKM					
440	See Special number 44					
440	Rotary shaft seal BABSL					
	For compressor applications					
445	Optimierte Dichtungsschmierung					
	Plastic plain bearings (non-ferrous metal-free)					
446	For compressor applications					
440	See Special number 445					
447	For compressor applications					
	See Special number 445					
454	Driving shaft with nozzle					
	+ Special number 197					
472	Combination of Special number 44 + 197					
7/4	Plastic plain bearings (non-ferrous metal-free)					
498	See Special number 266					
531	White metal bearing					
	+ Special number 197					

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3.7 Free shaft end



Nominal size	Driving shaft	L	S _{h6}	M	d _{k6}	d₁	I	m	n	t	u	
	P-Welle				19	20	F0	20	5	21.5	6	
KE 2.4	N-Welle	60	120	-	24	35	50	30	10	27	8	
KF 3/.	R-Welle	50	130	5	20	25	40	30	5	21	8	
	M-Welle	70	70		28	35	60	40	10	31	8	
	P,N-Welle	60			24	25	50	40	5	27	8	
KF 4/.	R-Welle	60	150	150		32	40	50	0 40	5	35	10
	M-Welle	95			32	40	80	50	15	33	10	
	P, N-Welle	70		8	28	30	60	40	10	31	8	
KF 5/.	R-Welle	70	180) -	8	38	45	60	40	10	41	10
	M-Welle	95			36	45	80	50	15	41	10	
VE 67	P, N-Welle	OF	180		38	40	00	62	8 -	41	10	
KF 6/.	M-Welle	95	190		42	45	80	63		45	12	



Nominal size	Special num- ber	L	S _{h6}	M	d _{k6}	d ₁	I	m	n	t	u
KE 2 /i+h	-	120			24	35	50		10	27	8
KF 3/. with Mechanical seal	153/172/177/ 216/379/415	60	130	5	19	19	40	30	5	21.5	6
VE 47:+b	-	125			24	25	50	40		27	8
KF 4/. with Mechanical seal	445/446/447/ 531	110	150		19	20	40	30	5	21.5	6
KF 5/. with	-	125	100	8	28	30	60	40	10	31	0
Mechanical seal	447	120	180		24	25	50	40	5	27	8
KF 6/. with	-	160	100		38	40	80	63	8	41	10
Mechanical seal	153/172/447	125	180		32	35	50	40	5	35	10

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.

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4 Technical data

4.1 General

General information			General information					
		KF 3/.	Flange connection SAE 1 1/2" – M10					
		KF 4/.	Flange connection SAE 2"					
		KF 5/200	Flange connection SAE 2 1/2"					
		KF 5/250 - KF 5/315	Flange connection SAE 3" – M12					
		KF 6/.	Flange connection SAE 4"					
Havaina aannastian		KF 3/ + KF 4 U 04	Flange connection SAE 2"					
Housing connection		KF 4/ + KF 4 U 05	Flange Connection SAE 2					
		KF 5/200 + KF 5 U 06 - KF 5/315 + KF 5 U 07	Flange connection SAE 3" – M12					
			Suction connection :					
			Flange connection SAE 4"					
		KF 6/ + KF 6 U 08	Pressure connection :					
			Flange connection SAE 3" – M12					
			A					
		Without fluid buffer	Any					
Mounting position		KF ./.	Shaft end horizontal,					
wiodining position		with fluid buffer	fluid buffer connection top					
		KF ./.+ KF . U	Piston horizontal					
		N ./.∓ N . U	Pressure connection on top					
		Special number : 153; 172; 177; 216; 393; 446	Vertical, shaft end up					
Mounting position For compressor application	ons	Special number : 379; 415; 438; 445; 531	Shaft end horizontal					
			Shaft end horizontal / Vertical, shaft end up					
External loads on shaft end		KF ./.	Axial and radial forces are only permissible in combination with an outboard bearing.					
external loads on shart end			Nominal sizes [▶ 27]					
		Version with Mechanical seal	Axial and radial forces are not allowed.					
Speed	n	Nominal sizes [> 27] + Vissignment [> 28]	cosity - Rotation speed as-					
Operating processes	p _e							
Operating pressure	p _b	Permissible pressure range [▶ 28]						

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General information				
Vicacity	\mathbf{v}_{min}	Differential pressure - viscosity assignment [▶ 31]		
Viscosity v_{max}		Consult the manufacturer		
Fluid temperature	id temperature ϑ _m Permissible temperature range [▶ 31]			
Ambient temperature	ී	Permissible temperature range [> 32]		
Filtering	β	≤ 60 μm		
Material		Material data [▶ 33]		
		Lubricating fluids without abrasive components		
Permissible media		(Petrols, solvents, etc. are not permissible)		
		For compressor applications :		
		Refrigerator oil , Hydraulic oil , Mineral oil		



TIPP

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

4.2 Nominal sizes

Nominal	Geom.	Spe	ed n	perm. ra-	perm. axial	Sound	Mass iner-
size V_{gn}	displace- ment V _g [cm ³ / rev.]	n _{min} [rpm]	n _{max} [rpm]	dial force F _{radial} [N] (n =1500 rpm]	force F _{axial} [N] (n =1500 rpm]	pressure level L _{pA} [dBA]	tia x 10 ⁻⁴ J [kg m ²]
KF 3/63	63.8					≤ 75	4.25
KF 3/80	81.3					z 76	5
KF 3/100	100.8					≤ 76	6.75
KF 3/112	112.6			1500	200	≤ 77	7.5
KF 4/125	129					≤ 78	13.75
KF 4/150	153					≤ 79	16
KF 4/180	184	200	2000			≤ 80	19.25
KF 5/200	204	200				≤ 81	27.5
KF 5/250	255			2000	300		34.5
KF 5/315	321					≤ 82	43
KF 6/400	405						105
KF 6/500	505			2000	F00	≤ 83	130
KF 6/630	629			3000	500	≤ 84	160
KF 6/730	730		1500			≤ 85	195

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4.3 Viscosity - Rotation speed assignment

Kinematic viscosity ν [mm²/s]	Recommended rpm n [rpm]
400	2000
500	1800
1000	1200
2000	800
3000	650
6000	450
10000	300
15000	250
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 $p_{e\,min.}$

4.4 Permissible pressure range

4.4.1 Operating pressure at suction side

Seal	Special	Operating pressure					
type	number	suction side					
		p _{e min} [bar abs.]	P _{e max} [bar rel.]				
		0.6 (1)	1				
	_	0.0	(KF 5/.: 0.5)				
1	74	0.1	0.2				
	191	0.1	0.2				
	196	0.6 (1)	Operating pressure at pressure side				
	309	0.1	0.2				
	_	0.6 (1)	1				
	_	0.0	(KF 5/.: 0.5)				
2	74	0.1	0.2				
	191	U.1	0.2				
	196	0.6 (1)	Operating pressure at pressure side				
	309	0.1	0.2				
29	-		10				
30	-		10				
32	-	0.6 (1)	0.5				
37	-	0.0	0.5				
39	-		10				
40	-		10				

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Seal	Special	Operating pressure			
type	number	suction side			
		p _{e min} [bar abs.]	P _{e max} [bar rel.]		
79	-		0.5		
(1) Start-up condition: 0.4 bar absolute (max. 30 minutes)					

	Universal valve						
Nominal size	size Operating pressure						
V_{gn}	suction side						
	p _{e min} [bar abs.]	p _{e max} [bar rel.]					
KF 3/63							
KF 3/80	0.64						
KF 3/100							
KF 3/112	0.65						
KF 4/125	0.66						
KF 4/150	0.67						
KF 4/180	0.68	Operating pressure at suc-					
KF 5/200	0.62	tion side [▶ 28]					
KF 5/250	0.63						
KF 5/315	0.64						
KF 6/400	0.63						
KF 6/500	0.64						
KF 6/630	0.67						
KF 6/730	-						

4.4.2 Operating pressure at pressure side

Nominal size	Operating pressure				
$V_{\rm gn}$	pressure side				
	p _ь [bar]	p _{b max} [bar]			
	(perm. continous pressure)	(Maximum pressure) (1)			
KF 3/63		50			
KF 3/80		40			
KF 3/100		30			
KF 3/112	25	25			
KF 4/125	25	40			
KF 4/150		30			
KF 4/180		25			
KF 5/200		30			
KF 5/250	20	25			
KF 5/315	16	20			
KF 6/400	25	30			

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Nominal size	Operating pressure			
V_{gn}	pressure side			
	p _b [bar]			
	(perm. continous pressure)	(Maximum pressure) (1)		
KF 6/500	20	25		
KF 6/630	16	20		
KF 6/730	14	16		

⁽¹⁾ Maximum pressure: only applicable when using mineral oil at speeds of > 700 1/min and viscosity values of 30 mm²/s - 1000 mm²/s.

4.4.3 Operating pressure of suction side and pressure side

4.4.3.1 Compressor applications

Seal	Special	Operating pressure								
type	number	suctio	n side	pressure side						
		p _{e min} [bar abs.]	P _{e max} [bar rel.]	p _ь [bar]						
				(perm. continous pressure)						
	153									
74	177									
	379									
	172									
75	216									
	415									
	393	0.6 (1)	25	25						
87	438									
	445			35						
	446			KF 6/730 : 31						
	447									
	445									
88	446									
	447									
	445									
89	446									
	447									
 ⁽¹⁾ Start-	Start-up condition: 0.4 bar absolute (max. 30 minutes)									

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4.5 Differential pressure - viscosity assignment

Bearing	Δp _{max} {bar]						
	$v = 1.4 \text{ mm}^2/\text{s}$	$v = 6 \text{ mm}^2/\text{s}$	ν = 12 m	m²/s			
			KF 3/.				
Multi layer friction bearings			KF 4/.	25			
contains lead (Standard)			KF 5/200				
DU , P10			KF 5/250	20			
	3	12	KF 5/315	16			
			KF 6/400	25			
Multi layer friction bearings non-ferrous metal-free			KF 6/500	20			
DP4			KF 6/630	16			
			KF 6/730	14			
Plastic plain bearings							
Iglidur® G ; Iglidur® X ; H370		3	10 ⁽¹⁾ KF 6/730 : 6 ⁽¹⁾				
White metal bearing	-	3					
TEGO® V738							
(1) For compressor applications $v \ge 7 \text{ mm}^2/\text{s}$							

4.6 Permissible temperature range

Sealing material	Fluid temperature එ _m				
	ϑ _{m min} [°C]	ϑ _{m max} [°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			

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Sealing material	Ambient temperature $artheta_{\scriptscriptstyle m u}$			
	ဗီ _{u min} [°C]	ઝ _{u max} [°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

Size 3 gear pumps for compressor application have bearing material Iglidur® G , here is the fluid temperature $\vartheta_{m\,max}$ 110 °C



NOTICE

Comply with media-specific properties

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4.7 Material data

Seal			Materia	al	
type	Shaft seal	O-ring/ Gasket	Housing/ Flange cover/ End cover/ Pressure relief valve	Gears	Bearing
1	NBR	NBR , C4400			Multi layer friction bearings contains
2	FKM	FKM , C4400			lead (Standard) DU , P10
29	SAVGG , FKM , 1.4571	FEP , C4400			(Steel , CuSn , PTFE , Pb)
30	SATGG , PTFE , 1.4571	FEP , C4400		Case-hardened steel (Steel 1.7139)	Plastic plain bear- ings non-ferrous metal-free
32	PTFE	FEP , C4400	EN-GJL-250 (GG-25)		Iglidur® X
37	FKM (Low temperature)	FKM (Low tem- perature)	 EN-GJS-400-15 (GGG-40)		EN-GJS-400-15 (GGG-40) (Steel 1.7139) Multi bearing rous
39	SAVGG , FKM , 1.4571	FKM , C4400	(666 16)		
40	QQTGG , PTFE , 1.4571	FEP with FKM- core , C4400			PTFE) White metal bear- ing
79	FKM (Low temperature)	FKM (Low tem- perature)			TEGO® V738 (Steel , Cu , Sn , Sb , Cd , Ni , As)

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4 | Technical data Kracht GmbH

4.7.1 Compressor applications

Seal	Material							
type	Shaft seal	O-ring	Housing/ Flange cover/ End cover/ Pressure relief valve	Gears	Bearing			
74	Q3ANFE , CR	CR						
75	Q3AP1FE , HNBR	HNBR	EN-GJL-250 (GG-25) EN-GJS-400-15 (GGG-40)					
77	Q3AVFE , FKM	FKM			Plastic plain			
87	Q2B2K1G3, FFKM	CR		Case-hardened steel (Steel 1.7139)	bearings non-fer rous metal-free			
88	Q2B2K1G3 , FFKM	HNBR			Iglidur® X			
89	Q2B2K1G3 , FFKM	FKM						

Refrigerant		Oil							
		М	M*	M* - PAO	AB	E	PAO	AB – PAO	PAG
R717 (NH3)	Ammonia	CR / HNBR	CR / HNBR	CR / HNBR	CR	-	CR ⁽¹⁾ / HNBR	CR	CR / HNBR
R290 (C3H8)	Propane	-	-	-	-	-	HNBR	-	HNBR
R1270 (C3H6)	Propylene	-	ı	ı	-	-	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

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4.8 Weight

Nominal size		Gear pump [kg	Added we	eight [kg]		
$V_{\rm gn}$	with end cover	with pressure relief valve	with univer- sal valve	Mechanical seal	Mounting angle	
KF 3/63	12	13.5	32			
KF 3/80	12	15.5	32		2.6	
KF 3/100	12.5	1.5	2.4		2.0	
KF 3/112	13.5	15	34	1.5		
KF 4/125	18.5	20	39			
KF 4/150	20	21.5	40		4.9	
KF 4/180	21	22.5	41			
KF 5/200	28	30	80			
KF 5/250	22	25	0.5	2	8.8	
KF 5/315	33	35	85			
KF 6/400	51	59	103			
KF 6/500	55	63	107		10.0	
KF 6/630	CE	72	44-	3	18.8	
KF 6/730	65	73	117			

4.9 Dimensions

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

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5 | Transport and storage Kracht GmbH

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 ϑ_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 ϑ_U .

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.

ATTENTION

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

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6 | Installation Kracht GmbH

6 Installation

6.1 Safety instructions for installation



⚠ 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.

Kracht GmbH Installation | 6



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.

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6 | Installation Kracht GmbH

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.



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.

Kracht GmbH Installation | 6



A CAUTION

Hot surfaces

Burn injury to skin if touched.

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

Tightening torques [Nm]							
Thread size	M6	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) Savoya (Alute with min strongth class 9.9/9							

¹⁾ Screws/Nuts with min. strength 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.
 - \Rightarrow The connection on the device must point upward.
 - ⇒ Checking the fluid level must be possible at any time.

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6 | Installation Kracht GmbH

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.

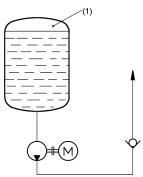
- Stipulate the nominal width of the suction line so that the permissible operating pressure $p_{e\,min}$ is not exceeded on the suction side.
- Avoid large suction heights.
- Avoid additional pressure loss through line resistances such as fittings, screwed connections, formed parts or suction filters/suction 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).

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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

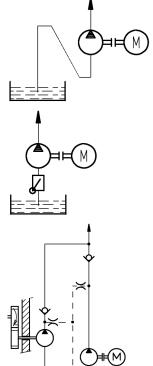
If there is a possibility that the suction line can run dry if the pump stops, piping the suction line as siphon is an option to avoid suction problems. This way, the pump will remain permanently filled after initial commissioning.

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.



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6 | Installation Kracht GmbH

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 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** [> 16]

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

For gear pumps with special number, check whether the direction can be reverted.



TIPP

The gear pump type KF 6/370 does not allow for the rotation direction to be reversed. Unit must be replaced.

Kracht GmbH Operation start-up | 7

7 Operation start-up

7.1 Safety instructions for start-up



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.



⚠ WARNING

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.

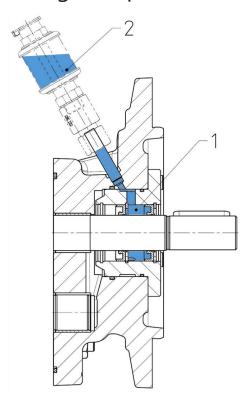
7.2 Preparation

- 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.

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7 | Operation start-up Kracht GmbH

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

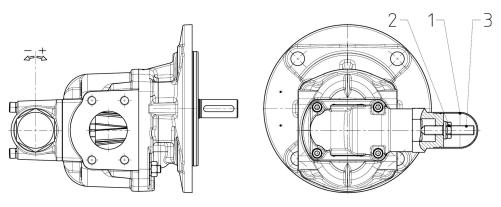
A lack of quench liquid can lead to a failure of the seal.

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

Kracht GmbH Operation start-up | 7

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 Adjustment screw
- 2 Hexagonal nut
- 3 Cover

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



⚠ WARNING

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.

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7 | Operation start-up Kracht GmbH

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 [**▶ 53]
- 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.

Kracht GmbH Removal | 8

8 Removal

8.1 Safety instructions for removal



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

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.

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8 | Removal Kracht GmbH

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.

Kracht GmbH Maintenance | 9

9 Maintenance

9.1 Important notes about explosion protection



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.



⚠ WARNING

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.

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9 | Maintenance Kracht GmbH

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.

Kracht GmbH Maintenance | 9

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	

^{1 - 0,1} h; 2 - 0,2 h; 3 - 0,75 h

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9 | Maintenance Kracht GmbH

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.

Kracht GmbH Maintenance | 9

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.

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9 | Maintenance Kracht GmbH

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.

Kracht GmbH Repairs | 10

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.



⚠ 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.



A CAUTION

Hot surfaces

Burns of the skin on contact.

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

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10 | Repairs Kracht GmbH

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.

Kracht GmbH Repairs | 10

10.3 Detecting and eliminating failures

Fault	Potential causes	Possible measures			
Increased noise					
	Excessive negative pressure (not	Check suction line design			
Pump cavitation	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			
	small	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			
	Shaft seal defective	Replace seals			
	Suction connection leaking	Tighten or replace the screw connections			
Foaming or air 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			
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			
	The air in the suction line can-	Reduce the start-up pressure			
	not be compressed in the pressure line	Vent the pressure line			

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10 | Repairs Kracht GmbH

	I	I		
		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		
	Condatic sustion hand too high	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 element in the suction line	Open the shut-off element		
	Suction line clogged	Clean the suction line		
	Suction filter plugged or too small	Clean suction filter or use a larger filter		
		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		
Excessive operating temperature				
	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		
L	(i .		

Kracht GmbH Repairs | 10

Impermissible pump heating				
	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 inte vals		
		Replace seals		
	Mechanical damage	Replace seals		
	Thermal overload	Check operating data		
	Thermal overload	Replace seals		
	Prossure too high	Check operating data		
	Pressure too high	Replace seals		
Seal failure	Cas assistant in mandia to a bish	Check operating data		
	Gas content in media too high	Replace seals		
		Check material compatibility		
	Corrosion/chemical degradation	Replace seals		
	NAV diversalis	Correct the direction of rotation		
	Wrong direction of rotation	Replace seals		
		Provide filtration		
	Contaminated medium	Replace seals		
	Gland lid not sufficiently tightened (for gland seal)	Retighten gland lid		
	Loose screw connection	Tighten or replace the screw connections		

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10 | Repairs Kracht GmbH

Coupling				
Coupling wear	Alignment error	Correct the alignment of the coupling and secure the coupling halves		
arapimig maar	Spider overloaded	Check operating data		
		Use harder spider		
Cam break	Spider wear Torque transmis-	Adapt maintenance intervals		
	sion due to metal contact	Replace coupling		
	Alignment error	Correct the alignment of the coupling and secure the coupling halves		
Premature spider wear		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		
	Current consumntion to a bigh	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		

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