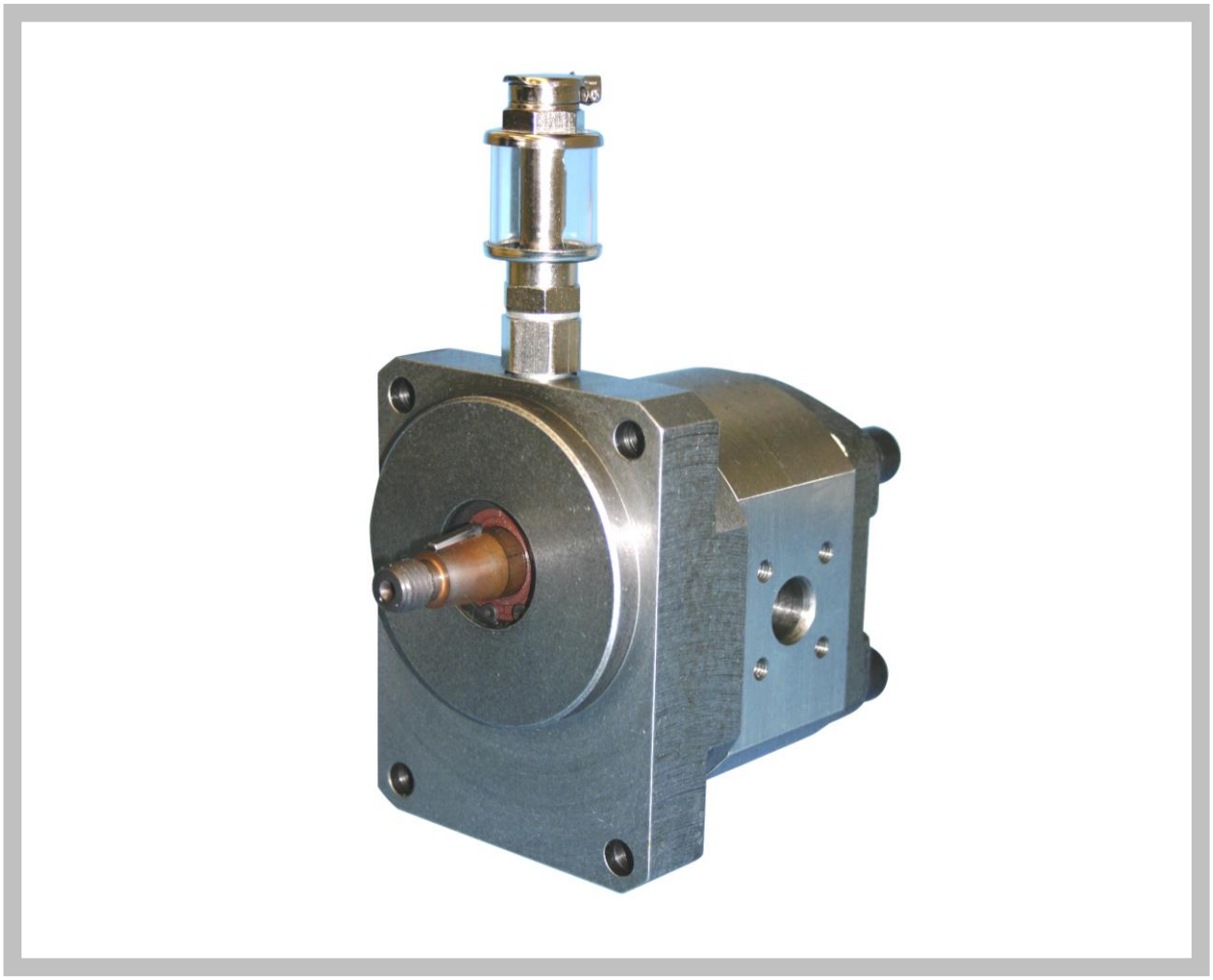
Process gear pumps DuroTec®

Operating and Maintenance Instructions **D.0034620002**



KP1/. G.0. .0A 4VL2/245, KP 1/. …/486, KP 1/. …/492

88034620002-02
Englisch
2016-08-04

KRACHT

Content

Safety 4
Symbols for safety instructions 4
General safety instructions 4
Manufacturer's address 4
The documentation 5
Description of equipment 5
General 5
Direction of rotation 5
Specified use 6
Construction 6
Type code 7
Technical data 8
General data 8
Overview of materials 8
Permissible operation parameter 9
Viscosity, pressure, speed 9
Calculation formulars for hydraulik pumps 10
Installation and Removal of the Pump 11
Corrosion Protection 11
Mechanical installation 11
Alignment of the coupling 12
Protective Housing 13
Assembly Together with Additional Devices or Components 13
Mechanical Installation 13
Installing the pump 13
Determination of the direction of rotation 13
Design of the Pressure and Suction Conduit 13
General Design of the Connections and Conduits 13
Sizing of the pressure line 14
Selection of the suction line 14
Connect the pipelines 14
Filling the fluid container 14
Pump removal 15
Commissioning 15
Radial shaft seals 16
Maintenance 17
Unusual noises 17
Static seals 17
Radial shaft seals 17
Level of sealing medium 17

Screw connections 18
Coupling 18
Damage 18
Surface temperatures 18
Sonstige Wartungsarbeiten 18

Repairs 18

Elimination of damages 18
Error diagnostics 18
Return of pumps 18
Failure and their reason 19

Safety

Symbols for safety instructions

The safety instruction embodied in these operating instructions are identified with the attention!-symbol. If these instructions are not heeded, hazards to personnel and damage to equipment may result.

Further notes which do not have a warning character but provide tips for optimum operation are symbolised by a hand:

General safety instructions

The operating safety of the process gear pumps DuroTec supplied is only guaranteed if the pump is used as specified (see "Description of equipment"). The stated limiting values (see also "Technical data") must not be exceeded under any circumstances.
Personnel having the responsibility for installing, operating or repairing the pump need to have the appropriate qualifications; these may have been obtained through training or appropriate instruction. Such personnel must be familiar with the content of these operating instructions.
During the execution of all work, the prevailing national rules for accident prevention and safety at the work place and where appropriate the internal regulation of the operator must be observed, even if the latter are not named in these operating instructions.
Leakages of dangerous substances handled by the pump must be contained and disposed in such a way that there is no danger to personnel or the environment. The relevant statutory regulations must be observed.
During all work on the pump and prior to installation, the connecting pipeline must be depressurised and the motor isolated!
The operator has to ensure that these operating instructions are accessible at all times to personnel in charge.

KRACHT pumps are displacement pumps.

Displacement pumps must never be operated against "closed valves", since the uncontrollable pressure heads which occur in this case could damage the pump and the associated plant elements.

This means that the use of a pressure relief valve or some other means of restricting pressure in the system is essential!

Manufacturer's address

KRACHT GmbH
Gewerbestrasse 20
D-58791 Werdohl
Germany

Tel. +49 / 2392 / 935-0
Fax +49 / 2392 / 935209
e-mail: info@kracht.eu
Internet: www.kracht.eu

The documentation

The present operating instructions describe the installation, the operation and the repair of the KRACHT process gear pumps DuroTec **KP1/. G.0. .0A 4VL2/245, KP 1/. …/486, KP 1/. …/492.**
The process gear pump DuroTec is manufactured in different versions. The specific version can be identified from the type label affixed to the pump. The structure of the type designation and a detailed description of the individual versions and nominal sizes can be found in the "Technical data" section (see "Description of equipment").

Description of equipment

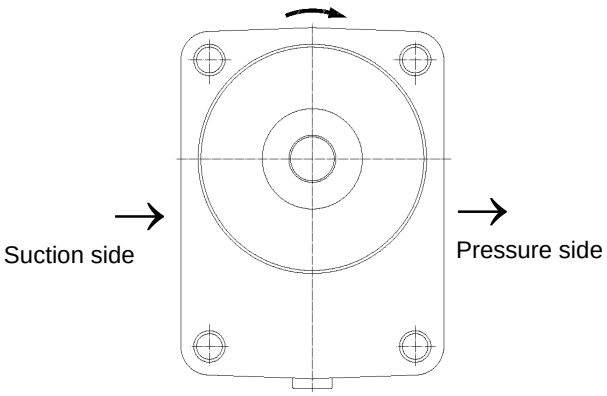
General

KRACHT process gear pumps DuroTec KP are external gear pumps which operate according to the displacement principle. Two gear wheels which are rotating in mesh with each other cause an increase in volume to occur as the spaces between the gear wheels are exposed at the pump inlet (suction side), so that the medium can flow into the pump. Simultaneously, a corresponding volume is displaced at the pump outlet (pressure side) through rotation of the gear teeth into the filled area vacated by the preceding teeth. The transport of fluid is achieved through the entrainment along the cavities between the gear teeth and the walls of the gear chambers. The so called geometric delivery volume V_g is displaced per revolution of the gear wheels. A value V_{gn} referred to as the nominal volume is used in technical documentation to identify the pump size.
Gear pumps are self-priming in wide confines. The described displacement process is initially achieved without noticeable pressure rise. It is only after the burden of external loading is applied, for example if a delivery head is imposed, there is resistance at the pump outlet, pipeline components, etc. that a working pressure must be generated to overcome these resistances.

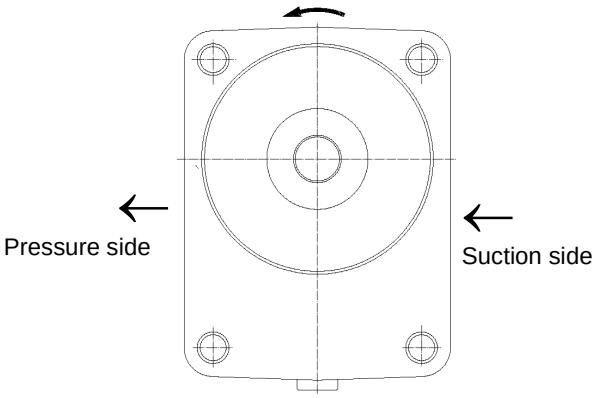
Direction of rotation

The pumps direction of rotation is determined as follows:

- When viewing on the end of the pump shaft, the direction of supply is from left to right when the shaft rotates **clockwise**



- When viewing on the end of the pump shaft, the direction of supply is from right to left when the shaft rotates **counterclockwise**



Specified use

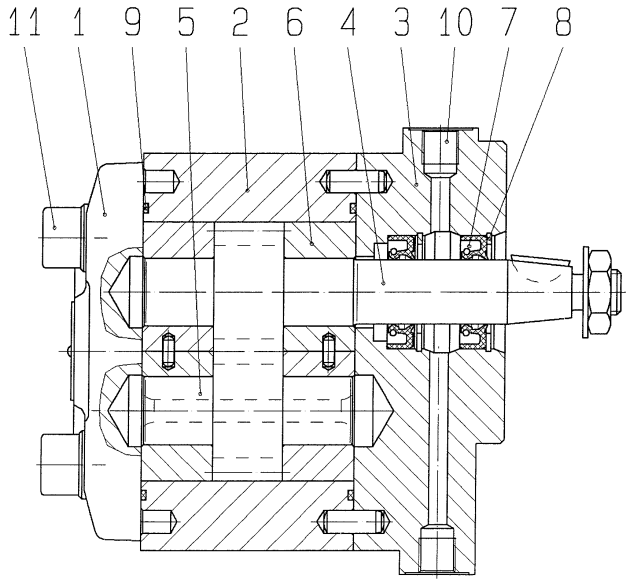
The KP is a pump for the continuous delivery of fluids. The different variants enable the pump to be used for various media.

It has to be ensured that the medium to be delivered is compatible with the materials used in the construction of the pump (see "Technical data"). In case of doubt, please consult the manufacturer.

The maximum permissible operating data described in the chapter "Technical Data" must be observed without fail. Identification plates or other instructions on the equipment may be neither removed nor rendered illegible or unrecognisable. If these instructions are not observed, any guarantee or responsiblity on the part of the manufacturer shall lapse.

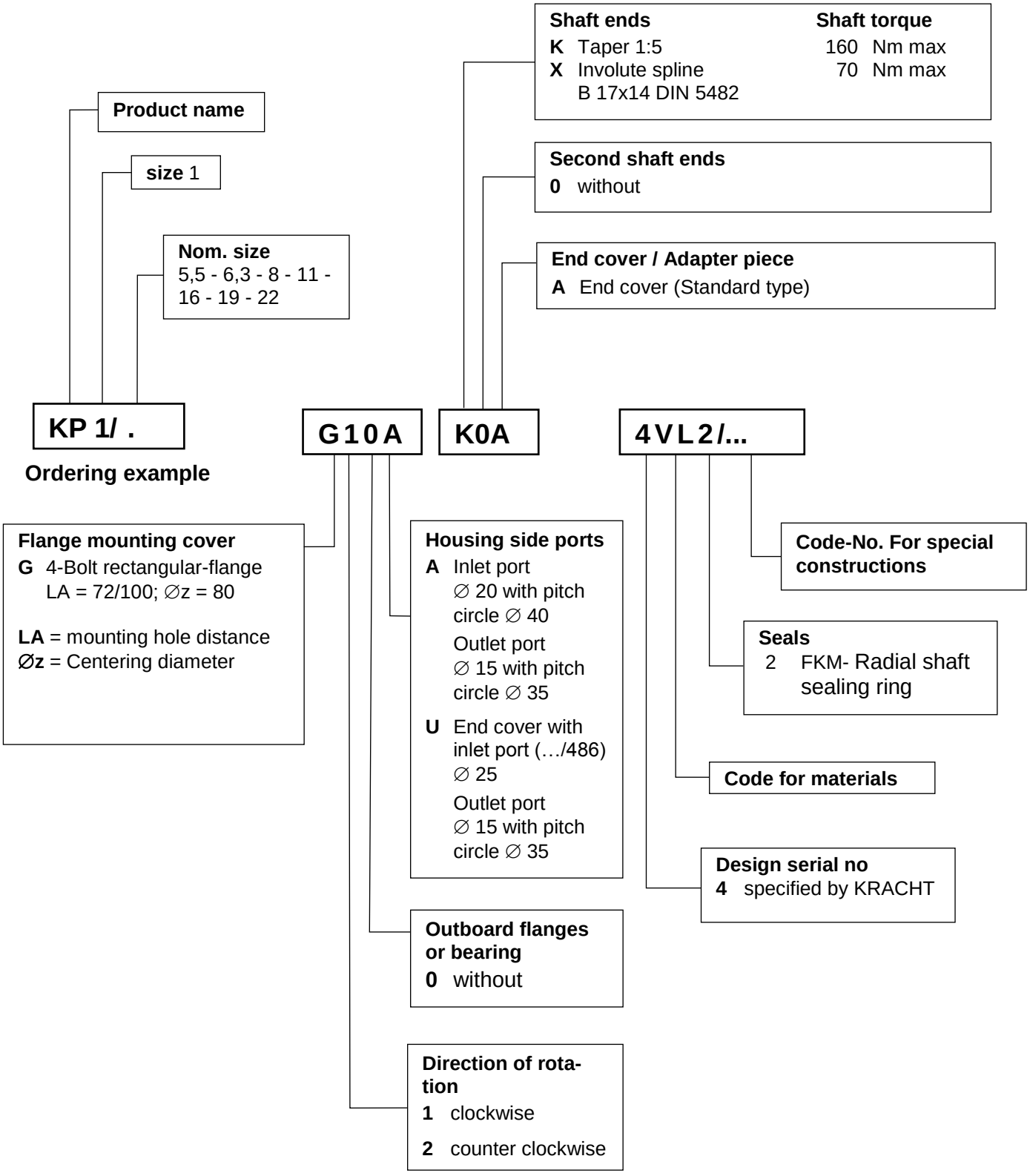
Construction

The basic construction of the process gear pumps DuroTec KP is shown in the figure below:



1. End cover
2. Housing
3. Flange cover
4. Driving shaft
5. Driven shaft
6. Bearing bush
7. Radial shaft sealing ring
8. Retaining ring
9. O-Ring
10. Port for liqiud sealing
11. Hex. socket head cap screw

Type code


Shaft ends
K Taper 1:5
X Involute spline B 17x14 DIN 5482
Shaft torque
160 Nm max
70 Nm max
Product name
size 1
Nom. size
5,5 - 6,3 - 8 - 11 - 16 - 19 - 22
Second shaft ends
0 without
End cover / Adapter piece
A End cover (Standard type)
KP 1/ .
G10A
K0A
4VL2/...
Ordering example
Flange mounting cover
G 4-Bolt rectangular-flange LA = 72/100; ∅z = 80
LA = mounting hole distance
∅z = Centering diameter
Housing side ports
A Inlet port ∅ 20 with pitch circle ∅ 40
Outlet port ∅ 15 with pitch circle ∅ 35
U End cover with inlet port (…/486) ∅ 25
Outlet port ∅ 15 with pitch circle ∅ 35
Code-No. For special constructions
Seals
2 FKM- Radial shaft sealing ring
Code for materials
Design serial no
4 specified by KRACHT
Outboard flanges or bearing
0 without
Direction of rotation
1 clockwise
2 counter clockwise

Technical data

The information provided in this chapter are applicable for all pumps, as far as there are no additional notes in the operating and maintenance instructions.

General data

Type of construction	Extrenal gear pump
Materials	See overview „Materials“
Flange mounting	See type code or technical data
Driving shaft end	See type code or technical data
Pipeline connection	See type code or technical data
Direction of rotation	See type code or technical data
Tightening torque M_A for fixing srews	50^{+10} Nm
Tightening torque M_A for Hexagon nut at version with taper shaft end	Hexagon nut M12x1,5: 30 Nm

Overview of materials

Component	**Material**	
	KP 1/. …/245 **KP 1/. …/486**	**KP 1/. …/492**
Housing	EN-GJS-600-3	1.4404
Flange cover	EN-GJS-400-15	1.4404
End cover	EN-GJS-400-15	1.4404
Bearing bush	SSiC	SSiC
Gear	1.2379 hardened, CVD-TiC-TiCN-TiN coated	1.4462, nickel-phosphorus coated
Radial shaft sealing ring	FKM	FKM
O-Ring	FKM	FKM

Permissible operation parameter

Permissible ambient temperature	$\vartheta_{u\,min}$ $\vartheta_{u\,max}$	-20°C +60°C
Medium temperature	$\vartheta_{m\,max}$	150°C
Speed	n	See “Viscosity, pressure, speed”
Operating pressure pressure side	p_{max}	See “Viscosity, pressure, speed”
Max. shaft torque	M	See “type code“
Operating pressure suction side	$p_{e\,min}$ $p_{e\,max}$	-0,4 bar (vacuum) 2 bar
Operating pressure suction side temporary (≤ 1s)	$p_{e\,max}$	5 bar
Permissible viskosity at max. permissible Medium temperature	ν_{min} ν_{max}	30 mm²/s 20000 mm²/s
Installation attitude		horizontal
Permissible medium at KP 1/. …/245; KP 1/. .../486		Polyol, Sodium Silicate, Isocyanate with abrasive components, mineral oils
Permissible medium at KP 1/. …/492		With 1.4404 compatible fluids

Viscosity, pressure, speed

KP 1/. …/245
KP 1/. .../486

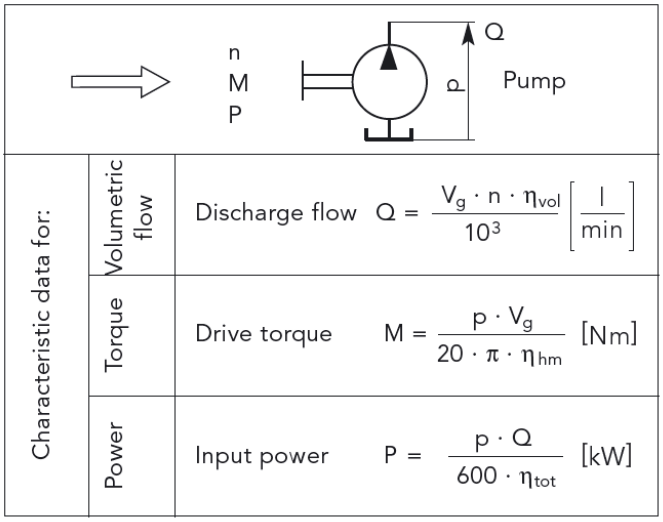
Viscosity ν [mm²/s]	30	100	300	1000	3000	6000	10000	20000
Speed n_{min} [rpm]	300	200	100	100	100	100	100	100
Speed n_{max} [rpm]	1500	1500	1500	1100	750	600	500	350
Pressure p at n_{min} [bar]	50	50	150	150	150	150	150	150
Pressure p at n_{max} [bar]	100	120	150	150	150	150	150	150
Added power by viskosity [kW / l/min]	-	-	0,003	0,009	0,017	0,023	0,027	0,034

Viscosity ν [mm²/s]	30	100	300	1000	3000	6000	10000	20000
Speed n_{min} [rpm]	500	250	250	150	100	100	100	100
Speed n_{max} [rpm]	1500	1500	1500	1100	750	600	500	350
Pressure p at n_{min} [bar]	20	30	60	80	80	80	80	80
Pressure p at n_{max} [bar]	40	80	120	120	120	120	120	120
Added power by viskosity [kW / l/min]	-	-	0,003	0,009	0,017	0,023	0,027	0,034

Calculation formulars for hydraulik pumps

Characteristic data, formula signs, units

Discharge flow / input flow	Q	rpm
Pump / motor displacement	V_g	cm³/r
Pressure	P	bar
Speed of rotation	N	rpm
Torque	M	Nm
Power	P	kW
Total efficiency	η_{tot}	-
Volumetric efficiency	η_{vol}	-
Hydr./mech.. Efficiency	η_{hm}	-
Flow velocity	V	m/s
Pipe diameter	d	mm



General

$Q_{th} = V_g \cdot n$, $\eta_{tot} = \eta_{vol} \cdot \eta_{hm}$

$M = 9549 \cdot \frac{P,}{N}$ $v = 21.22 \frac{Q}{d_2}$

Installation and Removal of the Pump

Corrosion Protection

All devices are inspected in the factory for their functionality with mineral hydraulic oil. Afterwards the connections are closed with a stopper only, so that the inner parts are **not** protected against corrosion for a long period

During transport and storage, the devices may not be exposed to any weather influences and significant temperature fluctuations, and they must be stored in dry conditions.

Should the devices be stored for a longer period of time, then they are to be treated in the interior and externally with a suitable corrosion protection oil. Furthermore, exposure of the device to moisture is to be prevented with an absorbent medium.

Appropriate corrosion-preventative measures are to be undertaken if high humidity or an aggressive atmosphere is anticipated during transport.

Preservatives used in preservation are to be examined for their compatibility with the materials and elastomers used.

Mechanical installation

Only pipelines and connections compatible with the anticipated operating pressure range can be used. The relevant manufacturer's specifications should be considered!

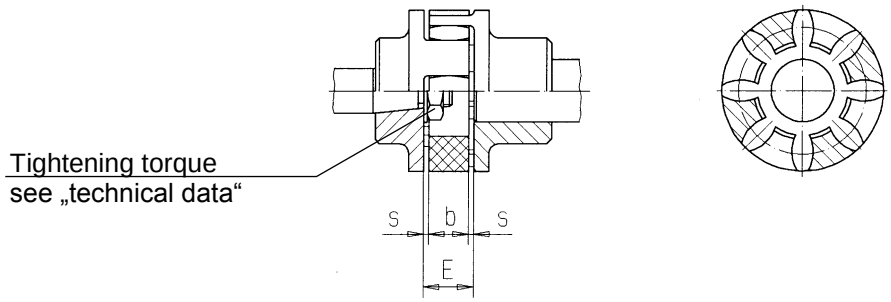
- Before installation the pump has to be checked for possible damage and contamination during transport.
- The corresponding coupling hub has to be mounted on the motor- and pump shaft.
  When installing the coupling, the hub should be heated up and slid onto the shaft in the heated condition.
- The shaft must not be struck during the mounting operation!

Each coupling hub has to be secured on the respective shaft against axial displacement by means of the threaded pin which presses on the adjusting spring!

Alignment of the coupling

When installing the coupling it has to be assured that the "E" dimension is precisely kept so that the coupling can move freely in the axial way during operation. In order that the elastic toothed rim is not exposed to pressure on its face, for axial movement, the dimension "E" is to be taken as a minimum.

Shaft separation "E"



Careful and exact alignment of the shafts prolongs the durability of the coupling!

Type of coupling		**24** 24/28	**28** 28/38	**38** 38/45	**42** 42/55
Separation dimensions*	E	18	20	24	26
Dimension*	s	2	2,5	3	3
max. axial movement*	ΔK_a	1,4	1,5	1,8	2,0
max. radial offset* n=1500 rpm	ΔK_r	0,22	0,25	0,28	0,32
max. angle offset n=1500 rpm	ΔK_w	0,9°	0,9°	1,0°	1,0°

* *Dimensions in mm*

The given permissible misalignment values for the couplings represent general guidelines which take the loading of the coupling into consideration up to the nominal torque TKN and an operating rpm n = 1500 as well as an ambient temperature of +30° C. For operating conditions outside these limits, the KRACHT GmbH should be consulted. The misalignment values are individually applicable, in the case of a simultaneous occurrence they should be applied proportionately.
The couplings can **either** take up a radial- **or** an angular misalignment.

An appropriate transfer of power between the pump and the drive is a prerequisite for smooth operation. In the event that no corresponding clutch is included in the scope of delivery of the pump, then the customer or operator assure an appropriate transfer of power between the pump and the drive. The following points are to be observed in any case.

Protective Housing

Rotating parts must be protected by the customer against unintentional contact!

The customer or operator must ensure that the clutch used is appropriately protected, e.g., against falling parts. The following points are to be observed in this regard:

Assembly Together with Additional Devices or Components

Assembly and maintenance may only be carried out by trained and qualified staff.

Mechanical Installation

- Before installation the pump has to be checked for transport damage and dirt.
- Any materials which have been applied for conservation purposes have to be removed before installation.

Installing the pump

- Before installing the pump clean the pipeline system, remove dirt, sand, swarf etc. Welded pipes, in particular, must be scoured or scavenged. Do not use cotton waste/rags for cleaning purposes.
- Couplings, Coupling halfs to be mounted at the drive, make sure that you don't strike the shaft end of the pump
- Mount the pump on the pump supports or foot.
- All screws to be fastened with the correct torque (see technical data), avoid draft of the pump
- Remove the protective stoppers in the pump's suction and pressure connections.

Determination of the direction of rotation

In order to ensure risk-free operation of the pump, it must be ensured that the pump is rotating in the correct direction. If the pump is installed the wrong way round, serious damage to persons and equipment can result.

Design of the Pressure and Suction Conduit

General Design of the Connections and Conduits

Only connections and conduits that are approved for the anticipated pressure area may be used. The regulations of the respective manufacturer must be observed!
The pipelines have to be connected absolutely stress-free to the pump supports.
All conduits are to be designed so that also during operation, no tensions can be transferred to the pump, for example as a result of length alterations due to temperature fluctuations.
It must be assured that all conduits and connections are sealed and no leakages can occur.
Damaged pipe and hose conduits are to be replaced immediately.

Sizing of the pressure line

The nominal size of the suction pipe has to be selected in a way that the flow speed does not exceed 3 ... 5 m/s.
The pump pressure should be checked by a gauge installed as close as possible to the pump connection.

Selection of the suction line

- Provision of the suction line should be carried out with great care, since the operational behaviour of the pump is greatly affected by this factor.
- The suction line should be as short and straight as possible. Recommended flow velocity in the suction line max. 1,5 m/s.
- Additional conduit resistances, such as molded parts, fittings, coolers or fine-meshed filters increase the conduit resistance of the suction conduit and are to be avoided.
- The depression in the suction line depends on the sum of all the resistances at the suction side and the suction head, taking account of the specific data to the medium in the line.

☞ The depression can be checked by installing a vacuum meter on the pump/suction connection.

The permissible pressure at the pump inlet must not fall below the mentioned value $p_{e\ min}$ in the "Technical data" section.

☞ The nominal diameter of the suction line can be chosen to be considerably larger than that of the pump connection.

⚠ **The permissible pressure at the pump inlet must not fall below the mentioned value $p_{e\ min}$ in the "Technical data" section. In case of falling below the permissible values, the result would be a reduction of the delivery volume (due to the reduced filling of the pump), a higher sound level and cavitation.**

If hosing is used on the suction side of the pump, then it must be of adequate stability such that the hose does not deform and constrict the flow under the suction effect. The media-specific chacateristics must be taken into consideration.

☞ The provision of a funnel-shaped suction opening or an oblique intersection at the end of the suction pipe are recommended for increasing the cross-section on the suction side

⚠ **The pressure at the pump inlet must not exceed the $p_{e\ max}$ values specified in the "Technical Data" chapter, as this would result in unacceptable heating. There is also a risk of damage to the pump and shaft seal.**

In laying the suction conduit into the medium container, proper suction must be observed and the distances to the floor and the container walls must be sufficiently large. The suction opening must demonstrate an adequate distance to the deepest fluid level.

Connect the pipelines

- Connect the pipelines of both suction and pressure side of the pump and pay attention to the instructions of the relevant manufacturer.
- When installing it has to be assured that no sealing material an enter the pipeline. Sealing materials such as hemp and mastic are not permissible since they an lead to contamination and hence to operating failures.

Filling the fluid container

⚠ **The best possible cleanliness has to be assured when filling the fluid container!**

- Clean filler plugs and caps on fluid transport and storage containers before opening. Check fluid containers and clean if necessary. The filter gauze on filling tubes and filter inserts on fitted filters must not be removed under any circumstances.

- Check fluid containers and clean if necessary. The filter gauze on filling tubes and filter inserts on fitted filters must not be removed under any circumstances.
- Fill the medium container with the prescribed fluid.
- Attention should be paid to adequate filling of the fluid container!

Pump removal

During all work the best possible cleanliness should be assured. Before loosening screwed connections, the external surrounding should be cleaned.

During all work at the pump and before the removal, the connection lines have to be depressurised and the motor isolated!
In addition, precautions must be taken to ensure that the motor can not run-up during work on the pump.

- Remove the depressurised pipelines from the pump.

Leakages of dangerous media must be collected and disposed of in such a way that no danger results to personnel or the environment. The statutory regulations have to be observed.

- Secure the pump connections and pipelines against the ingress of dirt.

Commissioning

The commissioning is only to be carried out by appropriately trained and qualified personnel.

Before starting-up a plant it has to be ensured that an adequate quantity of the operating medium is available in order to avoid dry-run.

The pumps are only designed for running in the direction of rotation indicated by the arrow resp. indicated by the symbol on the type label.

Before start up the pump has to be filled with the fluid medium. Function-related leaks on the shaft seals must be taken into consideration by the customer or the plant operator.

- Check the permissible operating values against the anticipated operating conditions.
- Check all fixing bolts on the pump.
- Check the direction of rotation.
- The pumps should be started up at either very low or zero pressure loading. The existing shut-off devices should be fully opened and the pressure relief valve, installed in the pressure line, should be adjusted to the lowest opening pressure setting.

The start-up is achieved by repeated rapid switching on and off of the drive motor (inching mode) without reaching the full rpm, until it is apparent that the pump is operating satisfactorily. The satisfactory operation being detectable either from manometer reading, or from the noise generated by the pump, and being achieved over a period of not longer than 30 seconds.

This particularly applies when a cold pump must be started-up with a fluid medium that has already been warmed, in order to achieve a slow heating up of the pump and to prevent jamming of the pump due to heat shock. After switching on the motor, it is then allowed to run for a few minutes, under zero or low pressure. The pressure loading can then be increased in stages until the desired operating pressure is reached.

- On attaining the required operating values, the temperature of the medium and of the pump should be checked. The control points on the pump are the shaft bearing positions and the shaft seals. The temperatures reached on the surface of the pump housing should be approx. 20°C above the temperature of the medium.

- After several hours of running, the final operating temperature should be checked (for maximum permissible temperatures see section "Technical data").

If the max. measured surface temperature is more than 20°C above the medium input temperature, the operating conditions must be checked and the manufacturer consulted if necessary.

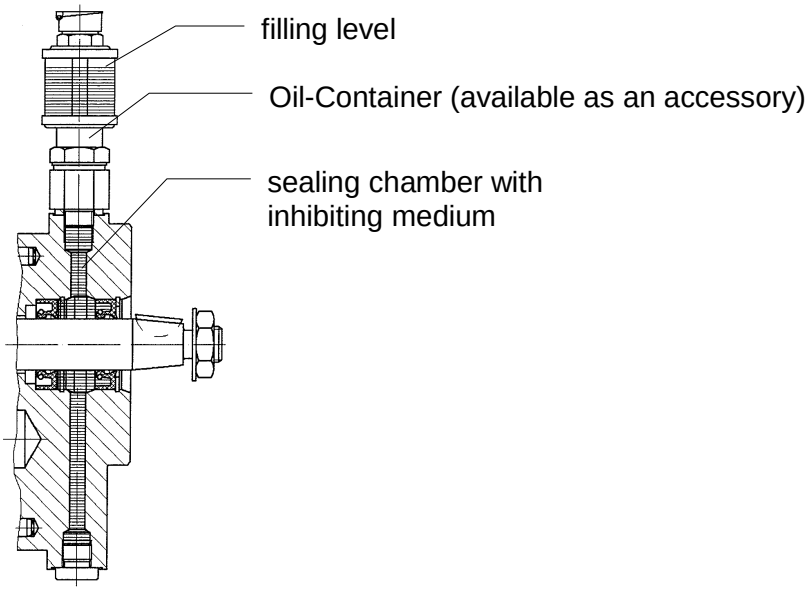
The volumetric efficiency of the pump is among other things dependent on the rotational speed, the pressure and the viscosity. During standard operation the volumetric efficiency at start up should be between 75 ... 98 %. In case it's not, the machine needs to be stopped immediately and the reason needs to be determined. This is necessary as otherwise a sufficient heat dissipation can not be guaranteed

Radial shaft seals

Before first commissioning the sealing chamber (see Fig.) has to be filled with a suitable inhibiting medium (flash point > 150°C).

This is necessary in order to prevent the sealing from running dry. This would result in early wear of the sealing and an impermissible rise in temperature.

Before commissioning the sealing chamber has to be filled with inhibiting medium. The minimum and maximum filling levels must be ensured by suitable technical and/or organisational means.



Maintenance

Regular maintenance is essential for safe operation of equipment in areas at risk from explosion. The scope of the maintenance and the maintenance intervals must be adapted to the requirements of the individual case. The first check has to take place directly after commissioning. At the start, further maintenance should be carried out at weekly intervals.

When it is certain that there will be no more changes in the operating behaviour of the pump, the maintenance intervals can be prolonged.

Assuming correct installation in accordance with the conditions of use and correct operation, KRACHT process gear pumps are of such a construction that a long and trouble-free operational life should be obtained. They only require a minimum of maintenance which, however, is necessary for reliable operation, since experience has shown that a high percentage of the failures and damages which can occur are attributable to the ingress of dirt and inadequate maintenance. The extent of servicing required and the service and inspection intervals are, in general, laid down by the manufacturer in an appropriate plan.

A regular check-up of all operating data as there are pressure, temperature, current consumption, degree of filter contamination etc. contributes to the early detection of potential failures.

The best possible cleanliness should be ensured during all work. Before loosening screwed connections, the surrounding areas are to be cleaned. All openings are to be sealed with protective covers so that there is no ingress of dirt into the system.

Unusual noises

The first sign of certain types of damage is unusual noise. If the operating sound of the pump changes (e.g. because of bearing damage or wear on the tooth flanks), the exact cause must be determined without fail.

Static seals

The static seals at the joints of the pump have to be checked for leakage at the beginning of the shift. If leaks are seen, the equipment must be decommissioned immediately.

Radial shaft seals

Because of their function, the radial shaft seals are particularly subject to wear and must accordlingly be checked very carefully. Even slight leakages are not permissible with regard to the function of the shaft sealing rings. If leakage is more serious, the radial shaft seals have to be renewed. However, the amount of permissible leakage depends on the conditions of use of the pump and cannot be quanitified. If there is excessive leakage, the equipment must be decommissioned immediately. The check / test should be made weekly at the beinning..

Level of sealing medium

If the pump is to operate safely, it is absolutely vital to check the level of the sealing medium. The medium must be topped up if necessary.

If the levels are not monitored automatically, they must be checked at the least at the start of every shift.

If the level falls unusually rapidly within a short time, the outer or inner shaft sealing may be leaking. The sealing medium then escapes into the coupling space or is sucked into the pump and mixes with the medium.

If the level rises, the inner shaft sealing is probably leaking and the sealing medium is mixed with the pressure medium.

In both cases the equipment must be brought to an immediate standstill.

Screw connections

All screw connections must be regularly checked for security. Loose connections must be tightened and be secured with Loctite (medium strength), if necessary. Checking must be carried out every week.

Coupling

Couplings of a different supplier need to be mantained as per their own operating and maintenance instructions

Damage

The pump and its environment have to be checked for damage at the start of each shift, for example for dents in the coupling cover.

Surface temperatures

In order to prevent premature wear or overload of the pump, the temperatures on the surface of the pump have to be checked each week. On no account may the temperatures be higher (max. 20°C) than the temperature of the medium at the pump inlet. If this is not the case, wear or damage to the bearings could be the cause. If so, the pump must be replaced.

Sonstige Wartungsarbeiten

The condition of a pump may be recognised by its volumetric efficiency. If the efficiency falls, the cause is generally wear. When maintenance work is carried out, therefore, all operating data such as throughput, pressure, temperature, motor data, dirt of filter, should be checked.

If there are greater deviations from the set data (>10%), more detailled examination is necessary. Premature failure of the pump can be recognised early by these means.

Repairs

Elimination of damages

The repair is made at on-site by replacing the defective pump.
The repair can only be made by the manufacturer. In realation to this it's very important to investigate the reason of the damage

Repairs may only be made by the manufacturer

Error diagnostics

Lack of adequate sealing is a frequent source of failure. If this occurs at the pipeline connections, it may be eliminated by simply tightening the screwed fittings.

Return of pumps

In case of a repair or check in the manufacturer's plant, the device has to be packed appropriately. Furthermore, a safety data sheet of the used medium has to be added to the device.
For hardening or sticking media the device has to be cleaned before being returned to Kracht.

Failure and their reason

The following list gives the causes of errors which are most frequently encountered during operational failures together with an indication of the problem areas to be rectified.
In the event of the occurrence of an errors which can not be identified, please ask for assistance from KRACHT GmbH.

Error	Possible cause	
Increased sound	Pump cavitation	• Suction level too high • built-on suction filters need to be removed • Internal diameter of the suction line too small • Suction line too long • Too many curves in the suction line • Too many local constrictions in the suction line • Suction line blocked or not sealed • Viscosity too high, speed too high • Temperature too low
	Formation of foam or air inclusion in the medium	• Suction line not sealed • Fluid reservoir level too low • Tank return line not sealed • Incorrect container layout • Lack of sealing, suction side or shaft seal • Return line ends above level of fluid in reservoir • Inadequate venting
	Mechanical vibrations	• Faulty aligned or loose coupling • Faulty or inadequate pipeline fixing • Flittering pressure relief valve • Construction not noise-optimised (lack of damping elements) • Unfavourable installation location of the pump • Pump worn out, tooth flank wear
Pump does not suck		• Fluid reservoir level too low • Wrong direction of rotation • Throttling element in the suction line • Contaminant in the suction line • Volume of the pressure line between pump and check valve too small, pump can not compress the air in the suction line into the pressure line • Check valve in the pressure line not vented

Error	Possible cause	
Insufficient supply flow		• Throttling element in the suction line • Fluid reservoir level too low • Viscosity too low • Rpm too high • Pressure too high • Pressure relief valve set too low • Pump sucks air • Pump worn out
Insufficient pressure	Supply flow too low	• Viscosity too low • Pressure relief valve set too low or does not lock • Rpm too low • Drive power too low
	Pressure drop of the pressure line too low	• Pump worn out
Power consumption too high		• Pressure too high • Viscosity too high • Drive power too low • Motor winding defective
Operating temperature too high		• Insufficient cooling and heating dissipation • Fluid supply too low • Fluid conveyed under load into the reservoir via pressure relief valve
Leakage at the shaft sealing		• Inlet pressure above permissible value • Wrong direction of rotation • Shat radial load too high • Seal wear • Seal temperature too high
Coupling wear		• Faulty aligned or loose coupling • Inadequate axial play in coupling • Coupling overloaded • Temperature too high