



Original Operating Manual GH/GV High-Pressure Centrifugal Pump

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Contents

1	GEN	ERAL	5
1	1.1	About this operating manual	5
1	1.2	Target groups	5
1	1.3	Other valid documents	5
1	.4	Warning notices and symbols	6
1	1.5	Copyright/changes	6
2	SAF	ETY	7
2	2.1	Correct and proper use	7
2	2.2	General safety instructions	8
	2.2.1	Product safety	8
	2.2.2	Duties of the system owner	8
	2.2.3	Duties of personnel	9
2	2.3	Dangers of non-observance of the safety instructions	10
2	2.4	Unauthorized conversion and production of spare parts	10
2	2.5	Unauthorized modes of operation	10
2	2.6	Special hazards	10
	2.6.1	Explosion area	10
	2.6.2	Phazardous pumping media	10
	2.6.3	Noise emissions	10
3	LAY	OUT AND FUNCTION	12
3	LAY 3.1	OUT AND FUNCTION	12 12
3 3	LAY 3.1 3.2	OUT AND FUNCTION Labeling Scope of delivery for a type-GH/GV high-pressure centrifugal pump	12 12 12
3 3 3	LAY 3.1 3.2 3.3	OUT AND FUNCTION Labeling Scope of delivery for a type-GH/GV high-pressure centrifugal pump General information	12 12 12 12
3	LAY 3.1 3.2 3.3 3.4	OUT AND FUNCTION Labeling Scope of delivery for a type-GH/GV high-pressure centrifugal pump General information Technical data	12 12 12 12 13
3	LAY 3.1 3.2 3.3 3.4 3.5	OUT AND FUNCTION Labeling Scope of delivery for a type-GH/GV high-pressure centrifugal pump General information Technical data Operating point	12 12 12 12 13 13
3	LAY 3.1 3.2 3.3 3.4 3.5 3.6	OUT AND FUNCTION Labeling Scope of delivery for a type-GH/GV high-pressure centrifugal pump General information Technical data Operating point Minimum output rates	12 12 12 13 13 13
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point. Minimum output rates Functional and operating elements	12 12 12 13 13 13 13
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point. Minimum output rates Functional and operating elements	12 12 12 13 13 13 13 14 14
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 1.1	OUT AND FUNCTION Labeling Scope of delivery for a type-GH/GV high-pressure centrifugal pump General information Technical data Operating point Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE Transport	12 12 12 13 13 13 14 16
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point. Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE. Transport. Unpacking and checking the delivery condition	12 12 12 13 13 13 14 16 16
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1 4.1.1 4.1.2	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE Transport Unpacking and checking the delivery condition	12 12 12 12 13 13 13 14 16 16 16
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1 4.1.2 4.2	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE Transport Unpacking and checking the delivery condition Lifting. Intermediate storage	12 12 12 13 13 13 14 16 16 16 17
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1 4.1.2 4.2 4.3	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE Transport Unpacking and checking the delivery condition Lifting. Intermediate storage Storage.	12 12 12 13 13 13 13 14 16 16 16 17 17
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1 4.1.2 4.1.2 4.3 4.4	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point. Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE Transport. Unpacking and checking the delivery condition Lifting. Intermediate storage Storage. Disposal	12 12 12 13 13 13 13 14 16 16 16 17 17 18
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1 4.1.2 4.1.2 4.3 4.4 ASS	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE Transport. Unpacking and checking the delivery condition Lifting. Intermediate storage Storage. Disposal	12 12 12 13 13 13 13 13 13 13 13 14 16 16 17 17 17 17
3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3 3	LAY 3.1 3.2 3.3 3.4 3.5 3.6 3.7 TRA 4.1.1 4.1.2 4.2 4.3 4.3 4.4 S.1.1	OUT AND FUNCTION Labeling. Scope of delivery for a type-GH/GV high-pressure centrifugal pump. General information Technical data Operating point. Minimum output rates Functional and operating elements NSPORT AND INTERMEDIATE STORAGE. Transport. Unpacking and checking the delivery condition Lifting. Intermediate storage Storage. Disposal EMBLY AND INSTALLATION Preparing the installation location	12 12 12 13 13 13 13 13 14 16 16 16 17 17 17 18 19



	5.2	Installation	19
	5.2.1	Installing the pump	19
	5.2.2	Assembling the motor	
	5.2.3	Fine alignment of the coupling	21
	5.2.4	Electrical connection	22
	5.3	Pipelines	22
6	CON	IMISSIONING / DECOMMISSIONING	25
	6.1	Commissioning	25
	6.1.1	Determining the pump configuration	25
	6.1.2	Filling the pump	25
	6.1.3	Checking direction of rotation	25
	6.1.4	Starting the pump	
	6.2	Decommissioning	27
	6.2.1	Draining the pump and protecting against frost	
	6.3	Recommissioning	
	6.4	Shaft seal	29
	6.4.1	Mechanical seal	29
	6.4.2	Gland packing	29
7	MAI	TENANCE AND REPAIR	
	7.1	General information	
	7.2	Servicing the electric motors	31
	7.3	Operational monitoring	31
	7.4	Gland packing maintenance	
	7.5	Sending the pump to the manufacturer	
8	FAU	LTS AND TROUBLESHOOTING	35
9	APP	ENDIX	
	9.1	Spare parts list for constant operation over two years as per DIN 24296	
	9.2	Cross-sections	
	9.3	Declaration of Conformity as per EC Directive 2006/42/EC, Annex IIA	45
	9.4	Clearance Certificate	



List of Tables

Table 1: Target groups and their tasks	5
Table 2: Other valid documents and their purposes Image: Comparison of the second	5
Table 3: Warning notices and consequences of non-observance	6
Table 4: Symbols and their meanings	6
Table 5: Sound pressure level	.11
Table 6: Minimum output rates with closed shut-off valve	.13
Table 7: Maximum authorized operating temperature and pressure at the shaft seal	.14
Table 8: Maximum authorized operating temperature and pressure on the casing	.15
Table 9: Settings for the time relay when using three-phase motors with star-delta switch	.22
Table 10: Measures in the event of operational interruption	.27
Table 11: Measures depending on the behavior of the pumping medium	.27
Table 12: Measures following longer shut down times	.28
Table 13: Stuffing box in the GH	.33
Table 14: Stuffing box in the GV	.33
Table 15: Measures for return	.34
Table 16: Fault/number allocation	.35
Table 17: Troubleshooting table	.37
Table 18: Spare parts for constant operation over two years	.38
Table 19: GH parts list	.41
Table 20: GV parts list	.44



List of Images

Figure 1: Model code	12
Figure 2: Scope of delivery for a GH pump with free shaft	12
Figure 3: Scope of delivery for a GH pump as a complete unit	12
Figure 4: Gland packing	14
Figure 5: Mechanical seal	14
Figure 6: Lifting a GH centrifugal pump (unit)	16
Figure 7: Lifting a GH centrifugal pump (free shaft end)	16
Figure 8: Lifting a GV centrifugal pump	17
Figure 9: Mounting material for complete units	20
Figure 10: Mounting material for pump with open shaft end	20
Figure 11: Positional alignment of the shafts	21
Figure 12: Directional alignment of the shafts	21
Figure 13: Functional and operating elements	23
Figure 14: Stuffing box on the GH/GV	32
Figure 15: Cross-section of GH with mechanical seal	39
Figure 16: Cross-section of GH with gland packing	40
Figure 17: Cross-section of GV with mechanical seal	42
Figure 18: Cross-section of GV with gland packing	43



1 General

1.1 About this operating manual

This operating manual contains important instructions that must be observed during installation, operation and maintenance. For this reason, ensure that it is read by specialist personnel and the responsible operator/owner prior to assembly and commissioning. The manual must be available at all times at the location where the system is used.

Please observe the safety instructions described in this operating manual, along with the relevant national accident prevention regulations and any internal work, operational and safety specifications of the operator. We assume no liability for damages and operational interruptions resulting from non-observance of this operating manual.



Pay particular attention to section 2 "Safety instructions" during commissioning and all maintenance work.

Section 2 also provides an explanation of the symbols used in this manual. Knowledge of this operating manual is essential to preventing errors and ensuring safe and uninterrupted operation.

The operating specification does not take local safety regulations into account. The owner bears full responsibility for compliance with these, including on the part of the assembly personnel used.

This operating manual:

- is part of the pump
- is valid for all type series mentioned
- describes safe and proper use in all phases of operation

1.2 Target groups

Target group	Task		
System owner	Ensure that this manual is available at the location where the system is used, including for later reference.		
	► Ensure that personnel read and observe this operating manual and the other valid documents, in particular the safety and warning information.		
	 Observe additional system-related regula- tions and specifications. 		
Specialist personnel, assembly staff	Read, observe and follow this operating manual and the other valid documents, in par- ticular the safety and warning information.		

Table 1: Target groups and their tasks

1.3 Other valid documents

Document	Purpose	
Installation diagram	Installation dimensions, connection dimensions, etc.	
Spare parts list	Ordering spare parts	
Clearance certificate	Returning the pump	
Declaration of conformity	Conformity with standards, content of the declaration of conformity	

Table 2: Other valid documents and their purposes



1.4 Warning notices and symbols

Warning notice	Hazard level	Consequenc- es of non- observance
	Immediate hazard	Death, severe physical injury
	Potential hazard	Death, severe physical injury
	Potentially dangerous situation	Minor physical injury
NOTICE	Potentially dangerous situation	Material dam- age

 Table 3: Warning notices and consequences of non-observance

Symbol	Meaning	
	Safety sign	
\triangle	 Follow all instructions identified with safety signs in order to avoid death or injuries. 	
•	Instruction	
1. , 2. ,	Instruction with multiple steps	
\checkmark	Condition	
\rightarrow	Reference	
Î	Information, note	

Table 4: Symbols and their meanings

1.5 Copyright/changes

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2 Safety

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The manufacturer shall not bear any liability for damages caused as a result of nonobservance of this documentation.

2.1 Correct and proper use

- Only use this pump for the purposes of conveying the agreed pumping media.
- Comply with operating limits.
- The water may not contain any abrasive or long-fibered components that may damage the pump materials. Consult the manufacturer if using other media.
- Ensure that the pump is only commissioned with pumping medium and is not operated without it.
- Open the suction-side fitting, and do not use it to control the flow rate.
- To avoid damaging the motor, observe the permitted number of times per hour that the motor can be switched on (→ Manufacturer information).
- Any other use must be agreed with the manufacturer.
- The temperature of the pumping medium must not exceed 90 °C.

Avoiding obvious misuse (examples)

• Observe the operating limits of the pump for temperature, pressure, flow rate and speed.

The main areas of use are:

- Pressure boosting systems, heating systems, hot and cold water circulation, water supply systems, power stations, filtering systems, filling and emptying of tanks, water circulation in pools and sprinkler systems
- Fresh water, drinking water, boiler feed water, process water, sea and brackish water, hot water, condensate and many media without aggressive components that do not chemically corrode the materials used in the pump

Do not operate the pump without water. Dry running can lead to damage to the pump.

Any use that goes beyond the purposes described above shall be considered improper use. OSNA shall bear no liability for any resulting damages. The owner bears full risk for improper use.



2.2 General safety instructions

Please observe the following specifications before performing any activities.

2.2.1 Product safety

This pump is constructed according to the latest state of the art and accepted safety rules. Nevertheless, risks to life and limb for the user or third parties are still possible when using the pump, as are impairments to the pump and other material assets.

- Only use the pump in a technically perfect state and for the intended purpose. Ensure compliance with this operating manual and be aware of the hazards and safety issues during operation.
- Keep this operating manual and all other valid documents in a complete and legible state, and store in a location that is accessible at all times to personnel.
- Do not permit any activity that endangers personnel or uninvolved third parties.
- In the event of a safety-relevant fault, stop the pump immediately and have the fault rectified by responsible personnel.
- In addition to this documentation, ensure compliance with the statutory or other regulations for safety and accident prevention, as well as the relevant standards and specifications of the respective country.
- Do not remove any technical stickers.

2.2.2 Duties of the system owner

Safety-conscious work

Observe the safety specifications detailed in this operating manual, along with the occupational safety regulations and all additional internal safety regulations.

- Only use the pump in a technically perfect state and for the intended purpose. Ensure compliance with this operating manual and be aware of the hazards and safety issues during operation.
- Ensure compliance and monitoring:
 - correct and proper use
 - statutory or other safety and accident prevention regulations
 - safety specifications for handling hazardous substances
- Provide personal protective equipment.
- Do not remove contact protection during operation.
- Prevent any dangers from electrical energy (for details, please refer to the specifications of the VDE and the local energy supplier).
- Switch off the motor during all assembly and maintenance works, and secure against reactivation.
- Only work on the system when the pump is at a standstill.



Personnel qualification

The owner of the system must ensure that the personnel tasked with working on the pump have read and understood this operating manual and all other valid documents before beginning work, in particular information on safety, maintenance and repair.

Work of any kind on the machine may only be performed when it has been completely decommissioned. Reinstall and reactivate all safety mechanisms after work. Before restarting the machine, ensure that all necessary commissioning steps have been completed (→ Fehler! Verweisquelle konnte nicht gefunden werden. Fehler! Verweisquelle konnte nicht gefunden werden., pg Fehler! Textmarke nicht definiert.).

- Determine responsibilities, tasks and monitoring for personnel.
- Only allow work of any kind to be performed by specialist technical personnel:
 - assembly, maintenance and repair work
 - work on the electrical systems
- Only allow personnel undergoing training to perform work on the pump under the supervision of specialist technical personnel.

Safety mechanisms

- Provide the following safety mechanisms and ensure that they function correctly:
 - for moving components: contact protection for the pump, installed by the customer
 - for potential electrostatic charges: provide appropriate earthing

Guarantee

- Please consult the manufacturer before carrying out any conversions, repairs or changes during the guarantee period.
- Only use original parts or parts approved by the manufacturer.

2.2.3 Duties of personnel

- Observe the information on the pump and ensure it is legible (e.g. direction of rotation arrow, fluid connection indicators).
- Do not remove the contact protection for moving parts during operation.
- Use personal protective equipment if necessary.
- Only work on the system when the pump is at a standstill.
- Switch off the motor during all assembly and maintenance works, and secure against reactivation.
- Reinstall the safety mechanisms after working on the pump according to specifications.



2.3 Dangers of non-observance of the safety instructions

- Non-observance of the safety instructions can lead to hazards to personnel, the machine and the environment.
- Non-observance of the safety instructions can also lead to the loss of any damage claims.
- In particular, non-observance can lead to the following dangers:
 - failure of important system functions
 - electrical and mechanical hazards to personnel

2.4 Unauthorized conversion and production of spare parts

Conversions or changes to the machine are only permitted following consultation with the manufacturer. Original spare parts and accessories authorized by the manufacturer help ensure safety. The manufacturer bears no liability for the consequences of the use of other parts.

2.5 Unauthorized modes of operation

The operational safety of the machine is only guaranteed when it is used for the intended purpose according to the operating manual (\rightarrow 2.1 Correct and proper use, pg 7).

Never exceed the limit values indicated in the technical data (\rightarrow Data sheet).

2.6 Special hazards

2.6.1 Explosion area

• Do not use the pump in areas where there is a risk of explosion.

2.6.2 Hazardous pumping media

- Observe the safety regulations for handling hazardous substances (e.g. toxic, hazardous to health).
- Use personal protective equipment when performing work on the pump.

2.6.3 Noise emissions

Conditions for measurement:

- Distance to pumping unit: 1 m
- Operation: Free of cavitation
- Motor: IEC standard motor
- Tolerance: ± 3 dB(A)



Drive power in	Noise emissions in dB(A)		
kW	1450 min ⁻¹	2900 min ⁻¹	
0.75	50	58	
1.1	53	62	
1.5	55	62	
2.2	56	63	
3.0	58	65	
4.0	60	66	
5.5	64	70	
7.5	65	71	
11.0	68	73	
15.0	69	74	
18.5	69	74	
22.0	70	75	
30.0	71	75	
37.0	72	76	
45.0	73	77	
55.0	73	79	
75.0	74	81	
90.0	74	82	
110.0	75	83	
132.0	76	84	
Greater power upon request			

Table 5: Sound pressure level

Low-noise motors can be provided if the expected noise values exceed the permitted limits.



3 Layout and function

brands, please ensure that the motors have the following drive torques as a multiple of the nominal torque.

3.1 Labeling

This operating manual applies to the GH/GV type series.

Model code:



Figure 1: Model code

3.2 Scope of delivery for a type-GH/GV high-pressure centrifugal pump

The customer can order the pump:

- with a free shaft, i.e. delivery without motor or foundation (→ Figure 2, pg 12)
- as a complete unit, i.e. fully assembled on a baseplate with drive motor, coupling and coupling guard (→ Figure 3, pg 12)
 - 1 Pump
 - 2 Drive motor
 - 3 Baseplate
 - 4 Coupling
 - 5 Coupling guard

The scope of delivery corresponds to the scope indicated in the order. Please check that the delivery is complete upon receipt. Notify the delivery company of any transport damage immediately. Please also refer to our conditions of sale and delivery. If using other motor



Figure 2: Scope of delivery for a GH pump with free shaft



Figure 3: Scope of delivery for a GH pump as a complete unit

3.3 General information

The GH/GV is a non self-priming, multistage, high-pressure centrifugal pump in horizontal (GH) and vertical (GV) configuration. These models have proven themselves thanks to their quiet running and long service lives. The suction and discharge nozzles can be produced variably at different stages of 90°.

Depending on requirements, the GH/GV pumps are fitted with either gland packing or mechanical seals (cooled version also available).

The horizontal configuration uses lubricated anti-friction bearings, whilst the vertical configuration uses both a lubricated anti-friction bearing and a liquid-lubricated plain bearing.

Depending on the demands of the pumping medium or customer requirements, it is also possible to use materials such as gray cast iron, spheroidal graphite iron, cast steel, bronze or stainless steel (also Duplex and Super Duplex).



The pumps are driven via standard IEC electronic motors. The horizontal pumps can also be driven by combustion motors or turbines. The drive is on the discharge side in the standard configuration. Drive on the suction side or on both sides is possible upon request.

The pump can be delivered as a complete unit (assembled on baseplate with drive motor, coupling and coupling guard), or with a free shaft end.

3.4 Technical data

Main parameters:

Output:	Up to 550 m ³ /h
Oulpul.	00 10 000 11 /11

Delivery head: See table

Speed:

n= 950, 1450 and 2900 rpm (at 50 Hz) n= 1150, 1750 and 3500 rpm (at 60 Hz)

Diesel and hydraulic motor with special speed limited to max. 3500 rpm.

Ambient temperature:	Max.	40	°C

Medium temperature: See table

Continuous sound pressure level: 70 dBA

Flange:

Suction nozzle: From DN 50 to DN 200, PN 40

Discharge	
nozzle:	From DN 32 to DN 150, PN 40
	BS and ANSI flanges possible

Drive unit:

- GH: 50 and 60 Hz electric motor, diesel motor or turbine
- GV: Electric motor with IEC flange, V1 configuration or hydraulic motor with special flange

3.5 Operating point

In order to reach the required operating point, it may be necessary to fit the pump with two different sizes of impeller blade. For this reason, please provide the impeller blade diameter or position on the shaft when ordering spare parts (1st, 2nd impeller, etc., beginning at the suction side of the pump).

Please always indicate the pump type and order number when ordering spare parts, or in the event of any queries.

3.6 Minimum output rates

Pump temperature range	Minimum output rate at design point
–10 to +100 °C	15% of Qopt
+100 to +140°C	20% of Qopt

Table 6: Minimum output rates with closed shut-off valve



3.7 Functional and operating elements

Shaft wearing sleeve:

Shaft wearing sleeve	GH	GV
Uncooled gland packing	Up to 110 °C	Up to 100 °C
Cooled gland packing (cooling units)	From 110 °C to 160 °C	-
Uncooled mechanical seal	Up to 120 °C	Up to 120 °C
Cooled mechanical seal	Up to 160 °C	-

Table 7: Maximum authorized operating temperature and pressure at the shaft seal

The pumps can be fitted with gland packing or mechanical seal as required.

Gland packing consists of a number of compression-molded rings in a stuffing box. Gland packings can be adjusted by hand with tools.



Figure 4: Gland packing

Mechanical seals are mechanical shaft seals with internal flushing of the rotating seal rings (self-adjusting).

Casings:

Max. operating temperature and pressure:



Figure 5: Mechanical seal

The technical dry running properties of gland packing and mechanical seals are extremely limited. For this reason, avoid dry running. Ensure that the pump is vented before commissioning.



		Max.	Max.
Туре	Casing material	temperature	pump pressure
		(°C)	(bar)
GH 32-2	Gray cast iron	110	30
	Cast iron with spheroidal graphite	130	40
	Bronze	160	20
	Stainless steel	160	40
GH 40-2	Gray cast iron	110	30
GH 50-2	Cast iron with spheroidal graphite	130	40
GH 65-2	Bronze	160	20
	Stainless steel	160	40
	Cast steel	160	40
GH 50-4	Gray cast iron	110	25
GH 65-4	Cast iron with spheroidal graphite	130	40
GH 80 / 100 / 125 / 150	Bronze	160	20
	Stainless steel	160	40
	Cast steel	160	40
GV 32 / 40 / 50 / 65	Gray cast iron	110	20
80 / 100 / 125 / 150	Cast iron with spheroidal graphite	120	20
	Bronze	120	20

Table 8: Maximum authorized operating temperature and pressure on the casing



4 Transport and intermediate storage

4.1 Transport

Weight information (→ Other valid documents)

4.1.1 Unpacking and checking the delivery condition

- 1. Check that the delivery is complete upon receipt.
- 2. Unpack the pump/unit upon delivery and check for transport damage.
- 3. Notify the delivery company of any transport damage immediately.
- 4. Dispose of the packaging material in line with the applicable local regulations.



Risk of death or crushed limbs from falling transported goods!

- Choose lifting equipment that is suitable for the total weight to be transported.
- ► Do not stand under suspended loads.



Figure 6: Lifting a GH centrifugal pump (unit)

4.1.2 Lifting

Transport the pumps carefully and secure them to prevent damage. If using a horizontal pump, transport the entire unit using ropes as shown in Figure 6 (pg 16) (do not secure the ropes on the motor eyelets). Transport vertical pumps as shown in Figure 8 (pg 17).



Figure 7: Lifting a GH centrifugal pump (free shaft end)





Figure 8: Lifting a GV centrifugal pump

4.2 Intermediate storage

Ensure during intermediate storage that the pump is not exposed to any weather conditions for a long period of time. If the pump is decommissioned for a longer period of time (approximately 2 to 3 months), ensure that it is fully drained. (\rightarrow 6.2 Decommissioning, pg 27)

4.3 Storage

NOTICE

Material damage due to incorrect storage!

• Ensure that the pump is correctly stored.

- 1. Close all openings with blank flanges, blind plugs or plastic covers.
- 2. Ensure that the storage area meets the following conditions:
 - dry
 - free of frost
 - free of vibrations
- 3. Rotate the shaft once per month by several rotations.

NOTICE

Damage to bearings due to high water pressure or splashing water!

Do not use water jets or steam jet cleaners to clean the bearing areas and motor.

NOTICE

Damage to seals due to incorrect cleaning agent!

- Ensure that the cleaning agent does not corrode the seals.
 - 1. Choose the cleaning agent according to the area of use.
 - 2. Dispose of preservatives in line with the applicable local regulations.



- 3. When storing for longer than 6 months:
 - Check all elastomers (round seals, shaft seal rings, gaskets and gland packing) for elasticity, and replace if necessary.

4.4 Disposal

Plastic parts may be contaminated by toxic or radioactive pumping media. If this is the case, cleaning is not sufficient.



Risk of poisoning and environmental damage from pumping medium!

- ► Use personal protective equipment when performing work on the pump.
- Before disposing of the pump:
 - Collect any remaining pumping medium in the pump, and dispose of it in line with the locally valid regulations.
 - Neutralize any pumping medium residues in the pump.
- Dispose of the pump in line with the applicable local regulations.



5 Assembly and Installation

NOTICE

Material damage due to contamination!

Only remove covers, transport caps and sealing caps immediately before connecting the pump to the pipelines.

Ensure compliance with all safety specifications during installation and operation.

1. Please consult the manufacturer when installing at altitudes over 1000 m above mean sea level.

5.1.1 Preparing the installation location

- Ensure that the installation location meets the following conditions:
 - pump is freely accessible from all sides
 - sufficient space for installing/removing piping, as well as for maintenance and

repair work, in particular for installing/removing the pump and motor

- no effects from external vibrations on the pump (bearing damage)
- protection against frost

5.1.2 Preparing the base surface and foundations

- ► Ensure that the base surface and foundations meet the following conditions:
 - level
 - clean (no oils, dust or other contaminations)
 - foundations can support the weight of the pump unit and all operating forces
 - stability of the pump unit ensured

5.2 Installation

5.2.1 Installing the pump

Prior to installation, remove the packaging (if present) and check the pump for any transport damage. Ensure that the installation area is dry and free of frost.

Do not operate the pump in areas where there is a risk of explosion. Ensure that the pump is installed and connected in line with the local regulations.



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We recommend installing the pump on a noise-insulating base, in order to prevent transmission noises to parts of the building.

Provide an outlet for leakage fluid during maintenance work.

During installation, align the entire unit on the foundation using а spirit level (on shaft/discharge nozzle). Maintain the distance between the coupling halves according to the installation plan. Always insert bearing plates on the left and right side next to the mounting material between the base plate/base frame and the foundation. Provide additional bearing plates if the distance between the mounting materials is greater than 800 mm. Ensure that all bearing plates sit solidly. Base plates with a width greater than 400 mm must be filled out after mounting with a vibration-dampening mortar up to the upper edge of the frame.



Figure 9: Mounting material for complete units

If the pump and motor are delivered separately, place the pump onto the foundation without the motor, align using a precision spirit level and secure. For alignment purposes, always insert bearing plates on the left and right side next to the mounting material between the pump base and the foundation. Ensure that all bearing plates sit solidly.



If the pump has two or more anchoring points (see overall diagram or installation plan), ensure that they are not strained axially or radially.

5.2.2 Assembling the motor

Ensure that the shaft is cleaned of anti-rusting agent, and that both coupling halves are pushed onto the shaft. We recommend checking the direction of rotation as per section 6.1.3 (pg 25) before assembling the motor.



Incorrect direction of rotation on the pump can lead to damage to the mechanical seal and a reduction in performance. Please observe the direction of rotation arrow on the pump.



Place the motor on the base plate. Compensate for the height difference between the shafts precisely using shims. The distance between the shaft ends should not exceed 3 mm.

NOTICE

Incorrectly aligned shafts can cause increased wear on the bearings, seal rings, shaft seals and elastic coupling elements. They can also cause increased noise when the unit is running.

5.2.3 Fine alignment of the coupling

The unit is correctly aligned when a ruler placed across both halves of the coupling is the same distance from the respective shaft at all points around the circumference. Do not forget to turn the measurement point by hand. Furthermore, both halves of the coupling must be the same distance from each other at all points around the circumference. Check this using a tracer or gauge.

The central axes of the pump and motor are aligned according to their:

- a) position
- b) direction

Achieve both of these conditions by inserting or removing shims of different thicknesses under the pump or motor feet as appropriate. Afterwards, tighten the fastening screws of the pump and motor.

a) Position

A ruler placed on the coupling must lie flat on both halves, offset by 90°, around the circumference (\rightarrow Figure 11, pg 21).



Figure 11: Positional alignment of the shafts

b) Direction

The axial distance (x) between the halves of the coupling must be equal around the entire circumference. Set coupling distance x to 4 - 5 mm, and secure against axial displacement (\rightarrow Figure 12, pg 21).



Figure 12: Directional alignment of the shafts

The coupling guard must always be mounted after aligning the coupling.



Never operate the pump without the coupling guard.





Risk of death due to rotating parts!

- Use personal protective equipment when performing work on the pump.
- Prevent the keys from being slung away when checking the direction of rotation.
- Ensure sufficient clearance to rotating parts.

5.2.4 Electrical connection



Electrical connection must be carried out by a specialist electrician, in line with the specifications of the local energy supplier or the VDE.

Install a motor protection switch to protect the motor. If using three-phase motors with stardelta switch, ensure that the switching points between star and delta are timed very closely together. Longer switching times can lead to damage to the pump.

Adjusting the time relay with star-delta activation:

Motor power	Time relay setting			
≤ 30 kW	3 s 30%			
> 30 kW	5 s 30%			

Table 9: Settings for the time relay when using threephase motors with star-delta switch

5.3 Pipelines

Determine the nominal widths of the pipelines, taking the local conditions into account. To keep flow losses to a minimum, avoid sudden constrictions and sharp bends. Route pipelines free of tension and pressure tight. Install them in a way that prevents forces and torques being transferred to the pump. Never use the pump as an anchor point for the pipeline.

Fit the suction pipe rising to the pump and the inlet pipe declining to the pump, in order to prevent the formation of air bubbles. Support the pipes immediately before the pump, and connect without tension. Ensure that the weight of the pipes does not strain the pump. If using short pipes, the nominal widths must be at least equal to those of the pump connections. If using long pipelines, determine the cost-effective nominal width on a case-by-case basis.

Before commissioning new systems, the tanks, pipelines and connections must be thoroughly cleaned, flushed and blown through. Welding beads, scales and other contaminations often only fall off after a longer period of time. Ensure that they are kept away from the pump by fitting a strainer in the suction pipe.



Taper pieces to larger nominal widths should have an extending angle of approx. 8° to prevent increased pressure losses. Install check valves and shut-off devices depending on the type of system and pump (\rightarrow Figure 13, pg 23).

Take appropriate measures to compensate any expansions of the pipelines caused by temperature influences, in order to avoid straining the pump with forces and torques.



Figure 13: Functional and operating elements

Key:

- 1 Eccentric taper piece
- 2 Shut-off valve
- 3 Suction pipe
- 4 Elbow
- 5 Foot valve with inlet strainer
- 6 Inlet pipe
- 7 Check valve
- 8 Control fitting

* not included in delivery

Control fitting

(→ Figure 13, pg 23, 8)

A control fitting is always required to regulate the pump power and block the pipeline during assembly work.

Check valve

(→ Figure 13, pg 23, 7)

A check valve is always required to protect the pump.

Monitoring fitting

Monitoring fittings are required to monitor the suction and inlet pressure. Monitoring valves help monitor the operating data.

Flushing the shaft seal

If the pumping medium is contaminated, we recommend flushing the shaft seal. This prevents contamination from penetrating the shaft seal, and therefore also prevents excessive wear.

Sealing and flushing fluid pressure

The pressure of sealing and flushing fluid should always be 1 bar above the pump operating pressure.

Sealing the shaft seal

Sealing the shaft seal prevents air entry at high suction heads.



Leak fluid (leakage)

Drain leak fluid using pipes or hoses.

Auxiliary pipes

Route auxiliary pipes according to their nominal connection values, provided that they are not pressurized internally by the pump. The connections on the pump are indicated. All auxiliary pipes must have a control fitting and non-return valve.



6 Commissioning / decommissioning

6.1 Commissioning

6.1.1 Determining the pump configuration

► Determine the pump configuration

NOTICE

Material damage due to dry running!

► Ensure that the pump is properly filled.

6.1.2 Filling the pump

6.1.3 Checking direction of rotation



Check that there is enough water in the well or feed tank.

Do not operate the pump without water. Dry running can lead to damage to the pump.

Incorrect direction of rotation on the pump can lead to damage to the mechanical seal and a reduction in performance. Please observe the direction of rotation arrow on the pump.



Risk of poisoning or injury due to hazardous pumping media!

 Collect any escaping pumping medium safely and dispose of in an environmentally friendly way. The cast direction of rotation arrow on the pump indicates the specified direction of rotation.

Before checking the direction of rotation, secure the pump against activation.





Risk of death due to rotating parts!

- ► Use personal protective equipment when performing work on the pump.
- ► Prevent the keys from being slung away when checking the direction of rotation.
- Ensure sufficient clearance to rotating parts.

After checking the direction of rotation, ensure that all safety and protective mechanisms are reinstalled and reactivated.

Never operate the pump without the coupling guard.

- ✓ All safety mechanisms installed and function tested
- ✓ Pump correctly prepared, filled and vented



Risk of injury due to running pump!

- Do not touch the running pump.
- Do not perform any work on the running pump.



Risk of poisoning or injury due to spurting pumping medium!

► Use personal protective equipment when performing work on the pump.

6.1.4 Starting the pump

- ✓ Pump correctly installed and connected
- ✓ Motor correctly installed and connected
- $\checkmark\,$ All connections established, sealed and free of tension



NOTICE

Material damage due to dry running!

► Ensure that the pump is properly filled.

Take the following measures in the event of operating interruptions:

Pump to be	Measure
Shut down for longer period	 Take measures according to the pumping medium
Drained	 Close suction and pressure-side fittings.
Disassembled	 Deactivate the motor and se- cure against unauthorized reactiva- tion.
Put into stor- age	• Observe the storage measures $(\rightarrow 4.3 \text{ Storage, pg 17}).$

Table 10: Measures in the event of operational interruption

NOTICE

Open the suction-side fitting, and do not use it to control the flow rate. Do not close the pressure-side fitting!

0.1 MPa = 1 bar ≈ 10 m

6.2 Decommissioning



Risk of injury from hazardous pumping media!

 Collect any escaping pumping medium safely and dispose of in an environmentally friendly way.

Flow medium behavior	Duration of operating inter- ruption (depending on pro- cess)			
	short	long		
Solid compo- nents settle	Flush pump.	 Flush pump. 		
Solidified/frozen, non-corrosive	 Heat or drain pump and contain- ers. 	Drain pump and contain- ers.		
Solidified/frozen, corrosive	Heat or drain pump and contain- ers.	 Drain pump and contain- ers. Apply pre- servative to pump and containers. 		
Remains fluid, non-corrosive	-	_		
Remains fluid, corrosive	_	 Drain pump and contain- ers. Apply pre- servative to pump and containers. 		

 Table 11: Measures depending on the behavior of the pumping medium

Drain the pump completely if shutting down for a longer period (approx. 2 - 3 months), or if there is a danger of frost.



NOTICE

This work must be carried out by a specialist service provider.



Disconnect the pump from the electricity supply if shutting down for a longer period.

6.2.1 Draining the pump and protecting against frost

The pump must be drained if there is a danger of frost. A pump that remains empty over a longer period must be preserved.

6.3 Recommissioning



The pump must move easily for recommissioning.

Check that the pump moves easily before recommissioning.

If the pump was preserved after decommissioning, flush it thoroughly before recommissioning.

Perform all further work steps in line with 6.1 Commissioning, pg 25.

Take the following measures before recommissioning following operating interruptions of > 1 year:

Shut down time	Measure			
> 1 year	Check visually for leaks			
> 2 years	Replace elastomer seals (gaskets, round seals, shaft seal rings and gland packings). ▶ Replace anti-friction bearings.			

Table 12: Measures following longer shut down times



6.4 Shaft seal

6.4.1 Mechanical seal

Excessive tightening places too much tension on the packing rings. This leads to wear and ultimately loss of tightness in the stuffing box.

NOTICE

Material damage due to dry running!

Ensure that the pump is properly filled.

Mechanical seals are self-adjusting mechanical shaft seals that require no maintenance. The mechanical seal must never run dry. Ensure therefore that the pump is filled.

Do not reinstall mechanical seals after removing them for inspection or maintenance. Replace them with new seals, or relap the contact surface.

6.4.2 Gland packing

Gland packing consists of a number of compression-moulded rings in a stuffing box. Gland packings can be adjusted by hand with tools. Replace the gland packing if the leaks in the stuffing box persist. Check at the same that the shaft wearing sleeves are in a good condition. Any worn or scored shaft wearing sleeves can lead to premature destruction of the packing.

NOTICE

Material damage due to dry running!

Ensure that the pump is properly filled.



7 Maintenance and repair

7.1 General information

We can provide trained customer service technicians for assembly and repair work. Please present proof of the conveyed goods upon request.

(DIN safety data sheet or clearance certificate)

Ensure that the pump runs smoothly and quietly at all times. Maximum permitted room temperature 40 °C.

The mechanical seal displays only limited or invisible leakage losses (in vapor form). It requires no maintenance.

The reserve pumps must be activated once per week in order to ensure operational readiness. To do so, switch the reserve pumps on and immediately off again. Monitor the function of the additional connections.

The pump shaft in the GV pump series is supported in the suction casing in a zeromaintenance bearing shell made from PTFE graphite. The pump shaft and motor shaft are connected rigidly by means of a muff coupling.

Risk of injury due to running pump!

- ► Do not touch the running pump.
- Do not perform any work on the running pump.



Risk of death from electric shock!

- Only allow work on the electrical systems to be carried out by a qualified electrician.
- Ensure that the supply of electricity is switched off and secured against reactivation when performing all maintenance work.

Risk of poisoning or injury due to hazardous pumping media!

Use personal protective equipment when performing work on the pump.



Only perform the inspection when the system is switched off and secured.



7.2 Servicing the electric motors



Electrical connection must be carried out by a specialist electrician, in line with the specifications of the local energy supplier or the VDE.

7.3 Operational monitoring

Ensure that the pump runs smoothly and quietly at all times. Maximum permitted room temperature 40°C. The bearing temperature may be up to 50°C above the room temperature, but may not exceed 90°C (measured externally on the bearing housing).

NOTICE

Material damage due to dry running!

- ► Ensure that the pump is properly filled.
- Longer operation against a closed shut-off device is not permitted.

If using a gland packing, this should drip slightly during operation. The gland may only be tightened slightly. Leakage is always required if using pure graphite packing rings. If leakage is too high after a longer period of operation, evenly tighten the nuts on the gland by 1/6 of a rotation, and observe the leakage. If it is no longer possible to adjust the gland, insert an additional packing ring. It is generally not reguired to replace the entire packing.

If using mechanical seals, these display only limited or invisible leakage losses (in vapor form). They require no maintenance.

The reserve pumps must be activated once per week in order to ensure operational readiness. To do so, switch the reserve pumps on and immediately off again. Monitor the function of the additional connections.

Replace the elastic elements of the coupling promptly should you notice signs of wear over time.

The bearings have a high-quality lithium-soap grease. Under normal operating conditions, this is sufficient for 15,000 operating hours or 2 years. If operating under unfavorable condi-



Only perform the inspection when the system is switched off and secured.



Risk of death from electric shock!

- Only allow work on the electrical systems to be carried out by a qualified electrician.
- Ensure that the supply of electricity is switched off and secured against reactivation when performing all maintenance work.



tions, such as high room temperature, high humidity, dusty air, aggressive industrial atmospheres, etc., check the bearings at an earlier time, and clean and relubricate if necessary. When relubricating, use a lithium-soap grease that is free of resins or acids, does not become brittle and protects against rust. Only half fill the cavities of the bearings with grease. If necessary, you can also lubricate the bearings with other soap-based greases. As greases with different soap bases may not be mixed, ensure that the bearings are thoroughly washed beforehand. Adjust the necessary relubrication intervals according to the greases used.

NOTICE

Material damage due to dry running!

► Ensure that the pump is properly filled.

7.4 Gland packing maintenance

Gland packing consists of a number of compression-moulded rings in a stuffing box. Gland packings can be adjusted by hand with tools. If using a gland packing, this should drip slightly during operation. The gland may only be tightened slightly. Leakage is always required if using pure graphite packing rings. If leakage is too high after a longer period of operation, evenly tighten the nuts on the gland by 1/6 of a rotation, and observe the leakage. If it is no longer possible to adjust the gland, insert an additional packing ring. It is generally not required to replace the entire packing.



Excessive tightening places too much tension on the packing rings. This leads to wear and ultimately loss of tightness in the stuffing box.



Figure 14: Stuffing box on the GH/GV



Pump size	Gland pa	cking	Dimensions in the stuffing box					x
	W x W x Length	Number of rings	L	I	Av. d	Av. D	L1	L2
GH 32	8 x 8 x 480	4	47	35	28	45	50	23
GH 40	8 x 8 x 480	4	47	35	28	45	50	23
GH 50-2	8 x 8 x 600	4	47	35	40	57	53	26
GH 50-4	8 x 8 x 600	4	47	35	40	57	53	26
GH 65-2	8 x 8 x 600	4	47	35	40	57	53	26
GH 65-4	8 x 8 x 600	4	47	35	40	57	53	26
GH 80-2	10 x 10 x 820	4	57	42	55	76	80	48
GH 80-4	10 x 10 x 820	4	57	42	55	76	80	48
GH 100-2	10 x 10 x 820	4	57	42	55	76	80	48
GH 100-4	10 x 10 x 820	4	57	42	55	76	80	48
GH 125-4	10 x 10 x 1200	5	68	53	65	86	92	56
GH 150-4	10 x 10 x 1200	5	68	53	65	86	92	56

7 Maintenance and repair

Table 13: Stuffing box in the GH

Pump size	Gland page	Dimensions in the stuffing box						
	W x W x Length	Number of rings	L	I	Av. d	Av. D	L1	L2
GH 32	10 x 10 x 440	4	-	43	25	45	69	42
GH 40	10 x 10 x 440	4	-	43	25	45	74	47
GH 50-2	7 x 7 x 600	4	-	33	40	55	98	72
GH 50-4	8 x 8 x 600	4	47	35	40	57	61	34
GH 65-2	7 x 7 x 600	4	-	33	40	55	93	67
GH 65-4	8 x 8 x 600	4	47	35	40	57	61	34
GH 80-2	10 x 10 x 820	4	57	42	55	76	80	48
GH 80-4	10 x 10 x 820	4	57	42	55	76	80	48
GH 100-2	10 x 10 x 820	4	57	42	55	76	80	48
GH 100-4	10 x 10 x 820	4	57	42	55	76	80	48
GH 125-4	10 x 10 x 1200	5	68	53	65	86	92	56
GH 150-4	10 x 10 x 1200	5	68	53	65	86	92	56

Table 14: Stuffing box in the GV



7.5 Sending the pump to the manufacturer

- ✓ Pump depressurized
- ✓ Pump completely drained
- ✓ Electrical connections disconnected and motor secured against reactivation
- ✓ Manometer removed together with supply lines and holders
- 1. Only send pumps or individual components to the manufacturer together with a verifiable and completely filled out clearance certificate. Request a clearance certificate from the manufacturer if required.
- 2. Using the following table, take the action required for returning the pump according to the necessary repair.

Repair	Action for return
At customer	 Return defective component to manufacturer.
At manufacturer	 Flush pump. Send complete pump (not disassembled) to manu- facturer.
At manufacturer, with guarantee claim	 Only if using hazard- ous pumping medium: flush pump. Send complete pump (not disassembled) to manu- facturer.

Table 15: Measures for return



8 Faults and troubleshooting

Please consult the manufacturer should you experience any faults that are not described in the following table, or cannot be traced back to the described causes.

In the following table, each potential fault is given a number. Use this number to find the corresponding cause and remedy in the troubleshooting table.

Fault	Number
Pump does not deliver	1
Flow rate too low	2
Flow rate too high	3
Pumping pressure too low	4
Pumping pressure too high	5
Pump runs noisily	6
Temperature of the anti-friction bearings too high	7
Pump leaks	8
Motor power consumption too high	9

Table 16: Fault/number allocation

Fault number									Cause	Remedy
1	2	3	4	5	6	7	8	9		
x	-	-	-	-	-	-	-	-	Inlet/suction pipe and/or pressure pipe closed by fitting	 Open fitting.
-	x	-	x	-	-	-	-	-	Inlet/suction pipe not completely opened	 Open fitting.
x	x	-	x	-	x	-	-	-	Inlet/suction pipe, pump or suction strainer blocked or encrusted	 Clean inlet/suction pipe, pump or suction strainer.
-	х	-	x	-	x	-	-	-	Cross-section of the inlet/suction pipe too tight	 Enlarge cross-section. Clean suction pipe of encrustations. Fully open fitting.
x	-	-	-	-	-	-	-	-	Transport sealing cap not re- moved	 Remove transport sealing cap. Disassemble pump and check for dry running damage.
-	х	1	x	-	x	-	-	-	Suction head too high: $NPSH_{pump}$ is greater than $NPSH_{system}$	 Increase inlet pressure. Consult manufacturer.
x	-	1	-	-	x	-	-	-	Inlet/suction pipe and pump not correctly drained or not complete- ly filled.	 Completely fill and drain pump and/or pipeline.
x	-	1	-	-	x	-	-	-	Air pockets in inlet/suction pipe	 Install fitting for venting. Correct pipeline routing.
х	х	-	х	-	х	-	-	-	Air sucked in	 Seal source of fault.
x	x	-	x	-	x	-	-	-	Gas component too high: pump cavitated	 Consult manufacturer.
-	х	-	х	-	х	-	-	-	Temperature of pumping medium too high: pump cavitated	 Increase inlet pressure. Reduce temperature. Consult manufacturer.



8 Faults and troubleshooting

Fault number									Cause	Remedy		
1	2	3	4	5	6	7	8	9				
	v		v						Geodetic delivery head and/or pipeline resistance too high	 Remove deposits in pump and/or pressure pipe. 		
-	^	-	^	-	-	-	-	-		 Install larger impeller and consult manufacturer. 		
-	х	-	-	x	х	-	-	-	Pressure-side fitting not opened far enough	 Open pressure-side fitting. 		
х	х	-	-	х	х	-	-	-	Pressure line blocked	► Clean pressure line.		
х	x	-	x	-	x	-	-	-	Incorrect direction of rotation on Swap any two phases on mot pump			
х	x	-	x	-	-	-	-	-	Speed too low	Compare required motor speed with pump type plate. Replace motor if nec- essary.		
-										Increase speed if possible.		
-	Х	-	Х	-	Х	Х	-	-	Pump components worn	Replace worn pump components.		
									Pressure-side fitting opened too	 Throttle with pressure-side fitting. 		
-	-	х	х	-	х	-	-	х	far	 Machine down impeller. Consult manufacturer and adjust impeller diam- eter. 		
_	_	x	_	_	×	_	_	×	Geodetic delivery head, pipeline resistance and/or other resistanc- es lower than designed	 Throttle flow rate with pressure-side fitting. Observe minimum flow rate here. Must include a inserting of the second secon		
		~			~			~		manufacturer and adjust impeller diameter.		
-	-	x	-	x	-	-	-	-	Viscosity lower than indicated	 Machine down impeller. Consult manufacturer and adjust impeller diam- eter. 		
-	-	x	-	x	x	x	-	x	Speed too high	 Compare required motor speed with pump type plate. Replace motor if nec- essary. 		
										 Reduce speed if possible. 		
		v		v	~			~	Number of stages too high	Throttle flow rate with pressure-side fitting. Observe minimum flow rate here.		
-	-	^	-	^	^	-	-	^		 Install pump with lower number of stages. 		
х	х	-	х	-	х	-	-	-	Impeller imbalanced or blocked	 Disassemble pump and check for dry running damage. 		
										► Clean impeller.		
-	Х	-	Х	-	х	-	-	-	Hydraulic pump components dirty, sticky or encrusted	 Disassemble pump. Clean components 		
							1			Clean components.		



8 Faults and troubleshooting

Fault number									Cause	Remedy	
1	2	3	4	5	6	7	8	9			
-	-	-	-	-	-	x	-	х	Defective anti-friction bearing in motor	 Replace anti-friction bearing. 	
-	-	-	-	-	-	x	-	-	Lubricant: too much, too little or not suitable	 Reduce, increase or replace lubri- cant. 	
-	-	-	-	-	-	-	х	-	Tie bolts not tightened correctly	► Tighten tie bolts.	
-	-	-	-	-	-	-	х	-	Mechanical seal worn	► Replace mechanical seal.	
-	-	-	-	-	-	-	х	-	Defective casing seal	► Replace casing seal.	
-	-	-	-	-	-	-	x	-	Shaft sleeve penetrated	 Replace shaft sleeve and round seal. 	
									Pump under tension	 Check pipeline connections and pump fastening. 	
-	-	-	-	-	Х	Х	Х	Х		 Check coupling alignment. 	
										Check support foot fastening.	
-	-	-	-	-	Х	Х	-	-	Coupling incorrectly aligned	► Align coupling.	
									Motor runs on 2 phases	Check fuse and replace if necessary.	
-	Х	-	Х	-	Х	-	-	Х		Check wire connections and insula- tion.	

Table 17: Troubleshooting table



9.1 Spare parts list for constant operation over two years as per DIN 24296

Part no.	Part designation	N	umber	of ide	ntical p	pumps (in umps)	cluding re	serve
		2	3	4	5	6 and 7	8 and 9	> 9
				Set/o	quantit	y of spare	parts	
211	Pump shaft with small parts	1	1	2	2	2	3	30%
230	Impeller (set)	1	1	1	2	2	3	30%
321	Radial grooved ball bearing (set)	1	1	2	2	3	4	50%
370	Foil bearing	1	1	2	2	3	4	50%
412	Round seal (set)	4	8	8	8	9	12	150 %
433	Mechanical seal (set)	2	3	4	5	6	7	90 %
461	Gland packing (set)	4	6	8	8	9	12	150 %
504	Correction ring	1	1	2	2	3	4	50%
524	Shaft wearing sleeve	2	2	2	3	3	4	50%
525	Interstage sleeve	2	2	2	3	3	4	50%

Table 18: Spare parts for constant operation over two years



9.2 Cross-sections



Figure 15: Cross-section of GH with mechanical seal





Figure 16: Cross-section of GH with gland packing



Part no.	Designation	Part no.	Designation
100/1	Casing	501	Multiple ring
100/2	Casing	502	Casing wear ring
106	Suction casing	504/1	Correction ring
107	Delivery casing	504/2	Spacer ring
108	Stage casing	504/3	Spacer ring
171	Diffuser	506	Retaining ring
		507	Thrower
211	Pump shaft	521	Interstage sleeve
230	Impeller	524	Shaft wearing sleeve
		529	Bearing sleeve
321	Radial grooved ball bearing		
323	Axial grooved ball bearing	636	Grease nipple
350	Bearing housing	674	Priming funnel
360/1	Bearing cover		
360/2	Bearing cover	701	Crossover pipe
360/3	Bearing cover	731	Pipe union
		752	Valve seat
411/1	Joint ring		
411/2	Joint ring	901	Hexagon head bolt
411/3	Joint ring	902/1	Stud
411/4	Joint ring	902/2	Stud
412/1	O-ring	903/1	Screwed plug
412/2	O-ring	903/2	Screwed plug
412/3	O-ring	903/3	Screwed plug
412/4	O-ring	904/1	Grub screw
433	Mechanical seal	904/2	Grub screw
451	Stuffing box housing	905	Tie bolt
452	Gland	920/1	Hexagon nut
459	Lantern neck bush	920/2	Hexagon nut
461	Gland packing	920/3	Hexagon nut
471	Casing cover	932	Circlip
		940/1	Кеу
		940/2	Кеу
		940/3	Кеу

Table 19: GH parts list





Figure 17: Cross-section of GV with mechanical seal





Figure 18: Cross-section of GV with gland packing



Part no.	Designation	Part no.	Designation
100	Casing	636	Grease nipple
106	Suction casing	674	Priming funnel
107	Delivery casing		
108	Stage casing		
154	Intermediate plate	710/1	Pipe
160	Cover	710/2	Pipe
171	Diffuser	710/3	Pipe
		710/4	Pipe
		723	Flange
211	Pump shaft	730/1	Pipe adaptor
230	Impeller	730/2	Pipe adaptor
		730/3	Pipe adaptor
		732	Holder
321	Radial grooved ball bearing	741	Valve
341	Motor stool		
360/1	Bearing cover		
360/2	Bearing cover	901/1	Hexagon head bolt
370	Bearing shell	901/2	Hexagon head bolt
		902/1	Stud
		902/2	Stud
400	Gasket	902/3	Stud
411	Joint ring	903	Screwed plug
412/1	O-ring	916	Plug
412/2	O-ring	920/1	Hexagon nut
412/3	O-ring	920/2	Hexagon nut
412/4	O-ring	920/3	Hexagon nut
452	Gland	920/4	Hexagon nut
461	Gland packing	932	Circlip
421	Radial joint ring	940/1	Кеу
433	Mechanical seal	940/2	Кеу
471	Casing cover	940/3	Кеу
		940/4	Кеу
501	Multiple ring		
502	Casing wear ring		
504/1	Correction ring		
504/2	Spacer ring		
506	Retaining ring		
521	Interstage sleeve		
524/1	Shaft wearing sleeve		
524/2	Shaft wearing sleeve		

Table 20: GV parts list



9.3 Declaration of Conformity as per EC Directive 2006/42/EC, Annex IIA

We hereby declare under our sole responsibility as manufacturer that the following machine series of the type, as well as the configurations distributed by us, conform to the relevant specifications of the **EC Machinery Directive 2006/42/EC**.

Designation: GH/GV 32/40/50/65/80/100/125/150

Pump number: 172000 - 210000

The machine also corresponds with the following directives published in the Official Journal of the European Union:

- Niederspannungsrichtlinie (2014/35/EU)
- EMV-Richtlinie (2014/30/EU)

This declaration shall cease to be valid in the event of any modifications to the machine and/or its protective mechanisms not agreed with us and approved in writing.

Applied harmonized standards and their references in the Official Journal of the European Union:

- DIN EN 809 : 2012
- DIN EN ISO 12100 : 2011
- DIN EN ISO 13732 : 2008
- DIN EN ISO 13849-1 : 2008
- DIN EN ISO 13857-1 : 2008
- DIN EN 60034 : 2007
- DIN EN 60204-1 : 2009
- DIN EN 55024 : 2011

Authorized representative for the composition of technical documentation for OSNA-Pumpen GmbH:

Mr. Rik Arensmann Brückenstrasse 3 49090 Osnabrück, Germany

Osnabrück, 12.01.2017

i.V.

Rik Arensmann Technical Director/QM Officer





9.4 Clearance Certificate

Please copy and send with the pump.

Clearance Certificate

Legal provisions oblige all businesses to protect their employees, other persons and the environment from damaging effects when handling hazardous substances. Products and their components may therefore only be repaired or inspected when the following declaration has been fully and correctly filled out and singed by an authorized and qualified specialist. Please provide the necessary information should safety measures on the part of the system owner still be required despite complete draining and cleaning. This clearance certificate is part of the repair or inspection order.

We hereby assure that the enclosed device

Type: ______

is free of substances that are hazardous to health. No special safety measures are required for further handling. The device was fully drained and thoroughly cleaned inside and outside before dispatch.

Company/institute:		
Address:		
Town/city, ZIP code:		
Phone:		
Name:		
Position:		
Date:		
Signature, company sta	mp:	



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PUMPS SYSTEMS WATER TREATMENT ENGINEERING SERVICES

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