



Original Operating Manual

CVP High-Pressure Centrifugal Pump

OSNA-Pumpen GmbH
Brückenstrasse 3
49090 Osnabrück, Germany
Phone: +49 541 1211 - 0
Fax: +49 541 1211 - 220
Internet: <http://www.osna.de>
E-mail: info@osna.de

Ver.17-01



Contents

1	GENERAL	4
1.1	About this operating manual.....	4
1.2	Target groups	4
1.3	Other valid documents	4
1.4	Warning notices and symbols.....	5
1.5	Copyright/changes	5
2	SAFETY	6
2.1	Correct and proper use	6
2.2	General safety instructions.....	7
2.2.1	Product safety	7
2.2.2	Duties of the system owner	7
2.2.3	Duties of personnel	8
2.3	Dangers of non-observance of the safety instructions.....	9
2.4	Unauthorized conversion and production of spare parts.....	9
2.5	Unauthorized modes of operation.....	9
2.6	Special hazards	9
2.6.1	Explosion area	9
2.6.2	Hazardous pumping media.....	9
2.6.3	Noise emissions	9
3	LAYOUT AND FUNCTION	10
3.1	Labeling	10
3.2	Scope of delivery for a type-CVP high-pressure centrifugal pump.....	10
3.3	General information.....	11
3.4	Technical data	11
4	TRANSPORT AND INTERMEDIATE STORAGE.....	13
4.1	Transport	13
4.1.1	Unpacking and checking the delivery condition.....	13
4.1.2	Lifting	13
4.2	Intermediate storage	14
4.3	Storage.....	14
4.4	Disposal.....	15
5	ASSEMBLY AND INSTALLATION.....	16
5.1.1	Preparing the installation location	16
5.1.2	Preparing the base surface and foundations.....	16
5.2	Installation	16
5.2.1	Installing the pump.....	16
5.2.2	Assembling the motor.....	17

5.2.3	Electrical connection	18
5.2.4	Adjusting the pump rotor	19
5.3	Pipelines.....	20
6	COMMISSIONING/ DECOMMISSIONING	22
6.1	Commissioning	22
6.1.1	Determining the pump configuration	22
6.1.2	Filling the pump.....	22
6.1.3	Checking direction of rotation	22
6.1.4	Starting the pump.....	23
6.2	Decommissioning.....	24
6.2.1	Draining the pump and protecting against frost.....	25
6.3	Recommissioning.....	25
6.4	Mechanical seal	25
7	MAINTENANCE AND REPAIR.....	27
7.1	General information.....	27
7.2	Sending the pump to the manufacturer.....	28
8	FAULTS AND TROUBLESHOOTING.....	29
9	APPENDIX	32
9.1	Service, spare parts, accessories.....	32
9.2	Individual parts of the CVP centrifugal pump	33
9.3	Declaration of Conformity as per EC Directive 2006/42/EC, Annex IIA.....	35
9.4	Clearance Certificate.....	36

List of Tables

Table 1: Target groups and their tasks	4
Table 2: Other valid documents and their purposes	4
Table 3: Warning notices and consequences of non-observance.....	5
Table 4: Symbols and their meanings.....	5
Table 5: Values table CVP 423	12
Table 6: Values table CVP 426	12
Table 7: Values table CVP 428	12
Table 8: Measures in the event of operational interruption	24
Table 9: Measures depending on the behavior	24
Table 10: Measures following longer shut down times	25
Table 11: Measures for return	28
Table 12: Fault/number allocation	29
Table 13: Troubleshooting table	31
Table 14: Parts list of the CVP centrifugal pump.....	34

List of Images

Figure 1: CVP model code	10
Figure 2: Scope of delivery for type CVP	10
Figure 3: Dimensions on the CVP centrifugal pump.....	11
Figure 4: Lifting a CVP centrifugal pump	13
Figure 5: Foundation plan for CVP 423 to 428.....	17
Figure 6: Overhead view of coupling	18
Figure 7: Adjusting the pump rotor	19
Figure 8: Functional and operating elements	20
Figure 9: Explosion diagram of the CVP centrifugal pump	33

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	3 Ensure that this manual is available at the location where the system is used, including for later reference. 3 Ensure that personnel read and observe this operating manual and the other valid documents, in particular the safety and warning information. 3 Observe additional system-related regulations and specifications.
Specialist personnel, assembly staff	3 Read, observe and follow this operating manual and the other valid documents, in particular 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	Consequences of non-observance
 DANGER	Immediate hazard	Death, severe physical injury
 WARNING	Potential hazard	Death, severe physical injury
 CAUTION	Potentially dangerous situation	Minor physical injury
NOTICE	Potentially dangerous situation	Material damage

Table 3: Warning notices and consequences of non-observance

1.5 Copyright/changes

The intellectual property and all copyrights related to this technical documentation remain exclusively with OSNA-Pumpen GmbH. All rights reserved, in particular the right to reproduction and distribution of this documentation, including translations thereof.

No part of this documentation may be reproduced in any form (print, photocopy, microfilm or any others process), stored, processed, reproduced or distributed using electronic systems without written permission.

Editorial changes reserved exclusively by OSNA-Pumpen GmbH.

Any violation is punishable and subject to compensation.

OSNA GmbH reserves the right to change the contents of this documentation without notice.

Symbol	Meaning
	Safety sign 3 Follow all instructions identified with safety signs in order to avoid death or injuries.
3	Instruction
1. , 2. , é	Instruction with multiple steps
✓	Condition
ÿ	Reference
	Information, note

Table 4: Symbols and their meanings

2 Safety



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

Avoiding obvious misuse (examples)

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

2.1 Correct and proper use

The main areas of use are:

- Only use this pump for the purposes of conveying the agreed pumping media.
- Comply with operating limits.
- The pumping medium 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 (See Manufacturer information).
- Any other use must be agreed with the manufacturer.
- The temperature of the pumping medium must not exceed 80 °C.
- Pressure boosting systems, heating systems, hot and cooling water circulation, water supply systems, power stations, filtering systems, fire extinguisher and sprinkler systems, and processing machinery
- Fresh water, drinking water, boiler feed water, process water, sea and brackish water, hot water, condensate, lyes, drilling and cutting oils, and many media without aggressive components that do not chemically corrode the materials used in the pump

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

Ensure that the foot valve is in the pumping medium at all times during suction.



WARNING

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 (ÿ 6.1 Commissioning, pg 22).

- 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 (ÿ 2.1 Correct and proper use, pg 6). Never exceed the limit values indicated in the technical data (ÿ 3.4 Technical data, pg 11).

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

The maximum continuous sound pressure level of a correctly installed and commissioned CVP high-pressure centrifugal pump is 70 dB(A).

3 Layout and function

3.1 Labeling

This operating manual applies to pumps of the CVP 423, CVP 426 and CVP 428 series.

Model code:

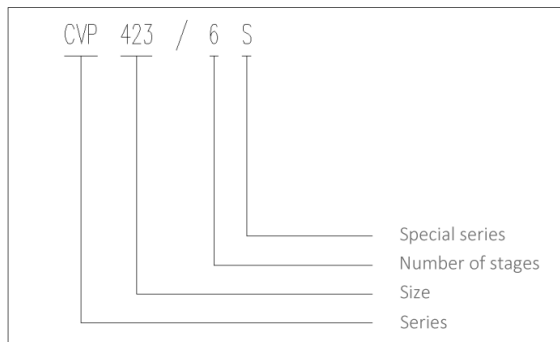


Figure 1: CVP model code

3.2 Scope of delivery for a type-CVP high-pressure centrifugal pump

The customer can order the pump:

- in a preassembled state, i.e. delivery without motor. The motor is installed by the customer.
- in a fully assembled state, i.e. the pump is fitted with motor ex-works.

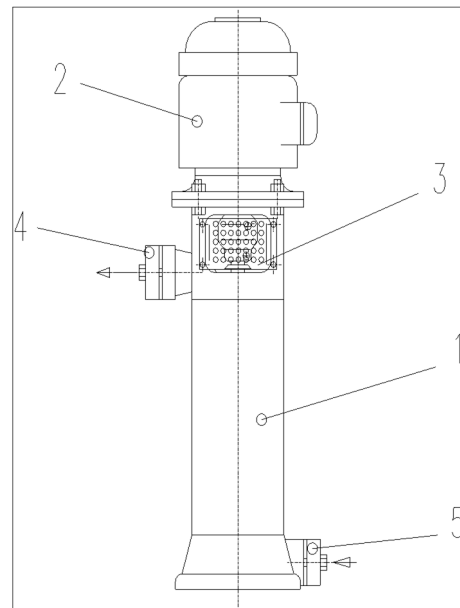


Figure 2: Scope of delivery for type CVP

- 1 Pump
- 2 Drive motor
- 3 Coupling guard
- 4 Delivery-side counter flange
- 5 Suction-side counter flange (oval)

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.

3.3 General information

The CVP is a non-self-priming, multi-stage high-pressure centrifugal pump in a vertical configuration (staged centrifugal pump). It features a variable connection point. The pumps are fitted with mechanical seals. Fluid-lubricated plain bearings are used. Materials: The shafts and impellers are made from stainless steel, the diffusers and wear plates are made from plastic, the suction and delivery casings are made from gray cast iron, and the stage casing is made from steel (stainless steel available). Other materials are also used

depending on customer requirements or the needs of the pumping medium. Only drive CVP pumps with electric motors that have a fixed bearing that cannot be shifted from the B side to the A side. The complete unit is fully assembled and includes the pump, drive motor, coupling and coupling guard.

3.4 Technical data

 Please check the pump type on the type plate to determine the correct gap.

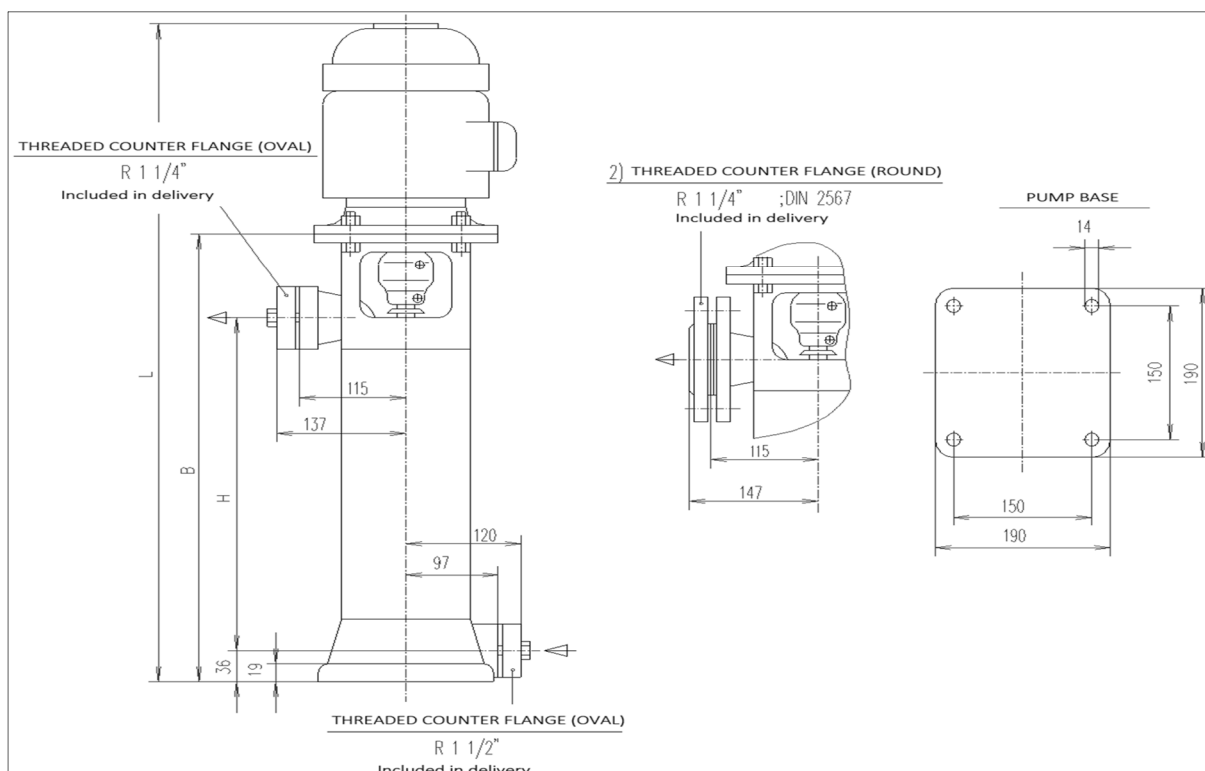


Figure 3: Dimensions on the CVP centrifugal pump

3 Layout and function

CVP 423					
No. of stages	H	Motor		L	B
		Pump size	Output (kW)		
2	166	71	0.37	493	292
4	242	80	0.75	600	373
6	318	80	1.1	676	449
8	394	90	1.5	768	525
10	470	90	2.2	869	601
12	546	90	2.2	945	677
14	622	100	3.0	1068	763
16	698	100	3.0	1144	839
18	774	112	4.0	1234	915

l/min m³/h	Flow rate											
	at n = 2900 min-1											
	16.7	33.3	50	66.7	83.3	100	116.7	133.3	150	166.7	183.3	
	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	
Total delivery head m												
423/ 2	19	18	17	16	14	11	8					
423/ 4	39	38	35	32	28	22	16					
423/ 6	59	56	53	48	41	33	24					
423/ 8	79	75	71	64	55	44	32					
423/10	98	94	88	79	69	55	39					
423/12	118	113	106	95	83	66	47					
423/14	137	131	123	111	96	77	55					
423/16	157	150	141	127	110	88	63					
423/18	177	169	159	143	124	99	71					

Table 5: Values table CVP 423

CVP 426					
No. of stages	H	Motor		L	B
		Pump size	Output (kW)		
2	166	71	0.55	493	292
4	242	80	1.1	600	373
6	318	90	1.5	692	449
8	394	90	2.2	793	525
10	470	100	3.0	916	611
12	546	112	4.0	1006	687
14	622	112	4.0	1082	763
16	698	132	5.5	1221	859
18	774	132	5.5	1297	935

l/min m³/h	Flow rate											
	at n = 2900 min-1											
	16.7	33.3	50	66.7	83.3	100	116.7	133.3	150	166.7	183.3	
	1.0	2.0	3.0	4.0	5.0	6.0	7.0	8.0	9.0	10.0	11.0	
Total delivery head m												
426/ 2	22	22	21	20	19	18	17	15	12	9	6	
426/ 4	44	43	42	41	39	37	33	29	25	19	12	
426/ 6	65	64	63	61	59	55	50	44	37	28	17	
426/ 8	87	86	84	82	78	73	67	59	49	37	23	
426/10	108	107	105	102	98	91	83	73	61	46	29	
426/12	130	128	126	122	117	110	100	88	73	56	35	
426/14	151	149	147	143	137	128	116	102	86	65	40	
426/16	173	171	168	163	156	146	133	117	98	74	46	
426/18	195	192	189	183	176	164	150	132	110	83	52	

Table 6: Values table CVP 426

CVP 428					
No. of stages	H	Motor		L	B
		Pump size	Output (kW)		
2	166	80	1.1	524	297
4	242	90	2.2	641	373
5	280	90	2.2	679	411
6	318	100	3.0	764	459
8	394	112	4.0	854	535
10	470	132	5.5	993	631

l/min m³/h	Flow rate											
	at n = 2900 min-1											
	16.7	50.0	83.3	116.7	150	166.7	183.3	200	216.7	233.3	250	
	1.0	3.0	5.0	7.0	9.0	10.0	11.0	12.0	13.0	14.0	15.0	
Total delivery head m												
428/ 2	25	25	24	22	20	19	18	17	16	14	13	
428/ 4	49	48	46	44	40	38	36	34	31	28	25	
428/ 5	62	60	58	55	50	48	45	42	39	35	31	
428/ 6	74	72	69	65	60	58	54	51	47	42	38	
428/ 8	99	96	92	87	80	77	72	68	62	56	50	
428/10	124	120	116	109	100	96	90	85	78	70	63	

Table 7: Values table CVP 428

- Note:
- 1) CVP 423 and 426/2-10 with V 18 small three-phase motor
 - 2) CVP 423 and 426/12-18, and 428/2-10 V 1 three-phase motor and delivery casing with threaded counter flange (round) R 1 1/4" PN 25; DIN 2567
 - 3) Motor output applies to 50-Hz/2-pole three-phase motors

4 Transport and intermediate storage

4.1 Transport

 Weight information (ÿ 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.

4.1.2 Lifting



Risk of death or crushed limbs from falling transported goods!

3 Choose lifting equipment that is suitable for the total weight to be transported.

3 Do not stand under suspended loads.

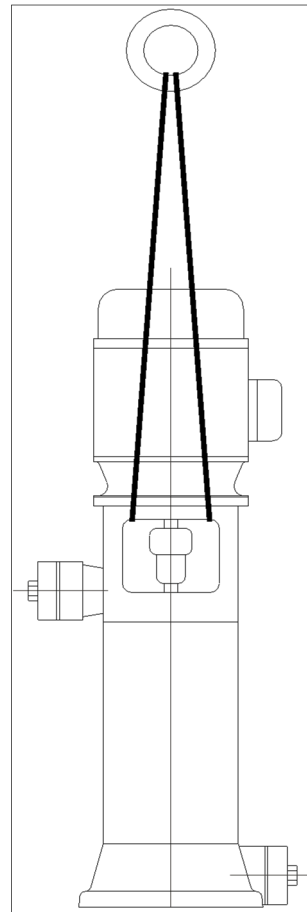


Figure 4: Lifting a CVP centrifugal pump

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 de-commissioned for a longer period of time (approximately 2 to 3 months), ensure that it is fully drained. (Y 6.2 Decommissioning, pg 24)

4.3 Storage

NOTICE

Material damage due to incorrect storage!

3 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:
 - ï dry
 - ï free of frost
 - ï 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!

- 3 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!

- 3 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:
 - ï 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.



WARNING

Risk of poisoning and environmental damage from pumping medium!

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

5 Assembly and installation

NOTICE

Material damage due to contamination!

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



CAUTION

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

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

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

5.1.2 Preparing the base surface and foundations

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



CAUTION

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.

i 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.

The pump's suction casing is shown as the base, and must be secured free of tension to a foundation using 4 M12 screws (→ Figure 5, pg 17).

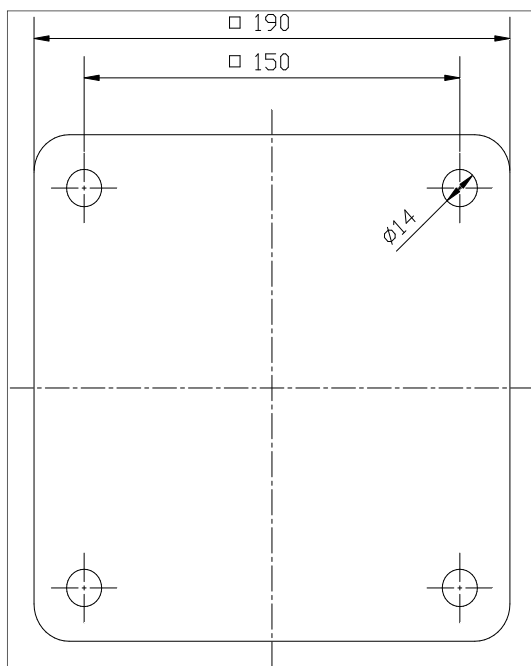


Figure 5: Foundation plan for CVP 423 to 428

⚠ CAUTION

Install the pump in such a way that prevents flooding of building sections as the result of a leak or when performing maintenance work.

5.2.2 Assembling the motor

Clean the motor shaft of any anti-rust agent and remove the keys if present.

Remove the socket head cap screws (29 and 30) of the coupling shells (28), place the motor on the delivery casing (20 or 26), and secure with screws (see Table 14, pg 34). Manually tighten the socket head cap screws on the coupling shells slightly, ensuring that the gap between the coupling shells is even (→ Figure 6, pg 18). Please also refer to 6.1.3 Checking direction of rotation, pg 22 for information on checking the direction of rotation.

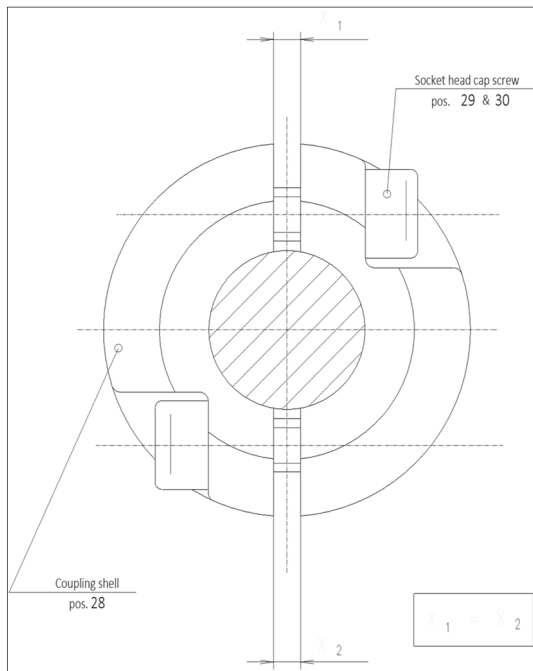


Figure 6: Overhead view of coupling

⚠ CAUTION

Incorrect direction of rotation on the pump can lead to damage to the mechanical seal and a reduction in performance. The pump shaft must rotate clockwise, as seen from the motor.

⚠ DANGER

Never operate the pump without the coupling guard.

⚠ DANGER

Risk of death due to rotating parts!

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

5.2.3 Electrical connection

⚠ CAUTION

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.

5.2.4 Adjusting the pump rotor

i The rotor is not set on pumps that are fitted with an electric motor ex-works.

Only drive CVP pumps with electric motors that have a fixed bearing that cannot be shifted from the B side to the A side.

Setting the rotor requires a fitting lever, a marking tool, a power drill, a screwdriver and a hexagonal socket wrench.

1. Press the pump rotor down together with the coupling shells until the impellers are in axial contact with the wear plate. Mark the pump shaft.
2. Raise the pump rotor with the coupling shells by the "y" dimension (→ Figure 7, pg 19) and mark the pump shaft.
3. Evenly tighten the socket head cap screws (29 and 30) (→ Figure 6, pg 18 and Figure 7, pg 19).
4. Check the pump rotor setting.
5. Drill a hole in the motor shaft and secure the coupling shells against axial shift with a grub screw (31).

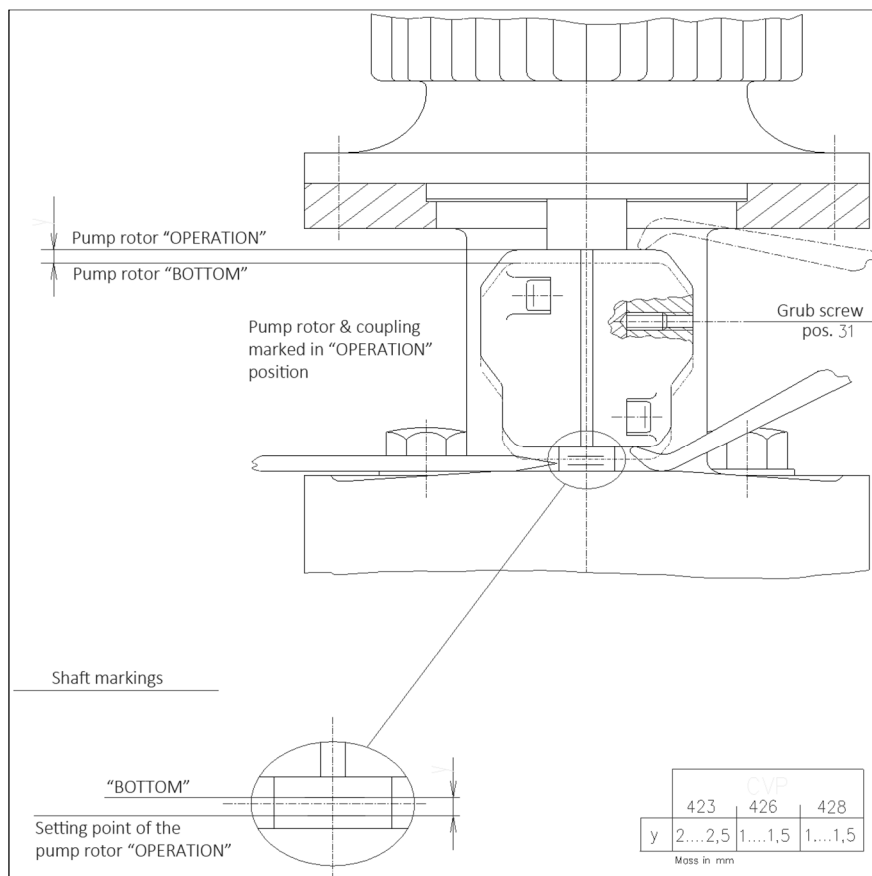


Figure 7: Adjusting the pump rotor

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.

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 (→ Figure 8, pg 20).

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.

CAUTION

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.

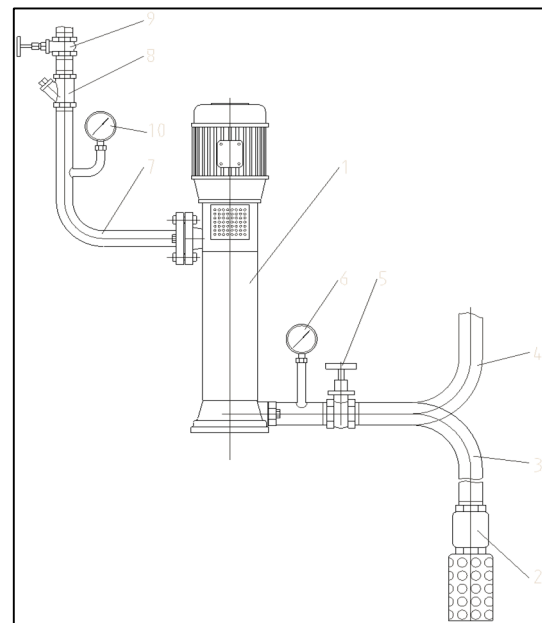


Figure 8: Functional and operating elements

Key:

- 1 Centrifugal pump
- 2* Foot valve with suction/inlet strainer
- 3* Suction pipe
- 4* Inlet pipe
- 5* Shut-off valve
- 6* Pressure gauge
- 7* Delivery pipe
- 8* Check valve
- 9* Control fitting
- 10* Pressure gauge

* not included in delivery

Suction or inlet pipe

(→ Figure 8, pg 20, 3 and 4)

Keep the suction pipe as short as possible, and route it in such a way that it is constantly rising to the pump. Route the inlet pipe constantly declining to the pump.

Provide a draining mechanism at the lowest point of the inlet pipe during inlet operation.



The CVP 428 requires a suction or inlet pipe of at least R 2½

Foot valve

(→ Figure 8, pg 20, 2)

The foot valve keeps the suction pipe filled with pumping medium.

Inlet sieve or strainer

(→ Figure 8, pg 20, 11)

An inlet sieve or strainer protects the pump against large-grain contaminations.

Monitoring fitting

(→ Figure 8, pg 20, 6)

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

Shut-off valve

(→ Figure 8, pg 20, 5)

A shut-off valve is used to block the pipe during assembly. The shut-off valve must be fully opened when the pump is in operation.

Delivery pipe

(→ Figure 8, pg 20, 7)

Control fitting

(→ Figure 8, pg 20, 9)

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

Check valve

(→ Figure 8, pg 20, 8)

A check valve is always required to protect the pump.

6 Commissioning/ decommissioning

6.1 Commissioning

6.1.1 Determining the pump configuration

- 3 Determine the pump configuration

6.1.2 Filling the pump



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.



Risk of poisoning or injury due to hazardous pumping media!

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

NOTICE

Material damage due to dry running!

- 3 Ensure that the pump is properly filled.

6.1.3 Checking direction of rotation



Incorrect direction of rotation on the pump can lead to damage to the mechanical seal and a reduction in performance. The pump shaft must rotate clockwise, as seen from the motor.

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.

- ✓ All safety mechanisms installed and function tested



- ✓ Pump correctly prepared, filled and vented

Risk of death due to rotating parts!

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

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



Risk of injury due to running pump!

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



Never operate the pump without the coupling guard.



Risk of poisoning or injury due to spurting pumping medium!

- 3 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
- ✓ All connections established, sealed and free of tension

NOTICE

Material damage due to dry running!

- 3 Ensure that the pump is properly filled.

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 à 10 m

6.2 Decommissioning



DANGER

Risk of injury from hazardous pumping media!

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

- 3 Take the following measures in the event of operating interruptions:

Pump to be	Measure
Shut down for longer period	3 Take measures according to the pumping medium
Drained	3 Close suction and delivery-side fittings.
Disassembled	3 Deactivate motor and secure against unauthorized reactivation.
Put into storage	3 Observe storage measures (Y 4.3 Storage, pg 14).

Table 8: Measures in the event of operational interruption

Flow medium behavior	Duration of operating interruption (depending on process)	
	short	long
Solid components settle	3 Flush pump.	3 Flush pump.
Solidified/frozen, non-corrosive	3 Heat or drain pump and containers.	3 Drain pump and containers.
Solidified/frozen, corrosive	3 Heat or drain pump and containers.	3 Drain pump and containers. 3 Apply preservative to pump and containers.
Remains fluid, non-corrosive	3	3
Remains fluid, corrosive	3	3 Drain pump and containers. 3 Apply preservative to pump and containers

Table 9: 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.

CAUTION

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

CAUTION

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 22.

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

Shut down time	Measure
> 1 year	3 Check visually for leaks
> 2 years	3 Replace elastomer seals (gaskets, round seals, shaft seal rings and gland packings). 3 Replace anti-friction bearings.

Table 10: Measures following longer shut down times

6.4 Mechanical seal

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.

NOTICE

Material damage due to dry running!

- 3 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)



Risk of injury due to running pump!

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



Risk of poisoning or injury due to hazardous pumping media!

- 3 Use personal protective equipment when performing work on the pump.
-

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

Ensure that the socket head cap screws of the coupling shells are tightened at regular intervals. Perform an initial check after 50 operating hours, and further checks after every 1,000 operating hours.



Risk of death from electric shock!

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



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

Repair	Action for return
At customer	3 Return defective component to manufacturer.
At manufacturer	3 Flush pump. 3 Send complete pump (not disassembled) to manufacturer.
At manufacturer, with guarantee claim	3 Only if using hazardous pumping medium: flush pump. 3 Send complete pump (not disassembled) to manufacturer.

Table 11: Measures for return

7.2 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.

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 12: 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	3 Open fitting.
-	X	-	X	-	-	-	-	-	Inlet/suction pipe not completely opened	3 Open fitting.
X	X	-	X	-	X	-	-	-	Inlet/suction pipe, pump or suction strainer blocked or encrusted	3 Clean inlet/suction pipe, pump or suction strainer.
-	X	-	X	-	X	-	-	-	Cross-section of the inlet/suction pipe too tight	3 Enlarge cross-section. 3 Clean suction pipe of encrustations. 3 Fully open fitting.
X	-	-	-	-	-	-	-	-	Transport sealing cap not removed	3 Remove transport sealing cap. 3 Disassemble pump and check for dry running damage.
-	X	-	X	-	X	-	-	-	Suction head too high: $NPSH_{\text{pump}}$ is greater than $NPSH_{\text{system}}$	3 Increase inlet pressure. 3 Consult manufacturer.
X	-	-	-	-	X	-	-	-	Inlet/suction pipe and pump not correctly drained or not completely filled.	3 Completely fill and drain pump and/or pipeline.
X	-	-	-	-	X	-	-	-	Air pockets in inlet/suction pipe	3 Install fitting for venting. 3 Correct pipeline routing.
X	X	-	X	-	X	-	-	-	Air sucked in	3 Seal source of fault.
X	X	-	X	-	X	-	-	-	Gas component too high: pump cavitated	3 Consult manufacturer.
-	X	-	X	-	X	-	-	-	Temperature of pumping medium too high: pump cavitated	3 Increase inlet pressure. 3 Reduce temperature. 3 Consult manufacturer.

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

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

Table 13: Troubleshooting table

9 Appendix

9.1 Service, spare parts, accessories

Please note in particular that spare parts and accessories not delivered by the manufacturer are also not checked and approved by the manufacturer. The installation and/or use of such products can therefore, under certain circumstances, have a negative effect on the properties of the centrifugal pump specified in the design. This can in turn jeopardize safety. Any liability and guarantee on the part of OSNA for damages resulting from the use of non-original spare parts and accessories is excluded.

Any faults that cannot be rectified by the owner may only be rectified by OSNA customer service or specialist service providers. Please provide a precise description of the fault, so that our service technician can prepare and bring the required spare parts. You can reach our customer service via the address on the last page.

Spare parts can be ordered via specialist retailers. Please refer to the type plate for the type designation.

In the event of any guarantee claims, please provide the machine number on the housing.

The following spare parts diagrams are intended solely to ease the process of finding and procuring the spare parts.

**WARNING**

Do not use the spare parts diagrams as assembly instructions.

Notes on ordering spare parts:

In order to prevent incorrect deliveries, please ensure that the information you provide when ordering is as precise as possible:

- Type designation
- Designation
- Required quantity
- Required shipping method (e.g. post, freight, express freight, courier delivery)
- Precise delivery address

9.2 Individual parts of the CVP centrifugal pump

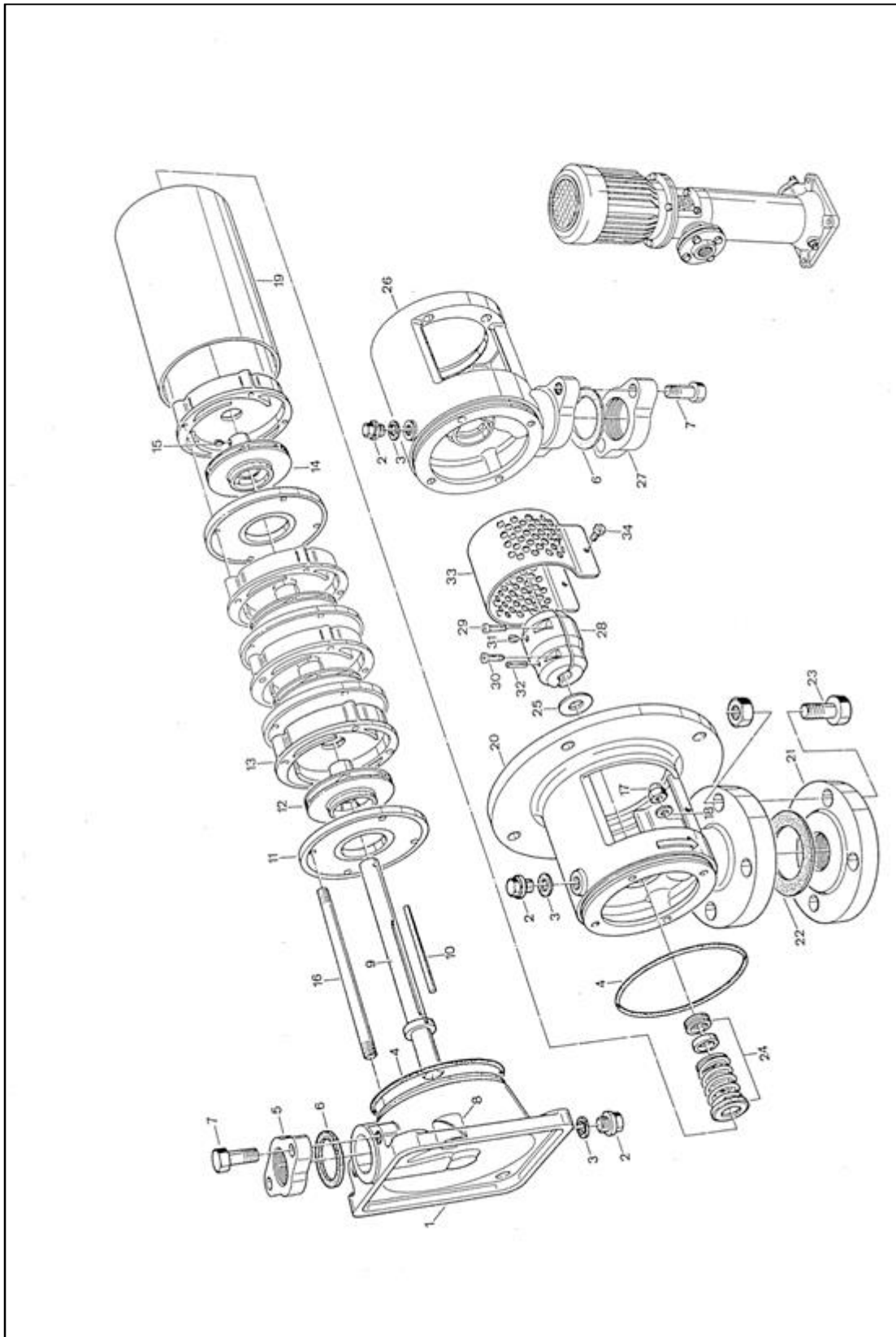


Figure 9: Explosion diagram of the CVP centrifugal pump

Item	Designation	Item	Designation
1	Suction casing	18	Screw lock
2	Screwed plug	19	Stage casing
3	Joint ring	20	Delivery casing
4	O-Ring	21	Flange
5	Flange	22	Gasket
6	Gasket	23	Hexagon head bolt with nut
7	Hexagon head bolt	24	Mechanical seal
8	Bearing shell	25	Thrower
9	Pump shaft with spacer ring	26	Delivery casing
10	Key (round)	27	Flange
11	Wear plate	28	Muff coupling, split
12	Impeller	29	Socket head cap screw
13	Diffuser	30	Socket head cap screw
14	Impeller (top)	31	Grub screw
15	Grub screw	32	Locking sleeve
16	Tie bolt	33	Coupling guard
17	Cap nut	34	Socket head cap screw

Table 14: Parts list of the CVP centrifugal pump

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: **CVP 423, 426, 428**

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)
- Ökodesignrichtlinie (2009/125/EG)

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



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 signed 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: _____

Serial no.: _____

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 stamp: _____



**PUMPS
SYSTEMS
WATER TREATMENT
ENGINEERING
SERVICES**

OSNA-Pumpen GmbH
Brückenstrasse 3
49090 Osnabrück, Germany
Phone: +49 541 1211 ï 0
Fax: +49 541 1211 ï 220
Internet: <http://www.osna.de>
E-mail: info@osna.de

Your no. 1 choice for the solution you need:

- | | |
|----------------------|---------------|
| - Consulting | - Training |
| - Planning | - Maintenance |
| - Project management | - Repair |
| - Assembly | |

OSNA customer service
Emergency service

Tel.: +49 541 1211 ï 254
Tel.: +49 171 4151 ï 674