Operating and Maintenance Instructions

Progressive Cavity Pump

Range MDP

Range	Size		Pressure stage	Stages	Admitted pressure (bar)
MDP	**0015**	**-**	**24**	**4**	**12**
	003	**-**	**12**	**2**	**12**
	006	**-**	**12**	**2**	**12**
	012	**-**	**12**	**2**	**12**

This operating and maintenance instruction includes important safety information and instruction for installation, commissioning, operating and maintenance of the **seepex** machinery. It is essential therefore, that the responsible specialist refers to it before starting any work on the machinery as well as prior to commissioning. Furthermore, this instruction must always be available on site.

EC Declaration of Conformity

complying with the Machinery Directive 98/37/EG, Appendix II A

Manufacturer: **seepex** GmbH

Address: P.O. Box 10 15 64
D-46215 Bottrop

We hereby declare that the following product

Progressive cavity pump

of ranges

- MDP
  - as block pump complete **with** flanged drive

that corresponds to the guideline marked above - including the changes valid at the time of statement -.

The following harmonized standards are applicable:

DIN EN 292-1	Safety of machinery Part 1
DIN EN 292-2	Safety of machinery Part 2
DIN 294	Safety distances to prevent danger zones being reached by the upper limbs
DIN EN 809	Pumps and pump units for liquids
DIN 811	Safety distances to prevent danger zones being reached by the lower limbs

The appertaining operating instruction includes important safety advices and rules for installation, commissioning and maintenance of the **seepex** machinery. The safeguarding of the machinery against inadmissible pressure, dry running and wrong direction of rotation must be ensured at site.

Bottrop, 18.05.01

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Pumpen

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ATTENTION

This EC Declaration of Conformity is **not** valid for pumps of the a.m. ranges when supplied **without** drive. In these cases, the EC Declaration by the Manufacturer acc. to the Machinery Directive 98/37/EG, Appendix II A is valid.

1. General

1.1 Copyright and Industrial Property Rights

These operating instructions are copyrighted. The reproduction, in particular by photocopying, of these instructions is not permitted (§§ 54, 54 UrhG) and constitutes a criminal offence (§ 106 UrhG). Proceedings will be instituted if the copyright is violated.

1.2 Specifications Required for Inquiries and Orders

The following information must be included when inquiring about replacement parts or placing orders:
- comm. no.
- range, sizes, pressure stage

This information is given on the type plate mounted on the machine.

1.3
Limits of Installation

	Shaft sealing	Pump with counter-clockwise direction of rotation [1]	Pump with clockwise direction of rotation [1]
Max. pump pressure	Mechanical Seal	12 bar	12 bar
	Lip Seal	12 bar	2 bar
Max. suction head	Mechanical Seal	2 mwc	8.5 mwc
	Lip Seal	1 mwc	8.5 mwc
Viscosity range	upto 20.000 CP affects flow rate		
Temperature	≤ 40°C		

Assignment: Size in proportion to grain size	Size	Max. grain size
	0015-24	1.3 mm
	003-12	1.4 mm
	006-12	1.7 mm
	012-12	2.2 mm

Media	**CAUTION: no operation with pure water**		
	Dependent on selected pump materials and shaft seals. Refer to enclosed data sheet.	Pumping product only acc. to specifications in the data sheet. In case of variations, please confer with **seepex.**	

[1] refer to item 6.1.4

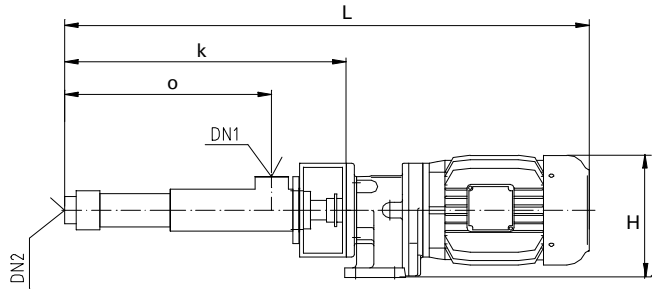
1.4
Performance data, dimensions for pump incl. drive

Range	Flow Rate L/h	Speed rpm	Power kW	Kind of Drive	Speed variation	Dimensions [mm] L x W x H	Weight kg
	7 - 32	190 - 900	0,25	Variable speed drive SF03 (50 Hz)	manual	595 x 194 x 183	17
	8,5 - 38	230 - 1080	0,3	Variable speed drive SF03 (60 Hz)	manual	595 x 194 x 183	17
		0 - 900	0,37	Variable speed drive SPFD05 (50 Hz)	manual		
		0 - 1080	0,44	Variable speed drive SPFD05 (60 Hz)	manual		
0015-24	3,6 - 50	100 - 1400	0,55	A.C. motor with integrated frequency inverter	Frequency inverter +potentiometer+switch	540 x 190 x 315	15
	0,4 - 22	25 - 630	0,13	D.C. motor with integrated control	Thyristor +potentiometer+switch	699 x 175 x 205	19
	25	700	0,25	8-pole-type electr. motor (50 Hz)	constant	540 x 160 x 195	13
	16 - 80	190 - 900	0,25	Variable speed drive SF03 (50 Hz)	manual	595 x 194 x 183	17
	19 - 96	230 - 1080	0,3	Variable speed drive SF03 (60 Hz)	manual	595 x 194 x 183	17
		0 - 900	0,37	Variable speed drive SPFD05 (50 Hz)	manual		
		0 - 1080	0,44	Variable speed drive SPFD05 (60 Hz)	manual		
003-12	8 - 118	100 - 1400	0,55	A.C. motor with integrated frequency inverter	Frequency inverter +potentiometer+switch	540 x 190 x 315	15
	1 - 50	25 - 630	0,13	D.C. motor mit integrated control	Thyristor +potentiometer+switch	699 x 175 x 205	19
	63	700	0,25	8-pole-type electr. motor (50 Hz)	constant	540 x 160 x 195	13
	30 - 135	190 - 900	0,37	Variable speed drive SPF05 (50 Hz)	manual	715 x 194 x 213	18
	36 - 160	230 - 1080	0,44	Variable speed drive SPF05 (60 Hz)	manual	715 x 194 x 213	18
		0 - 900	0,37	Variable speed drive SPFD05 (50 Hz)	manual		
		0 - 1080	0,44	Variable speed drive SPFD05 (60 Hz)	manual		
006-12	15 - 194	100 - 1400	0,55	A.C. motor with integrated frequency inverter	Frequency inverter +potentiometer+switch	574 x 190 x 315	16
	1 - 83	25 - 630	0,25	D.C. motor with integrated control	Thyristor +potentiometer+switch	735 x 175 x 205	20
	105	700	0,25	8-pole-type electr. motor	constant	574 x 160 x 195	13
	68 - 320	190 - 900	0,37	Variable speed drive SPF05 (50 Hz)	manual	735 x 194 x 213	18
	82 - 380	230 - 1080	0,44	Variable speed drive SPF05 (60 Hz)	manual	735 x 194 x 213	18
		0 - 900	0,37	Variable speed drive SPFD05 (50 Hz)	manual		
		0 - 1080	0,44	Variable speed drive SPFD05 (60 Hz)	manual		
012-12	21 - 450	100 - 1400	0,55	A.C. motor with integrated frequency inverter	Frequency inverter +potentiometer+switch	594 x 190 x 315	16
	4 - 190	25 - 630	0,25	D.C. motor with integrated control	Thyristor +potentiometer+switch	755 x 175 x 205	20
	250	700	0,25	8-pole-type electr. motor	constant	594 x 160 x 195	13

All specified data are non binding. Modifications reserved.

1.5
Sound Leve
The sound level of 70 dB (A) is not reached.

1.6
Dimensions



Range	o	k	standard		optional	
			DN1 ISO228	DN2 ISO228	DN1 NPT	DN2 NPT
0015-24	211	306	G 1"	G 1/2"	1"	1/2"
003-12	211	306	G 1"	G 1/2"	1"	1/2"
006-12	245	340	G 1"	G 1/2"	1"	1/2"
012-12	265	360	G 1"	G 1/2"	1"	1/2"

For dimensions L and H refer to table 1.3.2
For total weight refer to table 1.3.2
All data affecting dimensions and weight are non binding.
Modifications reserved.

2.
Safety

These operating instructions contain basic require-ments to be observed during the installation, opera-tion and maintenance of the pump. Therefore, the instructions must be read by the mechanical fitter and by the technical personnel/operator responsible for the pump prior to assembly and commissioning, and kept available at the operating site of the machine/plant at all times. Compliance is required not only with the general safety instructions given in this section but also with the detailed instructions, e.g. for private usage, given under the other main headings in these operating instructions.

2.1
Labelling of Advice in the Operating Instructions

In these operating instructions safety advice whose non-observance could lead to danger for life or limb is labelled with the following general hazard symbol:

safety symbol acc. to
ISO 3864 - B.3.1

Warnings regarding electric power are labelled with:

safety symbol acc. to
ISO 3864 - B.3.6

Safety instructions whose non-observance could jeopardize the machine and its functions are labeled by the word

CAUTION

Always comply with instructions mounted directly on the machine, e.g.
- rotational direction arrow
- fluid connection indicators

and ensure that the information remains legible.

2.2
Personnel Qualifications and Training

Personnel charged with operation, maintenance, inspection and assembly must be in possession
of the appropriate qualifications for the tasks.
The company operating the machine must define exact areas of responsibility, accountabilities and personnel supervision schemes. Personnel lacking the required skills and knowledge must receive training and instruction. If necessary, the operating company may commission the manufacturer/ supplier to conduct these training courses. Furthermore, the operating company must ensure that the personnel fully understands the contents of the operating instructions.

2.3
Dangers Resulting from Failure to Observe Safety Instructions

Failure to comply with the safety instructions may lead to hazards to life and limb as well as dangers for the environment and the machine. Non-observance of safety instructions can invalidate the right of claim to damages.
The following are just some **examples** of possible dangers resulting from failure to comply with the safety instructions:
- Failure of important machine/plant functions
- Failure of prescribed methods of service and maintenance
- Danger to life and limb due to electrical, mechanical and chemical influences
- Danger to the environment due to the leakage of hazardous substances

2.4
Safety-Conscious Working

Always comply with the safety instructions listed in this document, the existing national accident prevention regulations and any company-internal work, operating and safety rules.

2.5
Safety Instructions for the Operating Company/Machine Operator

- Any potentially hazardous hot or cold machine parts must be provided with protection against accidental contact at the customer´s premises.
- Protective guards for moving parts (e.g. coupling) must never be removed while the machine is in operation.
- Leakages (e.g. in the shaft seal) of hazardous conveying liquids (e.g. explosive, toxic, hot) must be drained in such a way that no danger arises for persons or for the environment. Always observe the relevant statutory requirements.
- The risk of exposure to electrical power must be eliminated (for details, see the VDE regulations, for example, or those of the local power supply company).

2.6
Safety Instructions for Maintenance, Inspection and Assembly Work

The operator must ensure that all maintenance, inspection and assembly tasks are carried out by authorized and qualified personnel who have studied the operating instructions closely and become sufficiently familiar with the machine.
As a basic rule, the machine must be brought to a standstill before work is carried out. Always comply with the de-commissioning procedure described in this document.
Any pumps or assemblies conveying media that are detrimental to health must be decontaminated.
Immediately following completion of work, all safety and protective devices must be replaced in position and, where applicable, re-activated.
Before re-starting the machine, observe the points listed under the heading "Initial Startup".

2.7
Unauthorized Modification and Manufacture of Replacement Parts

Conversions or modifications of the machine are permissible only in consultation with the manu-facturers. Original manufacturer replacement parts and manufacturer-approved accessories enhance the operational safety of the machine. The usage of unauthorized parts may lead to the nullification of the manufacturer's liability for any resultant damages.

2.8
Impermissible Modes of Operation

The operational safety of the machines supplied is warranted only for employment in accordance with the intended use as defined in Section 1 - General - of these operating instructions. Never allow the threshold values specified in the data sheet to be exceeded.

3.
Protection against Environmental Influences

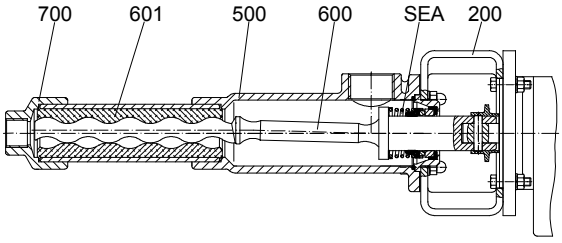
To afford protection against environmental influences, the intermediate storage location must be dry, enclosed and free from frost.

4.
Description of the seepex Progressive Cavity Pump and Accessories

4.1
General Description, Design and Mode of Operation

Like all progressive cavity pumps, **seepex** pumps belong to the rotating positive-displacement pump family. The characteristic attribute of these pumps is the special formation and arrangement of the two conveying elements, namely the rotor and the stator.
The difference in the number of threads possessed respectively by the rotor and stator produces a chamber that opens and closes alternately in line with the constant turning motion of the rotor, effecting the continuous transportation of the conveying product from the suction side to the pressure side.
The geometrical formation of the two conveying elements combined with the constant contact that
exists between them result in sealing lines that effect an airtight seal between the suction and pressure side in every position of the eccentric screw, even when the pump is stationary. The pump owes its high suction capacity to this sealing between the suction and pressure sides.

4.2
Mechanical Design



Item	Component
200	Lantern
SEA	Shaft seal
500	Suction casing
600	Rotating unit/rotor
601	Stator
700	Pressure branch

5.
Assembly / Installation

5.1
Position of installation

The pump can be either installed horizontally or vertically.

5.2
Erection of completely mounted pump

- Protective devices
  On completion of the assembly and installation work, immediately mount all safety and protective devices in their proper locations and set them in operation.

5.3
Electric Connection of Electric Motor and Frequency Converter

The electric connections must be established in accordance with the manufacturer's specifications, Point 10, as well as the safety specifications applying at the installation site. The mains voltage and frequency must match the ratings indicated on the type and rating plates.

Only a skilled electrician has to do the lead connection at the binders of the drive acc. to the valid instructions IEC 204-1 as well as EN 60204-1. Separative protective gears have to be available on site.

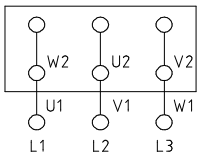
- Switch on electric motor „direct-on-line“

CAUTION

An increased starting torque is necessary due to the clamping between the rotor and stator conveying elements. This means the electric motors that drive the progressive cavity pumps must always be switched on directly. As a rule, star-delta startup is not possible unless special arrangements have been made with **seepex**.

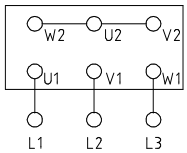
Three-phase cage motor

Delta connection +



Terminal board

Star connection



low. . . . high . . .

. . . voltage indicated on rating plate

6.
Commissioning/De-commissioning

6.1
Preparation for Operation

6.1.1
Shaft Sealing

6.1.1.1
Safety

Any mode of operation impairing the operating safety of the mechanical seal has to be avoided.
The operator is advised to consider the possible effects on the environment which could be caused by a defective mechanical seal and what additional measures must be taken to protect the environment and the public.
The pump must be mounted and operated in such
a way that operation with a defective mechanical seal will not result in injury or harm to the public and that any leakage can be safely and properly dealt with.
Mechanical seals are often used to seal hazardous material (chemicals, drugs, etc.). It is essential that rules pertaining to the handling of hazardous materials are adhered to.
Modifications effected by the customer himself and changes influencing the safety of the mechanical seal are not allowed

6.1.1.2
Emissions

A mechanical seal is a dynamic seal and leakage is unavoidable.

ATTENTION

Components that may contact leakage must be resistant to corrosion or be protected accordingly.
Mechanical seal leakage must be drained in a safe and proper manner.

6.1.1.3
Lubrication of shaft seal

In every operating status of the pump, the liquid to be sealed has to appear in fluid condition at the mechanical seal. This particularly applies to commissioning and de-commissioning of the pump.

6.1.2
Filling Up of Suction Side to Avoid Dry Running at Startup

CAUTION

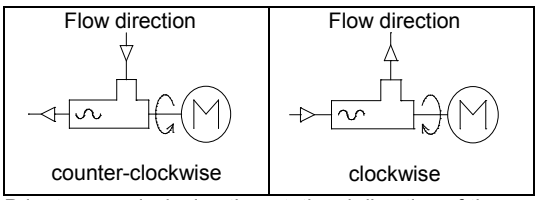
Before switching on the pump, fill the suction-sided pump casing with fluid so that the first rotations will lubricate the conveying elements immediately.

6.1.3
Electric Connections

The risk of exposure to electrical hazards must be ruled out. Always observe the safety regulations valid at the site of installation.

6.1.4
Checking Direction of Rotation

The rotational direction of the pump determines the flow direction of the conveying medium.



Prior to commissioning the rotational direction of the pump must be checked for compliance with the data sheet specification and the rotational direction arrow on the type plate of the pump..

6.2
Equipment for Protection of Persons

Machines must be fitted with mechanical protective devices complying with DIN EN 809.

- Moving or working parts must be protected against accidental contact.
- However, safety considerations demand it to be possible at all times to check without hindrance whether the shaft seal is fully functional.
  A protective guard is necessary in this area only if components are mounted on the rotating, smooth shaft.
- If pumps are operated with an open suction flange/feed hopper, a suitable protective guard complying with DIN EN 294 must be mounted.
- Country-specific protective regulations must be observed at the site of installation.
  Prior to activation of the pump, check the proper function of all protective equipment.

6.3
Commissioning

6.3.1
Initial Startup/Re-starting

CAUTION

Every **seepex** progressive cavity pump is designed for the specific operating conditions documented in the data sheet.
Commissioning is permissible only if the operating conditions conform with those indicated in the data sheet. Although the potential usages of the **seepex** pump are not confined to the specified operating conditions, any change in the original conditions must be checked and approved by **seepex**.
The right to make claims under the warranty agreement will be annulled if operating conditions are changed without prior approval by **seepex**.

6.3.2
Avoid Dry Running of Pump

CAUTION

The dry running of a pump increases the friction between rotor and stator, quickly causing an unacceptably high temperature to develop on the inner surface of the stator. This overheating leads to burning of the stator material and the total failure of the pump.

6.3.3
Check Pressure at Suction and Pressure Flanges

6.3.3.1
Safeguard Pump Against Excessive Pressure at the Suction Flange

The **seepex** pump is designed to operate with the pressure at the suction flange (suction head or inlet pressure) specified in the data sheet. Deviating pressure conditions may lead to the failure and/or destruction of the shaft seal or entire pump.
For this reason the suction pressure specified in the data sheet must be guaranteed.
Appropriate monitoring devices are oil-filled contact manometers that deactivate the pump.

6.3.3.2
Safeguard Pump Against Excessive Pressure at the Pressure Flange

The **seepex** pump operates according to the positive displacement principle. Operation of the pump against an excessive pressure caused by closed valves, by high pressure losses in the piping or by product sedimentation will lead to the destruction of the pump, drive, pipe work and/or downstream equipment. Every progressive cavity pump must therefore be protected against overpressure. Safety valves with bypass pipes or oil-filled contact manometers that disactivate the pump are appropriate protective devices.

6.4
De-commissioning

6.4.1
De-activation

The electric connections must be switched off and protected against accidental re-activation. Observe the safety regulations applying to the plants.

6.4.2
Stationary Pump

The pump and all optional equipment must be provided with the following protection modes while at a standstill:

- Frost protection
- Protection against solid particle deposits
- Protection against sedimentation of the medium
- Corrosion protection for parts in contact with the medium

We recommend that the pipeline and pump be emptied for the duration of the plant standstill. Following evacuation, the pump should be preserved

6.4.3
Draining of the Pump

- The piping at suction- and pressure side has to be drained or blocked directly behind the pump connections.
- Residual liquid in the pump casing has to be drained through the connections of the suction casing and pressure housing.
- Residuals of the liquid which may penetrate in transit or during pump disassembly always remain in the rotor- / stator chambers.
- Therefore, appropriate safety clothing has to be worn during all assembly work when aggressive or dangerous media are handled.

7.
Service and Maintenance

7.1
General Instructions

A requirement for the reliable operation of any pump is service and maintenance carried out in compliance with instructions. Maintenance personnel must therefore have access to these operating instructions and adhere to them meticulously. **seepex** will accept no liability for damages arising from non-observance of these operating instructions.

7.2
Maintenance and Inspection

7.2.1
Shaft Seal

No maintenance will be required when operating the pump conforming to specifications

7.2.2
Bearing of the Pump/Drive Engine

The bearing of the rotating pump parts is effected by the drive engine.
Therefore, for details about lubrication / lubricant quantity / filling quantity as well as maintenance and inspection, refer to the enclosed operating instruction of the drive.

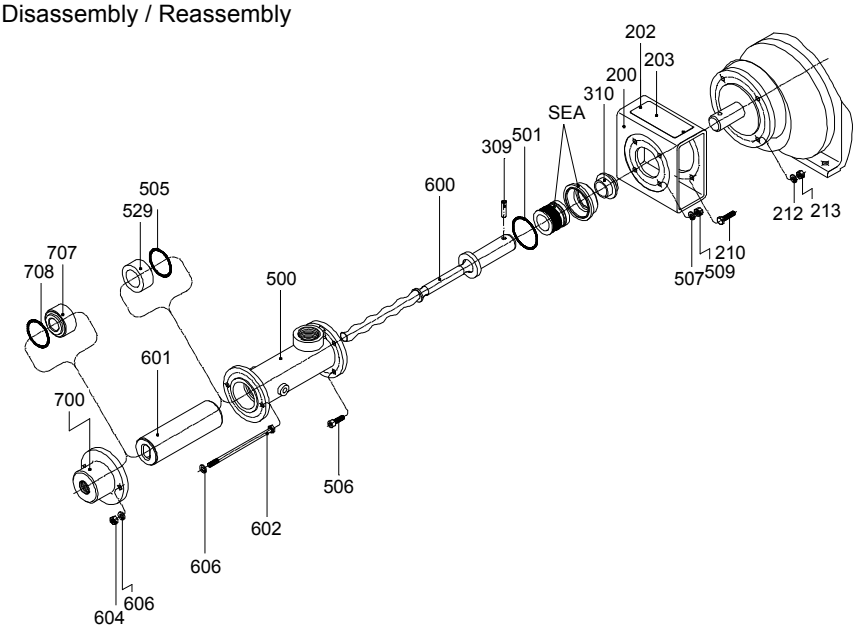
7.3
Preventive Measures

To avoid expenses incurred by lengthy stop periods of the pump, **seepex** recommends the acquisition of a set of wearing parts and a set of gaskets.

7.4
Wearing parts and gaskets

Designation	Set of wearing parts	Set og gasket	Item No. acc. to sectional drawing of pump and Parts list	Remarks
	Number			
Rotating unit	1		600	
Stator	1		601	
Casing gasket		1	501	
Mechanical Seal		1	SEA	See Sectional Drawing
Splash ring		1	310	

7.5
Disassembly / Reassembly



Pcs.	Item	Designation	
1	200	Lantern	
2	202	Round head grooved pins	
1	203	Type plate	
4	210	Hexagon bolt	
4	212	Spring washer	
4	213	Hexagon nut	
1	309	Plug-in shaft pin	
1	310	Splash ring	
1	SEA	Shaft Sealing	
1	500	Suction casing	
1	501	Casing gasket	
1	505	O-ring	1)
4	506	Hexagon bolt	
4	507	Spring washer	
4	509	Cap nut	
1	529	Reducing unit	1)
1	600	Rotating unit	1)
1	601	Stator	1)
2	602	Hexagon bolt	1)
2	604	Hexagon nut	
2	606	Washer	
1	700	Pressure branch	
1	707	Reducing unit	1)
1	708	O-ring	1)

1) dependent on sizes

8.
Operating Failures, Causes and Remedies

Excessive power consumption:	Stop and dismantle pump and check it for sedimented or rough solids.
Pump not priming:	Check rotating direction. Fully open valves.

Shaft seal leaky:	Check shaft seal for wear and resistance. Verify correct fit of sealing elements.

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