OPERATION & MAINTENANCE MANUAL

1-component print head vipro-HEAD 3 and vipro-HEAD 5

ViscoTec

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1 Introduction

Dear customer,

We are delighted that you have decided to purchase a ViscoTec product. We have no doubt that this product will meet all your requirements. We wish you trouble-free and successful operation.

Suitable for any commonly used additive manufacturing machine, the 1-component print head vipro-HEAD 3 and vipro-HEAD 5 enables highly accurate 3D printing.
The print head is installed in the 3D printer and the drive unit (stepper motor) is connected to the printer control unit. The print head is controlled via the printer control unit.

This operation manual describes the 1-component print head vipro-HEAD 3 and vipro-HEAD 5.

1.1 Scope of delivery

The scope of supply includes:
- 1 dosing unit (2)
- 1 drive unit (11)
- 1 stator (7)
- 1 assembly aid (6)
- 1 operation & maintenance manual

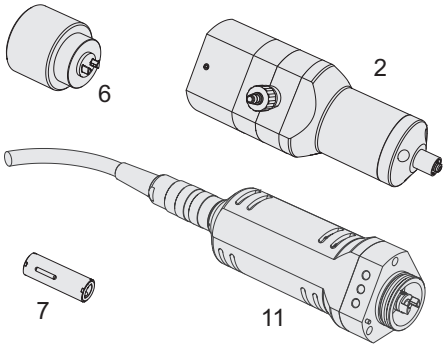


Fig. 1

1.2 Incoming inspection

Damage in transit can lead to malfunctions, and consequently to personal injury and damage to property. Damaged components must not be put into operation.

Check the delivery immediately on receipt for damage in transit and damage to the packaging. Check that the delivery is complete according to the enclosed delivery note. Make sure you have not left any part of the delivery in the packaging.

Compensation for damage during transport may be claimed only if the carrier is notified immediately.

1.3 Service hotline

If you have any questions about commissioning, maintenance, repairs or ways to optimise your processes, our Service employees will be happy to help.

Simply call our service hotline on +49 8631 9274--0. It is open Mondays to Thursdays from 8:00 – 17:00 and Fridays from 8:00 – 12:00 (CET/CEST).
We will respond to your service enquiry in German or English.

2 Safety

2.1 Explanation of symbols used

The following symbols are used in this manual:

•	Work step
(1) (A)	Legend number, reference to a figure
–	List
*	Reference to a comment
Bold text	Classification

The following notices indicate safety instructions and must be followed:

⚠ DANGER

Indicates a hazardous situation which, if not avoided, will result in death or serious injury.

⚠ WARNING

Indicates a hazardous situation which, if not avoided, may result in death or serious injury.

⚠ CAUTION

Indicates a hazardous situation which, if not avoided, may result in minor injury.

NOTE

NOTE Indicates a technical tip to avoid damage to property or equipment.

⚠ The note contains safety-related information or general safety measures. It does not refer to specific hazards or individual precautionary measures.

This manual is structured so that text and the related figure are on the same page as far as possible. In this way the information can be understood quickly. If reference is made to a component in a figure, the part has a key number.

2.2 Intended use

The 1-component print head vipro-HEAD 3 and vipro-HEAD 5 is designed for the highly accurate printing of viscous materials.

No liability can be accepted for damage caused by failure to observe this operation manual or due to a lack of maintenance or checks.

Misuse
Any use other than the stipulated intended use shall be considered as misuse.
This includes
– use outside the permissible operating limits
– use in explosive environments
– use underground
– use outdoors

Misuse also includes the following actions carried out without the explicit written approval of the manufacturer:
– Conversions and/or extensions
– Use of non-genuine spare parts
– Repairs carried out by unauthorised companies or persons
– Use of non-approved materials

Misuse is not permissible, and will result in voiding of guarantee, warranty and liability claims.

2.3 Informal safety precautions

The following documents must be read, understood and observed. They must always be available at the machine
– The operation manual for this product
– Generally applicable and local accident prevention and environmental protection regulations
– Safety data sheets for the materials used, as well as for any cleaning products or lubricants

All warning and information signs on the machine must be observed and kept in a legible condition. They must not be removed or obscured. Illegible warning labels must be replaced.

2.4 Personnel

The operating organisation shall ensure that only appropriately qualified and authorised personnel work on this machine. It is responsible for ensuring that operators and maintenance staff possess the necessary qualifications. The machine may only be operated by one person. Personnel must be at least 15 years old.

All personnel working with or on the machine must have read and understood this operation manual.

The operating company shall document the operators

2.4.1 Operators

Before starting work, the personnel assigned as operators must be adequately instructed regarding the nature and scope of their duties and the potential risks. Training shall be conducted on a regular basis (at least once a year). Training shall be conducted after any technical modifications.

2.4.2 Maintenance staff

The maintenance and repair staff must be authorised and
– adequately trained for the relevant activities
– familiar with and comply with the applicable technical rules and safety regulations

Competent personnel are persons who, by virtue of their training, experience and knowledge of the relevant requirements, standards and safety regulations, can carry out the necessary activities while recognising and avoiding potential hazards.

2.5 Preventing damage to equipment

In order to prevent damage to equipment and to ensure accurate printing results, make sure that

- the print head is never operated without material (the stator will be destroyed)
- the material inlet (feed) and the material outlet must never be closed during operation
- the material outlet (e.g. dosing needle or mixer) must not be damaged or blocked
- the print head is operated with a positive feed (inlet pressure)
- there is adequate inlet pressure when conveying highly viscous material
- when conveying without a positive feed (inlet pressure), no dry running or cavitation occurs in the print head
- the direction of rotation of the drive is always the same as the direction of flow of the print head
- the specifications in the product data sheet for the material are observed and adhered to

2.6 Organisational safety measures

The necessary personal protective equipment must be provided by the operating organisation. Personal protective equipment must be worn when carrying out all work and procedures.

To ensure the provision of suitable personal protective equipment, the safety data sheet for the conveyed material must be observed. Specifications for e.g. cleaning products and lubricants must also be checked and observed.

All personal protective equipment must be checked to ensure it is working properly before starting work.


Eye protection


Hand protection


Body protection


Foot protection

2.7 Residual risks

Thorough training, observance of the operation manual and compliance with safety regulations are key to permanently accident-free operation.

The following residual risks may occur when operating this machine:

⚠ WARNING

Material hazardous to health

The conveyed material may contain constituents which are hazardous to health. Such constituents may cause serious acute or chronic harm to health if they come into contact with skin, are inhaled or swallowed.

– Always wear appropriate protective equipment
– Observe the specifications in the safety data sheet for the material

⚠ WARNING

Risk of injury from moving components

The machine is driven by an electrical drive unit. These generate very high forces. Touching the components during operation may result in serious injuries.

– Do not operate the machine unless there is unrestricted visual contact with the moving component
– There must be no persons or foreign objects in the danger area

⚠ WARNING

Pressurised material

Depending on the setting of the machine, the material is conveyed under very high pressure. Material escaping from damaged pipe connections or components may result in serious injuries.

– Immediately switch off machine (actuate Emergency Stop button)
– The leak must be repaired by qualified maintenance staff before operation is re-started

⚠ CAUTION

Splashing material

During initial commissioning and after being refilled, air bubbles in the material could cause an uncontrollable spraying from the conveying area. This may result in injury.

– Always wear appropriate protective equipment
– Fully bleed the system before start of production

2.8 Transport and storage

Only personnel with the appropriate skills are permitted to transport the print head. Depending on the size, it can be transported manually or using a suitable means of transport. In doing so, all applicable standards and regulations must be observed to ensure transport safety.

The following ambient conditions must be observed for transportation and storage:
- Temperature between -10 °C and +40 °C (14 °F to 104 °F)
- Relative humidity less than 60 % (non-condensing)
- Uniform room climate
- Dry and free of dust
- No exposure to direct sunlight
- No aggressive, corrosive substances (solvents, acids, alkalis, salts, etc.) in the environment

For storage always remove the stator and store separately (at 15–20 °C/ 59–68 °F).

3 Product description

The print head was developed for the accurate additive processing of highly viscous materials with high repeat accuracy. Its specific design also enables the conveying and printing of abrasive materials.

ViscoTec print heads are rotating positive displacement pumps. The conveying elements comprise a rotating part, the “rotor”, and a stationary part, the ?stator”.
The rotor, which is in the form of a type of knuckle thread, rotates inside the stator, which has one more thread turn and twice the pitch length of the rotor. As a result, conveying areas are produced between the stator and the rotor rotating inside the stator. The rotor also moves radially within the stator. The conveying areas move forwards continuously due to the movement. The flexible shaft used to drive the rotor compensates for the eccentric movement of the rotor and is completely maintenance-free.
The sealing effect of the conveying elements of the print head is dependent on the viscosity and type (stator).

Since the direction of flow is reversible, the material can be sucked back to allow a clean thread break.

The print head can be dismantled very quickly without the need for special tools.

The print head is installed in the 3D printer and the drive unit (stepper motor) is connected to the printer control unit. The print head is controlled via the 3D printer control unit.

4 Operation

4.1 Initial commissioning

All activities described below may only be carried out by qualified staff.
When delivered, the stator is not installed. This is to avoid bearing damage to the elastomer.

4.1.1 Installing the stator

- Remove screws (8).
- Detach the end piece (3) from the dosing unit (2).
- Unplug the star-shaped coupling (5) from the drive unit (11).
- Plug the star-shaped coupling (5) into the dosing unit (2).
- Couple the assembly aid (6) to the dosing unit (2).

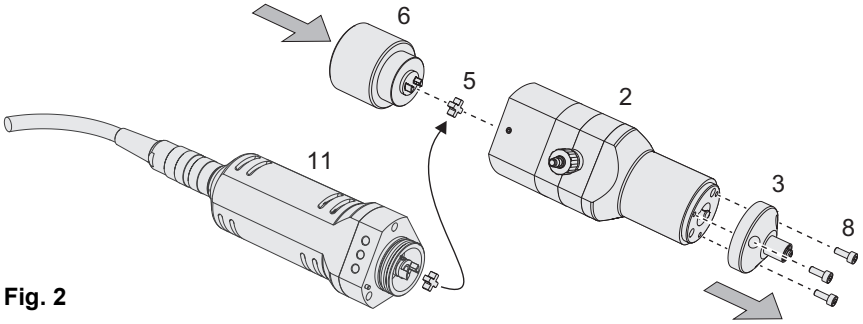


Fig. 2

- Coat the rotor (4) with material or a suitable lubricant.
- Screw the stator (7) onto the rotor (4) with the correct orientation until the rotor assembly (9) begins to dip into the groove (8).
- Lightly press the stator (7) towards the dosing unit (2) and turn the assembly aid (6) in the direction of the arrow until the stator (7) has been guided into the dosing unit (2).

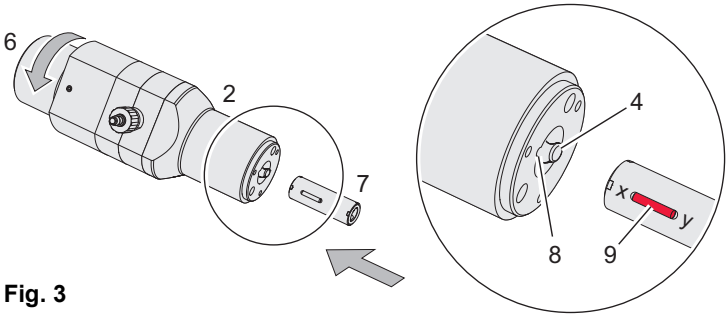


Fig. 3

- Uncouple the assembly aid (6) and fit the end piece (3).

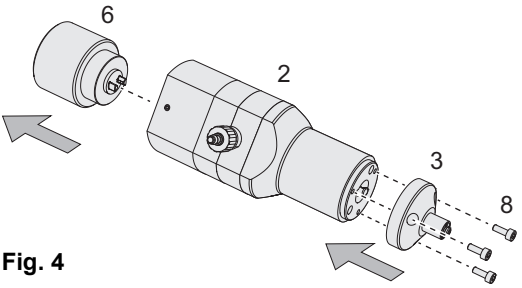


Fig. 4

4.1.2 Connecting the drive unit to the printer control unit

DANGER

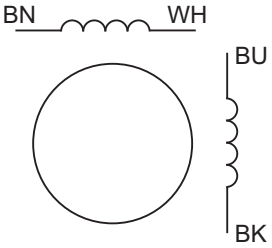
Danger to life from electrical voltage

There is a risk of fatal electric shock if equipment covers are removed and the motor is connected to the printer control unit. Improper handling may result in personnel coming into contact with live components.

– Work and repairs to live parts should only be carried out by qualified maintenance staff in compliance with all applicable standards, directives and safety regulations (e.g. EN 50110-1)

Motor connection

Bipolar	Connection pin	Cable cores
A	1	brown (BN)
A\	2	white (WH)
B	3	blue (BU)
B\	4	black (BK)



Step direction

Step	A	B	A\	B\	Suck-back	Printing
1	+	+	-	-	CCW ↑	CW ↓
2	-	+	+	-		
3	-	-	+	+		
4	+	-	-	+		

Recommendations

It is recommended that you operate the stepper motor in quarter-stepping mode.
To use the print head with a filament slicer, the correct parameters have to be configured. The slicer calculates the volume to be conveyed by means of the length and diameter of the filament.
To achieve the same volume discharge with the vipro-HEAD, either the filament diameter (in the slicer) or the steps/mm of the extruder (in the printing firmware) can be adjusted.
The material that is conveyed per rotation corresponds to either 0.03 ml (vipro-HEAD 3) or 0.05 ml (vipro-HEAD 5). With the setting “quarter-stepping mode”, the drive unit requires 9600 steps/rotation. The value for the steps/mm can be calculated based on a fictitious filament diameter d.

vipro-HEAD 3

$$\frac{\text{Steps}}{\text{mm}} = d^2 \times 251.32$$

vipro-HEAD 5

$$\frac{\text{Steps}}{\text{mm}} = d^2 \times 150.79$$

Accordingly, if a value is provided for the steps/mm, it is possible to calculate the filament diameter:

vipro-HEAD 3

$$d = \sqrt{\frac{\text{Steps}}{\text{mm}} : 251.32}$$

vipro-HEAD 5

$$d = \sqrt{\frac{\text{Steps}}{\text{mm}} : 150.79}$$

4.1.3 Connecting the dosing unit to the drive unit

- Before assembly, check whether the drive unit (11) rotates in the correct direction and with the corresponding speed (see enlarged image, Fig. 5).
- Unscrew the set screws (14) until they no longer protrude into the coupling area. **Risk of damage to the drive unit.**
- Attach the star-shaped coupling (5) onto the coupling of the drive unit (11).
- Set the anti-rotation device (S) in the correct position relative to the dosing unit (2).
- Fully assemble the dosing unit (2) and the drive unit (11).
- Lightly screw in the set screws (14) to centre the drive unit (11) in the correct position.

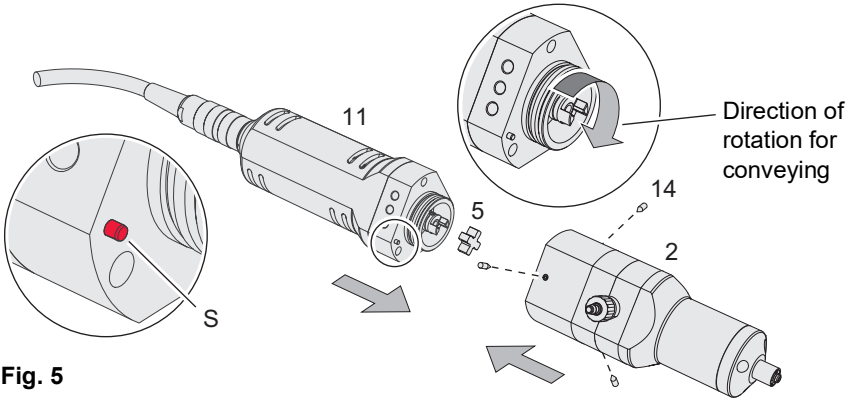


Fig. 5

4.1.4 Feeding material and bleeding the dosing unit for the first time

- Connect the material supply (feed line, cartridge) to the material inlet (A) of the dosing unit.
- Connect the transparent tube (2) (with an inner diameter of 4 mm) to the bleed valve (23).
- Check that the bleed valve (23) is closed.
- Pressurise the material.
- Slowly open the bleed valve by approximately half a rotation until the material comes out without bubbles.
- Close the bleed valve (23) and detach the tube.
- Connect the drive unit to the power supply and run slowly until the material escapes from the outlet nozzle (attached Luer-Lock needle) bubble-free.

Tip:
Ensure that the tube used is sufficiently long (approx. 20 cm) and is capable of holding all the material required for the bleeding process. You can dispose of this at the end of the process.

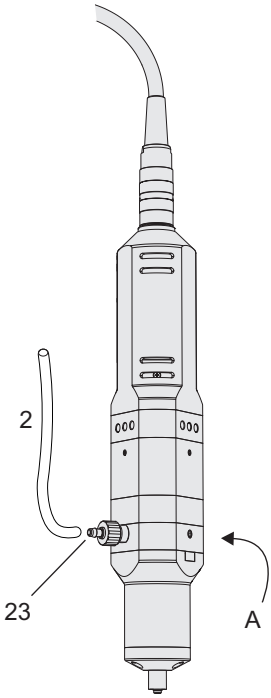


Fig. 6

4.2 Switching on, starting the printing process

Daily at the start of the shift/when starting work, perform the activities as described in Section 5.1 “Maintenance intervals” (Page 19).

NOTE

The supply of material to the dosing unit must be ensured before dosing starts. Dry running may destroy the stator.

- Start supplying the material to the dosing unit.
- If present, remove cover.
- Mount the new or cleaned dosing needle.
- Start the printing process via the printer control unit.

4.3 Switching off, terminating the printing process

- The printing process is switched off using the printer control unit. The exact procedure can be found in the printer control unit manual.
- Switch off the material supply to the dosing unit.
- Switch off the printer control unit and secure it against unauthorised restarting.
- Remove dosing needle.
- Seal outlet opening (e.g. with cover).

4.4 Decommissioning

All activities described below may only be carried out by authorised maintenance staff.

- Switch off the printer control unit and secure it against unauthorised restarting.
- Shut down material supply to the dosing unit (depressurise).
- Relieve inlet pressure via bleed valve (23).
- Remove material supply and seal openings with suitable plug.
- Disconnect the power supply to the drive units.
- Remove the print head from holder or system.
- Disconnect the dosing unit and drive unit.
- Remove the stator, clean and store separately.
- Disassemble and clean the dosing unit.
- Store the print head according to the storage conditions as described in Section 2.8 “Transport and storage” (Page 11).

4.5 Re-commissioning

Re-commissioning is the same as initial commissioning. The same specifications and work steps apply as described in Section 4.1 “Initial commissioning” (Page 13). It must be ensured that the dosing unit is free of material residues, dust and dirt.

5 Maintenance

In the event of a fault, or if there is any doubt that the machine/system is not completely ready for operation, it must be shut down immediately and inspected by competent maintenance staff before operation continues.

WARNING

Maintenance and cleaning work may only be carried out when the machine has been shut down safely and secured against unauthorised restarting. Otherwise, serious injuries may result.

– Switch off the main switch on the control unit and secure against unauthorised restarting (e. g. with a padlock)

5.1 Maintenance intervals

In order to ensure problem-free operation, we recommend complying with the following maintenance intervals.

When	Activity	Who
Start of shift / daily	• Visual check for leaks / contamination / damage.	1
End of shift	• Remove and clean the dosing needle, or dispose of it if necessary.	1
Every year	• Disassemble the print head, clean it, and check all parts such as stator, rotor assembly, seals, bearings and housing and replace if required.	2

1 = Operating staff
2 = Maintenance staff

The recommended change cycles are based on empirical values for dosing applications. The empirical values are based on different material properties, pressure conditions and dosing settings. Depending on the material used, the required change cycles may differ from the recommended cycles.

Ambient conditions, such as temperature and humidity, may affect the change cycles.

5.2 Troubleshooting

Fault	Possible cause	Action
No or too little material conveying	Motor not connected	Connect the motor
	Fault with mains supply	Check electrical installation
	Material hardened/set	Remove and clean print head
	Dosing needle blocked	Clean/replace dosing needle
	Stator/rotor worn	Replace stator/rotor
	Stator swollen	Check resistance of the stator to the material and replace stator
	Inadequate supply of material	Feed material, check inlet pressure and correct if required
Dripping or running on of material	Suck-back not set correctly	Adjust the suck-back
	Air bubbles in the material	Bleed print head/material pipes
	Material compressible	Degas the material

If you encounter any issues or have any questions, please contact the service hotline (see page 5).

5.3 Changing the stator

All activities described below may only be carried out by authorised maintenance staff.

Preparation

- Disconnect the printer control unit from the power supply.
- Unplug the power supply to the drive unit.
- Shut down material supply (depressurise).
- Relieve inlet pressure via bleed valve (23).
- Remove material supply and seal openings with suitable plug.
- Remove the dosing unit from the holder or system.

5.3.1 Disconnect the dosing unit and drive unit

- Undo set screws (14).
- Disconnect the dosing unit (2) and drive unit (11).
- Remove the star-shaped coupling (5).

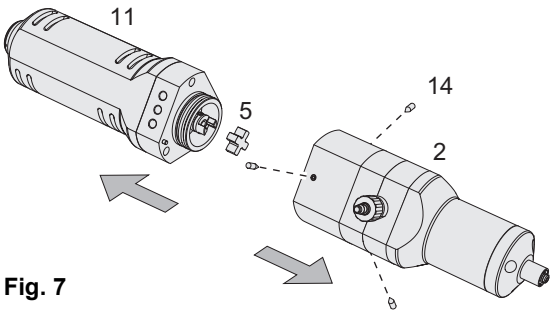


Fig. 7

5.3.2 Remove the stator

- Remove screws (8).
- Detach the end piece (3) from the dosing unit (2).
- Unplug the star-shaped coupling (5) from the drive unit (11).
- Plug the star-shaped coupling (5) into the dosing unit (2).
- Couple the assembly aid (6) to the dosing unit (2).
- Unscrew stator (7) with assembly aid (6).

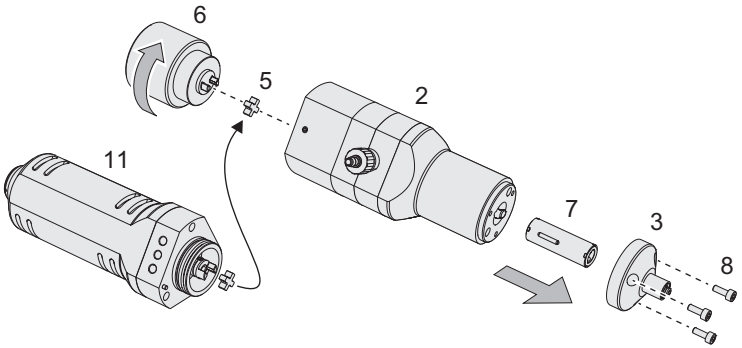


Fig. 8

Install the stator
Install the stator as described in Section 4.1.1 (page 13).

5.4 Dismantling before cleaning

When cleaning the dosing unit (2), please pay attention to the chemical properties and reactions of the material. In doing so, observe and comply with the corresponding specifications of the product data sheet. If you have any queries, contact the manufacturer of the material.
All activities described below may only be carried out by authorised maintenance staff.

Preparation

- Remove the stator as described in Section 5.3 “Changing the stator” (Page 21).

Remove the rotor assembly

- Unscrew the screws (26) and detach the pump housing (10) from the bearing unit (13).
- Remove the seal (22).

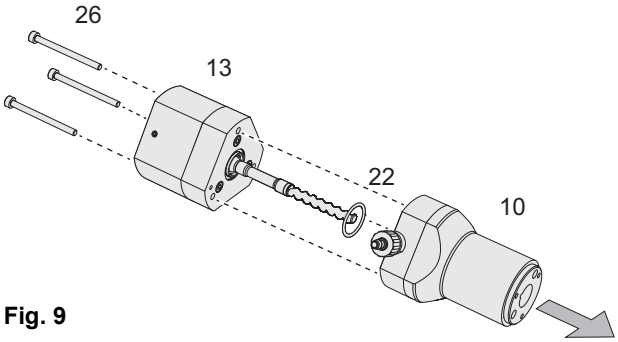


Fig. 9

- Unscrew the screws (18) and pull off the sealing unit (35) with O-ring (37) from the bearing unit (13).

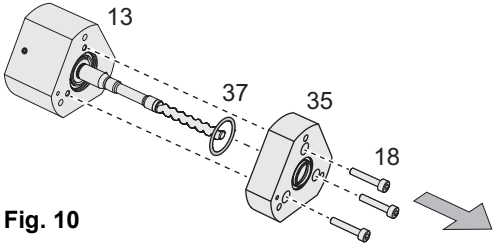


Fig. 10

NOTE

Don’t purge the bearing unit (13). This can damage the bearings! Clean it only with a cloth and brush.

Dismantle the pump housing

- Unscrew the screws (18) and disconnect the pump inlet housing (25) from the pump housing (10).
- Remove the seal (22) and the blind cap (33).
- Unscrew the valve attachment (32) for the bleed valve (23).

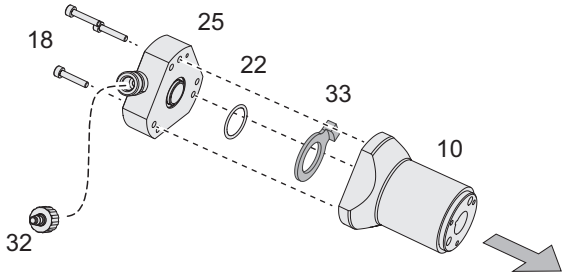


Fig. 11

Cleaning

Clean the components as described in Section 6 (page 25).

Assembly

After cleaning, the print head is assembled in the reverse order.

5.5 Note with respect to bleed valve

The bleed valve (23) can be mounted on the other side.

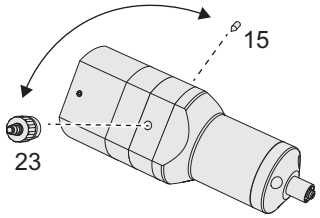


Fig. 12

NOTE

Screw in the set screw (15) so that it is flush with the adjacent areas. For sealing, we recommend using PTFE tape.

6 Cleaning

⚠ WARNING

Cleaning work may only be carried out when the machine has been shut down safely and secured against unauthorised restarting. Otherwise, serious injuries may result.
– Switch off the printer control unit
– Disconnect the printer control unit

If the dosing unit is soiled with material or if you disassemble and clean the dosing unit, use a cleaning agent that is compatible with the material. The information in the safety data sheet must be complied with.

Recommended cleaning agents, e.g. cellulose thinner, isopropanol, cleaner's solvent or alcohol.

Note the following points regarding the use of cleaning agents and the performance of cleaning work:
– Observe the specifications in the safety data sheet for the cleaning agent
– Personal protective equipment must be worn
– Compatibility with the materials installed in the dosing unit must be checked before use
– The cleaning agent must be used according to the manufacturer's specifications (e. g. application time)
– Cleaning agents must not penetrate electrical or mechanical system components
– Do not use high-pressure cleaners for cleaning
– Clean off all of the cleaning agent (if necessary, purge with water and then blow dry with compressed air)
– Dispose of cleaning agent properly
– Re-attach any protective and safety devices or cladding removed and check that they function correctly
– Use a metal-free tool (do not use steel wool or a screwdriver). We recommend that you use a small cylinder brush made of plastic.
– Place the elastomer components (e.g. stator, o-rings) in the cleaning agent for a short time only (max. two minutes)

7 Spare parts

Every time you order spare parts, please state the type identifier, serial number and order number.
The serial number is engraved on the bearing unit (13).

7.1 Overview drawing of the spare parts

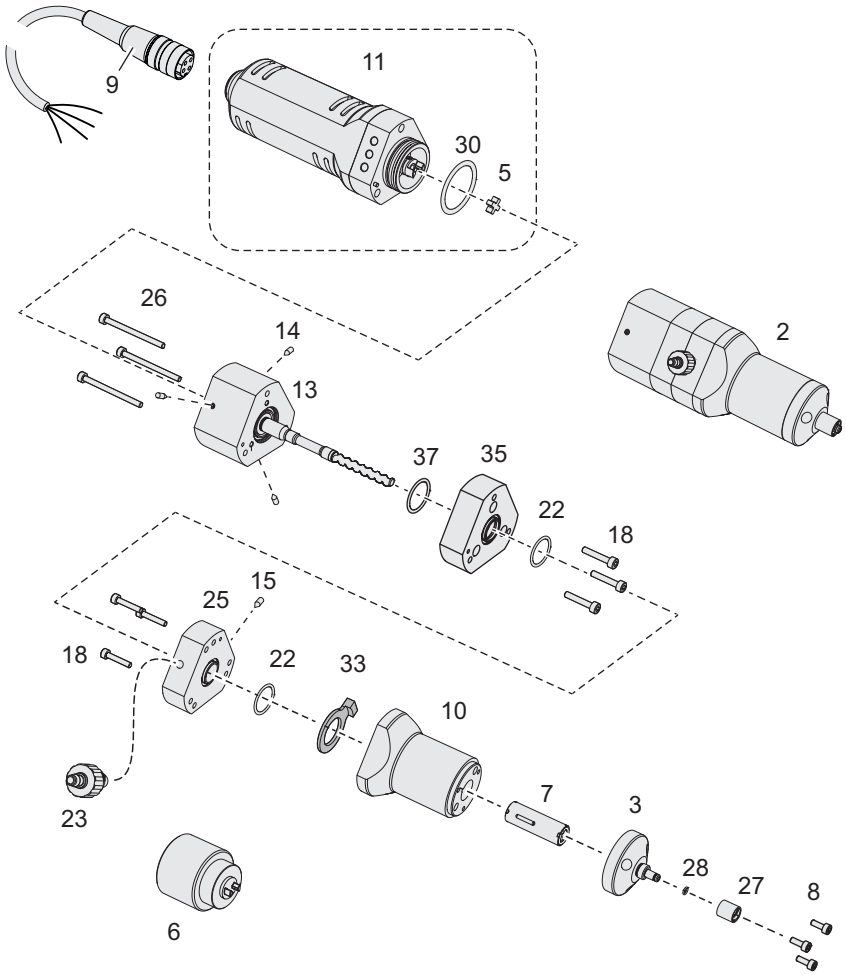


Fig. 13

7.2 Item list of the spare parts

Item	Description	S	pcs	vipro-HEAD 3	vipro-HEAD 5	Material
	Print head cpl. (incl. items 2, 6, 9)		1	161633	161634	
2	Dosing unit		1	161486	160771	
3	End piece, Luer-Lock		1	160743		AW-5754
5	Star-shaped coupling	1	1	139052		Elastomer
6	Assembly aid for stator		1	161435		AW-5754
7	Stator	1	1	161554	136097	VisChem
8	Allen screw M3 x 8		3	139370		A2
9	Connecting cable (5 m)		1	160795		
10	Pump housing		1	160731		AW-5754
11	Drive unit (incl. items 5, 30)	1	1	160706		
13	Bearing unit with rotor assembly	1	1	161483	160765	POM-C/ VisChem/ 1.4404
14	Set screw M3 x 5		3	130337		A2
15	Set screw M5 x 12		1	122996		A2
18	Allen screw M3 x 16		6	130322		A2
22	O-ring R 13 x 1.25	2	2	130317		FFKM
23	Bleed valve with M5 nipple		1	160773		1.4305/ FKM
25	Pump inlet housing		1	160726		AW-5754
26	Allen screw M3 x 40		3	119571		A2
27	Threaded sleeve Luer Lock		1	160797		AW-5754
28	O-ring R 2.69 x 0.64	1	1	139048		FKM
30	O-ring R 25 x 1.5	1	1	160175		FKM
33	Blind cap for heating assembly		1	160744		AW-5754
35	Sealing unit	1	1	160766		POM-C/ Z80/ FFKM/ 1.4571
37	O-ring R 16 x 1.25	1	1	130316		FKM

S = recommended spare parts and wearing parts

To avoid costly downtime, we recommend keeping a stock of spare and wearing parts.

8 Technical specifications

8.1 Installation declaration

Within the context of EU Directive 2006/42/EU on Machinery Annex II B

We,
ViscoTec Pumpen- u. Dosiertechnik GmbH
Amperstraße 13
D-84513 Töging am Inn,

hereby declare that, in the design and manufacture of the incomplete machine described below, the following basic requirements of EU Directive 2006/42/EC have been applied and complied with: 1.1.2, 1.1.3, 1.1.5, 1.3.2, 1.5.4, 1.6.1, 1.6.2, 1.7.4, 1.7.4.1, 1.7.4.2

We declare in addition that the special technical documents were drawn up in accordance with Annex VII part B of this Directive. Where applicable, the incomplete machine corresponds in addition to the stipulations of Directives 2014/35/EC on electrical equipment and 2014/30/EC on electromagnetic compatibility.

Product designation: 1-component print head vipro-HEAD 3 and vipro-HEAD 5

We undertake to convey to the market supervisory authorities, at their justifiable request, the special documents concerning the incomplete machine in electronic form via our documentation department.
The incomplete machine may only be put into operation once it has been determined, as required, that the machine or unit into which the incomplete machine is to be installed complies with the stipulations of Directive 2006/42/EC on machinery and that the EU Declaration of Conformity has been produced in accordance with Annex II A.

Töging am Inn, 10 September 2020

Martin Stadler
Managing Director and authorised representative

8.2 Technical data

Type of pump	vipro-HEAD 3	vipro-HEAD 5
Dosing volume (approx. ml/rotation)	0.03	0.05
Max. volume flow (ml/min) [1]	3.3	6
Min. dosing quantity (ml at 1/12 rotation) [2]	0.0025	0.004
Layer thickness (µm) [2]	from approx. 100	from approx. 300
Accuracy [3]	+/- 1 %	
Repeat accuracy [2]	> 99 %	
Max. inlet pressure (bar) [2]	6	
Max. dosing pressure (bar) [2]	20	
Self-sealing (bar) [4] (see Section 3)	approx. 2	
Ambient operating conditions	+10 °C to +40 °C (50 °F to 104 °F), air pressure 1 bar, relative humidity less than 60 % (non-condensing)	
Material temperature [2]	+10 °C to +70 °C (50 °F to 158 °F)	
Storage conditions	see page 11	
Weight approx. (kg)	0.75	0.75
Heating	Optional	
Max. revolutions (rpm) [5]	120	
Max. permitted torque (Nm)	8	
Sound level, (dB(A))	< 70	

[1] depends on the viscosity and inlet pressure

[2] depends on the dosing material

[3] volumetric dosing as absolute variation relative to one print head rotation, depending on the viscosity of the dosing material.

[4] max. dosing pressure and self-sealing decrease as viscosity decreases. Consult manufacturer.

[5] high revolutions cause increased wear

Threads used	
Material inlet	1/8"cylindrical Whitworth pipe thread DIN/ ISO 228
Dosing needle connection	Luer-Lock DIN EN 1707 with O-ring, patented
	Threaded needle available on request

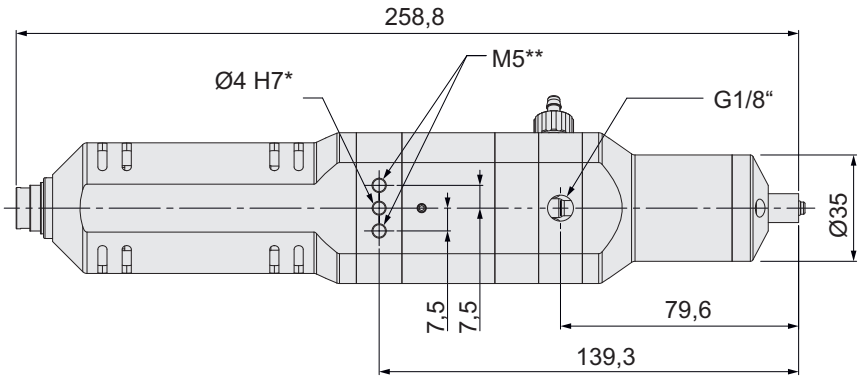
8.3 Materials used

Components in contact with the material	Material
Pump housing, end piece	Anodised aluminium
Bearing housing, seal housing	POM-C
Stator elastomer, flexible shaft covering	VisChem
Rotor seal	Z80
O-rings	FKM / FFKM
Drive shaft, rotor	Stainless steel A4

8.4 Stepper motor specification

24 V stepper motor with gearbox	
Type	Bipolar
Max. current / phase	1.4 A
Full step angle	1.8°
Full step angle (gear output)	0.15°
Max. revolutions (gear output)	120 rpm
Holding torque (gear output)	1.1 Nm
Gear ratio	12:1
Max. permissible temperature (motor)	130 °C (266 °F)
Max. humidity, non-condensing	60 %

8.5 Dimensions



Dimensions in mm

* Hole for centring
** Hole for fastening

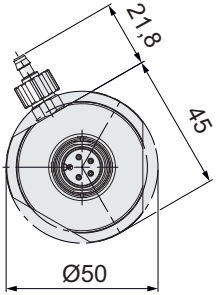
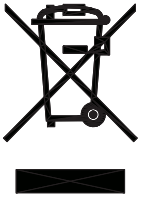


Fig. 14

9 Disposal

The print head must be dismantled by qualified maintenance staff. Disposal may only be performed in line with the currently applicable, country-specific specifications, standards and legislation.
Ensure environmentally friendly recycling of all materials.
Electrical parts must not be disposed of with household waste (2012/19/EU). They must be taken to the collection points provided for this purpose or disposed of in an environmentally appropriate way.



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Germany

Translation of original operation manual

Document no. / Version

INST-005513 / A