GEA Cleaning Technology

Rotating cleaner Troll Ball 2" / 3"

Operating instruction (Translation from the original language)

430BAL008980EN_4

engineering for a better world

gea.com

COPYRIGHT

TABLE OF CONTENTS

1 General Information

1.1 Information about this document

The present Operating Instructions are part of the user information for the component.

1.1.1 Binding Character of These Operating Instructions

These Operating Instructions contain the manufacturer's instructions to the operator of the component and to all persons who work on or use the component regarding the procedures to follow.

Carefully read these Operating Instructions before starting any work on or using the component. Your personal safety and the safety of the component can only be ensured if you act as described in the Operating Instructions.

Store the Operating Instructions in such a way that they are accessible to the operator and the operating staff during the entire life cycle of the component. When the location is changed or the component is sold make sure you also provide the Operating Instructions.

1.2 Manufacturer address

GEA Tuchenhagen GmbH

Am Industriepark 2-10

21514 Büchen

1.3 Contact

Tel.:+49 4155 49-0

Fax:+49 4155 49-2035

flowcomponents@gea.com

www.gea.com

1.4 Marking

The rotating cleaners have a marking on the upper, static housing. The following data are available depending on the materials used. The following identification is an example. The precise identification can be found in chap. 6 or the declaration of conformity.

Logo	 Fig.1
Short designation	TB2" PTFE 3/4" BSPT
Material number / Year of manufacture	for example, 4660-2101-112 YOC2018
Serial number	for example, SN 1439806-0150-001
Address	GEA Tuchenhagen GmbH Am Industriepark 2-10 21514 Buchen, Germany

2 Safety

2.1 Intended use

The cleaner Troll Ball 2"/3" is intended for the cleaning of vessels and containers. The cleaner has been designed for operation in a defined fitting position, which can be found in the Technical Data chapter. If the cleaner is used in a different fitting position, its performance may be impaired. All information contained in this document refers to a cleaner in the described fitting position. Using the device for any other purpose is considered contrary to its designated use.

Hint!

The manufacturer will not accept any liability for damage resulting from any use of the cleaner which is not in accordance with its designated use. The risk is borne solely by the operating company.

2.1.1 Requirements for operation

The prerequisite for reliable and safe operation of the component is proper transportation and storage as well as professional installation and assembly. Operating the unit within the limits of its designated use also involves adhering to the operating, inspection and maintenance instructions.

2.1.2 Improper operating conditions

The operational reliability of the cleaner cannot be ensured under improper operating conditions. Therefore avoid improper operating conditions.

Operating the cleaner is not permitted if

- Persons or objects are in the danger zone.
- Safety devices are not working or were removed.
- Malfunctions have been detected on the cleaner.
- Damage has been detected on the cleaner.
- Maintenance intervals have been exceeded.

2.2 Operator’s Duty of Care

The operating company of the component has a special responsibility for the proper and safe handling of the component within their company. Only use the component when it is in perfect operating condition in order to prevent danger to persons and property.

This operating manual contains information that you and your employees need for safe operation over the life of the component. Be sure to read these Operating Instructions carefully and ensure that the measures described here are observed.

The operator's duty of care includes planning the necessary safety measures and monitoring that these measures are observed. The following principles apply:

- Only qualified personnel may work on the component.

- The operating company must authorize personnel to carry out the relevant tasks.
- Order and cleanliness must be maintained at the work stations and in the entire area surrounding the component.
- Personnel must wear suitable work clothing and personal protective equipment. As the operating company must ensure that work clothing and personal protective equipment are used.
- Inform personnel regarding any properties of the product which might pose a health risk and the preventative measures to be taken.
- Have a qualified first-aid representative on call during the operation. This person must be able to initiate any necessary first-aid measures in case of an emergency.
- Clearly define procedures, competences and responsibilities for those working in the area of the component. Everybody must know what to do in case of an emergency. Instruct the staff in this respect at regular intervals.
- The signs on the component must always be complete and easy to read. Check, clean and replace the signs as necessary at regular intervals.
- Observe the Technical Data specified and the limits of use!

Hint!

Carry out regular checks. This way you can ensure that these measures are actually observed.

2.3 Subsequent changes

You should never make any technical modifications to the cleaner. Otherwise you will have to undergo a new conformity process in accordance with the EC Machinery Directive on your own.

In general, only original spare parts supplied by GEA Tuchenhagen GmbH should be installed. This ensures the reliable and economical operation of the cleaner. Using spare parts from third-party suppliers will invalidate any and all warranty claims.

2.4 General safety instructions and dangers

The component is safe to operate. It was built according to state-of-the-art science and technology.

Nevertheless, dangers can arise from the component, if:

- the component is not used as intended
- the component is used improperly
- the component is operated under impermissible conditions

2.4.1 Principles for safe operation

Dangerous situations during operation can be avoided by safety-conscious and proactive behaviour of the personnel.

To ensure the safe operation of the cleaner the following principles apply:

- The Operating Instructions must be kept ready to hand and accessible for everyone at the cleaner's place of use. They must be complete and in clearly legible form.
- Only use the cleaner for its intended use.
- The cleaner must be functional and in good working order. Check the condition of the cleaner before starting work and at regular intervals.
- Wear tight-fitting work clothing for all work on the cleaner.
- Ensure that nobody can get hurt on the parts of the cleaner.
- Immediately report any faults or noticeable changes on the cleaner to the person responsible.
- Never touch the pipes and the cleaner when these components are hot! Avoid opening the cleaner, unless the process units have been emptied and depressurised.
- Observe the accident prevention regulations and all local regulations.

2.4.2 Environmental Protection

Harm to the environment can be avoided by safety-conscious and proactive behaviour of the staff.

For environmental protection the following principles apply:

- Substances harmful to the environment must not be discharged into the ground or the sewage system.
- Always observe the pertinent regulations relating to waste avoidance, disposal and utilization.
- Substances harmful to the environment must be collected and stored in suitable containers. Clearly mark the containers.
- Dispose of lubricants as hazardous waste.

2.5 Supplementary Regulations

In addition to the instructions in this documentation the following also has to be observed:

- pertinent accident prevention regulations,
- generally accepted safety rules,
- national regulations applicable in the country of use,
- work and safety instructions applicable in the facility,

2.6 Qualification of personnel

This section provides information on how the personnel working on the component must be trained.

Operating and maintenance personnel must

- have the necessary qualification to carry out their tasks,
- be instructed with regard to possible dangers,
- know and observe the safety precautions given in the documentation.

The following minimum qualifications are required:

- Training as a specialist for working independently on the component.
- Adequate instruction to work on the component under the supervision and guidance of a trained specialist

Each employee must meet the following requirements to work on the component:

- Personal suitability for the respective task.
- Sufficient professional qualification for the respective task.
- Received instruction about the functionality of the component.
- Received instruction about operating sequences on the component.
- Familiar with the safety devices and their function.
- Familiarity with this instruction manual, especially with the safety precautions and the information which is relevant for the task on hand.
- Familiar with the basic regulations with regard to occupational health and safety and accident prevention.

When working with the component, a distinction is made between the following user groups:

User groups	
Staff	**Qualifications**
Operating personnel	Adequate instruction and sound knowledge in the following areas: • Functionality of the component • Operating sequences on the pump • What to do in case of an emergency • Lines of authority and responsibilities with respect to the task
Maintenance personnel	Appropriate training and a sound knowledge of the structure and functionality of the component. Sound knowledge in the following areas: • Mechanical equipment Authorization with regard to safety engineering standards to carry out the following tasks: • Setting devices into operation • Earthing of devices • Marking of devices

2.7 Safety precautions

Please heed the following notes

- Conformity applies only to cleaners without electrical components.
- Before putting the cleaner into operation, make sure that nobody can be endangered by the cleaner’s running.
- Never operate the cleaner outside the object to be cleaned.
- Rotating parts and spilled cleaning fluid can endanger people and cause property damage.
- The cleaners may only be operated if cleaning fluid is supplied. For the safe operation of the rotating cleaners it must be ensured that the cleaner is operated only with a supply of liquids, see Section 8.2, Page 26.
- The cleaner must not be exposed to gas and vapour instead of liquid, not even briefly when starting the cleaning process and emptying pipes. High speeds and increased friction could cause damage and ignition hazards.
- The cleaners must be filled with cleaning fluid without pressure and then started gently. A sudden startup can lead to damage. Pressure surges are to be avoided.
- In the event of malfunctions, shut down the cleaner (disconnect from fluids supply lines) and secure it against further use. Defects are to be rectified immediately.
- The maximum operating conditions must be observed and monitored, see Section 8.2, Page 26. There is the risk of excessive charge formation, increased wear and leakages, see .
- Observe the safety data sheets supplied by the detergent manufacturers. The cleaner must only be operated with such cleaning detergents and used in such mediums against which all materials used are sufficiently resistant. The sealing materials must always be matched to the type and temperature of the cleaning medium.
- At the start of vessel or container cleaning, atmospheric conditions must be present inside, see table "Conditions for starting tank cleaning".
- The cleaner must be regularly checked for damage and function, taking into account the operating conditions. GEA recommends a visual inspection before every cleaning process.
- Observe maintenance and inspection intervals, see Section 9.2, Page 27.
- The performed maintenance must be logged.
- The user must ensure a loss-proof lead connection into the tank. For this, GEA offers, among other things, suitable components and a mounting system.

Conditions when starting the tank cleaning	
Designation	**Size**
Absolute pressure	0.8 ... 1.1 bar
Ambient temperature	maximum 140 °C
Working temperature of the cleaning medium	maximum 95 °C
Acidity content	maximum 21 Vol.%
Relative ambient humidity	until saturation

2.8 Residual dangers

Dangerous situations can be avoided by safety-conscious and proactive behaviour of the personnel and by wearing personal protective equipment.

Residual dangers on the cleaner and measures		
Danger	**Cause**	**Measure**
Danger to life	Inadvertent switch-on of the cleaner	Effectively disconnect all components, effectively prevent switch-on.
Risk of injury	Danger presented by moving or sharp-edged parts	The operator must exercise caution and prudence. For all work: • Wear suitable work clothing. • Never operate the machine if the cover panels are not correctly fitted. • Never open the cover panels during the operation. • Never reach into openings. As a precautionary measure, wear personal protective equipment in the vicinity of the cleaner: • Protective gloves • Safety shoes

2.9 Danger zones

Transport, Installation

Do not set the cleaner down on the ball head. Store the cleaner in horizontal position and secure it against rolling away to the side.

Commissioning

Please observe the following notes:

- When installing the cleaner, secure it against tipping and twisting and secure all fixing points correctly.
- Only set the cleaner into operation in closed vessels.

Operation

Please observe the following notes:

- Provide suitable protective measures to ensure that the cleaner cannot be set into operation outside of the vessel.
- Stop all supply lines immediately in the event of malfunctions.
- Check the installation situation to ensure that the cleaner is not in contact with other parts and that rotation cannot be obstructed.
- Do not allow the maximum cleaning pressure and the maximum cleaning temperature to be exceeded.
- Ground containers, vessels, tankers, etc. by taking appropriate measures.

Maintenance

Please observe the following notes:

- Close all media supply lines and ensure that no hot or aggressive media are applied to or are in the cleaner.
- Never set the cleaner down on the ball head.

3 Description

3.1 Design

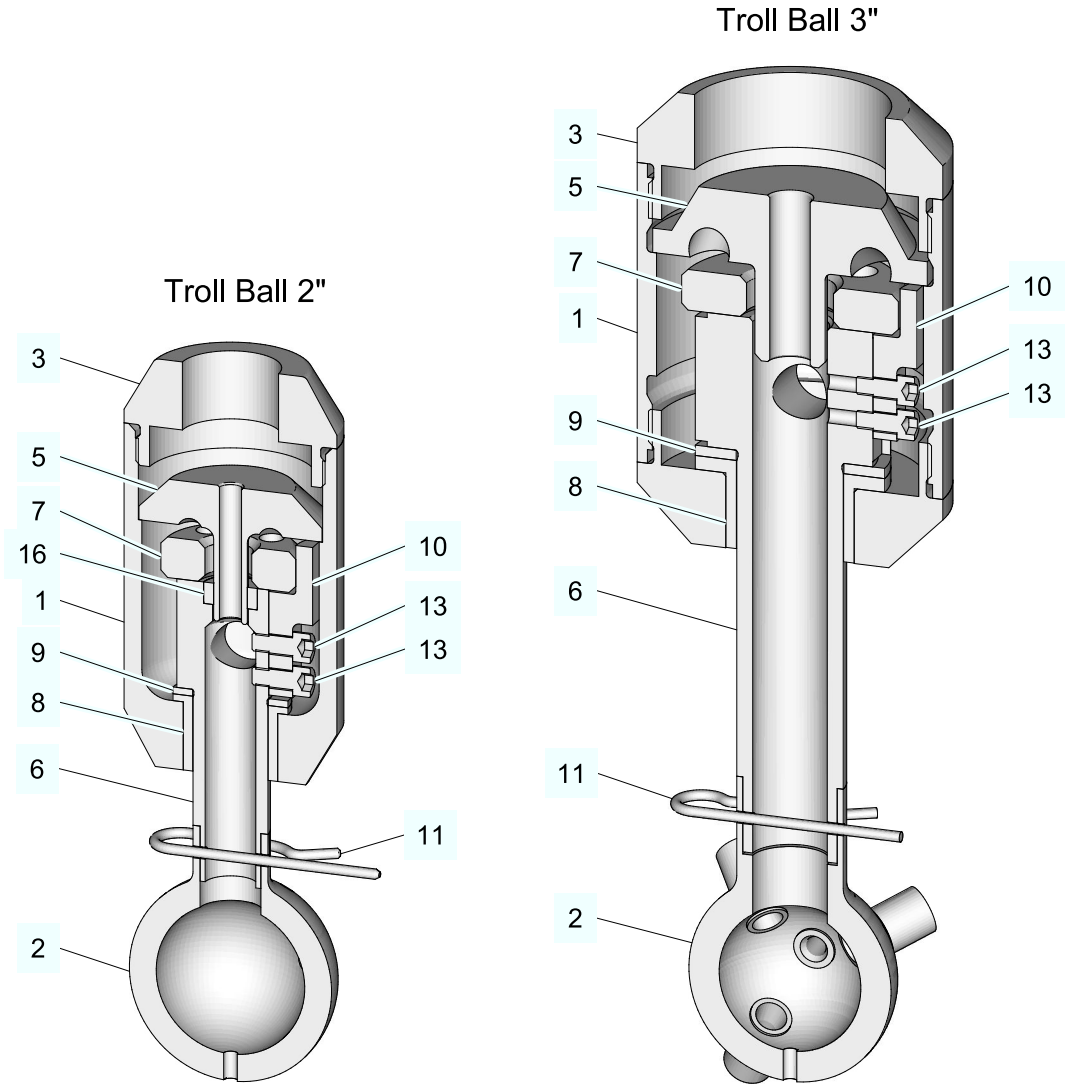


Fig.2

Design	
No.	**Designation**
1	Housing
2	Ball head
3	Inlet
5	Motor
6	Shaft
7	Regulator PTFE, optional C-PTFE
8	Bush PTFE, optional C-PTFE
9	Disk PTFE, optional C-PTFE

Design	
No.	**Designation**
10	Drive arm
11	R-clip
13	Hex socket screw
16	Bush

3.2 Functional description

3.2.1 Troll Ball 2" / 3"

The cleaner is intended for the cleaning of tanks and vessels. It is driven by the liquid flowing through it - an external actuator is not required.

Depending on the ball type, round and/or multiple jets emerge from the cleaner, ensuring efficient cleaning of the tank wall. After the liquid supply has been stopped, the remaining cleaning medium can run off through the integrated drainage openings.

3.2.2 Cleaning effect

The cleaning effect depends on the following factors:

- Temperature
- Time
- Mechanics
- Chemicals
- Degree of soiling

These factors can be combined in such a way as to make an optimal cleaning result probable.

4 Transport and storage

4.1 Storage conditions

Store the cleaner in a dry place and ensure it is not subjected to vibration and is protected from external influence.

Storage temperature +5...+40 °C

4.2 Transport

For transport, the following principles apply:

- Observe the pictograms on the package.
- Transport the components carefully to prevent damage due to external force or careless loading and unloading.
- Only qualified personnel are allowed to transport the component.
- Movable parts must be properly secured.
- Only use approved, fully functional load lifting devices and lifting accessories which are suitable for the intended purpose. Observe the maximum load-bearing capacities.
- Under no circumstances should anyone stand under a suspended load.
- Transport the component carefully. Do not grip sensitive parts of the unit to lift or push the unit or to support yourself. Avoid putting the unit down with a jerk.

4.2.1 Scope of supply

After taking delivery of the component, check if

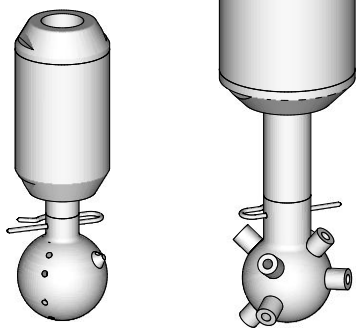
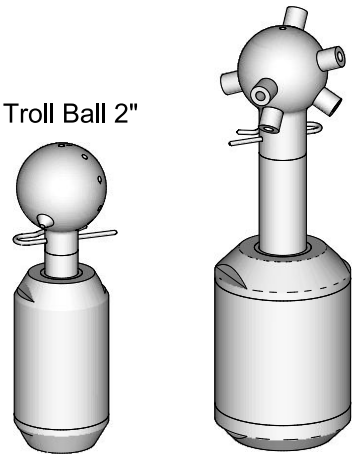
- the details on the type plate correspond to the data in the order and delivery documents,
- the equipment is complete and all components are in good order.

5 Technical data

5.1 Technical data

The most important technical data of the cleaner can be found in the following tables:

Technical data: Troll Ball 2" / Troll Ball 3"		
Designation	**Description**	
	Troll Ball 2"	Troll Ball 3"
connection	¾“ BSPT / BSP / NPT internal threads (DIN ISO 22801) or 1“ PinFix (for pipe outer diameters: 25.4 mm)	1 ½“ BSPT / BSP / NPT internal threads (DIN ISO 22801)
Ball types	C (360 °) B (360 ° fan) D (360 ° inverted) F (360 ° inverted fan) G (180 ° away) E (180 ° away fan) H (180 ° towards)	C (360 °) D (360 ° inverted) G (180 ° away) H (180 ° towards)
Fitting position	C, B, G, E, H: vertical position, suspended D, F: vertical position, upright (see drawings)	
Materials	Stainless steel AISI 316L (1.4404) PTFE or C-PTFE Check corrosion resistance with respect to media and detergents.	
Operating temperature	Maximum 95° C (203 °F)	
Ambient temperature	Maximum 140 °C (284 °F), 30 minutes	
Working pressure, at the cleaner inlet	3 to 12 bar	

Fitting position	
C, B, G, E, H	**D, F**
Troll Ball 3" Troll Ball 2"  Fig.3	Troll Ball 3" Troll Ball 2"  Fig.4

Operating flow and pressure conditions

The cleaner is driven by the cleaning liquid flowing through it at a suitable pressure and flow rate. It is essential that the cleaner is supplied with cleaning liquid at the correct pressure and flow rate for effective operation. The requirements are specified in the tables below.

Operating flow and pressure conditions Troll Ball 2" cleaner						
Required flow rate [m³/h]	3	3.5	4.3	4.9	5.7	6
Required pressure [bar]	3	4	6	8	10	12

Operating flow and pressure conditions Troll Ball 3" cleaner						
Required flow rate [m³/h]	8	9	11.5	13.2	15	16.2
Required pressure [bar]	3	4	6	8	10	12

5.2 Resistance and permitted operating temperature of the sealing materials

The resistance of sealing materials depends on the type and temperature of the medium conveyed. The exposure time can adversely affect the service life of the seals.

The resistance and permitted operating temperature of the sealing materials depend on the type and temperature of the medium conveyed. The exposure time can adversely affect the service life of the seals.

The maximum operating temperature is defined by the sealing type and its mechanical load.

Resistance:

- \+ = good resistance
- o = reduced resistance

- – = no resistance

Table of sealing resistance / permitted operating temperature			
Medium	**Maximum operating temperatures**	**Sealing material**	
		PTFE	**C-PTFE**
Alkalis up to 3%	up to 80 °C (176°F)	+	+
Alkalis up to 5%	up to 40 °C (104°F)	+	+
Alkalis up to 5%	up to 80 °C (176° F)	+	+
Alkalis more than 5%		+	+
Inorganic acids up to 3%**	up to 80 °C (176°F)	+	+
Inorganic acids up to 5%**	up to 80 °C (176°F)	+	+
Inorganic acids up to 5%**	up to 100 °C (212°F)	+	+
Water	up to 80 °C (176°F)	+	+
Steam	up to 135 °C (275°F)	+	+
Steam, approx. 30 min	up to 150 °C (320°F)	+	+
Fuels/hydrocarbons		+	+
Product with fat content up to a maximum of 35%		+	+
Product with a fat content of more than 35%		+	+
Oils		+	+
** Inorganic acids are, e.g. carbonic acid, nitric acid and sulphuric acid			

Table sealing materials - temperature resistance	
Sealing material	**General temperature resistance***
PTFE	-40…+260°C * (-40...500 °F)
C-PTFE	-40…+260°C * (-40...500 °F)
* The general resistance of the material does not correspond to the maximum operating temperature	

5.3 Tool

Tools used for several construction types	
Tools	**Material no.**
Belt wrench	408-142
1/4" screwdriver blade 9/64"	408-490
1/4" Torque wrench 1 - 5 Nm	408-449
1/2" Torque wrench 40 - 200 Nm	408-489

Troll Ball 2"	
Tools	
1/2" Socket wrench insert 1 1/2"	408-487

Troll Ball 3"	
Tools	
1/2" Socket wrench insert 2 1/4"	408-488

5.4 Weights

Size	Weight [kg]
Troll Ball 2"	1.1
Troll Ball 3"	2.3

6 Assembly and installation

6.1 Safety precautions

Hazardous situations during installation can be avoided by safety-conscious and proactive behaviour of the personnel.

For installation, the following principles apply:

- Only qualified personnel are allowed to set-up, install and commission the component.
- Ensure that adequate working and traffic areas are available at the place of installation.
- Observe the transport instructions and markings on the part(s) to be transported.
- Remove any nails protruding from transport crates immediately after opening the crate.
- Under no circumstances should anyone stand under a suspended load.
- Safety devices of the component may not work effectively during installation.
- Reliably secure sections of the plant which have already been connected against inadvertently being switched on.

6.2 Notes on installation

Observe the following points before installing the cleaner:

- Disconnect the supply line of the cleaning medium and secure it against opening. There must not be any chemical cleaning medium in the supply line.
- Make sure that there are no foreign objects in the system.
- Clean (rinse) the cleaning medium supply line before connecting the cleaner.
- The cleaner has been designed for operation in a defined fitting position, which can be found in the Technical Data chapter.

Installation dimensions		
Cleaner	**connection**	**Fitting opening x**
Troll Ball 2"	¾" BSPT / BSP / NPT 1" PinFix	70 mm
Troll Ball 3"	1 ½" BSPT / BSP / NPT	90 mm

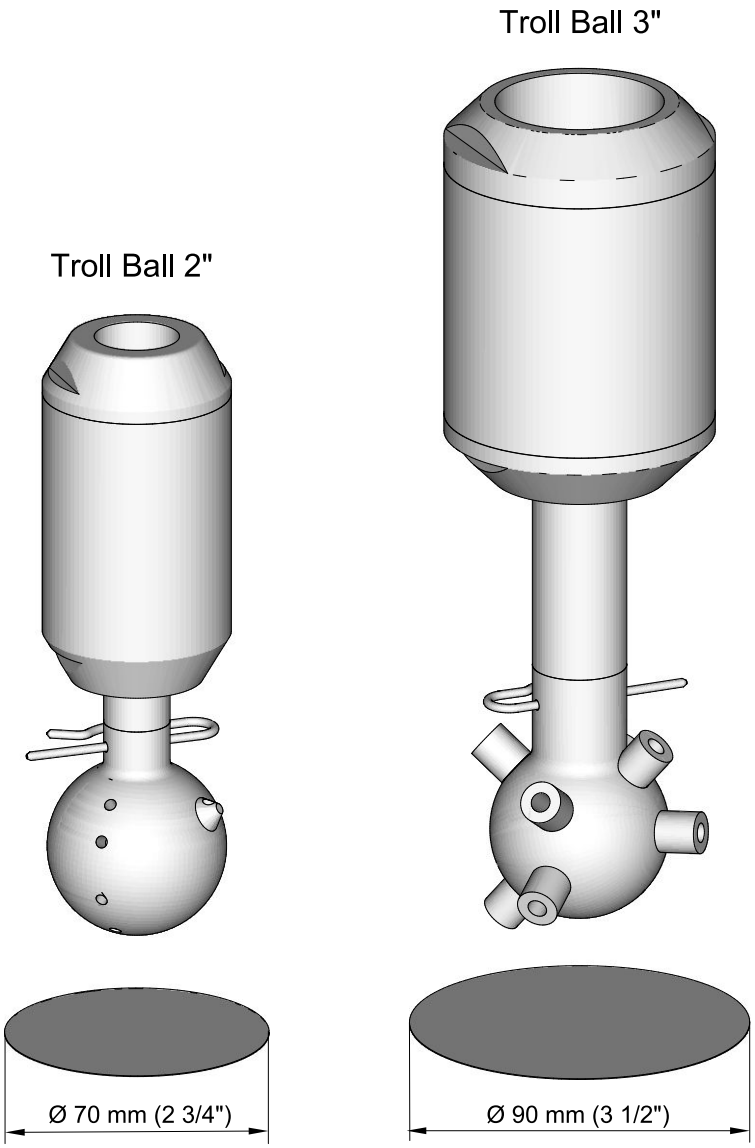


Fig.5

Sieve

It is recommended to install a filter with 500 µm in the CIP supply line of the tank cleaner to prevent blockages or damage due to foreign particles. It must be ensured that the retention rate of the filter is sufficient for the respective application.

Installation

Requirement:

- The cleaner must have a suitable pipe connection for this.
- A loss-proof transfer into the vessel must be ensured. For this, GEA offers, among other things, suitable components and a mounting system.

Notice

Incorrect assembly and tooling

Damage to the housing

► When screwing in and tightening the cleaner, be sure to hold it on the wrench surfaces of the inlet.
► Never use a chain or a tool with serrated clamping to turn the housing.

Carry out the following steps:

1. Hold the cleaner by the inlet and screw it by hand onto the threaded connection.
2. Connect the CIP medium.

→ Done

7 Start-up

7.1 Safety notes

Initial commissioning

For initial commissioning, the following principles apply:

- The cleaner must be completely assembled and correctly adjusted. All screw connections must be securely tightened.
- Reliably secure machine parts which have already been connected against inadvertently being switched on.
- After conversion of the cleaner, residual risks must be reassessed.

Commissioning

For commissioning, the following principles apply:

- Only allow properly qualified staff to set the cleaner into operation.
- Make sure that all connections are functioning properly.
- When the cleaner is switched on, the danger zones must be free.
- Remove any liquids that have escaped without leaving residues.

7.2 Notes on commissioning

Carry out the following activities before commissioning:

- Clean the pipe system prior to the first product run.
- Make sure that there are no foreign objects in the system.
- During commissioning, regularly check all sealing points for leaks.

7.3 Commissioning

Requirement:

- Avoid water hammers in the supply pipe.

⚠ Caution!

Risk of injury from hot and corrosive liquids

During commissioning and operation, hot and corrosive liquids may escape and cause injuries to the entire body.

► Ensure that nobody is within the operating range of the nozzles.
► Only operate the cleaner in vessels and containers.

Carry out the following steps:

1. Connect the cleaner and set it into operation.
2. During commissioning, check regularly that all seals are free of leakage.

- Done.

8 Operation and control

8.1 Safety instructions

Dangerous situations during operation can be avoided by safety-conscious and proactive behaviour of the personnel.

For operation, the following principles apply:

- Monitor the component during operation.
- Safety devices must not be changed, removed or taken out of service. Check all safety devices at regular intervals.
- All guards and hoods must be fitted as intended.
- The installation location of the component must always be properly ventilated.
- Structural changes to the component are not permitted. Report any changes to the component immediately to the person in charge.
- Always keep danger zones clear. Do not leave any objects in the danger zone. Only allow persons to enter the danger zone when the machine is de-energized.
- Regularly check that all emergency stop devices are working correctly.

8.2 Operating Conditions

The cleaner is driven by the cleaning liquid flowing through it at a suitable pressure and flow rate. For effective operation, the cleaning fluid must be supplied to the cleaner at the correct pressure, flow and temperature.

The corresponding values can be found in the Technical Data chapter.

9 Maintenance

9.1 Safety precautions

Maintenance and repair

For maintenance and repair, the following principles apply:

- Observe the intervals specified in the maintenance schedule.
- Only allow qualified staff to carry out maintenance or repair work on the cleaner.
- Before starting any maintenance or repair work, the cleaner must be switched off and secured against being switched back on. The addition of cleaning agents must be reliably prevented. Work may only be started once any residual energy has been discharged.
- Block access for unauthorized persons. Put up notice signs which draw attention to the maintenance or repair work going on.
- Wear suitable protective clothing.
- Only use suitable and undamaged tools to carry out maintenance work.
- When replacing parts only use approved, fully functional load suspension devices and lifting accessories which are suitable for the intended purpose.
- Before setting the unit back into operation refit all safety devices as originally provided in the factory. Then check that all safety devices are working correctly.
- Check pipes are firmly secured, also check for leaks and damage.
- Check that all emergency stop devices are working correctly.

Disassembly

For removal, the following principles apply:

- Only allow qualified staff to disassemble the cleaner.
- Before starting disassembly, the cleaner must be switched off and secured against being switched back on. Work may only be started once any residual energy has been discharged.
- Disconnect all power and utility lines.
- Markings, e.g. on lines, must not be removed.
- Mark the lines (if unmarked) prior to disassembly to ensure they are not confused when re-assembling.
- Protect open line ends with blind plugs against ingress of dirt.
- Pack sensitive parts separately.

9.2 Servicing intervals

The practical maintenance intervals can only be determined by the user since they depend on the operating conditions. For example:

- type and temperature of the cleaning solution,
- ambient conditions.

Servicing intervals	
Applications	**Servicing intervals (guideline values)**
Inspection	175 hours of operation
Maintenance	350 hours of operation

9.3 Disassembly

9.3.1 Prior to disassembly

Requirement:

- Make sure that during maintenance and servicing work no process is in operation in the area concerned.
- The component must be removed, cooled and completely drained.
- The vessel must be pressure/vacuum free.

Carry out the following steps:

1. Drain all pipeline elements leading to the component and, if necessary, clean or flush.
2. Allow the component to cool down.
3. Remove the component from the vessel.

→ Done

9.3.2 Dismantling the cleaner

The dismantling steps are the same for both types of cleaner.

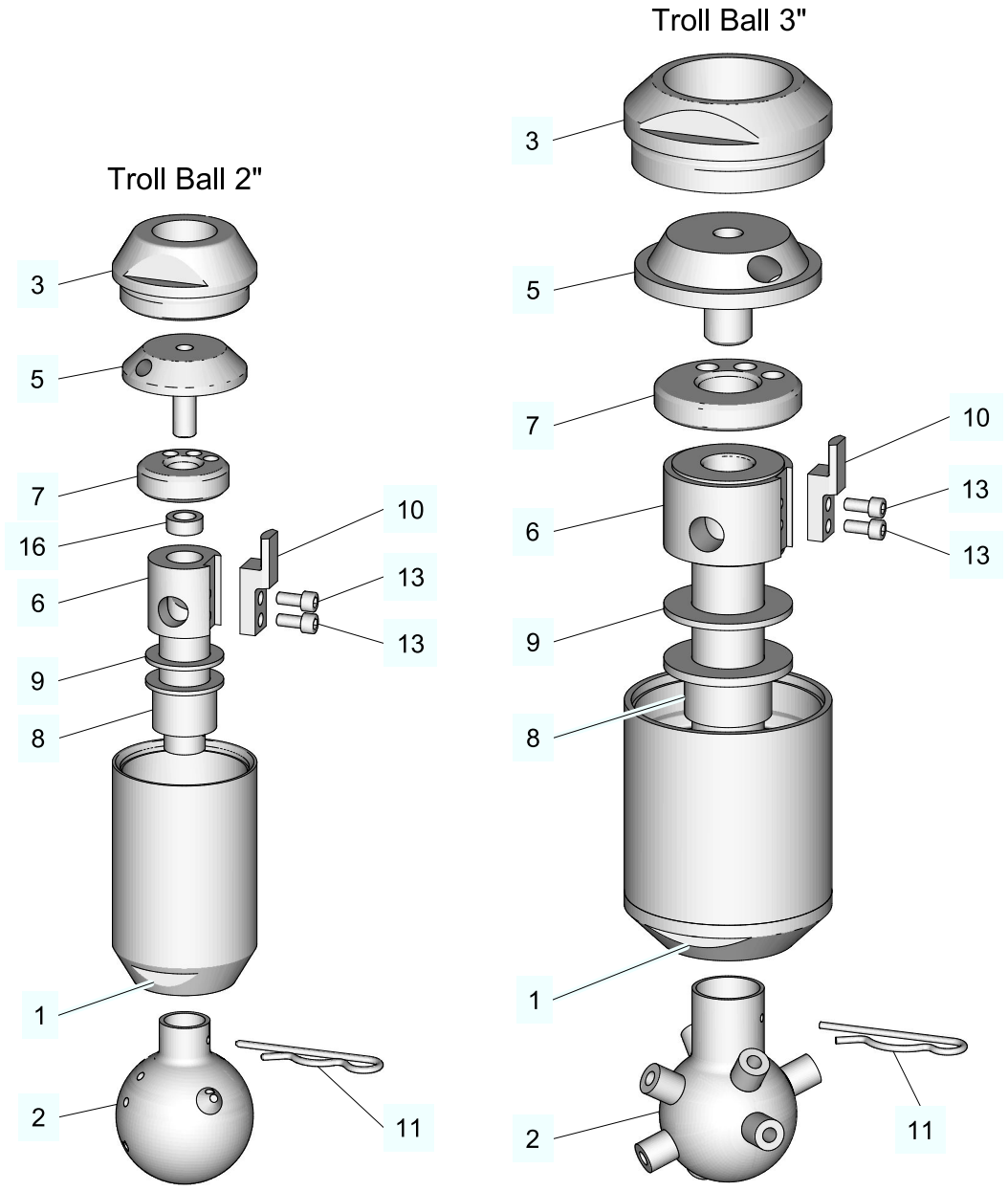


Fig.6

Carry out the following steps:

1. Remove the R-Clip (11) from the shaft (6) and remove the ball head (2).
2. Carefully clamp the two wrench surfaces on the lower housing (1) in a vice with padded jaws.
3. Unscrew the inlet (3) with a wrench of the appropriate size.
4. Remove motor (5), controller (7), shaft (6), disk (9) and bush (8) from the housing (1).
5. Remove the bush (16) from the shaft (only for TB 2”).
6. Loosen the screws (13) with a hex socket wrench and remove the drive arm (10) from the shaft (6).

→ Done.

9.4 Maintenance

9.4.1 Maintenance

This cleaner is designed for easy maintenance and has few mechanical/wear parts that are easy to replace. This cleaner should be visually inspected/ maintained regularly.

Carry out the following steps:

1. Check the parts for wear and damage and replace if necessary.
2. Replace all wearing parts marked in the spare parts list.

→ Done.

9.5 Installation

9.5.1 Torques

Item	Designation	Torque Nm
3	Inlet TB 2"	160
3	Inlet TB 3"	200
13	Hex socket screw	4

9.5.2 Installation

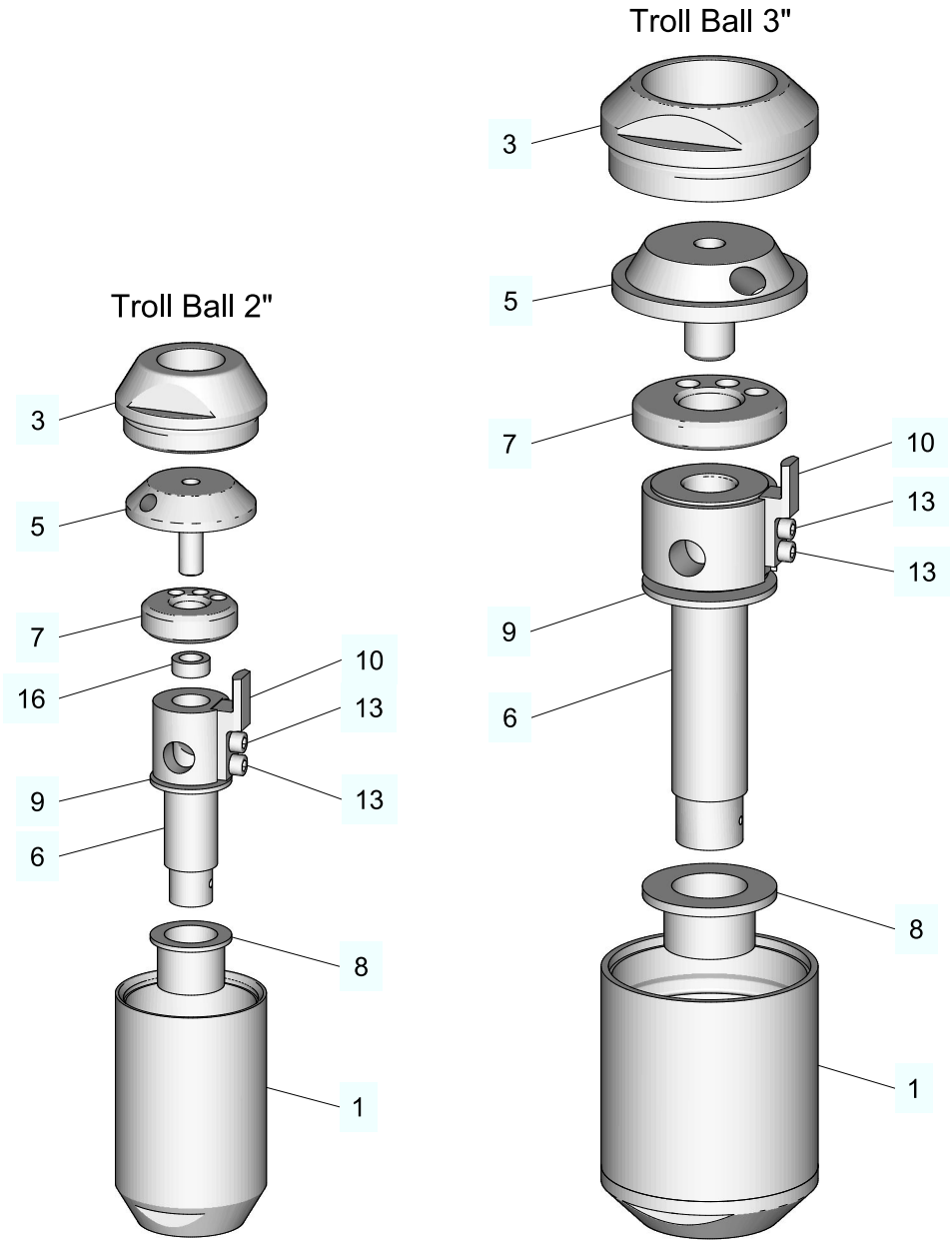


Fig.7

Carry out the following steps:

1. Lightly grease the screws (13) according to figure 9 along the full circumference along the thread pitch.

   Secure the drive arm (10) to the shaft (6) with the screws (13) and tighten with an Allen key and the defined torque.

2. Insert the bush (16) into the shaft (only for TB 2”).
3. Insert the bush (8) into the housing (1).
4. Push the disk (9) onto the shaft (6) and insert it into the bush (8).
5. Insert the regulator (7) and then the motor (5) in the housing (1).

6. Lightly grease the inlet (3) according to figure 9 along the full circumference along the thread pitch. Front face A must remain free of grease!

   Screw inlet (3) into the housing (1). To do this, carefully clamp the two wrench surfaces on the lower housing (1) into a vice with padded jaws. Tighten the inlet (3) using the torque wrench with the defined torque.

7. Slide the ball head (2) over the shaft (6). Align the holes and secure the R-clip (11).

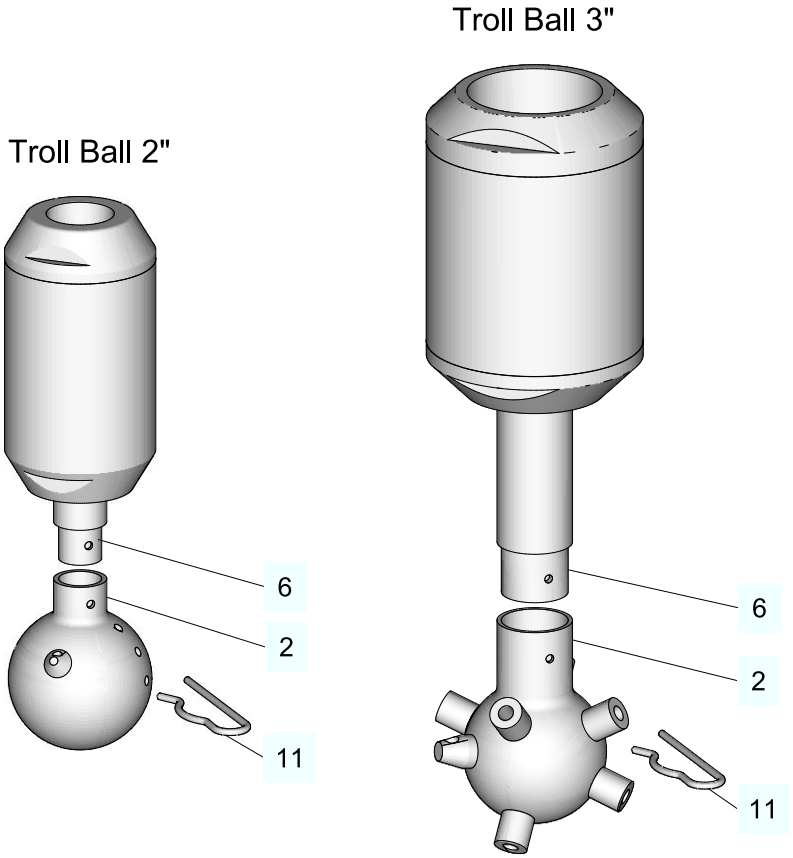


Fig.8

→ Done.

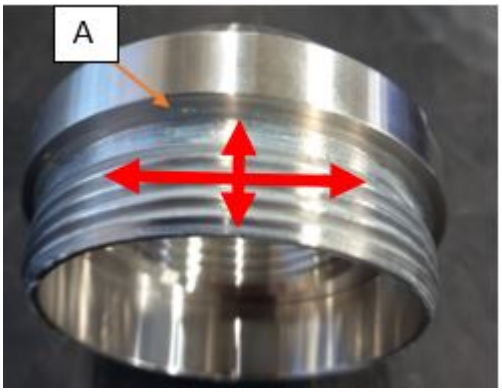


Fig.9

10 Alarms

10.1 Malfunctions and remedies

In the event of malfunctions immediately deactivate the cleaner and secure it against inadvertent reactivation. Malfunctions may only be remedied by qualified staff, who must observe the safety precautions.

Malfunction	Cause	Remedy
Ball head does not rotate and/or no liquid flows through the cleaner	Incorrect pressure or volume flow at the cleaner	Correct the pressure and volume flow at the cleaner
	Ball head blocked	Loosen the ball head and clean if necessary
Ball head does not rotate and sufficient liquid flows through the cleaner	Ball head blocked	Check whether the ball head and shaft can be turned by hand If the ball head and shaft can be easily turned by hand, follow the instructions in the maintenance chapter

11 Decommissioning

11.1 Safety precautions

For shutting down, the following principles apply:

- Switch off the component with the main switch.
- Padlock the main switch (if fitted) in the off position to prevent it from being switched back on. The key to the padlock must be deposited with the person responsible until the machine is restarted.
- For longer periods of standstill, observe the storage conditions, see Chapter 4, Page 17.

11.2 Disposal

11.2.1 General notes

Dispose of the cleaner in an environmentally friendly manner. Observe the statutory waste disposal regulations applicable at the place of installation.

Separate the different materials and dispose of them correctly sorted. Also observe the instructions regarding disposal in the operating instructions for the individual components.

12 Spare Parts List- Troll Ball 2"

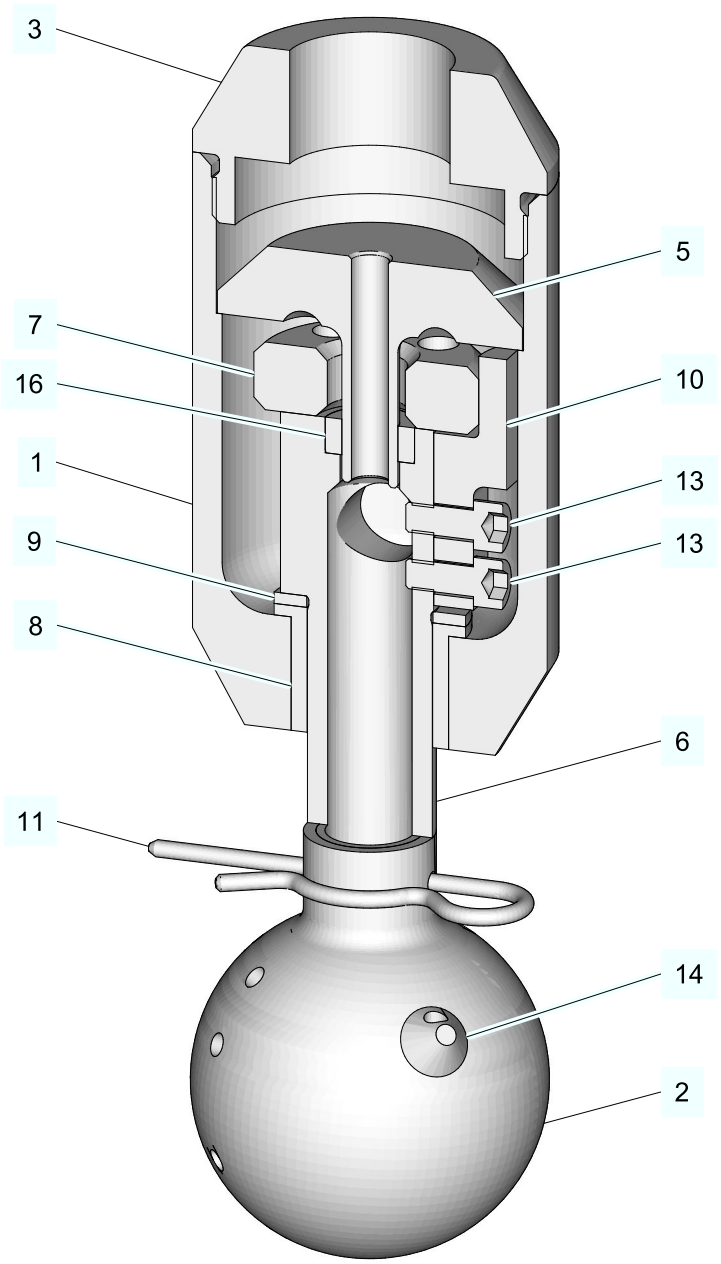


Fig.10

Position-No.	Designation	Quantity
1	Housing	1
2	Ball head type C	1
3	Inlet	1
5	Motor	1
6	Shaft	1
7 Standard	Regulator* PTFE	1
7 Option	Regulator* -C-PTFE	1
8 Standard	Bush* PTFE	1
8 Option	Bush* -C-PTFE	1
9 Standard	Disk* PTFE	1
9 Option	Disk * C-PTFE	1
10	Drive arm*	1
11	R-clip	1
13	Hex socket screw*	2
14	Vertical nozzle	1
16 Standard	Bush* PTFE	1
16 Option	Bush* -C-PTFE	1
Items marked with an * are wearing parts. They are only available as PTFE or C-PTFE wear kits.		

Wear sets	
Designation	**Part no.**
Troll Ball 2"PTFE	4660-4000-888
Troll Ball 2"C- PTFE	4660-4000-777

13 Spare Parts List- Troll Ball 3"

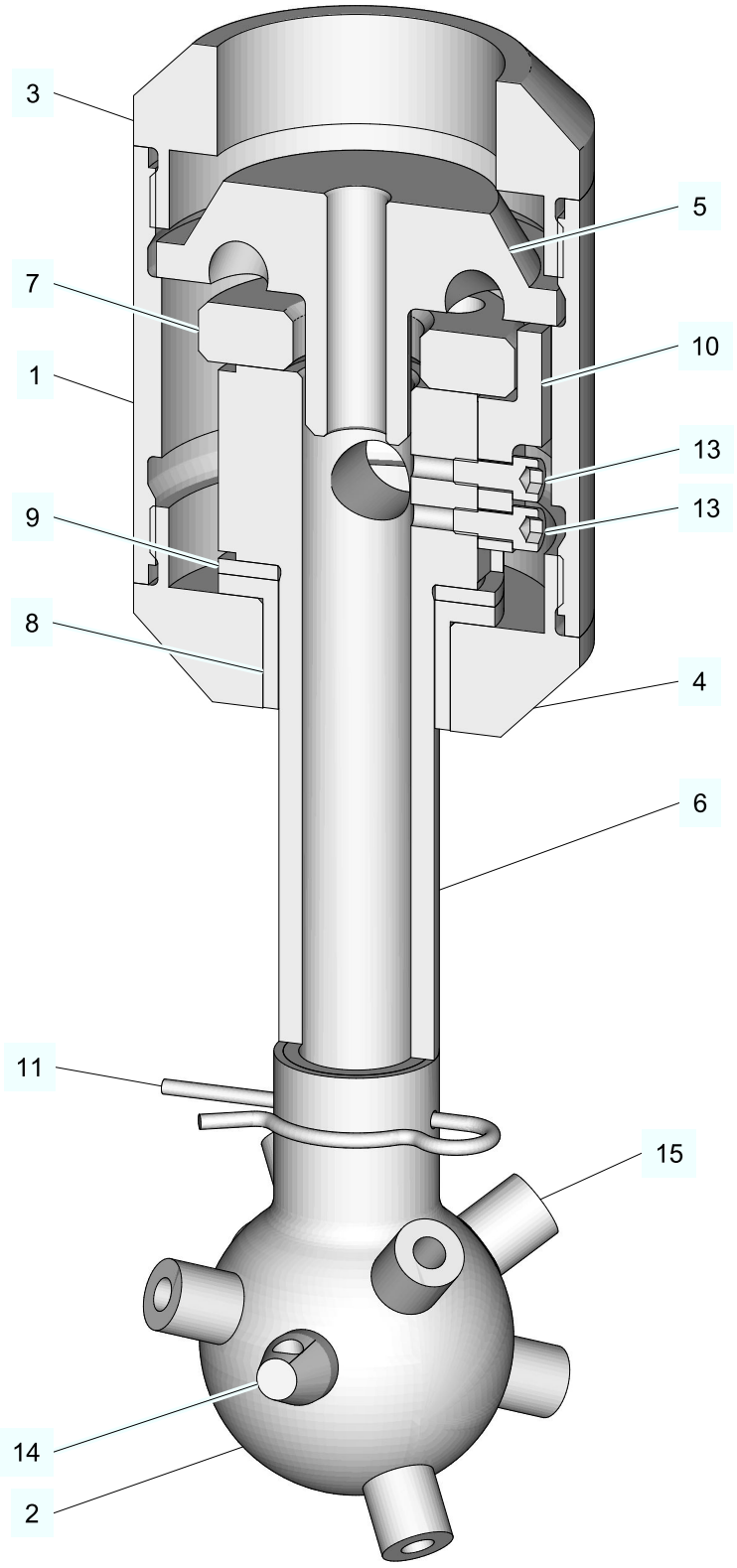


Fig.11

Position-No.	Designation	Quantity
1	Housing	1
2	Ball head type C	1
3	Inlet	1
4	Cap	
5	Motor	1
6	Shaft	1
7 Standard	Regulator* PTFE	1
7 Option	Regulator* -C-PTFE	1
8 Standard	Bush* PTFE	1
8 Option	Bush* -C-PTFE	1
9 Standard	Disk* PTFE	1
9 Option	Disk * C-PTFE	1
10	Drive arm*	1
11	R-clip	1
13	Hex socket screw*	2
14	Vertical nozzle	1
15	Straight nozzle	1
Items marked with an * are wearing parts. They are only available as PTFE or C-PTFE wear kits.		

Wear sets	
Designation	**Part no.**
Troll Ball 3"PTFE	4660-4001-888
Troll Ball 3"C- PTFE	4660-4019-888

14 Appendix

14.1 Lists

14.1.1 Abbreviations and terms

Abbreviation	Explanation
BS	British Standard
bar	Unit of measurement of pressure [bar] All pressure data expressed in [bar/psi] is assumed to be gauge pressure [barg/psig] unless explicitly specified otherwise.
BSP	British Standard Pipe Thread
BSPT	British Standard Pipe Tapered Tread
approx.	approximately
°C	Unit of measurement of temperature [degree Celsius]
DN	DIN nominal width
DIN	German standard issued by DIN (Deutsches Institut für Normung e.V., German Institute for Standardization)
EN	European Standard
GEA	Company group GEA AG GEA stands for Global Engineering Alliance
h	Unit of measurement of time [hour]
ISO	International Standard of the International Organization for Standardization
kg	Unit of measurement of weight [kilogram]
l	Unit of measurement of volume [litre]
min.	minimum
max.	maximum
mm	Unit of measurement of length [millimetre]
µm	Unit of measurement of length [micrometre]
M	Metric
NPT	National Pipe Thread
Nm	Unit of measurement of work [newton metre] TORQUE SPECIFICATION: 1 Nm = 0.737 lbft Pound-Force (lb) + Feet (ft)
PA	Polyamide
PEEK	Polyether ether ketone
C-PEEK	Polyether ether ketone containing carbon

Abbreviation	Explanation
PTFE	Polytetrafluoroethylene
C-PTFE	Carbonated polytetrafluoroethylene
SW	Indicates the size of spanners width across flats
Inch OD	Pipe dimension acc. to British standard (BS), Outside Diameter
Inch IPS	US pipe dimension Iron Pipe Size

engineering for
a better world

We live our values.

Excellence · Passion · Integrity · Responsibility · GEA-versity

GEA Group is a global engineering company with multi-billion euro sales and operations in more than 50 countries. Founded in 1881, the company is one of the largest providers of innovative equipment and process technology. GEA Group is listed in the STOXX® Europe 600 Index.

GEA Germany
GEA Tuchenhagen GmbH
Am Industriepark 2-10
21514 Büchen, Germany
Tel +49 (0)4155 49 0
Fax +49 (0)4155 49 2035
gea.com/contact