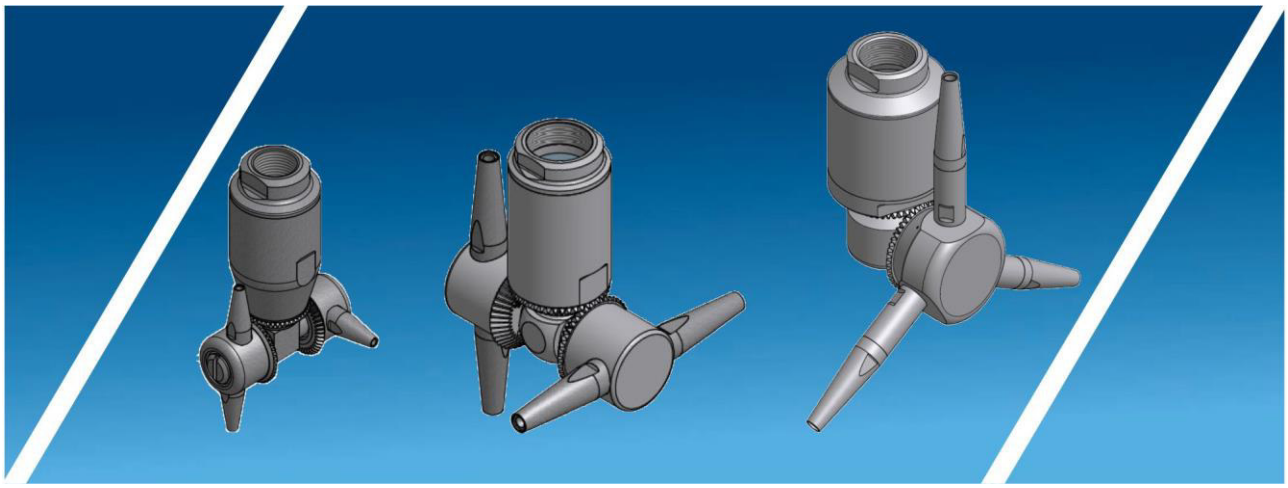
OPERATING / INSTALLATION INSTRUCTIONS

(Translation)



Container cleaning Device

Jet Cleaner TANKO®JM100/500/800

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NOTE

These instructions are an essential part of the device and must be available to operating and maintenance personnel at all times throughout its entire life cycle. The safety precautions they contain must be observed.

If the device is resold, the instructions must always be transferred to the new owner.

Translation

The operating instructions must be written in an official European Community language acceptable to the manufacturer of the machinery in which the partly completed machinery will be assembled, or to his authorized representative. If any discrepancies arise in the translated text, the original operating instructions (German) are to be consulted for clarification, or the manufacturer is to be contacted.

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Abbreviations

ATEX	**AT**mosphère **EX**plosible; Synonym for the ATEX Directive of the European Union; comprises measures for explosion protection for explosive atmospheres
AWH	Armaturenwerk Hötensleben GmbH
BetrSichV	Betriebssicherheitsverordnung (German industrial safety ordinance); ordinance concerning health and safety when using work equipment; German implementation of Directive 2009/104/EC of the European Parliament concerning the minimum safety and health requirements for the use of work equipment by workers at work
AU	Assembly unit
BS	British Standard
BSP	British Standard Pipe; British thread standard for pipe fittings
approx.	Approximately
CIP	Cleaning in Place; a local (automated) cleaning process without dismantling plant parts. Denotes a procedure for cleaning processing plants, predominantly in sectors with particularly critical hygiene requirements, such as the pharmaceutical industry, food and beverage industry or biofuel plants.
DN	DIN-Nennweite (DIN nominal width)
DIN	Deutsches Institut für Normung e.V.; is a national standards organization in the Federal Republic of Germany; The standards of this organization are referred to as DIN standards.
DP	Downpipe In the context of these instructions, this colloquial term describes a line or connection in cleaning technology between a media connection [MC] and a cleaning head or cleaning device. This line is generally used to establish the process connection [PC] for connection of the device to the container.
ES	European Standard
IP	Individual part
FDA	Food and Drug Administration (USA food and medication monitor regulation authority)
ISO	International Organization for Standardization
Jet	Cleaning jet In the context of these instructions, this colloquial term describes a cleaning jet from a jet cleaner [JC] using in cleaning technology.
JM	“JM” device series: Jet with media actuator
M	Metric
MC	Media connection In the context of these instructions, this colloquial term describes the interface used in cleaning technology for supplying cleaning agent from the supply line to the device.
max.	Maximum
min.	Minimum
NPT	National Pipe Thread; USA thread standard for pipe fittings

PC	Process connection In the context of these instructions, this colloquial term describes the interface used in cleaning technology for the connection to the process from the device to the container.
SI	Système international d'unités; the most widely used international system of units for physical variables
SN	Serial number
WAF	Width across flats [wrench size]
TRBS	"Technische Regeln für Betriebssicherheit" (German technical rules for operational reliability and safety); these rules put the "Betriebssicherheitsverordnung" (BetrSichV) into concrete terms with regard to the identification and assessment of hazards and the derivation of suitable measures.
v_{eff}	effective vibration velocity
WP	Wear part
AS	Assembly
JC	Jet cleaner

Terms

Stationary device:
The device remains fitted on the container for a long period, even during the production process.

Mobile device:
The device is mounted on and removed from the container several times in a short period, and can also be used for cleaning several containers.

Units of Measure

The following indicated factors are for orientation and conversion of the Si units to common units of measures for the American market.

bar	Unit of measure for pressure p [bar] All pressure [bar] specifications stand for positive pressure [bar] [bar_g] unless expressly described otherwise. Conversion: 1 bar = 14.50376... psi [pound-force per square inch]
°C	Unit of measure for temperature T [degrees Celsius] Conversion from Celsius to Fahrenheit: °C × 1.8 + 32 = °F [degrees Fahrenheit]
h	Unit of measure for time t [hour]
kg	Unit of measure for mass m [kilograms] Conversion: 1 kg = 2.20462 ... lb [Latin libra; pound]
l/min	Unit of measure for volume flow rate V [liters per minute] Conversion: 1 l/min = 0.06 m^3/h [cubic meters per hour] 1 l/min = 0.26417 ... gpm (US) [gallons per minute (US)] 1 m^3/h = 4.40286 ... gpm (US) [gallons per minute (US)]
lx	Unit of measure for illuminance E_v [Lux]
m	Unit of measure for length l [meters] Conversion: 1 m = 3.28083... ft [feet]
mm	Unit of measure for length l [millimeters] Conversion: 1 mm = 1 / 25.40005 in [inches] = 0.03937 in [inches]
Nm	Unit of measure for moment/torque M [newton meters] Conversion: 1 Nm = 0.737 lbft [pound-force + feet]
rpm	Unit of measure for speed n [revolutions per minute] Conversion: 1 rpm = 1 revolution per minute
µm	Unit of measure for length l [micrometers]

1 Introduction

These operating/installation instructions (referred to hereinafter as the instructions) are a component part of the device. They provide you with all the information required for smooth operation of the TANKO®JM jet cleaner (referred to hereinafter as the device).

The instructions must be read, understood, and applied by all persons employed to carry out installation and assembly, maintenance, cleaning and troubleshooting on the device. This applies in particular to the listed safety notes.

After studying the instructions, you will be able to

- assemble, install and operate the device safely,
- clean and service the device correctly and
- take the correct measures if a fault occurs.

In addition to these instructions, generally valid, statutory and other binding regulations in regard of the prevention of accidents and in regard of environmental protection in the country of use must also be observed.

The instructions must be kept at the location of use of the device so that it is available in legible condition at all times. If the device is resold, the instructions must always be transferred to the new owner.

Download the instructions if necessary from the http://www.awh.eu/de/downloads Internet page.

1.1 Means of Presentation

1.1.1 Explanation of Signal Words

The warnings are introduced with a signal word which describes the extent of the hazard. The meaning and their classification in case of hazardous situations are explained in the following overview.

Signal Word	Meaning	Consequences of Failure to Observe
⚠ DANGER	Hazard with a high level of risk	Death or severe physical injuries
⚠ WARNING	Hazard with a medium level of risk	Death or severe physical injuries
⚠ CAUTION	Hazard with a low level of risk	Minor or moderate physical injuries
NOTE	Hazard with a low risk	Risk of material damage

Table 1.1-1: Overview of Signal Words

1.1.2 Explanation of the Warnings

Section-related Warnings

The section-related warnings do not just apply for one particular action but rather for all actions within a section. In addition, the pictograms and symbols indicate a general or specific danger.

DANGER

This warning warns of a hazard with a high level of risk.

Failure to observe it can lead to death or severe physical injury.

- *Measure(s) to prevent the danger*

WARNING

This warning warns of a hazard with a medium level of risk!

Failure to observe it can lead to death or severe physical injury.

- *Measure(s) to prevent the danger*

CAUTION

This warning warns of a hazard with a low level of risk!

Failure to observe it can lead to minor or moderate injury.

- *Measure(s) to prevent the danger*

NOTE

This warning warns of a hazard with a minor level of risk!

Failure to observe it can lead to material damage.

- *Measure(s) to prevent the danger*

Embedded Warnings

The embedded warnings apply to specific actions and are integrated directly into the action before the specific action step.

The embedded warnings are structured as follows.

⚠ **SIGNAL WORD** Type and source of danger.

Possible consequences in case of failure to observe

- Measure(s) to prevent the danger

Further Means of Presentation

The "Info" symbol provides useful information, additional tips and recommendations.

– Texts which follow this mark, are bulleted lists.

• Texts which follow this mark, describe measures for prevention of the danger.

1. Texts which follow this numbering, describe the first step of a task which is followed by further numbered steps which have to be performed in the specified order.

(1) Numbers in brackets reflect the item numbers in illustrations or parts lists.

" " Texts in quotation marks are (direct) quotes from documents (e.g. directives or standards) or words, word groups and parts of a text with a special meaning.

Important, significant information is shown with additional **bold type**, *in italics* or CAPITAL LETTERS for emphasis of individual words or phrases.

1.1.3 Pictograms and Symbols

The following pictograms and symbols are used as a supplementary measure in these instructions to clarify the sources of dangers and measures. They can appear at all levels of danger.


Warning about electrical voltage

Warning about explosive atmosphere


Warning about hand injuries


Warning about a hot surface


Warning about corrosive substances


Warning about substances which are a water hazard


Unauthorized access prohibited


Wear protective work clothing


Wear safety shoes


Wear protective gloves


Wear safety goggles


Wear a hard hat


Wear hearing protection


Wear a welding mask


Isolate from voltage before work


Obey instructions


Protective grounding connection required


Secure against power being switched back on


Return for recycling

1.2 Warranty and Liability

The commitments agreed in the contract of supply and delivery, the general terms and conditions and the terms of delivery of Armaturenwerk Hötensleben GmbH Armaturenwerk Hötensleben GmbH (referred to hereinafter as AWH) and the statutory regulations valid at the time the contract was concluded shall apply.

Warranty and liability claims in the case of personal injury and damage to property shall be excluded in particular if these can be attributed to one or more of the following causes:

- Improper or incorrect use of the device,
- Improper assembly and installation, commissioning, operation and maintenance of the device,
- Failure to observe the instructions in the instructions regarding assembly and installation, commissioning, operation and maintenance of the device,
- Constructional modifications to the device (conversions or other modifications to the device must not be made without previous written approval from AWH. In case of infringement, the device will lose its EC conformity and the operating authorization),
- Use of spare parts that do not meet the specified technical requirements,
- Improperly performed repairs,
- Disasters, the effects of foreign objects and force majeure.

Disclaimer

AWH reserves the right to make alterations to this document at any time and without prior notice. AWH provides no guarantee (neither expressed nor implied) with regard to all information in this document, including but not limited to the implied warranty of merchantability and suitability for a particular purpose. Furthermore, AWH does not guarantee the correctness or completeness of information, text, graphics or other parts in this document.

1.3 Product Names and Trademarks

The product names and trademarks included in these instructions are brands or registered trademarks of the respective owners.

TANKO® and AWH® are registered trademarks of Armaturenwerk Hötensleben GmbH.

1.4 Related Documents

The following documents may contain supplementary information for these instructions:

- Manufacturer's declaration and/or certificates of conformity
- Certificates
- Additional documents for any attached or upstream components, e.g. Drawings, technical data, information on accessories etc.
- Supplements to these instructions (e.g. special versions)
- AWH catalog, product data sheet

2 Safety

The device has been built in accordance with state-of-the-art technology and the recognized rules of safety. Nevertheless, use of the device may represent a danger to the life and limb of the user and third parties or a risk of impairments to the device and other objects of material value as a result of its function.

The following basic safety notes are intended to prevent injury to personnel and material damage. The operating company must ensure that the basic safety instructions are observed and adhered to.

These instructions contain basic notes on installation, operation, maintenance and servicing of the device which must be complied with.

Anyone involved in installation, operation, maintenance and servicing must have read and understood these instructions.

The safety systems and safety notes described in these instructions must be adhered to.

WARNING

Failure to comply with these instructions, incorrectly performed installation and repair work or incorrect operation could lead to malfunctions on the device and to dangerous situations!

There is a risk of death or severe physical injuries.

- *All work performed on the device must be carried out only by a specialist and in compliance with*
  - *the corresponding detailed operating and installation instructions,*
  - *the warning and safety signs on the device,*
  - *regulations and requirements specific to the plant and*
  - *national/regional regulations for safety and the prevention of accidents.*
- *Never install damaged devices or components.*

The figures in these instructions are for basic understanding and are primarily representations of the principles involved. They may differ from the actual design of the device.

For maintenance and repair, we recommend a training course provided by the manufacturer or a person authorized by the manufacturer.

2.1 Intended Use

DANGER

Risk of injuries from fire/explosion when using the device in an explosive atmosphere.

Use of the device in an Ex area (potentially explosive atmosphere) is PROHIBITED.

There is a risk of death or severe physical injuries.

- *Adhere to the **type plate** of the device (see section 2.5.2 Type Plate) **and** the **respective operating instructions** .*

WARNING

Risk of hazardous situations caused by use going beyond intended use and/or other types of use of the device!

There is a risk of death or severe physical injuries.

- *Only use the device for the intended use.*
  - *Only ever use the device in accordance with the specifications contained in these instructions and the specifications on the device's type plate.*
  - *All the specifications in these instructions must be adhered to at all times.*
  - *Always keep the operating instructions at the location where the device is used.*
  - *Keep all signs on the device in legible condition.*
  - *Only use original spare parts.*
- *Modifications or conversions to the device are NOT permitted.*

WARNING

Danger from the incorrect use of materials/agents!

The materials/agents to be used for the intended operation of the device are procured and utilized by the operating company for the device.

If unsuitable materials or agents are selected, strong chemical reactions could lead to fatal injury or (severe) physical injuries.

- *The proper selection and treatment of these materials/agents is solely the responsibility of the operating company.*
- *When selecting the materials/agents, make sure that the permitted technical parameters of the device are NOT exceeded.*
- *The cleaning agents and media must be approved for all of the materials of the device (e.g. washers, bushings) and for the substances in the container to be cleaned which come into contact with them.*
- *Adhere to the specified chemical limitations for use in the material data sheets.*
- *Adhere to the safety data sheets supplied by the manufacturers of the materials and media, in particular for hazardous substances:*
  - *Comply with the hazard and disposal instructions.*
  - *Set out protective measures and compile operating instructions for hazardous substances.*
  - *This also applies to hazardous substances that may arise during work processes.*

Refer to the order confirmation / parts list from AWH for the materials used in the device.

The TANKO-JM is a rotating cleaning device and belongs to the group of jet cleaners. The device is driven by the cleaning agent. The device is used for cleaning the interiors of containers with and without installed equipment.

For the purpose of these instructions, containers refer to **enclosed, depressurized** tanks, silos, barrels, containers, pipes, etc., which are provided with an outlet that ensures a free outward flow of the supplied cleaning fluid.

The **pressure in the container** to which the device is attached may not exceed a **maximum of 0.5 bar** (7.25 psi).

The device was developed, engineered and built exclusively for industrial and commercial use. It must not be used for private use.

In all cases, operating company must check whether the device is suitable for its application.

The device can be used in containers inside and outside of buildings in compliance with the limitations for use (see *section 3.3 Technical Data*).

In the process, the following must always be observed:

- Only operate the device when installed inside an enclosed container.
- Never direct the cleaning jet or torrent from the device at persons.
- Protect the device from freezing (e.g. risk of frost from possible residual water).
- The device is designed for fixed pipe installation only. Installation on a hose is PROHIBITED.
- Use a suitable filter system in the supply line for the cleaning agent.
- Operate the container only within the approved parameters, e.g. pressure and temperature, (see *section 3.3 Technical Data*).
- Only cleaning agents which are compatible with the materials of the device (see *section 3.4 Cleaning Agents*) may be used.
- The preferred installation position for the device is vertical with the cleaning head pointing downwards. Other installation positions are possible (see *section 5.2.2 Installation Position*).
- The device may generate vibrations when cleaning the container. Any vibrations going beyond this must be avoided (see *section 7.4.1 Maintenance Intervals*).

The device is **NOT suitable** for the following applications:

- The device is NOT suitable for private use.
- The device is NOT suitable for ATEX applications.
- The device is NOT suitable for use outside of containers.
- Holding the device with your hand during operation is PROHIBITED.
- The device must NOT be immersed in the product of the production process (NOT even partially). This could cause the product to enter into the device. The spray boreholes may become blocked. The free movement of the actuator may be obstructed.
- The device must NOT by operated with air over a long period as the cleaning agent is used for lubrication of the bearings.

The device is intended exclusively for the purpose outlined above. Any other use beyond that described here or alteration of the device without written approval from the manufacturer is considered IMPROPER use.

The manufacturer accepts NO liability for damage arising from this. The operating company is solely responsible for the risk.

The device must not be put into operation until it has been assured that all the safety devices are fully functional and the plant in which the device is installed meets the safety requirements of all relevant European directives (e.g. the Machinery Directive).

2.2 Spare Parts, Replacement Parts and Accessories

WARNING

Risk of damage, malfunction or complete failure of the device!

Incorrect or faulty spare/replacement parts and accessories put the functional safety and reliability of the device at risk.

There is a risk of death or severe physical injuries.

The failure of components or a device malfunction can cause material damage and consequential damages.

- *Only use the manufacturer's original spare parts.*

We expressly draw attention to the fact that replacement parts and accessories NOT supplied by AWH have NOT been checked or approved by AWH. The installation and/or the use of such products could therefore under certain circumstances result in changes with negative results to the properties of the device specified by its design and the higher-level plant.

AWH is not liable for any damage arising from the use of non-original parts or non-original accessory parts. Standard parts can be obtained from specialist dealers.

Section 7.5 Spare Parts and Customer Service includes a list of spare parts.

2.3 Duties of the Operating Company

The device is used in the commercial sector. The operating company is thus subject to the legal obligations of occupational safety.

In the EEA (European Economic Area), the national implementation of the Framework Directive 89/391/EEC on carrying out measures for improving safety and protecting the health of employees during work, as well as the associated individual directives shall be observed and complied with in their current valid versions.
Of particular importance in this connection is Directive 2009/104/EC on the minimum specifications for safety and health protection of employees using work equipment in their work.

As a basic rule, in Germany the Industrial Safety Regulation (BetrSichV) must be observed.

In other countries, the respective national directives, statutes and country-specific regulations regarding occupational safety and accident prevention are to be complied with.

At the same time, the following, non-exhaustive instructions apply in particular:

– The operating company must ensure that the device is used only as intended (see *section 2.1 Intended Use*).

– The operating company must keep informed of the locally applicable occupational health and safety regulations and, in addition, use a risk assessment to determine the hazards resulting from the

specific working conditions at the location of use of the device. This must then be implemented in the form of operating instructions for the operation of the device.

- When using hazardous materials, protective measures must be specified in accordance with the safety data sheets and operating instructions shall be compiled for hazardous materials. Personnel must be appropriately briefed about this. This also applies to hazardous substances that may arise during work processes.
- A continuous risk assessment must be carried out for workplaces, including temperature conditions for the medium and the place of use (falling). The measures are to be defined in operating instructions. Personnel must be instructed accordingly.
- Supervisors must monitor compliance with the measures specified in the operating instructions.
- Throughout the entire operating period of the device, the operating company must check whether the operating instructions he has compiled reflect current legislation requirements and adapt them as necessary.
- The operating company must clearly regulate and specify the responsibilities of personnel (e.g. for operation, maintenance and cleaning).
- The operating company must allow only sufficiently qualified and authorized personnel to work on the device.
- The operating company must ensure that all employees handling the device have read and understood the instructions.
  Furthermore, he must provide personnel with training at regular intervals with certification and inform them about the hazards.
- The user must provide sufficient workplace lighting at the plant in accordance with the locally applicable regulations for occupational health and safety in order to prevent hazards occurring as a result of poor lighting.
- The operating company must provide personnel with personal safety clothing and equipment and make sure that this is used (see *section 2.4.1 Personal Protective Equipment*).
- The operating company must make sure that the danger area of the higher-level plant in which the device is installed is not accessible to unauthorized persons.
- The operating company must make sure that no one is permitted to work on the device whose ability to react is impaired by drugs, alcohol, medication or similar.
- The operating company must take appropriate measures to inform groups of persons who are not intended to come into direct contact with the device (e.g. visitor groups) about the potential dangers involved.
- The operating company is responsible for making sure that the device is only ever operated in perfect condition.
- Wherever high pneumatic pressures occur, there is a possibility of sudden failure of or damage to the lines and connections. This poses a hazard. The operating company must instruct operating and maintenance personnel at least once a year on the possible hazards.
- The constructor of the overall plant must install the switching and safety devices required for setting up, inspection, shutting down (including emergency shutdown), operation, maintenance, cleaning and repair.

- The operating company must design the disconnection of the energy sources on the higher-level plant technically in such a way that the Switch-off Procedure described in *section 7.2* can be adhered to.
- The operating company must define and adhere to the intervals for inspections and control measures in accordance with the environment and media used.
- The operating company must provide fire safety devices, e.g. the appropriate quantity of suitable hand-held fire extinguishers of the appropriate size, in easily accessible places and provide employees with training on fire safety.
- Warnings in the documentation for externally supplied assembly units must be adhered to and incorporated into the risk assessments for the specific workplace.

Connections:

Before operating the machine with the device, the operating company must make sure that the local regulations are observed for assembly and installation and commissioning, if these tasks are performed by the operating company.

2.4 Requirements for Personnel

The device must only be operated, maintained and repaired by persons with the appropriate qualifications. These persons must be familiar with these instructions and act in accordance with them. The respective authorizations for personnel must be clearly defined.

The following qualifications are designated in the instructions for various fields of activity:

Expert/Specialist Personnel

An expert is a person whose professional training, knowledge and experience and knowledge of the relevant standards and regulations enables them to carry out work on the device and identify and prevent potential risks independently.

Instructed Person

An instructed person has been briefed and, if necessary, trained by the operating company or an expert in a briefing on the assigned tasks and possible hazards in the event of improper actions, and instructed on the necessary safety devices and protective measures.

Only personnel with the following expertise are permitted to perform work on the device:

- **Assembly/disassembly:** Industrial mechanic or similar training, practical experience in the assembly/disassembly of devices
  The person must be familiar with the construction, mechanical installation, maintenance of the device and fault clearance on the device and have the following qualifications:
  - Vocational training and final qualification in the field of mechanics (e.g. mechanic or mechatronics technician)
- **Welding work:** Welder qualification in pipeline engineering or similar qualification.
- **Electrical work:** Electrician; person with appropriate specialized training, knowledge and experience, enabling them to identify and prevent risks which may be caused by electricity

The person must be familiar with the electrical installation, commissioning, fault clearance on and repair of the device and have the following qualifications:

- Vocational training and final qualification in electrical engineering (e.g. electrician, electronics engineer or mechatronics technician)
- Several years of vocational experience in the field of electrical engineering

- **Cleaning:** Instructed person

Work performed in other areas **transportation, storage, operation and disposal** must be performed exclusively by personnel who have received suitable instruction.

All of the personnel listed above must wear protective clothing in accordance with their respective activities.

2.4.1 Personal Protective Equipment

Personal protective equipment must be used in accordance with the respective task when working on the device in order to minimize health hazards.

Protective Work Clothing
Protective work clothing is tight-fitting work clothing with low resistance to tearing, with close-fitting sleeves and without protruding parts. It is mainly used for protection against getting entangled in moving components. Do not wear any rings, necklaces or other jewelry.

Safety shoes
Wear slip-resistant safety shoes for protection against heavy, falling objects or for protection against slipping on slippery surfaces.

Protective gloves
Wear protective gloves to protect your hands against friction, grazes, getting pricked or deep cuts and for protection against coming into contact with hot surfaces or chemical substances.

Protective goggles
Wear protective goggles for protection against media escaping at high pressure and against flying objects.

Hard hat
Wear a hard hat for protection against falling or flying objects.

Hearing protection
Wear hearing protection to protect yourself from an increased sound pressure level (≥ 85 dB(A)).

Welding mask
Wear a welding mask to protect against damage to the eyes or skin caused by the welding arc and to protect against burns caused by flying particles during welding.

Personal protective equipment must be provided by the user and must meet the valid requirements.

Furthermore, both the national regulations and, if necessary, the internal instructions from the operating company, must be observed.

2.5 Identification Marking

2.5.1 Type Designation

Example: Jet Cleaner **TANKO - JM800 – G13**

1) Brand of the cleaning devices: **TANKO**

2) Type: Jet with **M**edia actuator

3) Size: **800**

4) Variant: **G** for “gleitgelagert” (with slide bearing)

5) Number of nozzle carriers: **1**

6) Number of nozzles **3**

2.5.2 Type Plate

The information only applies to devices with types indicated on the title page of these instructions.

The marking is applied to the device according to the following illustration.

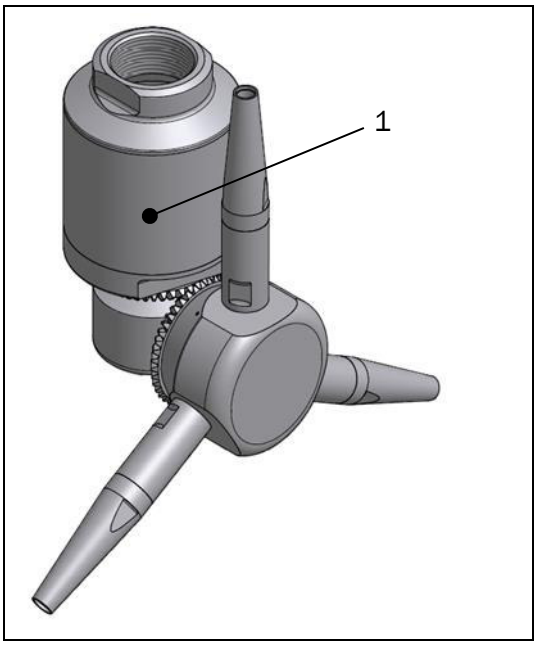


Figure 2.5-1: Type plate position

1 Device type plate

In case of inquiries, the data on the type plate of the device are important for proper and speedy processing:

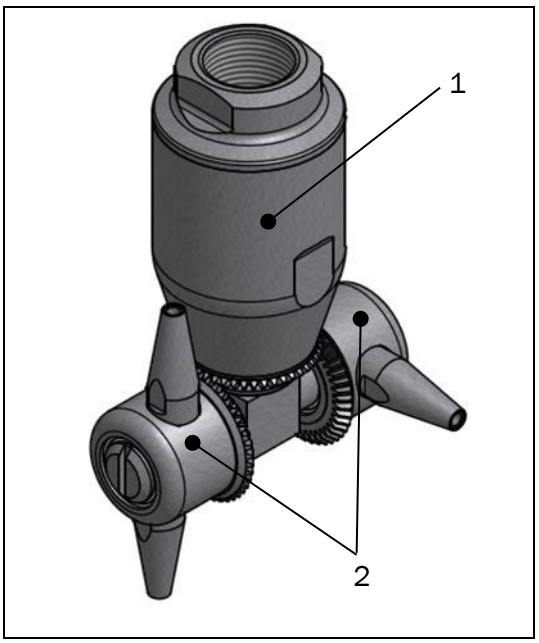
- Manufacturer
- Type designation
- Year of manufacture
- Article number
- Serial no. [SN]

3 Construction and Function

3.1 Construction

3.1.1 JM100 Construction

The container cleaning device comprises the following main components:



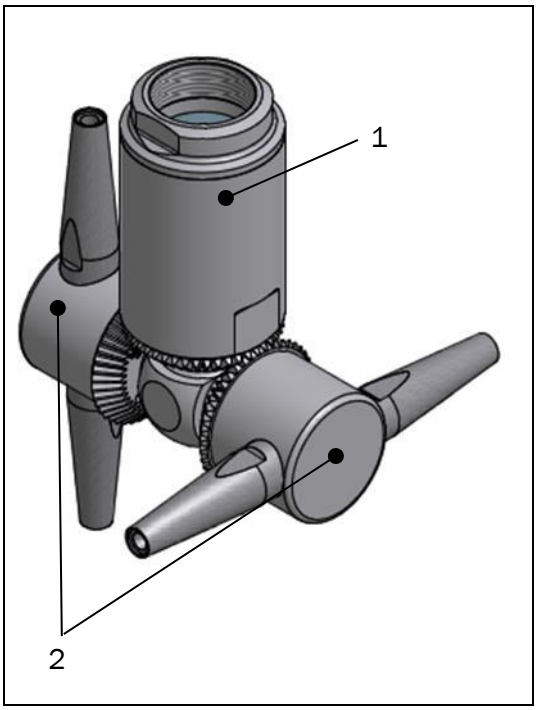
1 AU actuator unit

2 AU cleaning head

Figure 3.1-1: Overview of JM100

3.1.2 JM500 Construction

The container cleaning device comprises the following main components:

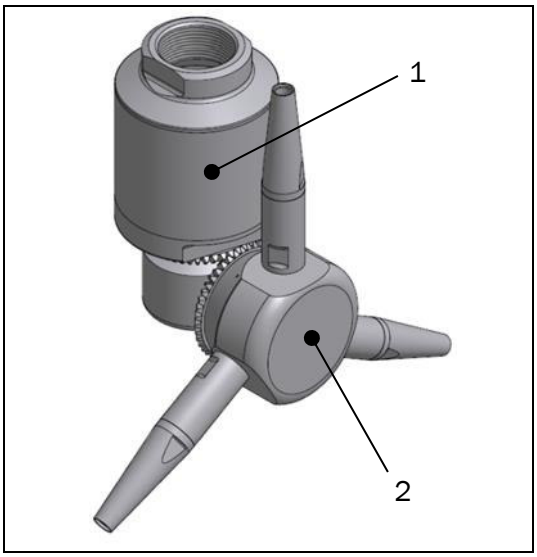


1 AU actuator unit
2 AU cleaning head

Figure 3.1-2: Overview of JM500

3.1.3 JM800 Construction

The container cleaning device comprises the following main components:



1 AU actuator unit
2 AU cleaning head

Figure 3.1-3: Overview of JM800

3.2 General Function Description

The jet cleaner of the TANKO-JM series is a cleaning device designed with an internal actuator. The materials of the device are stainless steel and plastic. The bearings do not require additional lubrication as they are flushed with cleaning agent during operation and thus simultaneously lubricated and cooled.

The actuator unit is driven by the cleaning agent which flows through it. The cleaning agent flows from the media connection, through an inflow disk and into the device and drives the impeller which is solidly connected to a rotor shaft.

The cleaning head is connected to the actuator unit in such a way that the generated torque is transmitted directly onto the integrated bevel gear unit.

The gear unit comprises one fixed bevel gear wheel and one circulating bevel gear wheel. The circulating bevel gear wheel drives the nozzle carrier (with nozzles).

The rotation of the circulating bevel gear wheel around the axis of the fixed bevel gear wheel and the forced rotation around its own axis generates the orbital rotary movement of the nozzles around the cleaning head.

The different number of teeth on the bevel gears causes the nozzle position to shift with each revolution of the cleaning head. A cycle is complete when the nozzles are back in their exact initial position after a certain number of revolutions.

The orbital movement of the jet creates a closed cleaning pattern on the inner surface of the container, the mesh size of which depends on the number of teeth on the bevel gears, the number of nozzles and the distance from the container wall.

The jet-blast principle of the nozzles concentrates the cleaning agent, generating a high-energy jet. The mechanical cleaning effect depends on the outlet speed, the mass and the angle of impact of the cleaning agent.

The intensive cleaning jets dislodge the deposits adhering to the container wall, rinse them off at high speed and discharge them.

Very good cleaning results can be achieved using the jet cleaner for soluble substances and if the appropriate jet cleaner is selected for the respective container size.

Differently sized devices, variations of head sizes, nozzle quantity and the nozzle bore are available to suit the specific requirement and the size of the container.

Sample applications for jet cleaner type TANKO-JM:

Tanks, silos, barrels, containers, pipes, dryers, centrifuges, agitators, vacuum containers, spraying towers, container washing plants, fermenters, filters, mixing containers and horizontal dryers.

3.2.1 Function of the JM100

The item numbers shown in brackets refer to the Figure 7.5-1: Internal construction of the JM100-G22.

The cleaning fluid enters at the connection cover (01) and flows through the holes of the flow-in disk (09) into the inside of the device in order to cause turbulent movement underneath the flow-in disk (09) in the liquid around the rotor shaft (10).

The liquid flows downwards on the outside of the rotor shaft (10) and hits the rotor star wheel (11). The rotor star wheel (11) sets the rotor shaft (10) in rotation.

The liquid then flows through the side bores in the rotor shaft (10) into the axle for nozzle carrier (13) and is distributed through the bores in the axle for nozzle carriers (13) in the bevel gear wheels with nozzle carrier (14) with the nozzles (06). From there, the fluid passes through the nozzle openings and back out again.

Any leakages from the cleaning device are used for the device's self-cleaning.

The rotation of the rotor shaft (10) causes an orbital rotation of the bevel gear wheels with nozzle carrier (14) around the rotor shaft (10). A simultaneous rotational movement of the bevel gears with nozzle carrier (14) around the axle for nozzle carriers (13) is triggered by the gearing of the bevel gears (12; 14).

The different number of teeth in the bevel gear wheels (12; 14) causes an offset in the nozzle position with each revolution and thus the initiation of a 360° spray angle.

JM100 cleaning times:

The speed of the cleaning head varies depending on the volume flow rate which is determined in particular by the number of nozzles, the size of the bores in the nozzles and by the pressure of the cleaning agent.

- If the entry pressure is 3 - 20 bar (44 - 290 psi), the speed of the cleaning head is 5 - 20 rpm. Fluctuations of 10 – 15% are to be expected due to the design.
- A complete cleaning cycle is completed after 45 revolutions. At a speed of 5 rpm, 9 minutes are required for a complete cleaning cycle.
- In order to determine the cycle time, divide the number 45 by the number of revolutions of the cleaning head per minute.

The speed of the cleaning head can be modified in the medium or bypass plug in the inflow disk to match the various operating situations (e.g. pressure, installation position and temperature of the cleaning medium).

When the medium pressure on the device is the same, the exchange of the medium plug (bypass) with the smaller bore leads to lower consumption. The flow speed via the bores/plugs of the inflow disk increases at the same time. This causes the actuator to become stronger/faster up to a certain ratio of pressure and volume flow rate and results in an increase in the speed of the cleaning head.

After installation of the device, you must check the speed of the cleaning head (see *section 6.2. Functional Check / Trial Run*). The speed must be adjusted if it is outside the recommended range. In the event of spontaneous pressure increase, a run-in period of 2-4 minutes may be required before the device reaches the speed.

3.2.2 Function of the JM500

The item numbers shown in brackets refer to the Figure 7.5-2: Internal construction of the JM500-G22.

The cleaning fluid enters at the connection cover (01) and flows through the holes of the flow-in disk (11) into the inside of the device in order to cause turbulent movement underneath the flow-in disk (11) in the liquid around the rotor shaft (12).

The liquid hits against the star wheel of the rotor shaft (12) and causes the rotor shaft (12) to go into rotation.

The liquid then flows through the side bores in the rotor shaft (12) into the shaft-axle connection (15) and is distributed through shaft-axle connection (15) in the nozzle carriers (18) with the nozzles (08). From there, the fluid passes through the nozzle openings and back out again.

Any leakages from the cleaning device are used for the device's self-cleaning.

The rotation of the rotor shaft with star wheel (12) causes an orbital rotation of the nozzle carrier (18) around the rotor shaft with star wheel (12). A simultaneous rotational movement of the nozzle carriers (18) around the respective axle of the nozzle carrier (16) is triggered by the gearing of the bevel gears (14; 17).

The different number of teeth in the bevel gear wheels (14; 17) causes an offset in the nozzle position with each revolution and thus the initiation of a 360° spray angle.

JM500 cleaning times:

The speed of the cleaning head varies depending on the volume flow rate which is determined in particular by the number of nozzles, the size of the bores in the nozzles and by the pressure of the cleaning agent.

- If the entry pressure is 3.5 - 13 bar (51 - 189 psi), the speed of the cleaning head is 5 - 20 rpm. Fluctuations of 10 – 15% are to be expected due to the design.
- A complete cleaning cycle is completed after 45 revolutions. At a speed of 5 rpm, 9 minutes are required for a complete cleaning cycle.
- In order to determine the cycle time, divide the number 45 by the number of revolutions of the cleaning head per minute.

The speed of the cleaning head can be modified in the medium or bypass plug in the inflow disk to match the various operating situations (e.g. pressure, installation position and temperature of the cleaning medium).

When the medium pressure on the device is the same, the exchange of the medium plug (bypass) with the smaller bore leads to lower consumption. The flow speed via the bores/plugs of the inflow disk increases at the same time. This causes the actuator to become stronger/faster up to a certain ratio of pressure and volume flow rate and results in an increase in the speed of the cleaning head.

After installation of the device, you must check the speed of the cleaning head (see *section 6.2. Functional Check / Trial Run*). The speed must be adjusted if it is outside the recommended range.

3.2.3 Function of the JM800

The item numbers shown in brackets refer to Figure 7.5-3: Internal construction of the JM800-G13.

The cleaning fluid enters at the connection cover (01) and flows through the holes of the flow-in disk (14) into the inside of the device in order to cause turbulent movement underneath the flow-in disk in the liquid around the rotor shaft (15).

The liquid flows downwards on the outside of the rotor shaft (15) and hits the rotor impeller (16). The rotor shaft is set into rotation via the impeller.

The liquid then flows through the side bores in the rotor shaft (15) into the shaft-axle connection (19) and is distributed through the bores in the axle (20) for nozzle carriers (22). From there, the fluid passes through the nozzle openings (11) and back out again.

Any leakages from the cleaning device are used for the device's self-cleaning.

The rotation of the rotor shaft (15) causes an orbital rotation of the nozzle carrier around the rotor shaft. A simultaneous rotational movement of the nozzle carrier around the axle of the nozzle carrier is triggered by the gearing of the bevel gears (18; 21).

The different number of teeth in the bevel gear wheels causes an offset in the nozzle position with each revolution and thus the initiation of a 360° spray angle.

JM800 cleaning times:

The speed of the cleaning head varies depending on the volume flow rate which is determined in particular by the number of nozzles, the size of the bores in the nozzles and by the pressure of the cleaning agent.

- If the entry pressure is 5 - 13 bar (73 - 189 psi), the speed of the cleaning head is 5 - 20 rpm. Fluctuations of 10 – 15% are to be expected due to the design.
- A complete cleaning cycle is completed after 45 revolutions. At a speed of 5 rpm, 9 minutes are required for a complete cleaning cycle.
- In order to determine the cycle time, divide the number 45 by the number of revolutions of the cleaning head per minute.

3.3 Technical Data

The estimated safe service life of the device is 10 years with single-shift operation and the use of drinking water.

Prerequisite for this: the device must be maintained properly at the intervals specified in the *section 7.4 Maintenance*, and the wear parts must be replaced regularly.

Aggressive agents can reduce the service life of the device.

Designation	TANKO-JM100	TANKO-JM500	TANKO-JM800
Range – Cleaning radius – Wetting radius	2 m / 6.5 ft 4 m / 13 ft	2.5 m / 8 ft 5 m / 16.5 ft	3.5 m / 11.5 ft 7 m / 23 ft
Operating temperature (permitted) – Cleaning agent	max. +95 °C / +203 °F	max. +95 °C / +203 °F	max. +95 °C / +203 °F
Ambient temperature (permitted) – Inside the container	min. +5 °C / +41 °F max. +140 °C / +284 °F	min. +5 °C / 41 °F max. +140 °C / +284 °F	min. +5 °C / +41 °F max. +140 °C / +284 °F
Operating pressure – Cleaning agent	3 – 10 – 20 bar / 44 – 145 – 290 psi	3.5 – 13 bar / 51 – 189 psi	5 – 13 bar / 73 – 189 psi
Volume flow rate / flow	See chart *Figure 3.3-1* and *Figure 3.3-2*	See chart *Figure 3.3-3*	See chart *Figure 3.3-4*
Process connection [PC]	not specified (provided by the operating company)	not specified (provided by the operating company)	not specified (provided by the operating company)
Media connection [MC]	3/4" BSP or NPT Inner thread	1 ½" BSP or NPT Inner thread	1 ½" BSP or NPT Inner thread
Number of nozzles – optional	4 (2x2) ---	4 (2x2) ---	3 (1x3) 2 (1x2)
Nozzle bore	Ø 3.2 / 3.7 / 4.3 mm	Ø 6.5 / 8.0 / 9.5 mm	Ø 8.0 / 9.5 mm
Jet movement	360° orbital	360° orbital	360° orbital
Actuator type	Hydraulic with cleaning agent	Hydraulic with cleaning agent	Hydraulic with cleaning agent
Sound pressure level – Outside the container	Depends on the properties of the container! The sound pressure level may exceed the permitted exposure value of $LE_{X,8h}$ = 85 dB(A).		
Translation – Actuator : Cleaning head	1 : 1	1 : 1	1 : 1
Speed of the cleaning head around the downpipe [DP]	≈ 5 – 20 rpm	≈ 5 – 20 rpm	≈ 5 – 20 rpm
Cleaning time	See *section 3.2.1*	See *section 3.2.2*	See *section 3.2.3*
Installation opening – Stationary device – Mobile device	See *section 5.2.1* Ø 100 mm / Ø 4 in > Ø 130 mm / Ø 5 in	See *section 5.2.1* Ø 220 mm / Ø 8½ in > Ø 280 mm / Ø 11 in	See *section 5.2.1* Ø 310 mm / Ø 12 in > Ø 380 mm / Ø 15 in
Orbital nozzle movement	Ball Ø 120 mm / 4¾ in	Ball Ø 270 mm / 10½ in	Ball Ø 370 mm / 14½ in
Materials – In contact with media – Other	1.4404 (AISI 316L) PTFE; PEEK+PTFE, 1.4301 (AISI 304) 1.4401 (AISI 316) 1.4571 (AISI 316Ti)	1.4404 (AISI 316L) PTFE; PEEK+PTFE, 1.4401 (AISI 316) 1.4571 (AISI 316Ti)	1.4404 (AISI 316L) PTFE; PEEK+PTFE, 1.4401 (AISI 316) 1.4571 (AISI 316Ti)
Weight (standard)	≈ 1.2 kg	≈ 5.2 kg	≈ 7.2 kg

Table 3.3-1: Operating parameters of the device

JM100 Variants (3 – 10 bar / 44 – 145 psi)

- TANKO-JM100-G22 2x 2 nozzles Ø 3.7 mm
- TANKO-JM100-G22 2x 2 nozzles Ø 4.3 mm

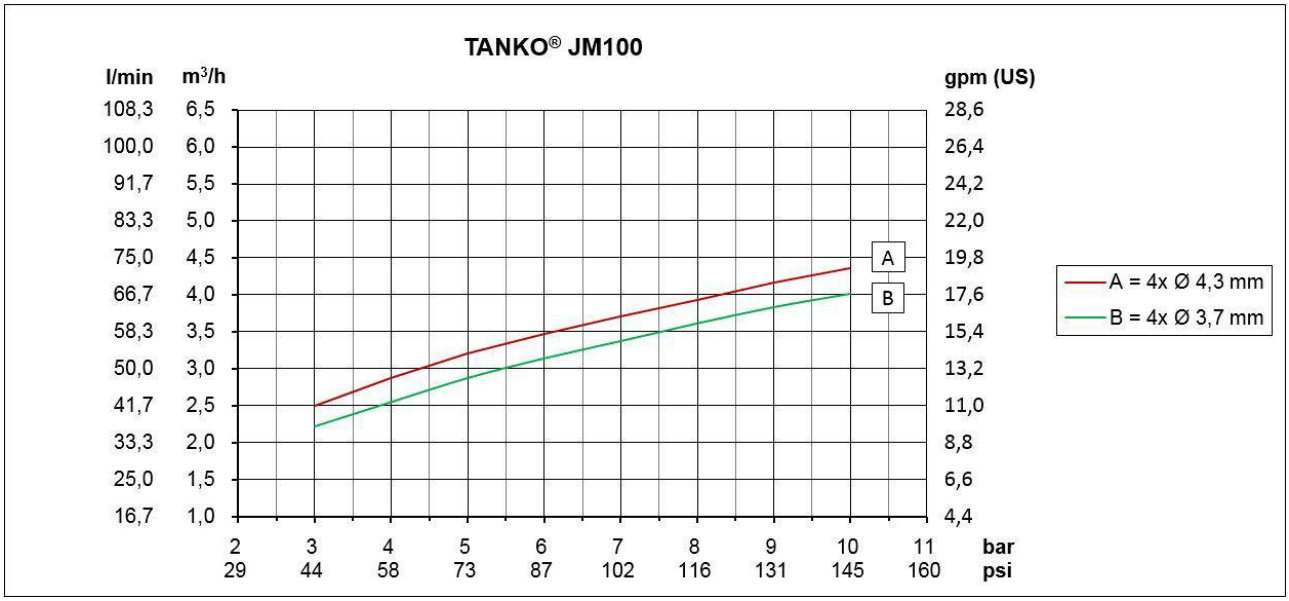


Figure 3.3-1: Diagram - Flow JM100-G22, (3 – 10 bar /44 – 145 psi)

JM100 Variants (10 – 20 bar / 145 – 290 psi)

- TANKO-JM100-G22 2x 2 nozzles Ø 3.2 mm
- TANKO-JM100-G22 2x 2 nozzles Ø 3.7 mm
- TANKO-JM100-G22 2x 2 nozzles Ø 4.3 mm

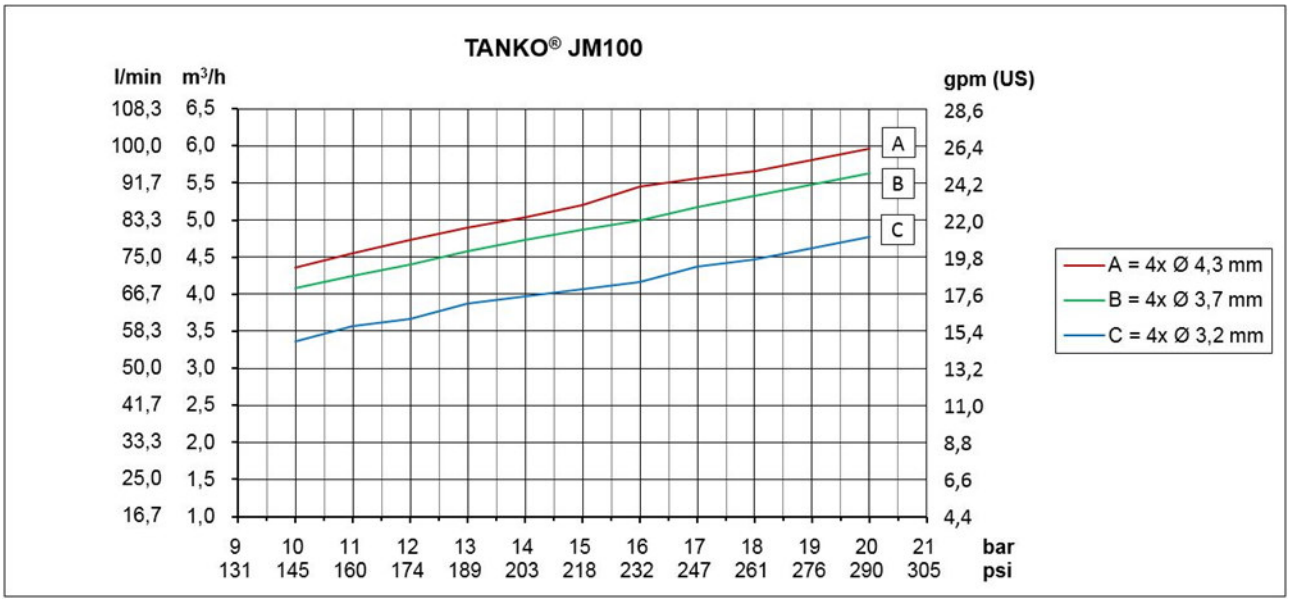


Figure 3.3-2: Diagram - Flow JM100-G22, (10 – 20 bar /145 – 290 psi)

JM500 Variants (3.5 – 13 bar / 51 – 189 psi)

- TANKO-JM500-G22 2x 2 nozzles Ø 6.5 mm
- TANKO-JM500-G22 2x 2 nozzles Ø 8.0 mm
- TANKO-JM500-G22 2x 2 nozzles Ø 9.5 mm

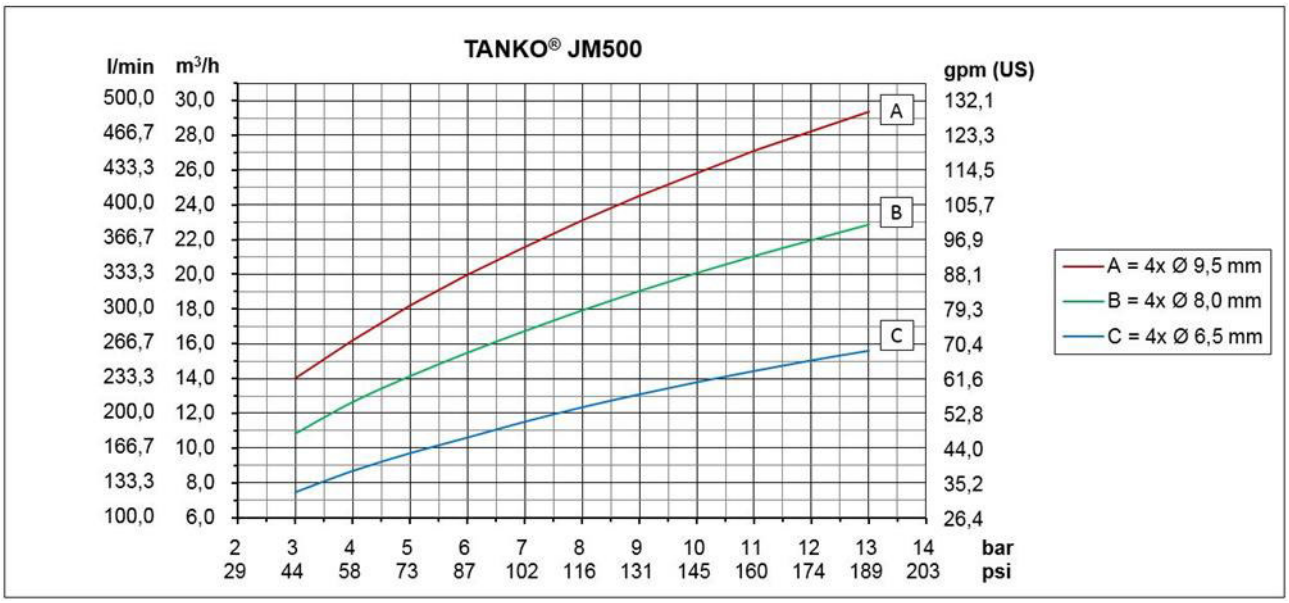


Figure 3.3-3: Chart - JM500-G22 flow

JM800 Variants (5 – 13 bar / 73 – 189 psi)

- TANKO-JM800-G13 1x 3 nozzles Ø 8.0 mm
- TANKO-JM800-G13 1x 3 nozzles Ø 9.5 mm

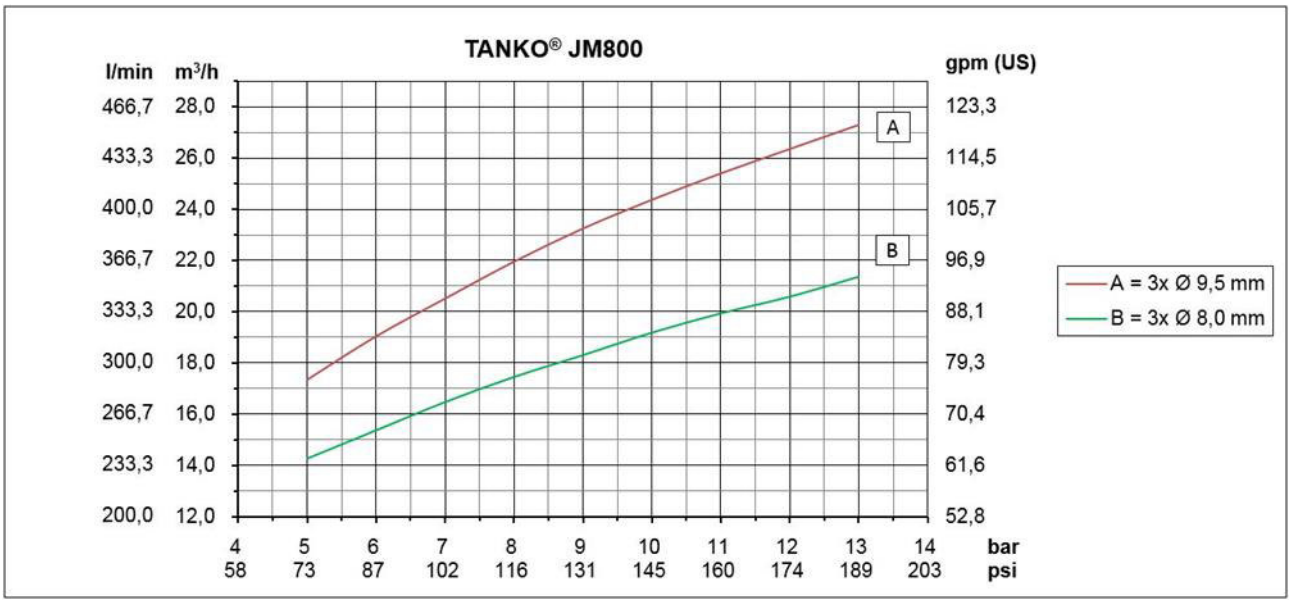


Figure 3.3-4: Chart - JM800-G13 flow

Consumption data and operating pressure for the cleaning process:

The specified values for consumption and rotation speed are average values, and may deviate by approx. ±10% during normal operation.
They apply to operation with clean water as the cleaning fluid at a temperature of +25 °C / +77 °F.
The values may differ if a different cleaning fluid and a different medium temperature are used.

The consumption of cleaning fluid in TANKO-JM devices depends on multiple factors, e.g. the pressure of the cleaning fluid, the size of the nozzle openings and the size of the bores in the plugs of the inflow disk for regulating the speed. An increase in pressure leads to increased consumption (throughput).
The permitted range for the operating pressure of the cleaning agent must be adhered to.

3.4 Cleaning Agents

Due to the wide variety of practical cases of application and use for the cleaning device, it is NOT possible for AWH to recommend specific cleaning agents for the operating company.

The operating company holds sole responsibility for the type of cleaning media, their use and handling.

For this reason, AWH can provide the owner with **a few reference points and notes, but only as a precautionary measure** (for a device in a container), which must be observed and integrated into the owner's risk assessments.

DANGER

Risk of explosion as a result of the formation of an explosive atmosphere!

There is a risk of death or severe physical injuries.

- *The following items are **PROHIBITED** for use as cleaning agents:*
  - *Fluids which may form a dangerous explosive atmosphere when splashed or sprayed.*
  - *Fluids which cause a chemical reaction with the substance to be cleaned that could form a dangerous explosive atmosphere.*
  - *Aggressive, flammable or explosive fluids (e.g. acids, thinners, etc.).*

WARNING

Warning against corrosive and aggressive cleaning agents!

There is a risk of death or severe physical injuries.

- *Adhere to the regulations and specifications in the safety data sheets for the cleaning agents (e.g. vapors or hazardous substances).*

The following limitations for cleaning agents are derived from the durability of the materials used in the device.

CAUTION

Danger as a result of use of incorrect cleaning agents!

There is a risk of minor or moderate injuries.

- *The cleaning agents must be approved for all of the materials of the device (e.g. seals, bushings) and for the substances to be cleaned in the container that come into contact with it.*
- *The following items are **PROHIBITED** for use as cleaning agents:*
  - *Cleaning agents containing solids or liquids with solid particles or solid content (e.g. abrasives) which can lead to increased wear and/or blockages of the spray holes.*
  - *Cleaning agents containing substances which may cause exothermic reactions with the materials of the cleaning agent, the container of the plant, e.g.:*
    - *chlorine and chlorine ions*
    - *substances containing salt (no resistance to seawater)*
    - *medium-concentrated to highly concentrated organic acids*
    - *strong acids, in particular nitric acid and sulfuric acid (with acid content > 65%)*
    - *aliphatic, aromatic and chlorinated hydrocarbons*
    - *phenols*
    - *fluorine compounds*

NOTE

Risk of damage to the device from the cleaning agent!

Soiling or foreign objects in the cleaning agent can have a negative effect on the function of the device.

There is a risk of material damage and consequential damages.

- *Use a suitable filter system in the cleaning agent supply line. The use of a filter with a filtration effect corresponding to a mesh width of 50 µm is recommended.*
- *Adhere to the instructions on the supply and return lines in the section 5.2 Installation.*

The following agents are permitted for use for container cleaning:

Clean, sprayable fluids (e.g. water with alkali cleaning additives and similar).

4 Transportation and Storage

AWH products are checked carefully before they are dispatched and are packaged in accordance with the respective transportation and storage conditions. However, it is NOT possible to rule out the possibility of damage during transportation completely.

CAUTION

Risk from protruding sharp edges on the device!

Depending on the design, the device may have protruding sharp edges which can be dangerous when handling it.

There is a risk of minor cuts.

- *Wear protective gloves when working on the device.*
- *When handling, e.g. unpacking, transportation without packaging, assembly/disassembly and maintenance work, beware of protruding sharp edges.*

CAUTION

Risk of crushing through exposed bevel gear wheels!

The device has exposed bevel gear wheels which are connected via a nozzle carrier with freely moving nozzles and which can be dangerous during handling. Unintended rotation of the nozzles could cause fingers to become jammed in the area of the bevel gear wheels or between housing and nozzles.

This could result in minor crush injuries.

- *Wear protective gloves when working on the device.*
- *When handling, e.g. unpacking, transportation without packaging, assembly/disassembly and maintenance work, beware of freely moving nozzles and exposed bevel gear wheels.*

In the event of damage (including cases involving spare and wear parts) please contact AWH immediately with a damage report.

Scope of delivery

– Container cleaning device

– Operating and installation instructions

– Technical documents in accordance with the order (e.g. certificates and reports)

The scope of delivery ends at the interfaces of the device (see *section 5.2.1 Interfaces*).

Refer to the delivery note and the order confirmation for full details of the scope of delivery.

Inspection on receipt of goods:

- Immediately check the delivery against the delivery note and the order confirmation on receipt to make sure that it is complete.
- Check the delivery for any transport damage (visual inspection).

Claims:

- Register claims for damaged and/or incomplete deliveries with the transport company immediately.
- Keep the packaging for a possible inspection by the transport company or for return delivery.

Return delivery:

In the event of a possible return delivery, pack the device parts so that they cannot become damaged during transportation. If possible, use the original packaging and the original packaging material. If neither is available anymore, request a packaging company with specialist personnel.

- Consult AWH if you have any questions regarding packaging and transport safety.

4.1 Packaging

The device is supplied fully assembled. The packaging is selected to suit the conditions of transportation. Required accessories, spare parts, operating or installation instructions and technical documents are packaged separately and enclosed with the delivery.

The packaging should protect the device up until the time of installation against transport damage, corrosion and other damage. Therefore, do not remove the packaging until shortly before installation.

NOTE

Risk of environmental damage as a result of incorrect disposal of the packaging!

Packaging materials are valuable raw materials and can be reused in many case or usefully processed and recycled.

Improper disposal can cause environmental damage.

- *Dispose of packaging materials in an environmentally friendly manner and recycle them.*
- *Adhere to the locally valid disposal regulations.*

4.2 Transportation

NOTE Improper transportation can cause damage to the device.

The functional safety and reliability of the device may be compromised.

- Adhere to the symbols and instructions on the packaging.
- Transport the device only in a dry condition.
- The device must be protected from impacts.
- If possible, use the original packaging for transportation.
- Proceed with care when unloading the device and when transporting it on your premises.
- Do not remove the packaging until shortly before installation.

4.3 Storage

The packaging of the device, the components and the replacement parts and consumables is designed for a storage period of 3 months.

NOTE Risk of damage as a result of incorrect storage!

Incorrect storage can cause damage to the device and its components and lead to premature aging (e.g. plastic parts).

The failure of components or a device malfunction can cause material damage and consequential damages.

- Adhere to the following storage conditions:
  - Store the device in the original packaging wherever possible.
  - Store the device in a clean and dry place (e.g. enclosed, dust-free room).
  - Store the device in constant environmental conditions.
  - Prevent major temperature fluctuations so that condensation does not form.
  - Prevent dirt and moisture from entering into the device.
  - Protect the device from the elements (e.g. formation of condensation in the device, sunlight).
  - Protect unpacked devices or components with dust-proof covers. Condensation must not be allowed to form beneath the covering.

Parameters for storage (recommended):

– Room temperature	+10 °C to +45 °C / +50 °F to +113 °F
– Relative humidity	max. 60% (non-condensing)
– Temperature fluctuations max.	10 °C / 18 °F per day
– Occurrence of oscillations	v_{eff} < 0.2 mm/s

5 Installation

5.1 Safety Notes for Installation

WARNING

Danger as a result of static charge!

Containers may become statically charged during cleaning operation. There is a risk of electric shock or electrical irritation in case of contact with the hand, which could cause a startled reaction.

There is a risk of death or severe physical injuries.

- *Only allow work on the device to be performed by experts.*
- *Make sure that an electrostatic charge is prevented. To do so, ground the device and the container to a common potential.*
- *The grounding must always be implemented before commissioning the device.*

WARNING

Risk of falling when working at heights!

When carrying out assembly/disassembly work on parts of the plant at heights, there is a risk of falling.

There is a risk of death or severe physical injuries.

- *Do not perform any work at heights except with a safety platform with cage or suitable fall protection (e.g. safety rope and safety harness).*
- *If you are using a harness as fall protection, it is imperative that the rescue concept is observed for a person in the harness.*
- *A person must not remain suspended in the harness for longer than 15 min as there is otherwise a risk of shock or even death.*
- *Wear protective work clothing, safety shoes, protective gloves and a hard hat for work at heights.*

CAUTION

Risk of accidents as a result of improper installation!

Incorrect installation, falling components or failure to comply with the indicated safety notes can result in accidents or damage to property.

There is a risk of minor or moderate injuries.

- *Allow only experts to perform work on the device.*
- *Before starting work, observe the* ***working steps of the switch-off procedure*** *(see section 7.2 Switch-off Procedure).*
- *Wear protective work clothing, protective gloves and safety shoes when performing work.*
- *Do not on the device unless it is depressurized and in a cool state.*
- *Maintain a safe distance when working on the device. We recommend that you provide 1 m of space for free movement around the device and container.*

CAUTION

Risk from protruding sharp edges on the device!

Depending on the design, the device may have protruding sharp edges which can be dangerous when handling it.

There is a risk of minor cuts.

- *Wear protective gloves when working on the device.*
- *When handling, e.g. unpacking, transportation without packaging, assembly/disassembly and maintenance work, beware of protruding sharp edges.*

CAUTION

Risk of crushing through exposed bevel gear wheels!

The device has exposed bevel gear wheels which are connected via a nozzle carrier with freely moving nozzles and which can be dangerous during handling. Unintended rotation of the nozzles could cause fingers to become jammed in the area of the bevel gear wheels or between housing and nozzles.

This could result in minor crush injuries.

- *Wear protective gloves when working on the device.*
- *When handling, e.g. unpacking, transportation without packaging, assembly/disassembly and maintenance work, beware of freely moving nozzles and exposed bevel gear wheels.*

5.2 Installation

The safety notes in *section 5.1 Safety Notes for Installation* must be adhered to before installation of the device in the container.

CAUTION

Risk of a fault as a result of soiling, foreign objects or damage to the device!

There is a risk of minor or moderate injuries.

The following measures must be observed before installing the device for the first time and when installing it after retooling work on the plant in which the device is installed.

- *All supply and return lines for the cleaning agent must be flushed with clear water in order to remove any contamination, foreign objects or residue in the supply line (e.g. scale, chippings, welding particles etc.).*
- *Take suitable measures to prevent soiling and foreign objects from entering via the interfaces of the device. Install a filter upstream of the media connection [MC] in the supply line for the cleaning agent (see section 3.4 Cleaning Agents).*
- *Only fixed pipe installation is permitted. Do not install with a hose. Installation with a hose can cause the installed cleaning device to thump/whip.*
- *When selecting the installation position of the device, make sure that a safe distance from the inner wall of the container and from surrounding components is maintained, so as to prevent scraping or knocking during vibration.*
  - *It is imperative to prevent collisions while the cleaning head and surrounding components (e.g. agitators) are moving simultaneously.*
- *Longer line lengths can cause vibration in certain operating statuses. In case of heavy vibrations on the plant, the pipe connection to the device may come loose.*
  In case of vibrations, take additional measures to prevent the connection from coming loose, such as spot welding or gluing (e.g. Loctite).
- *Install the device free of mechanical strain.*
- *Paint must not be applied to the surface of the device.*
- *Refer to the figures in section 5.2.1 Interfaces for the installation dimensions.*

5.2.1 Interfaces

5.2.1.1 JM100 Installation Dimensions and Interfaces

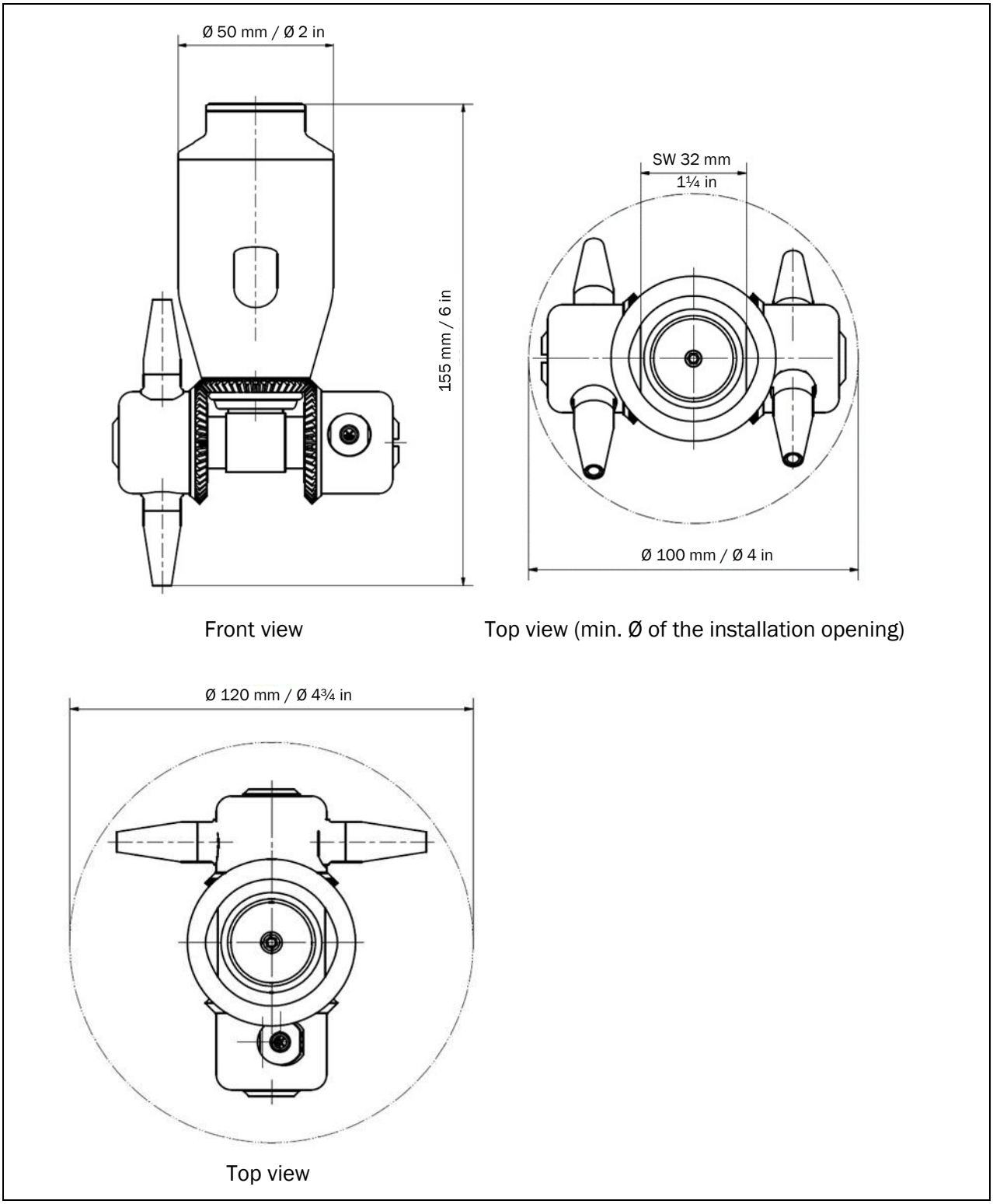


Figure 5.2-1: Installation dimensions of the JM100 device

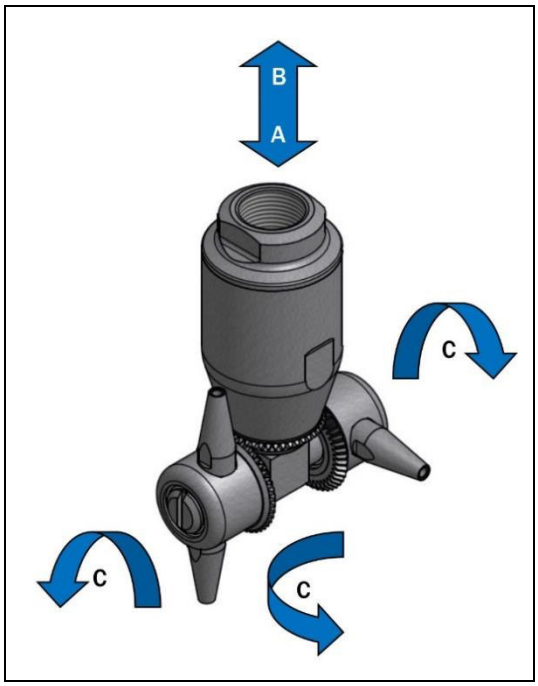


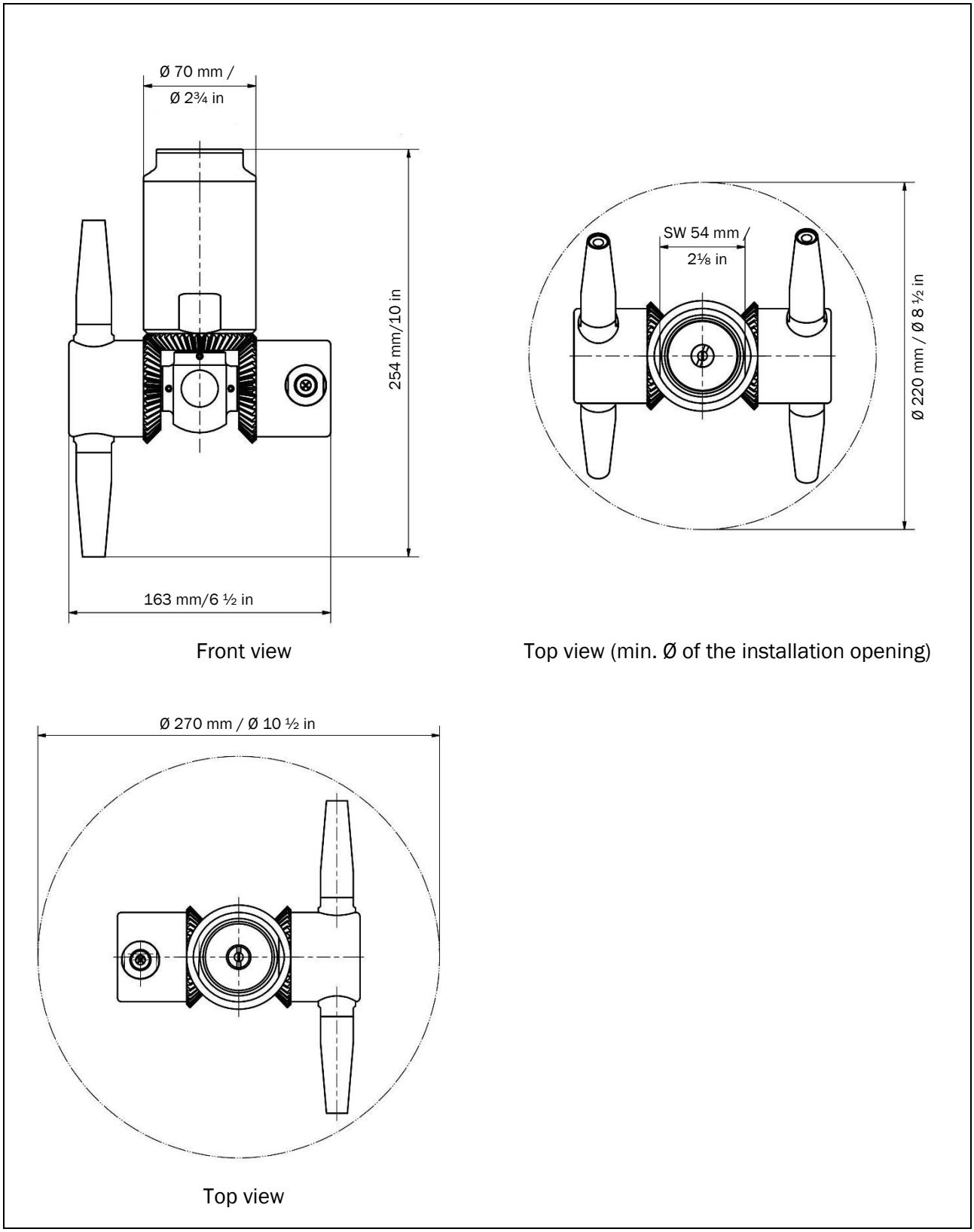
Figure 5.2-2: Interfaces of the JM100 device

A Actuator / Energy Supply
Media connection [MC]]
(connection of the downpipe [DP] to the device)

B Device / Container
Process connection [PC]]
(connection of the downpipe [DP] to the container)

C Space for Movement / Installation Space
Cleaning head with nozzles
(space for orbital nozzle movement and outlet of cleaning agent)

5.2.1.2 JM500 Installation Dimensions and Interfaces

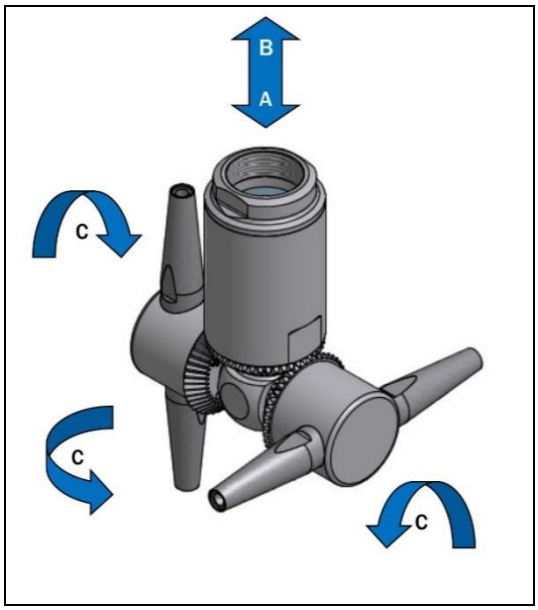


Front view

Top view (min. Ø of the installation opening)

Top view

Figure 5.2-3: Installation dimensions of the JM500 device



A Actuator / Energy Supply
Media connection [MC]
(connection of the downpipe [DP] to the device)

B Device / Container
Process connection [PC]
(connection of the downpipe [DP] to the container)

C Space for Movement / Installation Space
Cleaning head with nozzles
(space for orbital nozzle movement and outlet of cleaning agent)

Figure 5.2-4: Interfaces of the JM500 device

5.2.1.3 JM800 Installation Dimensions and Interfaces

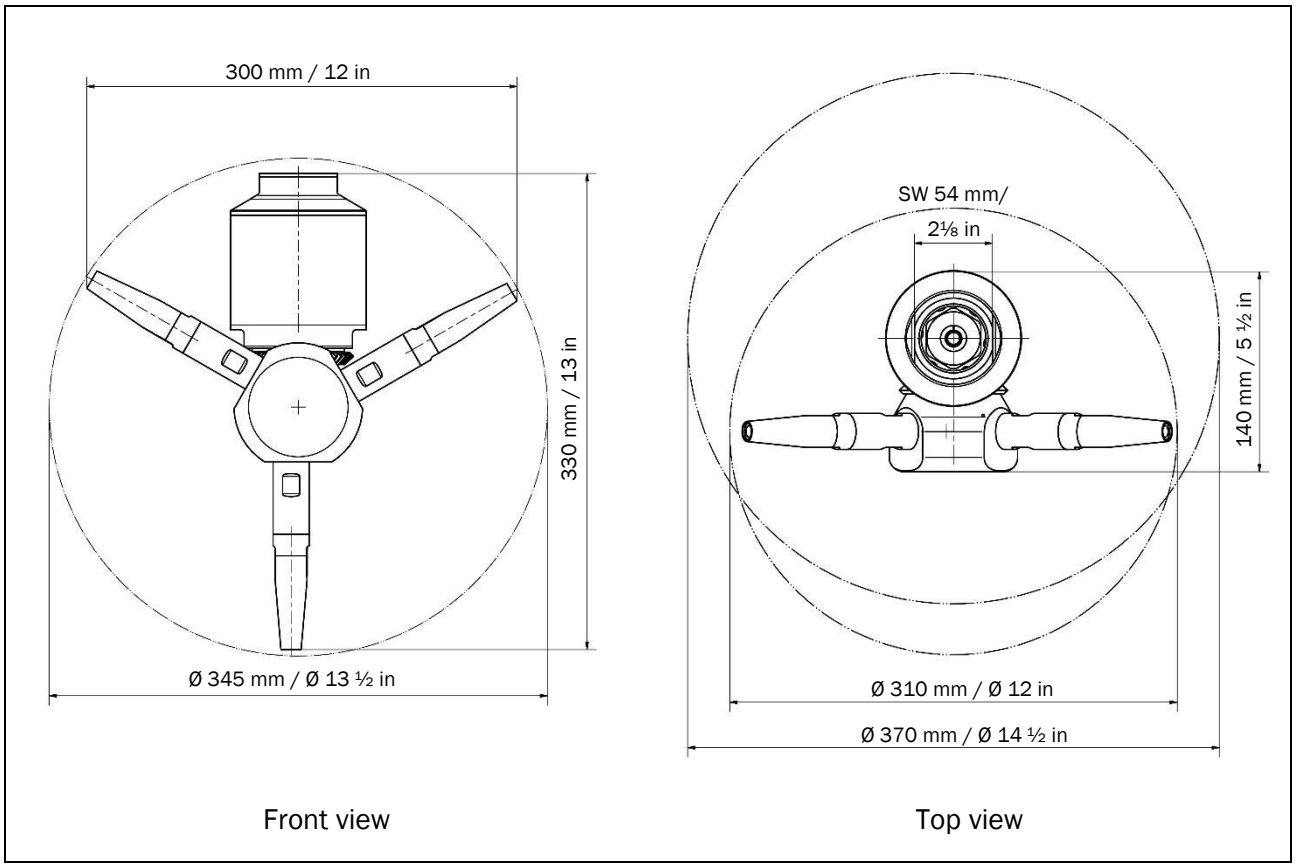


Figure 5.2-5: Installation dimensions of the JM800 device

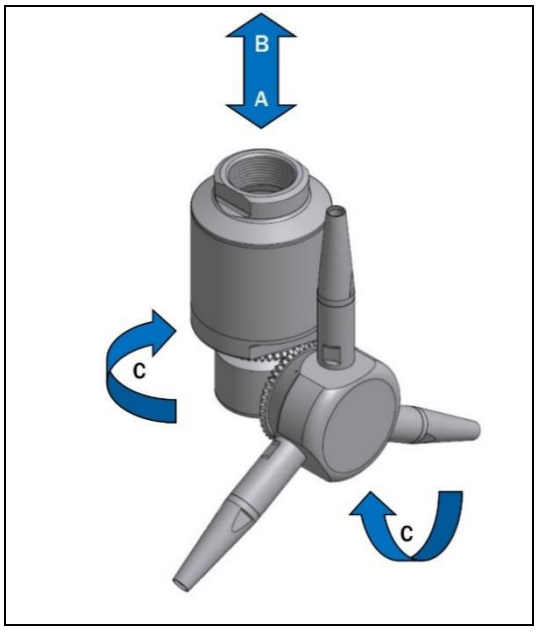


Figure 5.2-6: Interfaces of the JM800 device

A Actuator / Energy Supply
Media connection [MC]]
(connection of the downpipe [DP] to the device)

B Device / Container
Process connection [PC]]
(connection of the downpipe [DP] to the container)

C Space for Movement / Installation Space
Cleaning head with nozzles
(space for orbital nozzle movement and outlet of cleaning agent)

5.2.2 Installation Position

1) Aligned vertically with the cleaning head pointing downwards (standard):
The device is designed for vertical installation as the preferred position. This installation position means that the device can drain automatically.

2) Different installation position from the standard:
A different installation position to the standard position means that the device may NOT always be able to drain automatically. The strain on the bearings is also increased.

Adhere to the following:

- The running performance may be compromised.
- The service life of the bearing elements may be shortened as a result of the increased strain.
- Maintenance intervals should be shortened if necessary (see *section 7.4.1 Maintenance Intervals*).

5.2.3 Installing the Device

Installation Opening of the Container

The use of the device (mobile or stationary) is the decisive factor for the required size of the installation opening. The specified installation dimensions in *Table 3.3-1: Operating parameters of the device* are

recommended minimum dimensions for the installation opening and for installing the device in the container and removing it from the container in assembled condition.

A “stationary device” can be installed in different ways depending on the properties of the container and the size and accessibility of the installation opening.

– Before installation, the device is fastened to the media connection [MC] at the downpipe [DP] and inserted into the container from the outside via the installation opening.
  The process connection [PC] of the downpipe [DP] is then fastened to the container or
– the device is fastened to the media connection [MC] on an existing downpipe [DP].

⚠ **WARNING** Risk of the device falling accidentally!

The device may strike personnel when falling.

There is a risk of severe physical injuries.

- Hold the device firmly when installing/removing it.
- There must be nobody beneath the device when installing/removing it.

NOTE Risk of dirt and foreign objects in the device!

Functional safety and reliability may be compromised.

- During installation, make sure and check that there is no dirt or foreign objects in the device (e.g. small particles, sealing material).

NOTE No torque may be initiated into the device via the nozzles while the device is being installed/removed! Lever action can cause a torque to be transferred via the nozzle carrier to the bevel gear wheels.

The threaded connections of the bevel gear wheels could become loose.

- When setting the device down with the downpipe fastened in place, make sure that the nozzles ARE NOT under pressure due to the weight and length of the downpipe.
- Clamp the downpipe in a vise so that the device can be fastened to or loosened from the downpipe.

Interface A

The supply line connection must be configured to be compatible with the media connection [MC] of the device. The supply line for the cleaning agent must be fastened permanently and leak-tight to the media connection [MC].

Threaded Connection

NOTE Risk of damage to the device during assembly!

The flats on the housing are NOT suitable for fastening and unfastening the device on the pipe for the media supply.

The threaded connection between the housing and the connection cover may become damaged as a result of excessive tightening torque. Maintenance and cleaning may become more difficult or even impossible.

- Only use the wrench flat on the connection cover for screwing on and unscrewing the device on the pipe for the media supply (see Figure 5.2-7: Assembly of threaded connection (example JM100)).

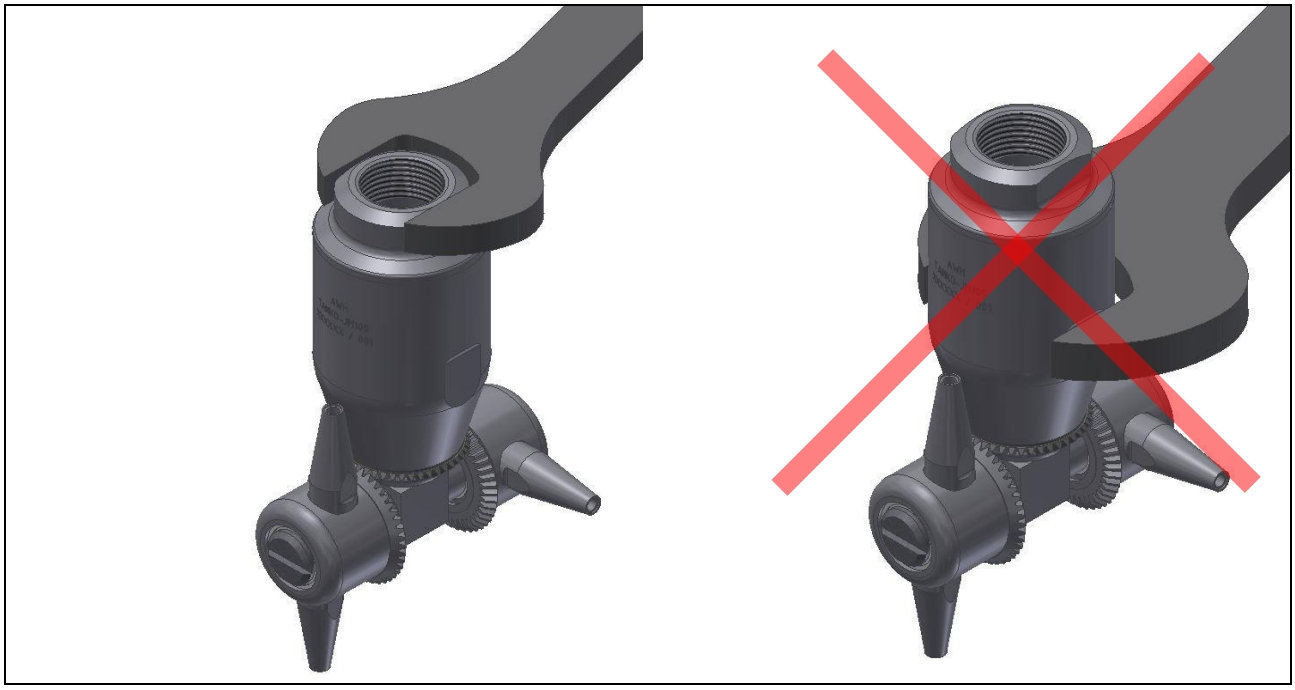


Figure 5.2-7: Assembly of threaded connection (example JM100)

1. Remove the screw cap/sealing plug from the media connection [MC].
2. Screw the female thread in the connection cover (01) to the male thread on the connection line for the media supply.

   NOTE There is a risk of damage to the thread if the tightening torque applied for the threaded connection between the connection cover and the pipe is excessive!

   - The tightening torque value for the threaded connections between the connection cover and pipe depends on the material of the pipe for the media supply.
3. Tighten the threaded connection between the connection cover and the pipe using an open-ended wrench or adjustable pliers wrench, as shown in *Figure 5.2-7*.

Interface B

The connection to the container must be designed to that it is compatible with the process connection [PC] for the downpipe [DP]. The process connection [PC] must be fastened permanently and leak-tight to the connection on the container (e.g. screwed or clamping) and secured to prevent it from coming loose.

⚠ **WARNING** NON-threaded process connections [PC], e.g. detachable connections with a clamp or catch design, may come loose unintentionally!

There is a risk of fluids getting in or spraying out (carryover of zones).

- Process connections [PC] with a clamp or catch design must:
  - be self-locking (e.g. mechanical locking with safety lock) or
  - provided with an additional securing mechanism to prevent them from coming loose accidentally.

The operating company is solely responsible for fastening the device to the container.

Interface C

NOTE Excessively small installation openings on the container or components (e.g. agitators) in the container! Nozzles collide during installation!

Damage to the device. The nozzle carrier may come loose.

- The nozzles must NOT collide!

1. Check the following before inserting the device into the container:
   - The minimum dimension for the installation opening (see *section 3.3 Technical Data*),
   - Presence of interfering contours on surrounding components in the container and
   - That the nozzle carrier with nozzles is firmly in place on the cleaning head.
2. Insert the device into the container through the installation opening with the utmost care.

NOTE “Installation opening - stationary device”

- Before installation, align the position of the nozzles if necessary by rotating the cleaning head/nozzles.
- Fasten the cleaning head/device inside the container.
  - Provided that proper installation and assembly/removal of the cleaning head/device inside the container is assured and
  - The diameter of the installation opening on the container is at least 5 mm greater than the outer diameter of the downpipe [DP].

NOTE “Installation opening - mobile device”

Smaller installation openings on the container “for mobile use” of the device, as specified in *section 3.3 Technical Data*, are permitted only:

- If the cleaning head fits through the installation opening with the nozzles in any position during installation and removal of the device (e.g. by using shorter nozzles) and
- a safety clearance of at least 5 mm all around the device between the device and the installation opening is ensured.

NOTE An excessively strong cleaning jet can subject the container, the surrounding components in the container or the device itself to strong forces and cause damage!

Material damage as a result of an excessively strong cleaning jet.

- Maintain sufficient distance from surrounding components during operation so the force of the cleaning jet:
  - does not cause vibrations in the surrounding components,
  - does NOT influence the rotary movement of the cleaning head due to recoil and
  - does not provoke vibrations in the device itself (see *section 7.4.1 Maintenance Intervals*).

The same applies when installing more than one device in one container!

6 Commissioning

Before the device is commissioned in Germany, the user of the plant must adhere to the Industrial Safety Regulation (BetrSichV).

In other countries, the respective national directives, statutes and country-specific regulations regarding occupational safety and accident prevention are to be complied with.

WARNING

Hazardous situations when commissioning as a result of incorrect installation of the device!

There is a risk of death or severe physical injuries.

- *As a basic rule, commissioning of the device (with cleaning agent) must not be performed until the following has been checked:*
  - *Correct mechanical installation of the device on / in the container*
  - *The safe and reliable functioning of the device*

6.1 Safety Notes for Commissioning

Before the device is commissioned, the operating company must ensure that local regulations are observed during commissioning.

We recommend that you document the commissioning in a report.

WARNING

Risk of burns from hot surfaces!

The device is supplied without additional measures to provide protection from hot surfaces.

The device may heat up significantly as a result of the cleaning fluid or the heat transfer from the container. Contact with the device can cause burns on the skin.

There is a risk of burns from cleaning agent at temperatures of more than +60 °C / +140 °F.

- *Insulate hot surfaces.*
- *Secure hot surfaces with a guard or barriers.*
- *Put up warning signs in the direct vicinity of the hot surfaces.*
- *Use protective work clothing and protective gloves when working.*

WARNING

Danger resulting from negative pressure/vacuum in the container!

A cold cleaning process in hot enclosed containers can generate negative pressure, which may lead to damage to the container.

There is a risk of death or severe physical injuries.

- *Take precautions to allow gases or vapors to escape during operation (e.g. install devices for ventilation).*

As a result of the variety of practical applications and uses for the cleaning device, AWH CANNOT specify a noise level for the device under load, i.e. installed in the container and operating with cleaning fluid.

For this reason that the manufacturer can offer the operating company, **solely as a precautionary measure, a few points of reference and some notes** to be observed and to be integrated into the operating company's hazard assessments.

CAUTION

Risk of hearing damage as a result of an increased noise level!

The device emits a sound pressure level of L_{pA} < 70 dB(A).

When the device is operated in a container, the sound level may exceed the maximum permitted exposure value of $L_{E,8hX}$ = 85 dB(A) and varies depending on the properties of the container in the plant and the existing operating conditions of the device.

Hearing damage could be incurred as a result.

- *The plant noise level must always be measured and documented by the operating company.*
- *Keep the plant noise level within the legal range:*
  - *Perform noise reduction measures (e.g. sound insulation).*
  - *Delimit and mark the noise area (e.g. with mandatory sign “Wear hearing protection”).*
  - *Use effective hearing protection (e.g. ear muffs or ear plugs).*

Comply with the technical health and safety rules (TRLV Lärm in Germany) relating to noise and vibration. State-of-the-art technology must be used to implement the measures to provide protection from exposure to noise based on the risk assessment. In this case, noise emissions must be prevented at source, or reduced as far as possible.

CAUTION

Insufficient lighting in the working environment!

The device DOES NOT have illumination. Insufficient lighting when working on the device can cause accidents.

There is a risk of minor or moderate injury.

- *Make sure that there is sufficient and even lighting in all areas of the plant in which the devices is used when work is performed on the device.*
- *In Germany, the technical rules for workplaces (ASR A3.4) apply. An illumination level of **300 lx (lux)** is recommended (maintenance value).*

6.2 Functional Check / Trial Run

All the screw connections on the device are firmly tightened in the factory. Nevertheless, a trial run should be carried out to check that the device functions safely and reliably and that it is leak-tight once installed.

Do not operate the device unless it is in perfect condition.

The container to be cleaned must be run empty and depressurized.

WARNING Persons in the container. A person may be struck by the jets from the cleaning head! There is a risk of death or severe physical injuries.

- DO NOT start cleaning operation while there are persons in the container.

1. Close all of the openings on the container (e.g. inspection openings).
2. Switch off moving parts in the container and secure against being inadvertently switched back on or set in motion.
3. Check to see if there is a safe distance around the container and the surrounding components.
4. Switch on the device (see *section 6.3 Switch-on Procedure*).
5. Check the interfaces on the device for leaks.
6. ***NOTE*** Danger of collisions with moving parts!
   Observe the following steps if components in the container are required to rotate during the cleaning process:
   - Start up the surrounding components (e.g. agitators) step by step.
   - Carefully check that the cleaning head and surrounding components (e.g. agitators) do NOT collide while moving simultaneously.
7. Make sure that there are no unusual vibrations.
8. Check the device to make sure that it runs quietly and smoothly.
9. Switch off the device (see *section 7.2 Switch-off Procedure*).

6.3 Switch-on Procedure

In accordance with the type of device activation and how it is integrated (e.g. manual or automatic) on the cleaning plant, the switch-on procedure has to be integrated and the following instructions have to be observed when switching on.

WARNING

Risk from sudden, unforeseeable or unauthorized activation of the device *(e.g. triggering of a start command as a result of incorrect operation of a start-up control device)**!***

There is a risk of death or severe physical injuries.

*When commissioning the device, it is imperative to perform the following **working steps** in the specified order.*

Switch-on procedure

1. *Close all of the openings on the container (e.g. inspection openings).*
2. *Switch on the supply of cleaning agent (e.g. slowly open the shut-off valve or ball cock).*
3. *Check that the supply of cleaning agent is NOT interrupted and the media pressure on the device is established.*
4. *Take suitable measures to secure the supply of cleaning agent to prevent it from switching off suddenly, unexpectedly or without authorization.*

NOTE

Risk of breakage due to material overload!

Pressure surges when switching the cleaning agent on or off, in particular pressure surges which exceed the operating pressure, and gas components in the cleaning agent may cause hammering in the cleaning device.

There is a risk of material damage or destruction of plant parts, e.g. leakage in the pipe system or on connected devices.

- *Prevent pressure surges (“water hammers”) and gas components in the cleaning agent, e.g. caused by:*
  - *installing a water hammer arrester or pressure relief valve in the supply line,*
  - *starting up/stopping the pump slowly and*
  - *opening/closing the shut-off fitting slowly (e.g. valve or ball cock).*

The term “water hammer” denotes a pressure surge in a fluid line which is generated by opening/closing a shut-off fitting (e.g. valve or ball cock) quickly at the end of a pipeline.

Pressure hammers/pressure surges can also be provoked by quick changes in the flow speed (pressure increase or pressure drop) or by sudden changes in direction of the flow of fluids. This effect is particularly common in pump systems with long pipelines when starting up, stopping or changing the speed of pumps.

6.4 Operation

After commissioning and performing inspection, the device can be put into operation, observing the following instructions.

WARNING

Risk when using outdoors!

If the device is used outdoors, there is a risk of a lightning strike in case of a storm.

There is a risk of death or severe physical injury.

- *The devices are usually operated in an enclosed factory hall and are thus protected from the **risk of lightning**.*
- *In case of use outdoors and in case of storms or the risk of lightning strikes, stop work immediately.*

WARNING

Risk if the operating/working area is accessed by unauthorized persons!

Unauthorized persons ARE NOT familiar with the hazards in the working area as described in these instructions.

There is a risk of death or severe physical injuries.

- *Permit only authorized specialist personnel who are qualified and trained for the operation to operate the cleaning device.*
- *Keep unauthorized persons away from the working area of the plant/machine in which the device is installed.*
  If in doubt, address these persons direct them to exit the working area.
- *Stop the work for as long as there are unauthorized persons in the working area.*

WARNING

Risk of chemical burns and burns when opening the container!

The supply line is pressurized. The person may be struck by cleaning jets or come into contact with residual fluid from the supply line and device. There may also be hot vapors in the container.

There is a risk of death or severe physical injuries.

- ***DO NOT open the container** during the cleaning process.*
- *Before starting work, adhere to the **working steps of the switch-off procedure** (see section 7.2 Switch-off Procedure).*
- *Before opening the container, observe the **cooling and draining time**.*
- *Use personal protective equipment (e.g. protective gloves, safety shoes, safety goggles).*

WARNING

Risk of burns from hot surfaces!

The device may heat up significantly as a result of the cleaning fluid or the heat transfer from the container. Contact with the device can cause burns on the skin.

There is a risk of death or severe physical injuries.

- *Comply with the warning signs and DO NOT touch the indicated areas.*
- *Do NOT remove insulation from protected hot surfaces.*
- *Maintain safety clearance of existing protective equipment or barriers.*
- *Use protective equipment (e.g. protective gloves; cloths) to provide protection from the hot surface.*
- *Do not touch the device until after a sufficient cooling time.*

The safety systems and safety notes in the operating instructions for the higher-level plant/machine must be adhered to.
The area around the plant/machine and the operator work stations at the plant/machine must be keep free of objects during operation so that unobstructed access is possible at all times.
In order to ensure fault-free operation, the device must be treated with care at all times.
When operating the device, adhere to the following additional instructions:

⚠ WARNING Persons in the container. A person may be struck by the jets from the cleaning head!
There is a risk of death or severe physical injuries.

- DO NOT start cleaning operation while there are persons in the container.
- NEVER direct the cleaning jet at persons.

⚠ WARNING Incorrect operation of the device!
There is a risk of death or severe physical injuries.

- Only operate the device when it is in perfect condition.
- Do not operate the device unless it is installed inside an enclosed container.
- Drain and depressurize the container being cleaned.
- Close all of the openings on the container (e.g. inspection openings).
- When operating the device, **adhere to the switch-on and switch-off procedures** (see *sections 6.3 Switch-on Procedure* and *7.2 Switch-off Procedure*).
- There is no need for the device to be run in.
- The following operating states of the device are NOT permitted:
  - Operation of the device without cleaning agent.
  - Immerse the device in the product of the production process.
  - Operation of the device outside the permitted parameters (see *section 3.3 Technical Data*).
- Immediately stop operation in the event of leaks outside the container.
- Refrain from any type of work which compromises the safe and reliable function of the device.
- Immediately inform the operating company of any changes to the device or the plant that may impair its safety.

If you notice vibrations on the plant while commissioning the device which are NOT generated by the device, then they must be prevented with suitable measures so that the vibrations CANNOT be transmitted to the device.

If this is NOT possible, the maintenance intervals in *section 7.4.1 Maintenance Intervals* must be shortened accordingly.

During normal operation of the device, you must make sure that the mixture of supplied cleaning agent and detached substances can flow freely from the container.

NOTE Clogging in the drain of the container is to be eliminated at once so that:

- no large quantities of dirt can accumulate in the container,
- there is NO impermissible filling of the container with cleaning agent,
- the device DOES NOT become immersed as the fluid level rises.

For cleaning agent in circulation:
Run the final cleaning step with clean water to remove any suspended matter which may have been introduced.

7 Maintenance

The following safety notes apply to all work on the device that is listed and described in this chapter and must be observed at all times.

Use only **original spare parts** when replacing parts of the device. A **functional check** must be performed after every repair (see *section 6.2 Functional Check / Trial Run*).

7.1 Safety Notes for Maintenance

DANGER

Fatal shock hazard through contact with live parts!

Activated electrical components are live with dangerous electrical voltage and may perform uncontrolled movements.

There is a risk of death or severe physical injuries.

- *Allow only **qualified electricians** to perform work on the electrical system.*
- *Before starting work, observe the **working steps of the switch-off procedure** (see section 7.2 Switch-off Procedure).*
- *Cover adjacent live parts to prevent contact.*
- *Beware of the hazards caused by electrical current (e.g. warnings).*

WARNING

Risk of accident caused by incorrectly performed maintenance and repair work!

Improper maintenance, falling components or failure to adhere to the listed safety notes can lead to accidents.

There is a risk of death or severe physical injuries.

- *Allow only **experts** to perform work on the device.*
- *Do not work on the device unless it is insulated from electrical voltage, depressurized and in a cool state.*
- *Maintain a safe distance when working on the device.*
  We recommend that you provide 1 m of space for free movement around the device and container.

WARNING

Risk of chemical burns and burns when opening the container!

The supply line is pressurized. The person may be struck by cleaning jets or come into contact with residual fluid from the supply line and device. There may also be hot vapors in the container.

There is a risk of death or severe physical injuries.

- ***DO NOT open the container** during the cleaning process.*
- *Before starting work, observe the **working steps of the switch-off procedure** (see section 7.2 Switch-off Procedure).*
- *Before opening the container, observe the **cooling and draining time**.*
- *Use personal protective equipment (e.g. protective gloves, safety shoes, safety goggles).*

WARNING

Risk of burns from hot surfaces!

The device may heat up significantly as a result of the cleaning fluid or the heat transfer from the container. Contact with the device can cause burns on the skin.

There is a risk of death or severe physical injuries.

There is a risk of burns from cleaning agent at temperatures of more than +60 °C / +140 °F.

- *Do not remove the devices unless they are in a cool state.*
- *Allow the device to cool down before starting work.*
- *Beware of hot surfaces (e.g. warning signs).*
- *Use safety clothing and equipment (e.g. protective gloves, cloths) to provide protection against the hot surface.*

WARNING

Risk of crushing when carrying out maintenance, cleaning and repair work!

The container and the interfaces of the device (e.g. media connections) may be pressurized.

There is a risk of death or severe physical injuries.

- *Before starting work, depressurize the container and all lines.*
- *Switch off moving parts in the container and secure against being inadvertently switched back on or set in motion.*
- *Do not remove the device unless it has been depressurized.*
- *Wear protective gloves.*

7.2 Switch-off Procedure

In accordance with the type of device activation and how it is integrated (e.g. manual or automatic) on the cleaning plant, the switch-off procedure must be integrated and the following instructions must be observed when switching off.

WARNING

Risk from sudden, unforeseeable or unauthorized reactivation of the device *(e.g. triggering of a start command as a result of incorrect operation of a start-up control device)!*

There is a risk of death or severe physical injuries.

Before performing any disassembly, maintenance, repair or cleaning work on the device, it is imperative to carry out the following ***working steps*** *in the specified order:*

Switch-off procedure

1. *Stop the supply of cleaning agent (e.g. slowly close the shut-off valve or ball cock).*
2. *Check that the supply of cleaning agent is stopped and there is no media pressure on the device.*
3. *Safeguard the supply of cleaning agent to protect it from sudden, unforeseeable or unauthorized reactivation (e.g. lockable switches/shut-off elements).*
4. *Make sure that the cleaning device and supply line for cleaning agent have been completely drained (e.g. by waiting before opening the container).*

NOTE

Risk of breakage due to material overload!

Pressure surges when switching the cleaning agent on or off, in particular pressure surges which exceed the operating pressure, and gas components in the cleaning agent may cause hammering in the cleaning device.

There is a risk of material damage, e.g. leakage in the pipe system or on connected devices.

- *Prevent pressure surges (“water hammers”) and gas components in the cleaning agent, e.g. caused by:*
  - *installing a water hammer arrester or pressure relief valve in the supply line,*
  - *starting up/stopping the pump slowly and*
  - *opening/closing the shut-off fitting slowly (e.g. valve or ball cock).*

7.3 Removal

The safety notes in *section 7.1 Safety Notes for Maintenance* must be adhered to before removing the device from the container.

WARNING




Risk of chemical burns and burns when opening the container!

The supply line is pressurized. The person may be struck by cleaning jets or come into contact with residual fluid from the supply line and device. There may also be hot vapors in the container.

There is a risk of death or severe physical injuries.

- ***DO NOT open the container** during the cleaning process.*
- *Before starting work, observe the **working steps of the switch-off procedure** (see section 7.2 Switch-off Procedure).*
- *Before opening the container, observe the **cooling and draining time**.*
- *Use personal protective equipment (e.g. protective gloves, safety shoes, safety goggles).*

CAUTION

Risk of a fault as a result of soiling, foreign objects or damage to the device!

There is a risk of minor or moderate injuries.

- *Implement suitable measures to prevent soiling and foreign objects from entering via the interfaces of the device.*
- *Before starting work, make sure that all necessary tools, accessories and information are available and observe the instructions for the interfaces.*
- *When lifting the device out of the container, maintain a gap from the inner wall of the container and surrounding components (e.g. agitators), to avoid scraping or knocking.*
- *Set the device down on a stable surface after removing it.*

7.3.1 Removing the Device

Installation Opening of the Container

The use of the device (mobile or stationary) is the decisive factor for the required size of the installation opening. The specified installation dimensions in *Table 3.3-1: Operating parameters of the device* are

recommended minimum dimensions for the installation opening and for installing the device in the container and removing it from the container in assembled condition.

A “stationary device” can be removed in different ways depending on the properties of the container and the size and accessibility of the installation opening.

– Before removal, the downpipe [DP] is disconnected from the process connection [PC] and lifted out of the container through the installation opening from the outside, together with the device. The device is then disconnected from the downpipe [DP] at the media connection [MC] or

– the device is disconnected from the downpipe [DP] at the media connection [MC] inside the container.

⚠ WARNING Risk of the device falling accidentally!
The device may strike personnel when falling.
There is a risk of severe physical injuries.

- Hold the device firmly when installing/removing it.
- There must be nobody beneath the device when installing/removing it.

NOTE No torque may be initiated into the device via the nozzles while the device is being installed/removed! Lever action can cause a torque to be transferred via the nozzle carrier to the bevel gear wheels.

The threaded connections of the bevel gear wheels could become loose.

- When setting the device down with the downpipe fastened in place, make sure that the nozzles ARE NOT under pressure due to the weight and length of the downpipe.
- Clamp the downpipe in a vise so that the device can be fastened to the downpipe or loosened from it.

Interface A

The supply line for the cleaning agent must be disconnected at the media connection [MC] . The media connection [MC] is to be sealed with a screw cap.

For threaded connection (see *Figure 5.2-7: Assembly of threaded connection (example JM100)*).

1. Undo the connection cover threaded connection (01) / media supply pipe with an open-end wrench or an adjustable pliers wrench.
2. Unscrew the device from the pipe for the media supply.
3. Provide the media connection [MC] with a suitable screw cap/sealing plug.

Interface B

NOTE Excessively small installation openings on the container!
Risk of damage to the device or its surroundings.

- Before undoing the process connection [PC], check whether the device can be lifted out together with the cleaning head through the installation opening of the container (see *section 3.3 Technical Data*).
- The instructions for interface “C” must be observed if the installation opening is too small.

Interface C

NOTE Excessively small installation openings on the container or components (e.g. agitators) in the container! Nozzles collide during removal!
Damage to the device. The nozzle carrier may come loose.

- The nozzles must NOT collide!

1. Check the following before lifting the device out of the container:
   - The minimum dimension for the installation opening (see *section 3.3 Technical Data*) and
   - Presence of interfering contours on surrounding components in the container.
2. Lift the device (downpipe [DP] with cleaning head) out of the container through the installation opening with the utmost care

NOTE "Installation opening – Stationary device" Before removal, align the position of the nozzles if necessary by rotating the cleaning head/nozzles.

- Or loosen the cleaning head/device inside the container from the downpipe [DP].
  - Provided that proper assembly/disassembly of the cleaning head/device inside the container is assured.

7.4 Maintenance

To ensure the trouble-free operation, high operational safety and long service life of the cleaning device, it is imperative to have it cleaned and maintained at regular intervals.

We recommend that you document the maintenance work in a report.

The safety notes in *section 7.1 Safety Notes for Maintenance* must be adhered to when carrying out cleaning, maintenance and repair work.

7.4.1 Maintenance Intervals

NOTE

Component failure due to vibration damage!

During operation, vibration can cause screw and clamp connections to work loose or the device to be subjected to severe strain, thus possibly leading to component failure.

The failure of components or a device malfunction can cause material damage and consequential damages.

- *Check the installed device for loose connections at regular intervals.*
- *Watch out for vibration damage during maintenance and checking.*
- *Adapt the maintenance intervals according to the operating conditions of the plant.*
  After commissioning, start first with short maintenance intervals.
  If no damage occurs, the maintenance intervals can be adapted incrementally until the intervals specified in the instructions are reached.

Maintenance Intervals and Methods

Shorten the maintenance intervals by 30% in the event of:

- *Deviation from the preferred installation position of the device (see section 5.2.2 Installation Position),*
- *Vibrations that occur in the plant which are NOT caused by the device and CANNOT be prevented.*

If the device is NOT operated for a longer period, we recommend that you check the device completely before re-commissioning to make sure that it is fully functional (see *section 6.2 Functional Check / Trial Run*).

The specified times of the maintenance intervals are based on single-shift operation (8 hours per working day, 12 months per year) of the device and operation with

Cleaning agent: *Water*
Media pressure: *8 bar / 116 psi*
Media temperature: *+25 °C / +77 °F.*

Interval:

h_O	= operating hours of the device
d	= daily
w	= weekly
m	= monthly
¼ y	= quarterly
½ y	= every six months
y	= annually

Method:

V	= visual inspection
F	= functional check
M	= measurement
C	= cleaning*

*The cleaning intervals are to be defined by the operating company in accordance with operating conditions.

7.4.1.1 JM100 Maintenance Intervals

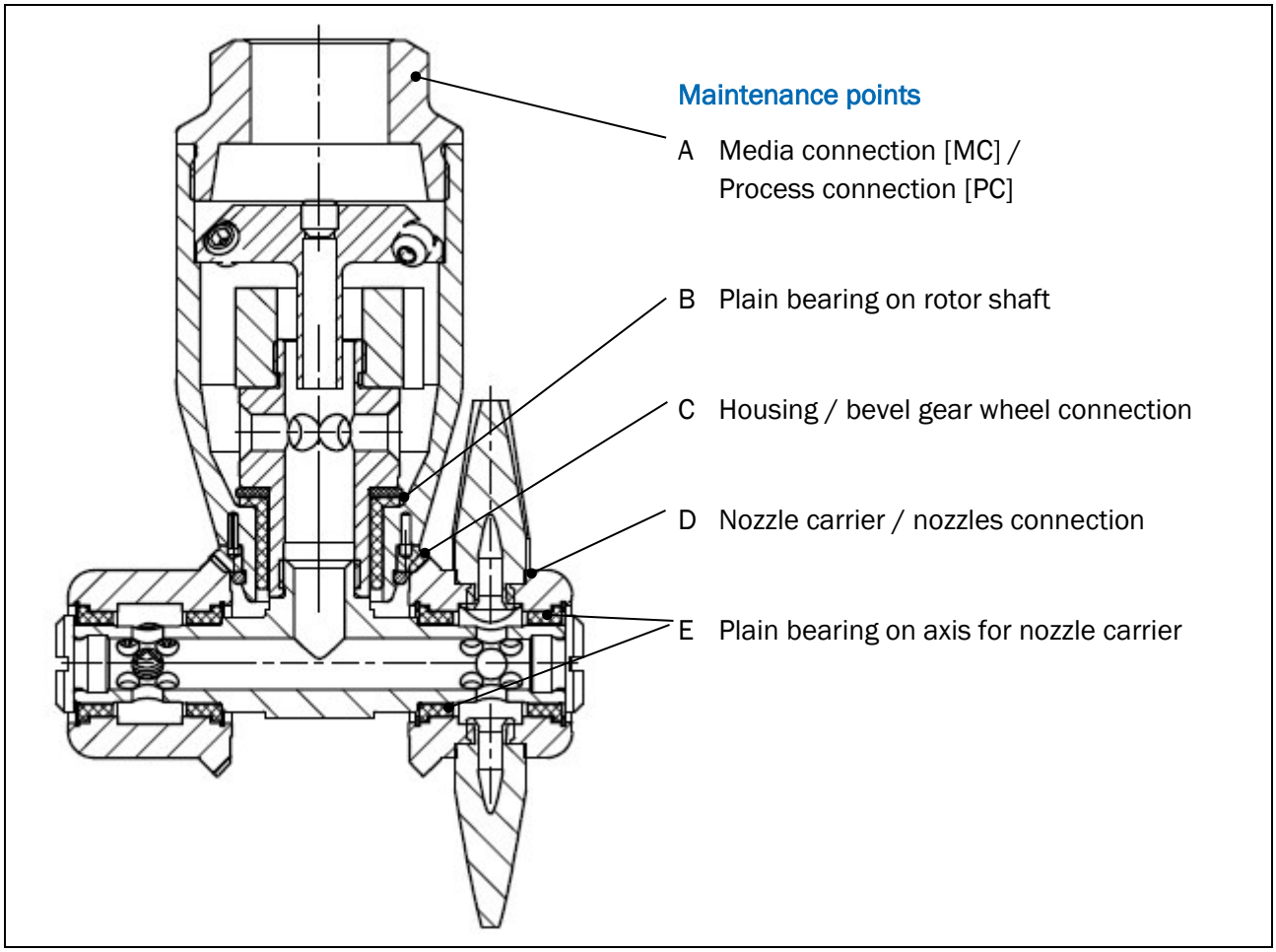


Figure 7.4-1: JM100 maintenance points

The tightening torque values for the thread connections required for maintenance are listed in section 7.5.1 JM100 Spare Parts.

Point	Inspection and Maintenance Work	Interval	Method
A	The fluid and process connection is implemented using a threaded connection. Vibrations from operation could under certain circumstances cause the connection to become loose. You must therefore regularly check to see if they are firmly in place.	m	S, F
B	Check plain bearing to make sure it is fully functional and for wear. Clean or replace the plain bearing washers as necessary.	200 h_O	S, F, R
C	The housing/bevel gear wheel connection is implemented via a threaded connection. Check the secure placement and functionality of the bevel gear wheel (rotation) and the wear on the teeth.	m	S, F
D	Check the nozzle carrier / nozzles connection to make sure that it is securely in place.	m	S, F
E	Check the ball bearings to make sure they are fully functional and for wear. Clean or replace the balls as necessary.	200 h_O	S, F, R

Table 7.4-1: JM100 inspection and maintenance work

7.4.1.2 JM500 Maintenance Intervals

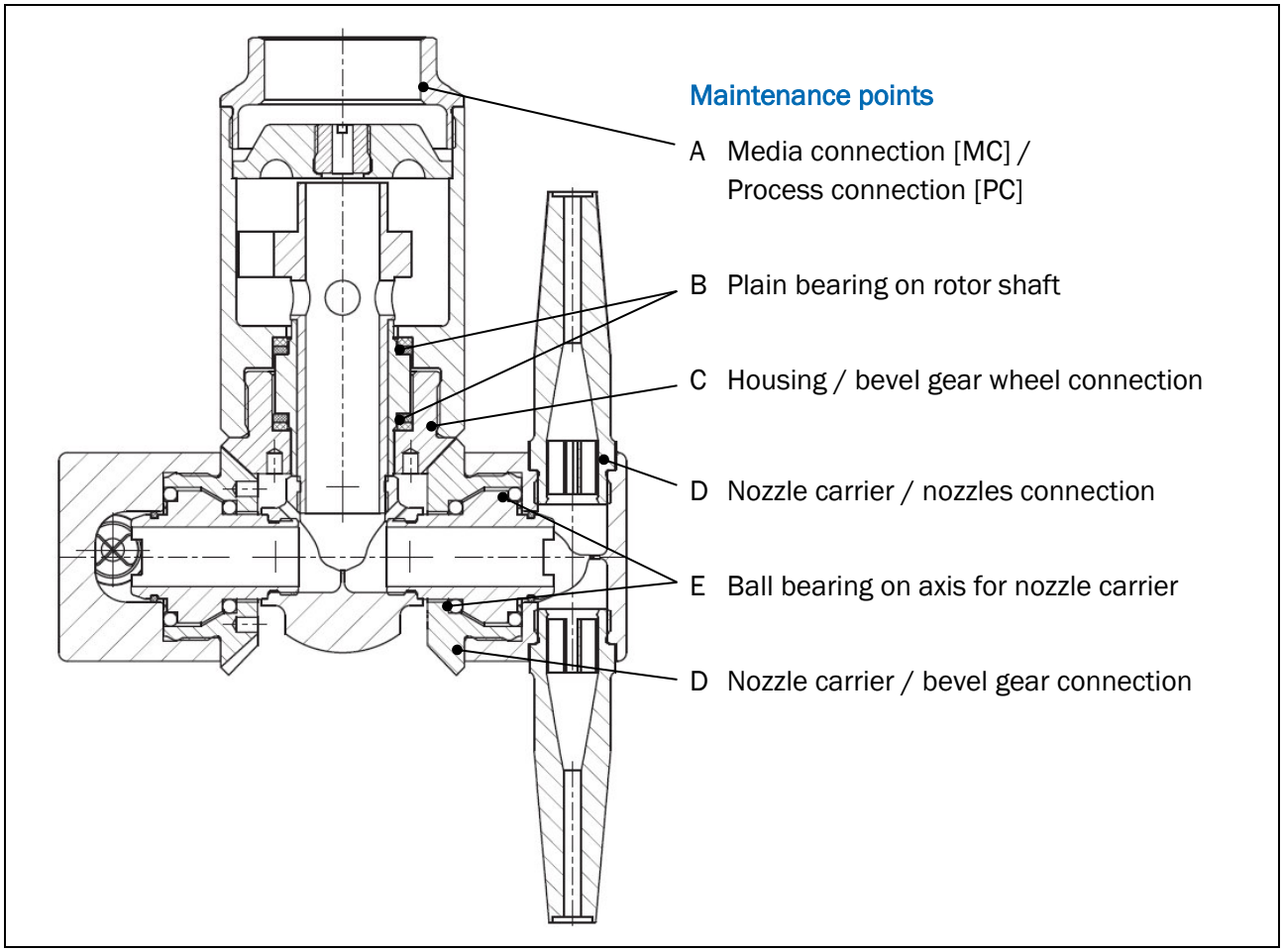


Figure 7.4-2: JM500 maintenance points

The tightening torque values for the thread connections required for maintenance are listed in section 7.5.2 JM500 Spare Parts.

Point	Inspection and Maintenance Work	Interval	Method
A	The fluid and process connection is implemented using a threaded connection. Vibrations from operation could under certain circumstances cause the connection to become loose. You must therefore regularly check to see if they are firmly in place.	m	S, F
B	Check plain bearing to make sure it is fully functional and for wear. Clean or replace the plain bearing washers as necessary.	200 h_O	S, F, R
C	The housing/bevel gear wheel connection is implemented via a threaded connection. Check the secure placement and functionality of the bevel gear wheel (rotation) and the wear on the teeth.	m	S, F
D	Check the nozzle carrier / nozzles connection to make sure that it is securely in place.	m	S, F
E	Check the ball bearings to make sure they are fully functional and for wear. Clean or replace the balls as necessary.	200 h_O	S, F, R
F	A thread is used to connect the bevel gear wheel to the nozzle carrier. Check the secure placement and functionality of the bevel gear wheel (rotation) and the wear on the teeth.	m	S, F

Table 7.4-2: JM500 inspection and maintenance work

7.4.1.3 JM800 Maintenance Intervals

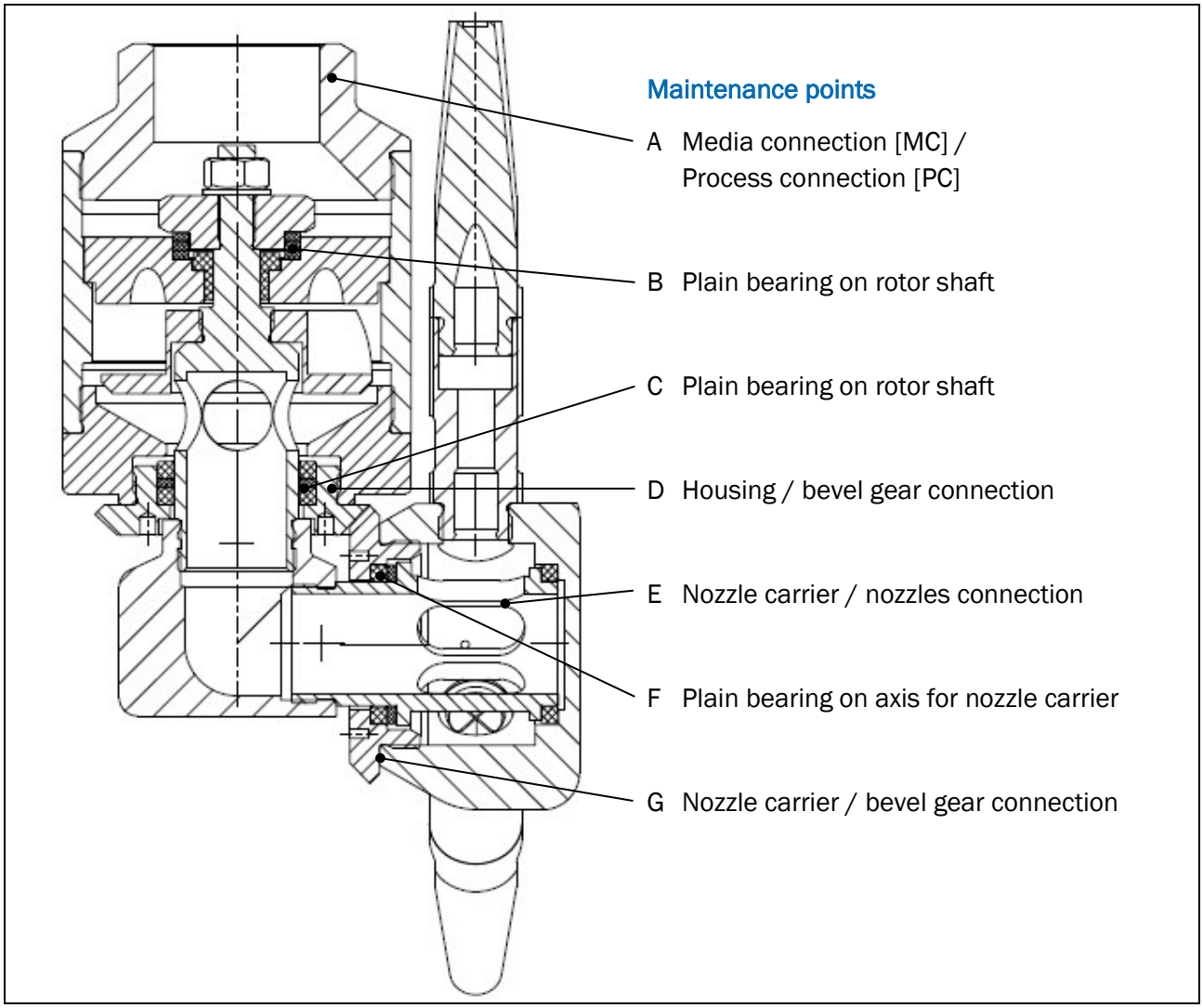


Figure 7.4-3: JM800 maintenance points

The tightening torque values for the thread connections required for maintenance are listed in section 7.5.3 JM800 Spare Parts.

Point	Inspection and Maintenance Work	Interval	Method
A	The fluid and process connection is implemented using a threaded connection. Vibrations from operation could under certain circumstances cause the connection to become loose. You must therefore regularly check to see if they are firmly in place.	m	S, F
B	Check plain bearing to make sure it is fully functional and for wear. Clean or replace the plain bearing washers as necessary.	200 h_O	S, F, R
C	Check plain bearing to make sure it is fully functional and for wear. Clean or replace the plain bearing washers as necessary.	200 h_O	S, F, R
D	The housing/bevel gear wheel connection is implemented via a threaded connection. Check the secure placement and functionality of the bevel gear wheel (rotation) and the wear on the teeth.	m	S, F
E	Check the nozzle carrier / nozzles connection to make sure that it is securely in place.	m	S, F
F	Check plain bearing to make sure it is fully functional and for wear. Clean or replace the plain bearing washers as necessary.	200 h_O	S, F, R
G	A thread is used to connect the bevel gear wheel to the nozzle carrier. Check the secure placement and functionality of the bevel gear wheel (rotation) and the wear on the teeth.	m	S, F

Table 7.4-3: JM800 inspection and maintenance work

7.4.2 Tools and Tightening Torque Values

Use only proper tools which are required for performing the required work and approved for use.

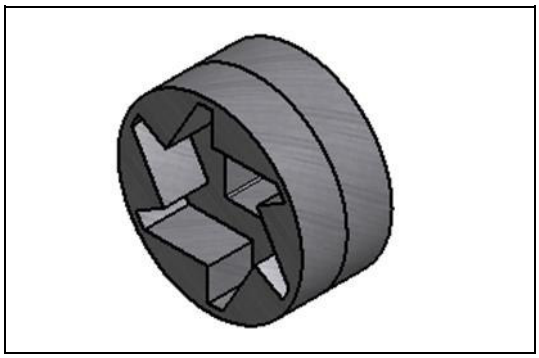
Standard workshop equipment and the special tools listed are sufficient for performing mechanical tasks on the device. The following tools are required:

- Screwdriver set (slot head)
- Hexagon socket wrench (WAF 2; 3 mm)
- Set of socket wrenches (WAF 28; 38 mm)
- Open end / box wrench set (WAF 12; 16; 22; 28; 32; 38; 48; 54; 75 mm)
- Pliers wrench or adjustable wrench / crescent wrench with smooth parallel jaws
- Torque wrench with socket shaft ☐ 14 x 18
- Torque screwdriver with inserts and accessories
- Strap wrench/belt pipe wrench (e.g. Ø 140) with woven belt
- Square bar 10 x 10 – 300 mm for JM 500

All the screw connections on the device are firmly tightened in the factory with a corresponding tightening torque. This ensures that the required clamping force between the components to be joined is also present during the time of maximum application of operating forces.

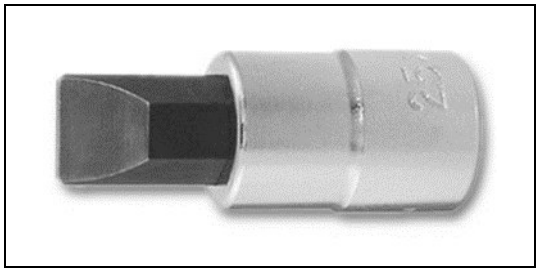
All the relevant tightening torque valued for the screw connections are listed in section 7.5 Spare Parts and Customer Service.

JM100 Special Tool



Assembly/disassembly tool for ☐ 1/2" rotor star wheel:

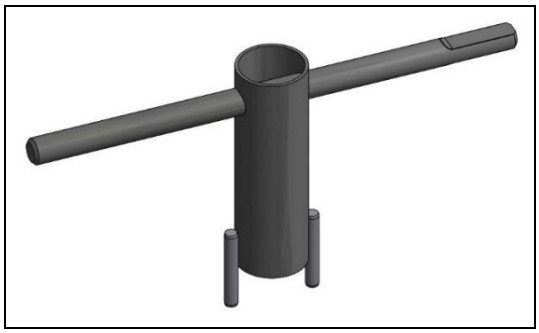
Art. no. 664 MWJ 132 000 0



Screwdriver insert for ☐ 1/2" locking screw:

Art. no. 664 MWJ 153 000 0

JM500 / JM800 Special Tool

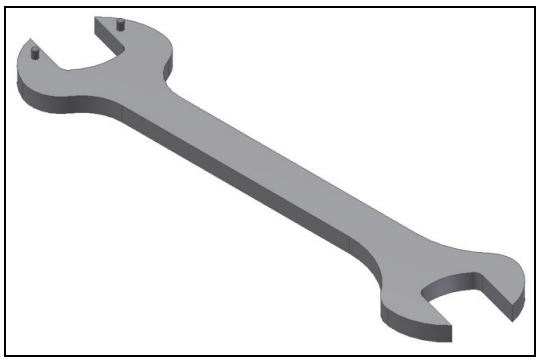


Assembly/disassembly for rotor:

Art. no. 664 MWJ 832 000 0 – ZB pin-type socket wrench

Art. no. 664 MWJ 831 011 0 – Hand lever

Art. no. 664 MWJ 832 011 0 – SG pin-type socket wrench

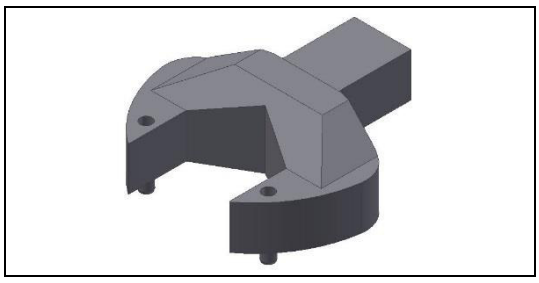


Assembly/disassembly for bevel gear wheel:

Face wrench

Art. no. 664 MWJ 540 000 0 (JM500)

Art. no. 664 MWJ 840 000 0 (JM800)

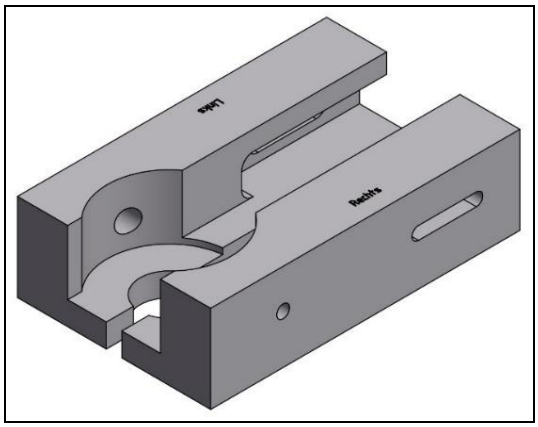


Assembly/disassembly for bevel gear wheel:

Face wrench with socket shaft ☐ 14 x 18

Art. no. 664 MWJ 540 000 S (JM500)

Art. no. 664 MWJ 840 000 S (JM800)



Assembly aid:

Clamping jaws for vise

Art. no. 664 MHJ 800 Z00 S (JM500/800)

7.4.3 Disassembling the Device

NOTE

Risk of damage to the device as a result of improper assembly/disassembly work!

Assembly/disassembly of the device which is NOT performed properly can cause damage to the device which puts the functional safety and reliability at risk when re-commissioning.

The failure of components or a device malfunction can cause material damage and consequential damages.

- *Use a vise with protective jaws, e.g. plastic or light metal, for clamping.*
- *Use only suitable tools which do not damage the surface.*
- *For assembly work, adhere to the specified tightening torque values (see section 7.5 Spare Parts and Customer Service).*

NOTE

Edge compression in the area of the wrench flats!

If workpieces are NOT grasped without play and in a protective manner by the flats during assembly/disassembly, then they are at risk of damage:

- *To avoid causing damage during assembly/disassembly work, use an adjustable wrench with parallel, smooth clamping jaws.*
- *Apply the clamping jaws of the adjustable wrench or pliers wrench to the flats without play so that they rest evenly across the surface and loosen or tighten the screwed part.*

The tools required for assembly/disassembly work are listed in section 7.4.2 Tools and Tightening Torque Values.

7.4.3.1 Removing the JM100 Device

The item numbers shown in brackets refer to the Figure 7.5-1: Internal construction of the JM100-G22.

1) Disassembly - Actuator Unit Assembly

1. ***NOTE*** Incorrect clamping in the vise can cause threaded connections to become jammed and deformed unintentionally!
   The threaded connection cannot be screwed and may become damaged.
   - The jaws of the vise must not be clamped either too firmly or too close to the area of the threaded connection to be loosened.
   - Clamp the device in the vise in such a way on the housing (02) that the threaded connection on the connection lid (01) does NOT become jammed.
2. Loosen the connection lid (01) and unscrew it from the housing (02).
3. Remove the inflow disk (09) from the housing (02).
4. If necessary, loosen the plug (08.1; 08.2) and screw if off the inflow disk (09).
5. Clamp the device on the flat surfaces of the axle for nozzle carriers (13) in the vise.
6. ***NOTE*** Housing (02) could fall down!
   The housing (02) can become damaged by the impact.
   - When screwing out the parts, take care to ensure that the housing (02) CAN NOT fall down (e.g. by holding it with one hand).
   - Loosen the rotor star wheel (11) with the assembly/disassembly tool for rotor star wheel and unscrew it from the rotor shaft (10).
     Remark: The rotor shaft (10) can become detached at the same time.
   - Loosen the rotor shaft (10) with a WAF 28 socket wrench and screw it out of the axle for nozzle carriers (13).
   - Lift the housing (02) together with the rotor shaft (10) and the parts (03, 05, 12, 15, 16) from the axle for nozzle carriers (13).
7. Remove the sliding disk (05) from the rotor shaft (10)
8. Press the collar bushing for housing (03) out of the housing (02).
9. ***NOTE*** Incorrect clamping in the vise can cause threaded connections to become jammed and deformed unintentionally!
   The threaded connection cannot be screwed and may become damaged.
   - The jaws of the vise must not be clamped either too firmly or too close to the area of the threaded connection to be loosened.
   - Screw the connection cover (01) back into the housing (02) so that the housing (02) does not become dented while clamping.
   - Clamp the housing (02) with the parts (02, 12, 15, 16) in the vise. The bevel gear wheel (12) faces upwards.
10. Lever the round wire spring-lock washer (16) out of the groove and from the housing (02) with the flat tip of a small screwdriver.
11. Lift the bevel gear wheel for the housing (12) from the housing (02).
12. Secure dowel pin (15) against becoming lost.

2) Disassembly - Cleaning Head Assembly Unit

1. Clamp the axle for nozzle carriers (13) on the flat surfaces into the vise.
2. Use a screwdriver or a screwdriver insert to screw locking screw (18) out of the axle for nozzle carriers (13).
3. Slide bevel gear wheel with nozzle carrier (14) from the axle for nozzle carriers (13).
4. Remove axle for nozzle carriers (13) from the vise.
5. Clamp the bevel gear wheel with nozzle carrier (14) in the vise.
6. Unfasten the nozzle (06) and unscrew it from the bevel gear wheel with the nozzle carrier (14).
7. Use a pair of pliers to pull the jet concentrator (07) from the nozzle (06).
8. Remove the bevel gear wheel with nozzle carrier (14) from the vise.
9. Lever the circlip (17) out of the internal groove on the bevel gear wheel with nozzle carrier (14) by applying the flat tip of a small screwdriver to the removal notch.
10. Press the collar bushing for nozzle carriers (04) out of the bevel gear wheel with nozzle carrier (14).

The device is now completely disassembled. The individual parts can now be checked for soiling or damage and cleaned as necessary (e.g. in an ultrasound bath). Damaged parts and wear parts that exhibit signs of wear must be replaced.

7.4.3.2 Removing the JM500 Device

The item numbers shown in brackets refer to the Figure 7.5-2: Internal construction of the JM500-G22.

1) Disassembly - Actuator Unit Assembly

1. ***NOTE*** Incorrect clamping in the vise can cause threaded connections to become jammed and deformed unintentionally!
   The threaded connection cannot be screwed and may become damaged.
   - The jaws of the vise must not be clamped either too firmly or too close to the area of the threaded connection to be loosened.
   - Clamp the device in the vise in such a way on the housing (02) that the threaded connection on the connection lid (01) does NOT become jammed.
2. Loosen the connection lid (01) and unscrew it from the housing (02).
3. Remove the inflow disk (11) together with the plug (10) from the housing (02).
4. If necessary, screw the plug (10) out of the inflow disk (11).
5. Loosen 3x threaded pins (19) on the shaft-axle connection (15) and screw them out.
6. Clamp the device in the vise on the flat surfaces of the shaft-axle connection (15).

7. *NOTE* Housing (02) could fall down!
   The housing (02) can become damaged by the impact.
   - When screwing out the parts, take care to ensure that the housing (02) CAN NOT fall down (e.g. by holding it with one hand).
   - Undo the rotor shaft with star wheel (12) with the aid of the assembly/disassembly tool for rotors and screw it out of the shaft-axle connection (15).
   - Lift the housing (02) with the rotor shaft with star wheel (12) and the parts (03; 04; 13; 14) from the shaft-axle connection (15).
8. *NOTE* Incorrect clamping in the vise can cause threaded connections to become jammed and deformed unintentionally!
   The threaded connection cannot be screwed and may become damaged.
   - The jaws of the vise must not be clamped either too firmly or too close to the area of the threaded connection to be loosened.
   - Screw the connection cover (01) back into the housing (02) so that the housing (02) does not become dented while clamping.
   - Clamp the housing (02) together with the parts (03; 04; 13; 14) in the vise. The bevel gear wheel for housing (14) faces upwards.
9. Unfasten the bevel gear wheel for the housing (14) with a face wrench and unscrew it from the housing (02).
10. Remove sliding disks (03 and 04) and the bearing bush (13) from the housing (02).
11. Remove the housing (02) from the vise.

2) Disassembly - Cleaning Head Assembly Unit

1. Clamp the cleaning head on the nozzle carrier (18) in the vise.
2. Unfasten the nozzle (08) and unscrew it from the nozzle carrier (18).
3. Use a pair of pliers to pull the jet concentrator (09) from the nozzle (08).
4. Clamp the shaft-axle connection (15) in the vise.
5. Slide a square bar (10 x 10 mm) through the bores in the nozzle carrier (18) within the slot of the axle for nozzle carriers (16).
6. Use the square bar (10 x 10 mm) to loosen the axle for nozzle carriers (16) and screw it out of the from the shaft-axle connection (15).
7. *NOTE* The balls (06, 07) could become lost!
   The balls (06; 07) fall out and will NOT be intercepted!
   - Clamp the nozzle carrier (18) in the vise and use the face wrench to loosen the bevel gear wheel for nozzle carriers (17).
   - Remove the nozzle carrier (18) with the parts (06; 07; 16; 17) from the vise.
   - Unscrew the bevel gear wheel for nozzle carrier (17) out of the nozzle carrier (18) over a collecting receptacle and carefully catch the balls (06; 07), above and below the axle for nozzle carriers (16).

The device is now completely disassembled. The individual parts can now be checked for soiling or damage and cleaned as necessary (e.g. in an ultrasound bath). Damaged parts and wear parts that exhibit signs of wear must be replaced.

7.4.3.3 Removing the JM800 Device

The item numbers shown in brackets refer to the Figure 7.5-3: Internal construction of the JM800-G13.

1) Disassembly - Actuator Unit Assembly

1. ***NOTE*** Incorrect clamping in the vise can cause threaded connections to become jammed and deformed unintentionally!
   The threaded connection cannot be screwed and may become damaged.
   - The jaws of the vise must not be clamped either too firmly or too close to the area of the threaded connection to be loosened.
   - Clamp the device on the housing (02) into the vise in such a way that the threaded connection for the connection cover (01) is NOT jammed.
2. Loosen the connection lid (01) and unscrew it from the housing (02).
3. Loosen hexagonal nut (24) and slide cap (17).
4. Remove sliding disks (05 and 06) and collar bushing (04).
5. Remove the inflow disk (14) from the housing (02).
6. Screw the rotor impeller (16) from the rotor shaft (15) with the help of the assembly/disassembly tool for rotors.
7. Lift the housing assembly unit (02; 03; 08 and 09) from the rotor shaft (15).
8. Clamp the base of the housing (03) and remove the housing (02).
9. Clamp the base of the housing (03) backwards into the vise.
   Remark: The bevel gear wheel (18) faces upwards.
10. Use a face wrench to screw the bevel gear wheel for housing (18) from the base of the housing (03).
11. Remove sliding disks (08 and 09) from the base of the housing (03).

2) Disassembly - Cleaning Head Assembly Unit

1. Loosen threaded pins (25) at the shaft-axle connection (19).
2. Clamp nozzle carrier (22) in a vise and remove nozzles (11) and the nozzle extensions (13).
3. Use pliers to pull the jet concentrators (12) out of the nozzles (11) and out of the nozzle extensions (13).
4. Clamp the shaft-axle connection (19) in the vise.
5. Slide a bar or the hand lever of the assembly/disassembly tool for rotors through the nozzle bores in the nozzle carrier (22) and through the lateral bores of the axle for nozzle carriers (20).
6. Loosen axle for nozzle carrier (20) and unscrew if from the shaft-axle-connection (19).
7. Clamp the nozzle carrier (20) in the vise.
8. Loosen the bevel gear wheel for nozzle carriers (21) with a face wrench and unscrew it from the nozzle carriers (20).
9. Remove sliding disks (07 and 10), the axle for nozzle carriers (20) and the sliding disk (09).

The device is now completely disassembled. The individual parts can now be checked for soiling or damage and cleaned as necessary (e.g. in an ultrasound bath). Damaged parts and wear parts that exhibit signs of wear must be replaced.

7.4.4 Assembling the Device

NOTE

Risk of damage to the device as a result of improper assembly/disassembly work!

Assembly/disassembly of the device which is NOT performed properly can cause damage to the device which puts the functional safety and reliability at risk when re-commissioning.

The failure of components or a device malfunction can cause material damage and consequential damages.

- *Use a vise with protective jaws, e.g. plastic or light metal, for clamping.*
- *Use only suitable tools which do not damage the surface.*
- *For assembly work, adhere to the specified tightening torque values (see section 7.5 Spare Parts and Customer Service).*

NOTE

Edge compression in the area of the wrench flats!

If workpieces are NOT grasped without play and in a protective manner by the flats during assembly/disassembly, then they are at risk of damage:

- *To avoid causing damage during assembly/disassembly work, use an adjustable wrench with parallel, smooth clamping jaws.*
- *Apply the clamping jaws of the adjustable wrench or pliers wrench to the flats without play so that they rest evenly across the surface and loosen or tighten the screwed part.*

NOTE

Damage to the screw connections!

Stainless steel screw connections may tend to seize up during assembly as a result of friction caused by high preload forces and high friction values and can then cause problems when tightening and loosening.

- *Lubricate the screw connections before assembly.*
- *Define the choice of lubricant very exactly for the application and the requirements (e.g. Klüberpaste UH1 96-402 or UH1 84-201).*
- *Adhere to the information in the safety data sheets provided by the lubricant manufacturer.*

NOTE

Risk of dirt and foreign objects in the device!

Dirt or foreign objects can compromise the functional safety and reliability of the device.

- *During assembly, make sure and check that there is no dirt or foreign objects in the device (e.g. small particles, sealing material).*

The tools required for assembly/disassembly work are listed in section 7.4.2 Tools and Tightening Torque Values.

7.4.4.1 Assembling the JM100 Device

The item numbers shown in brackets refer to the Figure 7.5-1: Internal construction of the JM100-G22.

The tightening torque values for the screw connections required for assembly are listed in the Table 7.5-1: JM100 tightening torque values.

1) Assembly - Cleaning Head

1. Press collar bushings for nozzle carriers (04) into the axle bore of the bevel gear wheels with nozzle carrier (14).
2. Insert the circlip (17) into the internal groove of the bevel gear wheel with nozzle carrier (14) and allow it to engage in place.
3. Press jet concentrators (07) in all nozzles (06) and check that they are firmly in place.
4. Clamp the bevel gear wheel with nozzle carrier (14) in the vise.
5. Screw and tighten nozzles (06) in the bevel gear wheel with nozzle carrier (14).
6. Remove the screwed parts from the vise.
7. Slide bevel gear wheel with nozzle carrier (14) on the axle for nozzle carriers (13).
8. Clamp the axle for the nozzle carrier (13) in the vise.
9. Screw and tighten the locking screw (18) in the axle for nozzle carriers (13).
10. Check to see if the bevel gear wheel with nozzle carrier (14) is rotating freely on the axle for nozzle carriers (13).

2) Assembly - Actuator Unit Assembly Unit

1. Press collar bushing for housing (03) with collar up to the stop into the bore housing (02).
2. Slide the sliding disk (05) onto the rotor shaft (10).
3. Clamp the axle for nozzle carriers (13) at the flat surfaces together with the assembled bevel gear wheels with nozzle carrier (14) in the vise.
4. ***NOTE*** To ensure that the device functions securely, the position of the nozzles on the opposite nozzle carriers with respect to one another must be observed at the time of assembly!
   - Align the nozzles (06) the opposite bevel gear wheels with nozzle carrier (14) perpendicular to one another so that the axles of the nozzles (06) form a cross and are in horizontal/vertical position with respect to the housing (02).
5. Slide the rotor shaft (10) with sliding disk (05) from the interior of the housing (02) outwards through the collar bushing for the housing (03).
6. Screw the rotor shaft (10) into the axle for nozzle carrier (13) and tighten it with a socket wrench.
7. Screw the rotor star wheel (11) auf the rotor shaft (10) and tighten it with the assembly/disassembly tool for the rotor star wheel.
8. Remove the screwed parts from the vise.

9. Clamp the housing (03) in the vise.
10. Screw and tighten the plug (08.1; 08.2) in the inflow disk (09).
11. Place the inflow disk (09) with the even surface facing downwards into the housing (02).
12. Screw the connection cover (01) into the housing (02) and tighten it.
13. Remove the screwed parts from the vise.

The device is fully assembled and ready for installation (see *section 5.2 Installation*) on the plant.

7.4.4.2 Assembling the JM500 Device

The item numbers shown in brackets refer to the Figure 7.5-2: Internal construction of the JM500-G22.

The tightening torque values for the screw connections required for assembly are listed in the Table 7.5-4: JM500 tightening torque values.

1) Assembly - Cleaning Head

1. ***NOTE*** The balls (06, 07) could become lost!
   The balls (06; 07) fall out and will NOT be intercepted!
   - Use a collecting receptacle for positioning the balls (06; 07).
   - Insert a locating pin (e.g. plastic cap or similar) from the outside to the inside through the axle bore bevel gear wheel for nozzle carriers (17).
2. Carefully use a pair of tweezers to place the first layer of balls around the locating pin on the running surface. Depending on the version:
   – 22 stainless steel balls (06) alternating
   – 11 stainless steel balls (06) and 11 Nylon balls (07)
3. With the thread facing downwards, insert the axle for nozzle carriers (16) through the axle bore bevel gear wheel for nozzle carriers (17) while at the same time pulling the locating pin back out.
4. Position the bevel gear wheel for nozzle carrier (17) in such a way that the axle for nozzle carriers (16) can hang downward freely.
5. Carefully use a pair of tweezers to place the second Place bearing balls around the axle for nozzle carriers (16) on the running surface. Depending on the version:
   – 28 stainless steel balls (06) alternating
   – 14 stainless steel balls (06) and 14 Nylon balls (07)
6. Screw the bevel gear wheel for the nozzle carrier (17) into the nozzle carrier (18) and tighten it with a face wrench.
7. Check to see if the nozzle carrier (18) on the axle for nozzle carriers (16) is rotating freely!
8. Clamp the shaft-axle connection (15) in the vise.
9. Slide square bar (10 x 10 mm) through the nozzle bores of the nozzle carrier (18) into the slot of the axle for nozzle carriers (16).
10. Screw the axle for nozzle carriers (16) with the preassembled parts (06; 07; 16; 17; 18) into the shaft-axle connection (15) and tighten with the square bar (10 x 10 mm).

11. To secure the connection against loosening, screw 2x threaded pins (19) into the shaft-axle connection (15) and tighten them with a hexagon socket wrench.
12. Press jet concentrators (09) in all nozzles (08) and check that they are firmly in place.
13. Screw and tighten nozzles (08) into the nozzle carrier (18).

2) Assembly - Actuator Unit

1. Insert a sliding disk (03) in the bevel gear wheel for housing (14) and a sliding disk (04) on top of the first one.
2. Slide bearing bush for plain bearing (13) through the sliding disks into the bevel gear wheel for housing (14).
3. Slide a sliding disk (04) and a sliding disk (03) on the bearing bush for plain bearing (13).
4. ***NOTE*** Incorrect clamping in the vise can cause threaded connections to become jammed and deformed unintentionally!
   The threaded connection cannot be screwed and may become damaged.
   - Screw a connection cover (01) into the housing (02).
   - Clamp the housing (02) in the vise.
5. Screw the bevel gear wheel for the housing (14) into the housing (02) and tighten it with a face wrench.
6. Remove the screwed parts from the vise.
7. Unscrew the connection cover (01) from the housing (02) once again.
8. Clamp the shaft-axle connection (15) with preassembled parts (05, 06, 07, 08, 09, 17, 18) in the vise.
9. Slide the rotor shaft with star wheel (12) into the housing (02) through the bearing bush for plain bearing (13).
10. ***NOTE*** To ensure that the device functions securely, the position of the nozzles on the opposite nozzle carriers with respect to one another must be observed!
    - Align the nozzles (08) the opposite nozzle carriers (18) perpendicular to one another so that the axles of the nozzles (08) form a cross and are in horizontal/vertical position with respect to the housing (02).
    - Screw the rotor shaft with star wheel (12) into the shaft-axle connection (15) and tighten with the assembly tools for rotors.
11. To secure the connection against loosening, screw 1x threaded pin (19) into the shaft-axle connection (15) and tighten it.
12. Screw and tighten the bypass plug (10) in the inflow disk (11).
13. Place the inflow disk (11) with the smooth surface facing downwards into the housing (02).
14. Check to see if the assembled nozzle fitting is rotating freely around the rotor shaft with star wheel (12).
15. Clamp the housing (02) into the vise again.
16. Screw the connection cover (01) into the housing (02) and tighten it.

17. Remove the screwed parts from the vise.

The device is fully assembled and ready for installation (see *section 5.2 Installation*) on the plant.

7.4.4.3 Assembling the JM800 Device

The item numbers shown in brackets refer to the Figure 7.5-3: Internal construction of the JM800-G13.

The tightening torque values for the screw connections required for assembly are listed in the Table 7.5-7: JM800 tightening torque values .

1) Assembly - Cleaning Head

1. Clamp the nozzle carrier (22) in the vise. In doing so, the thread of the bevel gear wheel for nozzle carrier (21) faces upwards.
2. Press the sliding disk (09 white) into the nozzle carrier (22).
3. Insert the axle for nozzle carriers (20) with the thread facing upwards through the nozzle carrier (22) into the sliding disk (09 white).
4. Insert the sliding disks (07 white and 10 blue) in the correct sequence on the axle for nozzle carriers (20).
5. Screw the bevel gear wheel for the nozzle carrier (21) into the nozzle carrier (22) and tighten it with a face wrench.
6. Check to see if the nozzle carrier (22) on the axle for nozzle carriers (20) is rotating freely.
7. Remove the screwed parts from the vise.
8. Clamp the shaft-axle connection (19) in the vise.
9. Screw the axle for nozzle carriers (20) with the nozzle carrier (22) and the bevel gear wheel (21) into the shaft-axle connection (19).
10. Slide the hand lever of the assembly/disassembly tool for rotors with the flat side through the nozzle bores in the nozzle carrier (22) and through the lateral bores of the axle for nozzle carriers (20).
11. Tighten the screwed-in axle for nozzle carriers (20).
12. Screw and tighten the rotor shaft (15) into the shaft-axle connection (19).
13. To secure the connection against loosening, screw the threaded pins (25) into the shaft-axle connection (19) and tighten them.

2) Assembly - Actuator Unit Assembly Unit

1. Place sliding disks (09, 08, 09) in sequence into the bevel gear wheel for housing (18).
2. Screw the bevel gear wheel for housing (18) with the sliding disks into the base of the housing (03).
3. Clamp the base of the housing (03) with bevel gear wheel for housing (18) and sliding disks (09, 08, 09) in the vise. The bevel gear wheel for housing (18) faces upwards thereby
4. Use a face wrench to tighten the bevel gear wheel for housing

5. Remove the screwed parts from the vise.
6. Clamp the shaft-axle-connection (19) with the rotor shaft (15) and the preassembled parts in the vise.
7. Slide the base of the housing (03) with the screwed-on parts over the rotor shaft (15).
8. Screw the rotor impeller (16) on the rotor shaft (15) and tighten with the assembly/disassembly tool for rotor.
9. Screw and tighten the housing (02) on the base of the housing (03).
10. With the recess in the middle facing upward, guide the inflow disk (14) over the rotor shaft (15) and place it into the housing (02).
11. Connect bushing (04) over the rotor shaft (15) into the inflow disk (14) until it stops.
12. Place sliding disks (05, 06, 05) in sequence in the recess of the inflow disk (14).
13. Screw the slide cap (17) onto the rotor shaft (15) and tighten with a socket wrench.
14. Screw and tighten hexagonal nut (24) with spring ring (23) on the rotor shaft (15).
15. Check to ensure that the assembled nozzle fitting (20, 21, 22, 07, 09, 10) rotates freely around the rotor shaft (15).
16. Remove the screwed parts from the vise.
17. Clamp the housing (02) with the screwed-on parts in the vise.
18. Screw the connection cover (01) into the housing (02) and tighten it.
19. Press jet concentrators (12) in all nozzles (11) and nozzle extensions (13) and check that they are firmly in place. Remove the screwed parts from the vise.
20. Screw the nozzle extensions (13), together with the nozzles (08), into the nozzle carrier (22) and tighten them.
21. Remove the screwed parts from the vise.

The device is fully assembled and ready for installation (see *section 5.2 Installation*) on the plant.

7.4.5 Notes on Cleaning

It is recommended for the device to be cleaned during maintenance.

Comply with the following safety notes prior to cleaning.

WARNING



Hazard from corrosive or aggressive cleaning agents!

There is a risk of death or severe physical injuries.

- *Adhere to the regulations and specifications in the safety data sheets for the cleaning agents (e.g. vapors or hazardous substances).*
- *Use personal protective equipment (e.g. protective gloves, safety shoes, safety goggles).*
- *Avoid excessive concentration of the cleaning agent.*
- *Use only clean and chlorine-free water as a diluting agent.*
- *Flush the device with plenty of clean water after cleaning.*
- *Store cleaning agent in accordance with the applicable safety guidelines.*

NOTE

Risk of damage to the device during cleaning!

The use of incorrect cleaning agent or sharp objects can damage the device.

The functional safety and reliability of the device may be compromised.

- *The cleaning agents must be approved for all materials of the device (e.g. seals, bushings).*
- *Do not use sharp objects (e.g. knives) or tools.*

Cleaning in assembled state:

As a basic rule, cleaning the device parts that are located in the **interior of the container** is NOT necessary. Self-cleaning takes place during the cleaning process.

Cleaning is carried out by simply flushing the surfaces that come into contact with media (CIP cleaning).

Cleaning agents:	3% nitric acid	max. +60 °C / +140 °F
	3% caustic soda	max. +80 °C / +176 °F

Cleaning after removal:

Prior to cleaning, the device must have been removed from the container by an **expert** and disassembled into its individual parts. The safety instructions in *section 7.1 Safety Notes for Maintenance* must be observed.

Cleaning the device in a disassembled state can be carried out by **instructed persons**. After cleaning, the device must be assembled, checked and reinstalled in the container by an **expert** (see *section 5.2 Installation*).

NOTE

Environmental damage, in case of improper disposal!

Cleaning agents, consumables and lubricants must NOT be allowed to enter the groundwater, waterways or sewerage system.

There is a risk of environmental damage.

- *Dispose of any cleaning agents, lubricants and consumables (e.g. brushes and cloths) which have been used for cleaning in accordance with the local regulations and in accordance with the information in the manufacturer's safety data sheets.*
- *Dispose of packaging materials in an environmentally friendly manner and turn them in for recycling.*

7.5 Spare Parts and Customer Service

Spare Parts and Wear Parts

Subject to technical modifications in the interest of further development and improvement to the properties of the device. The Article No., dimensions or materials may differ from those of the supplied device.

The following data is important when requesting spare parts and for all inquiries:

Device

- Type
- Serial number

Spare part

- Designation
- Article no.

Customer Service

For technical questions or spare part requests, you can contact Customer Service department as follows:

Armaturenwerk Hötensleben GmbH
Schulstraße 5 – 6
D-39393 Hötensleben, Germany
Telephone +49 39405 92-0
Fax +49 39405 92-111
E-mail info@awh.eu
Internet http://www.awh.eu

7.5.1 JM100 Spare Parts

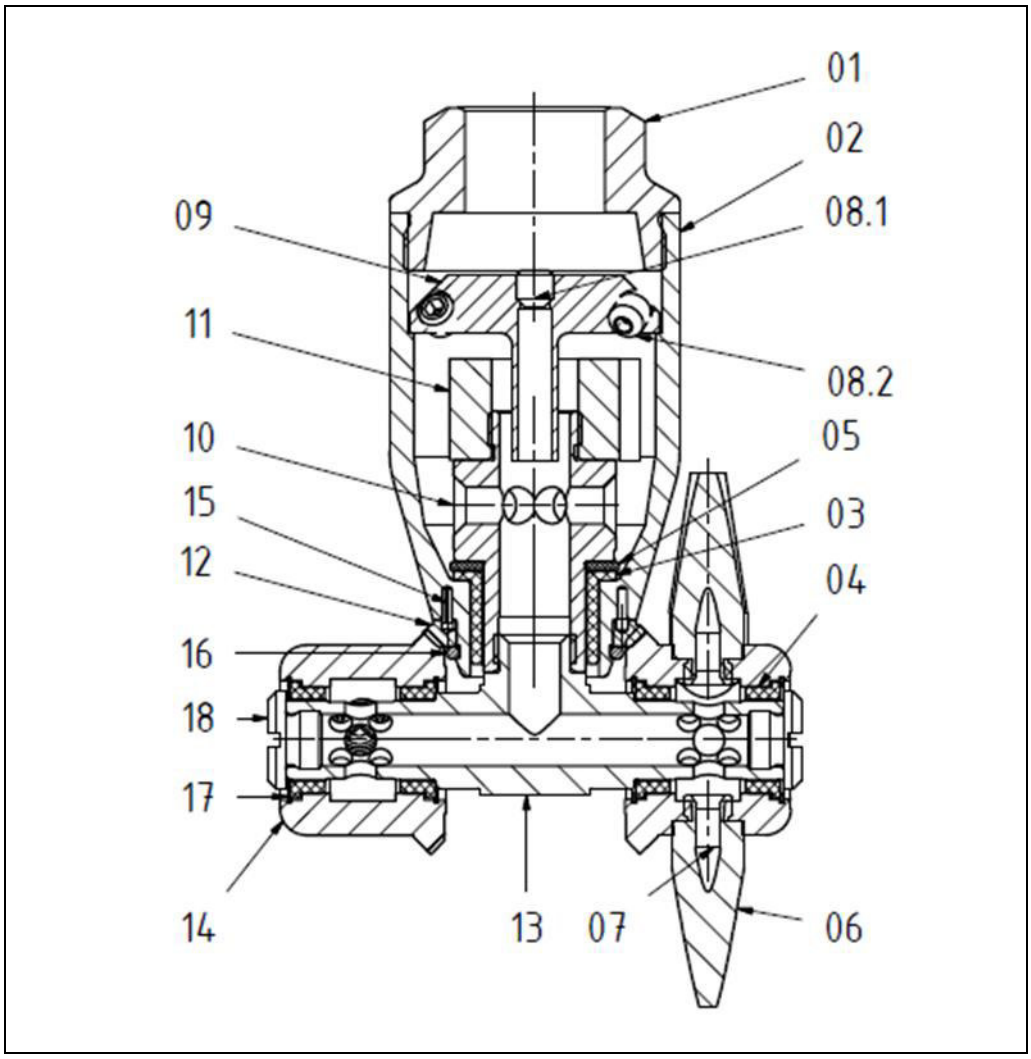


Figure 7.5-1: Internal construction of the JM100-G22

Tightening torque values for screw connections

Item / Item	Item / Item	Thread	Tightening Torque [Nm] / [lbft]
01 / 02	–	M45 x 1.5	82 / 64.43
10 / 11	–	M16 x 1.5	35 / 25.79
10 / 13	–	M14 x 1.5	32 / 23.58
06 / 14	13 / 18	M10 x 1	28 / 20.63
08.1 / 09	08.2 / 09	UNC 1/4-20	2.6 / 1.91

Table 7.5-1: JM100 tightening torque values

Remark: The items marked “X” or “■” are included in the wear parts package and can be ordered. The items marked “■” are required for replacing wear parts [WP].

Item	Qty.	Designation	Remark	Article No.	Material	[WP]
01	1	Connection cover	BSP 3/4"	668 100 378 010 020	1.4404 (AISI 316L)	–
			NPT 3/4"	668 100 478 010 020	1.4404 (AISI 316L)	
02	1	Housing		668 100 000 020 020	1.4404 (AISI 316L)	–
03	1	Collar bushing for housing		668 100 000 060 0K0	PTFE	X
04	4	Collar bushing for nozzle carrier		668 100 000 080 0K0	PTFE	X
05	1	Sliding disk	29.0 x 17.6-1.6	668 100 000 140 0N0	PEEK+PTFE	X
06	–	Nozzle	see *Table 7.5-3*	see *Table 7.5-3*	1.4404 (AISI 316L)	–
07	4	Jet concentrator	6.8 x 0.4- 6.8	668 100 000 210 020 668 100 000 210 050	1.4404 (AISI 316L) 1.4571 (AISI 316Ti)	– –
08.1	–	Medium plug (bypass)	see *Table 7.5-3*	see *Table 7.5-3*	1.4404 (AISI 316L)	X
08.2	–	Motor plug	see *Table 7.5-3*	see *Table 7.5-3*	1.4404 (AISI 316L)	–
09	1	Inflow disk		668 104 U00 300 820	1.4404 (AISI 316L)	–
10	1	Rotor shaft	Hex SW28	668 100 000 310 020	1.4404 (AISI 316L)	–
11	1	Rotor star wheel		668 100 000 320 020	1.4404 (AISI 316L)	–
12	1	Bevel gear wheel for housing		668 100 000 400 020	1.4404 (AISI 316L)	–
13	1	Axis for nozzle carrier		668 100 000 420 020	1.4404 (AISI 316L)	–
14	2	Bevel gear wheel with nozzle carrier		668 102 000 430 020	1.4404 (AISI 316L)	–
15	1	Dowel pin acc. to ISO 8748	0.062 x 0.25"	668 100 000 500 050	1.4301 (AISI 304)	X
16	1	Round wire snap ring	similar to DIN 7993	668 100 000 510 050	1.4571 (AISI 316Ti)	X
17	4	Lock washer	20.62 / 0.812"	668 100 000 520 020	1.4401 (AISI 316)	■
18	2	Locking screw		668 100 000 530 020	1.4404 (AISI 316L)	–
–	–	Wear parts package	Standard	668 160 00G V00 000		X

Table 7.5-2: JM100 parts list (standard)

Assignment to the Variants of the JM100

The specified plugs correspond to the standard configuration. A selection of various medium plugs is a component part of the scope of delivery. Discrepancies may be encountered in individual cases.

Item	Designation	Remark	Article No.	Article No. TANKO-JM100				
				3-10 bar 44 - 145 psi		10-20 bar 145 - 290 psi		
				668 160 3NG Z0M 020 668 160 4NG Z0M 020	668 160 3NG Z0P 020 668 160 4NG Z0P 020	668 160 3HG Z0K 020 668 160 4HG Z0K 020	668 160 3HG Z0M 020 668 160 4HG Z0M 020	668 160 3HG Z0P 020 668 160 4HG Z0P 020
				Quantity				
06	Nozzle	NB = 3.2 mm	668 100 000 20K 020			4		
		NB = 3.7 mm	668 100 000 20M 020	4			4	
		NB = 4.3 mm	668 100 000 20P 020		4			4
08.1	Medium plug (bypass)	d = 0.0 mm	668 100 U00 230 020	1	1	1	1	1
		d = 1.0 mm	668 100 U00 23A 020	–	–	–	–	–
		d = 1.4 mm	668 100 U00 23B 020	–	–	–	–	–
		d = 1.6 mm	668 100 U00 23C 020	–	–	1	–	–
		d = 1.8 mm	668 100 U00 23D 020	–	–	–	–	–
		d = 2.0 mm	668 100 U00 23E 020	–	–	–	–	–
		d = 2.4 mm	668 100 U00 23F 020	1	–	1	1	–
		d = 2.6 mm	668 100 U00 23G 020	–	–	–	–	–
		d = 2.8 mm	668 100 U00 23H 020	1	1	–	1	1
		d = 3.0 mm	668 100 U00 23J 020	–	–	1	1	–
		d = 3.2 mm	668 100 U00 23K 020	1	–	–	–	1
		d = 3.6 mm	668 100 U00 23L 020	–	1	–	–	1
		d = 3.8 mm	668 100 U00 23M 020	–	1	–	–	–
		d = 4.0 mm	668 100 U00 23N 020	–	–	–	–	–
08.2	Motor plug	d = 3.2 mm	668 100 U00 23K 020	4		4	4	
		d = 3.6 mm	668 100 U00 23L 020		4			4

Table 7.5-3: JM100 standard configuration

7.5.2 JM500 Spare Parts

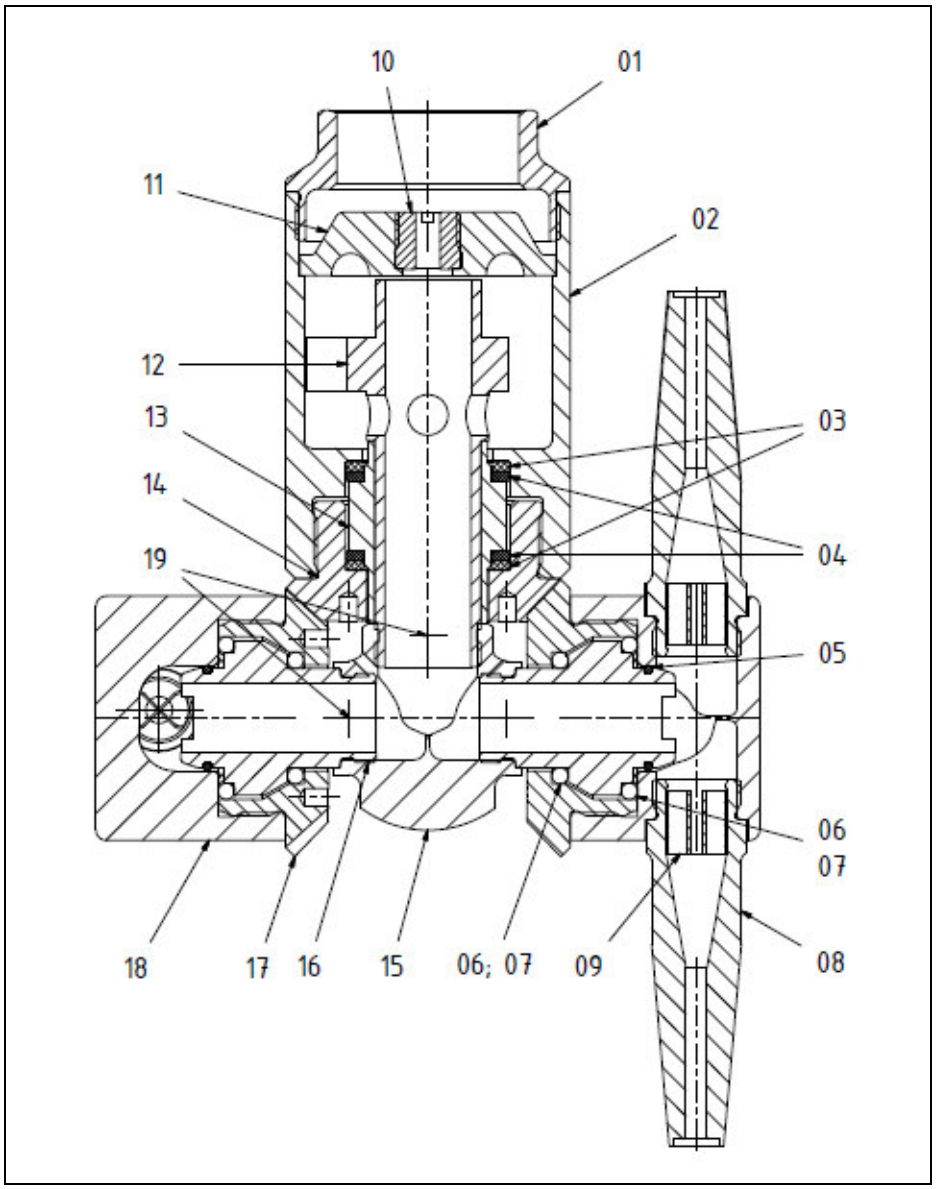


Figure 7.5-2: Internal construction of the JM500-G22

Tightening torque values for screw connections

Item / Item	Thread	Tightening Torque [Nm] / [lbft]
01 / 02	M65 x 1.5	135 / 99.49
02 / 14	M56 x 1.5	130 / 95.81
08 / 18	M22 x 1.5	105 / 77.38
10 / 11	M16 x 1.5	35 / 25.79
12 / 15	M26 x 1.5	75 / 55.27
15 / 16	M22 x 1.5	48 / 35.37
15 / 19	M4	1.8 / 1.32
17 / 18	M48 x 1.5	95 / 70.01

Table 7.5-4: JM500 tightening torque values

Remark: The items marked “X” or “■” are included in the wear parts package and can be ordered. The items marked “■” are required for replacing wear parts [WP].

Item	Qty.	Designation	Remark	Article No.	Material	[WP]
01	1	Connection cover	BSP 1 ½"	668 500 381 010 020	1.4404 (AISI 316L)	–
			NPT 1½"	668 500 481 010 020	1.4404 (AISI 316L)	
02	1	Housing		668 500 000 020 020	1.4404 (AISI 316L)	–
03	2	Sliding disk	40.0 x 31.6-2.4	668 500 000 140 0K0	PTFE	X
04	2	Sliding disk	40.0 x 31.6-2.4	668 500 000 140 0N0	PEEK+PTFE	X
05	2	O-ring	22.0 x 2.0	668 500 000 170 0K0	PTFE	X
06	100	Ball	d 4.0 G300	1037	1.4401 (AISI 316)	X
07	–	Ball [a)]	d 4.0 Gde 1	1140	Nylon	–
08	–	Nozzle	see *Table 7.5-6*	see *Table 7.5-6*	1.4404 (AISI 316L)	–
09	4	Jet concentrator	15.4 x 0.5-15.4	668 500 000 210 050	1.4571 (AISI 316Ti)	–
10	–	Plug	see *Table 7.5-6*	see *Table 7.5-6*	1.4404 (AISI 316L)	–
11	–	Inflow disk	see *Table 7.5-6*	see *Table 7.5-6*	1.4404 (AISI 316L)	–
12	1	Rotor shaft with star wheel		668 500 000 310 020	1.4404 (AISI 316L)	–
13	1	Bearing bush for plain bearing		668 500 000 330 020	1.4404 (AISI 316L)	–
14	1	Bevel gear wheel for housing		668 500 000 400 020	1.4404 (AISI 316L)	–
15	1	Shaft-axle connection		668 500 000 410 T20	1.4404 (AISI 316L)	–
16	2	Axis for nozzle carrier		668 500 000 420 020	1.4404 (AISI 316L)	X
17	2	Bevel gear wheel for nozzle carrier		668 500 000 430 020	1.4404 (AISI 316L)	–
18	2	Nozzle carrier 2x		668 502 000 440 020	1.4404 (AISI 316L)	–
19	3	Threaded pin ISO 4029	M4 x 5 ISK/RS	430178	1.4404 (AISI 316L)	■
–	–	Wear parts package	Standard	668 560 0NG V00 000		X

Table 7.5-5: JM500 parts list (standard)

a) Item 07 replaced by Item 06 since 2014

Assignment to the Variants of the JM500

The specified plugs correspond to the standard configuration. A selection of various medium plugs is a component part of the scope of delivery. Discrepancies may be encountered in individual cases.

Item	Designation	Remark	Article No.	Article No.		
				668 560 3NG Z0S 020 668 560 4NG Z0S 020	668 560 3NG Z0U 020 668 560 4NG Z0U 020	668 560 3NG Z0V 020 668 560 4NG Z0V 020
				Quantity		
08	Nozzle	NB = 6.5 mm	668 500 000 20S 020	4		
		NB = 8.0 mm	668 500 000 20U 020		4	
		NB = 9.5 mm	668 500 000 20V 020			4
10	Plug (Bypass)	d = 0.0 mm	668 500 000 230 020	1	1	1
		d = 4.0 mm	668 500 000 23N 020	–	–	–
		d = 5.0 mm	668 500 000 23R 020	1	–	–
		d = 6.0 mm	668 500 000 23S 020	1	–	–
		d = 7.0 mm	668 500 000 23T 020	1	1	–
		d = 8.0 mm	668 500 000 23U 020	–	1	–
		d = 9.0 mm	668 500 000 23V 020	–	1	–
		d =10.0 mm	668 500 000 23W 020	–	–	1
		d =11.0 mm	668 500 000 23Y 020	–	–	1
		d =12.0 mm	668 500 000 23Z 020	–	–	1
11	Inflow disk	2 x 60° NB = 9.4	668 502 000 30V 820	1	–	–
		4 x 60° NB = 9.4	668 504 000 30V 820	–	1	1

Table 7.5-6: JM500 standard configuration

7.5.3 JM800 Spare Parts

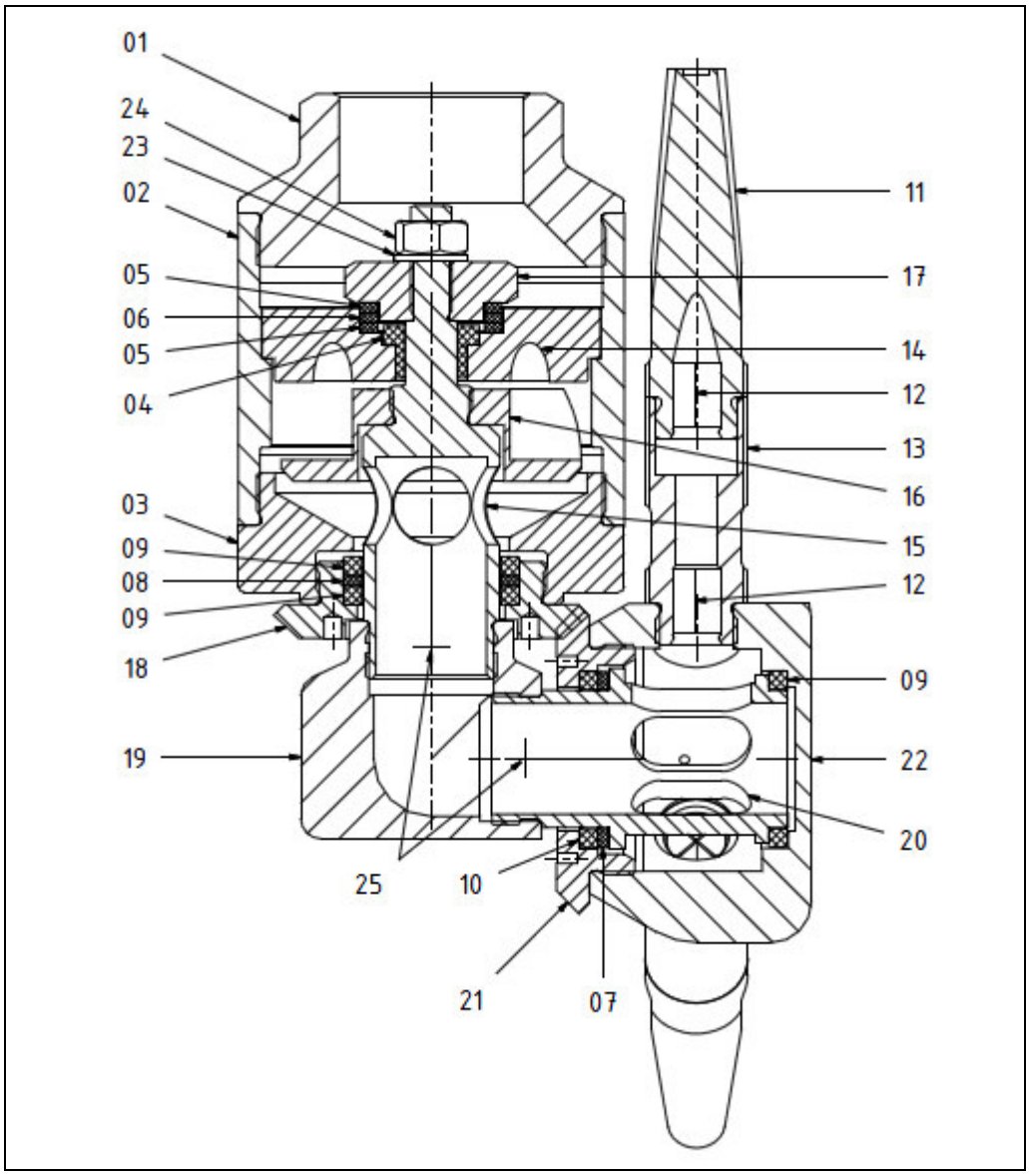


Figure 7.5-3: Internal construction of the JM800-G13

Tightening torque values for screw connections

Item / Item	Item / Item	Thread	Tightening Torque [Nm] / [lbft]
01 / 02	02 / 03	M85 x 1.5	150 / 110.55
03 / 18	21 / 22	M56 x 1.5	130 / 95.81
16 / 15	–	M20 x 1.5	70 / 51.59
15 / 19	20 / 19	M32 x 1.5	78 / 57.48
15 / 24	15 / 17	M10 x 1	30 / 22.11
25 / 19	–	M4	1.8 / 1.32
11 / 13	13 / 22	M22 x 1.5	105 / 77.38

Table 7.5-7: JM800 tightening torque values

Remark: The items marked “X” or “■” are included in the wear parts package and can be ordered. The items marked “■” are required for replacing wear parts [WP].

Item	Qty.	Designation	Remark	Article No.	Material	[WP]
01	1	Connection cover	BSP 1 ½"	668 800 381 010 020	1.4404 (AISI 316L)	—
			NPT 1½"	668 800 481 010 020	1.4404 (AISI 316L)	
02	1	Housing		668 800 000 020 020	1.4404 (AISI 316L)	—
03	1	Base of the housing		668 800 000 030 020	1.4404 (AISI 316L)	—
04	1	Collar bushing for inflow disk		668 800 000 070 0K0	PTFE	X
05	2	Sliding disk	34.4 x 26-2.4	668 800 000 140 0K0	PTFE	X
06	1	Sliding disk	34.4 x 26-2.4	668 800 000 140 0N0	PEEK+PTFE	X
07	1	Sliding disk	42.8 x 34-2.4	668 800 000 150 0K0	PTFE	X
08	1	Sliding disk	42.8 x 34-2.4	668 800 000 150 0N0	PEEK+PTFE	X
09	3	Sliding disk	42.8 x 34-4.6	668 800 000 160 0K0	PTFE	X
10	1	Sliding disk	42.8 x 34-4.6	668 800 000 160 0N0	PEEK+PTFE	X
11	—	Nozzle	see *Table 7.5-9*	see *Table 7.5-9*	1.4404 (AISI 316L)	—
12	6	Jet concentrator	15.4 x 0.5-15.4	668 500 000 210 050	1.4571 (AISI 316Ti)	—
13	3	Nozzle extension		668 800 000 220 020	1.4404 (AISI 316L)	—
14	—	Inflow disk	see *Table 7.5-9*	see *Table 7.5-9*	1.4404 (AISI 316L)	—
15	1	Rotor shaft		668 800 000 310 020	1.4404 (AISI 316L)	—
16	—	Rotor impeller	see *Table 7.5-9*	see *Table 7.5-9*	1.4404 (AISI 316L)	—
17	1	Slide cap		668 800 000 340 020	1.4404 (AISI 316L)	—
18	1	Bevel gear wheel for housing		668 800 000 400 020	1.4404 (AISI 316L)	—
19	1	Shaft-axle connection		668 800 000 410 L20	1.4404 (AISI 316L)	—
20	1	Axis for nozzle carrier		668 800 000 420 020	1.4404 (AISI 316L)	—
21	1	Bevel gear wheel for nozzle carrier		668 800 000 430 020	1.4404 (AISI 316L)	—
22	1	Nozzle carrier, 3x		668 803 000 440 020	1.4404 (AISI 316L)	—
23	1	Spring ring DIN 127-B10		450212	1.4404 (AISI 316L)	■
24	1	Hex nut ISO 8673	M10 x 1	570022	1.4404 (AISI 316L)	■
25	2	Threaded pin ISO 4029	M4 x 5 ISK/RS	430178	1.4571 (AISI 316Ti)	■
—	—	Wear parts package	Standard	668 830 0NG V00 000		X

Table 7.5-8: JM800 parts list (standard)

Item	Designation	Remark	Article No.	Article No.	
				668 830 3NG Z0U 020 668 830 4NG Z0U 020	668 830 3NG Z0V 020 668 830 4NG Z0V 020
				Quantity	
11	Nozzle	NB = 8.0 mm	668 500 000 20U 020	3	
		NB = 9.5 mm	668 500 000 20V 020		3
14	Inflow disk	6 x 30° NB = 9.5	668 806 000 30V 220	–	1
		6 x 45° NB = 9.5	668 806 000 30V 520	1	–
16	Rotor impeller	left	668 800 000 320 L20	1	1
		right	668 800 000 320 R20	–	1 a)

Table 7.5-9: JM800 standard configuration

a) Old version

8 Faults

8.1 Safety Notes for Fault Clearance

Before clearing a fault, the following safety notes must always be adhered to:

WARNING




Risk of chemical burns and burns when opening the container!

The supply line is pressurized. The person may be struck by cleaning jets or come into contact with residual fluid from the supply line and device. There may also be hot vapors in the container.

There is a risk of death or severe physical injuries.

- ***DO NOT open the container** during the cleaning process.*
- *Before starting work, observe the **working steps of the switch-off procedure** (see section 7.2 Switch-off Procedure).*
- *Before opening the container, observe the **cooling and draining time**.*
- *Use personal protective equipment (e.g. protective gloves, safety shoes, safety goggles).*

WARNING

Hazardous situations caused by performing work on the device incorrectly!

There is a risk of death or severe physical injuries.

- *Repairs and fault clearance work must be performed only by qualified experts who have knowledge of the "Technische Regeln für Betriebssicherheit (TRBS)" (German technical rules for operational reliability and safety).*
- *Before eliminating any malfunction, comply with the safety notes in chapter 7 Maintenance.*
- *In case of any uncertainty or doubt, contact AWH.*

8.2 Faults and Remedial Action

Fault	Cause	Remedy
Cleaning head and/or nozzle carrier not rotating or rotating unevenly.	– There is no media pressure on the device.	– Open the shut-off valve for the medium.
	– Pressure of the cleaning agent too low.	– Increase the pressure (adhere to the max. permitted pressure).
	– Pressure of the cleaning agent too high.	– Reduce the pressure.
	– Excessive friction due to wear on the bushings and/or bearings.	– Check the bushings and/or bearings for wear, clean or replace them.
	– Actuator unit in the device damaged or contaminated with deposits or foreign objects. The teeth of the spur gears jam.	– Clean the inside of the device and remove any foreign objects. Replace the spur gears.
	– The cleaning head collides with installed components.	– Eliminate the interfering contours.
	– Nozzles are blocked mechanically by interfering contours.	– Check the position in the container.
	– Nozzle jet too close to surrounding components. Due to high media pressure (recoil).	– Increase the distance to surrounding components.
	– Filter or nozzles blocked.	– Clean the filter or nozzles.
Effectiveness of cleaning is inadequate.	– Nozzles soiled or blocked.	– Clean or replace the nozzles.
	– Pressure of the cleaning agent too low.	– Increase the pressure (adhere to the max. permitted pressure).
	– Volume flow rate too low.	– Increase the volume flow rate
	– Filter blocked.	– Clean or replace the filter.
Jet pattern not ideal.	– No jet concentrators in the nozzles.	– Retrofit jet concentrators.
	– Nozzles soiled.	– Clean the nozzles.
	– Nozzles damaged.	– Replace the nozzles
Process or media connection leaking.	– Seal defective.	– Replace the seal.
	– Connections have come loose.	– Check the tightening torque values of the screw connections.
Volume flow rate too high.	– Increased leakage due to heavily worn bushings or bearings.	– Replace the bushings or bearings.

Table 8.2-1: Operating faults – cause and remedy

If the specified measures are NOT successful, please contact AWH.

In the event of return shipment (e.g. repair / servicing / return), a hazardous substance declaration must be enclosed with the device in accordance with the Hazardous Substance Directive (GefStoffV).

Request the form for the hazardous substance declaration from AWH.

8.3 How to Act in Case of an Emergency

If a hazardous situation occurs, or if you need to avert a potential danger, quickly set the device to a safe state.

The type of EMERGENCY STOP circuit used for the device is to be determined depending on the hazards and operating conditions and is the sole responsibility of the operating company.

It is for this reason that AWH can offer the operating company, solely as a precautionary measure, a few points of reference and notes to be observed and to be integrated into the operating company's hazard assessments.

- The working steps listed in *section 7.2 Switch-off Procedure* must be adhered to for switching off the device.
- The EMERGENCY STOP circuit must be designed in such a way that the machine or system operator can actuate it immediately in the event of an emergency.
- Switching off with the “EMERGENCY STOP” in case of emergency is designed to disconnect the entire machine from the supply voltage without delay in order to eradicate the risks caused by electrical voltage immediately.
- Shutting down in case of emergency using the “EMERGENCY STOP” is intended to prevent risks which cause hazardous movements as soon as possible.
- The EMERGENCY STOP must have priority over all other functions and actuations in all operating modes.
- Resetting must not cause the plant/machine to start up again.

Source:
- *DIN EN 60204-1 / VDE 0113-1 “Safety of machinery – Electrical equipment of machines – Part 1: General requirements”*
- *DIN EN ISO 13850: Safety of machinery - Emergency stop - Principles for design*

In case of emergency:

Trigger the EMERGENCY STOP function on the higher-level plant/machine.

- Actuate the **EMERGENCY STOP** switch
- Interrupt actuating energy supply!
  - Interrupt electricity supply (e.g. electrical actuator)
  - Switch off higher-level main switch
  - Pull out power plug
  - Close the compressed air shut-off valve (e.g. pneumatic actuator)
- Interrupt the supply of cleaning agent (actuator energy)
  - Close the shut-off valve

9 Decommissioning

Once the device has reached the end of its service life, it must be removed from the container, dismantled and disposed of in an environmentally friendly manner. Disposal must be performed in accordance with the respective valid local, national and international regulations.

WARNING

Danger due to improper removal from operation / disposal!

A risk of poisoning or irritation exists when using media that is hazardous to health, toxic or hazardous in any other way.

There is a risk of death or severe physical injuries.

- *Only an expert should perform the work.*
- *Before starting work, observe the* ***working steps of the switch-off procedure*** *(see section 7.2 Switch-off Procedure).*
- *Use protective work clothing, protective gloves and safety goggles when carrying out the tasks.*
- *In case of any uncertainty or doubt, contact AWH.*

Removal

Only experts are permitted to perform the removal from the container and the disassembly of the device for disposal. The *section 7.3 Removal* contains information on the removal of the devices and its interfaces. The safety instructions in *section 7.1 Safety Notes for Maintenance* must be observed.

9.1 Disposal

CAUTION

Danger of injuries from harmful liquids which are a health hazard!

When performing disposal, there is a risk of injury from contact with harmful liquids.

There is a risk of minor or moderate injuries.

- *Use personal protective equipment (e.g. protective gloves, safety shoes, safety goggles).*

NOTE

The cleaning device is made of stainless steel and plastic. Stainless steel is a valuable raw material and can easily be recycled.

After removal, the entire device must be properly:

- cleaned (see *section 7.4.5 Notes on Cleaning*) and
- disassembled into its assembly units and individual parts (see *section 7.4.3 Disassembling the Device*).

Unless other arrangements for return or disposal have been made, disassembled components should be turned in for recycling:

- Scrap any parts made of metal
- Recycle any parts made of plastic

If necessary, contact a specialist company to arrange for disposal.

Comply with locally applicable health, safety, disposal and environmental protection regulations.

NOTE

Risk of environmental damage as a result of improper disposal!

Cleaning agents, consumables and lubricants must NOT be allowed to enter the groundwater, waterways or sewerage system.

There is a risk of environmental damage.

- *Dispose of any cleaning agents, lubricants and consumables (e.g. brushes and cloths) which have been used for cleaning in accordance with the local regulations and in accordance with the information in the manufacturer's safety data sheets.*
- *Dispose of packaging materials in an environmentally friendly manner and recycle them.*

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Appendices

Appendix 1: Declaration (Translation)

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Declaration for incorporation as per

– EC Directive - Machinery 2006/42/EC, Annex II B

We hereby declare that the container cleaning device

Name:	**Jet cleaner**
Type:	**TANKO-JM100 / TANKO-JM500 / TANKO-JM800**
Year of manufacture:	**See type plate on the device**
Serial number:	**See type plate on the device**

is consistent with the following essential health and safety requirements of directive 2006/42/EC: 1.1.2 – 1.1.7, 1.3, 1.5.2 – 1.5.9, 1.5.15, 1.5.16, 1.6, 1.7.1 – 1.7.3, 1.7.4, 1.7.4.1, 1.7.4.2, 1.7.4.3.

The specific technical documents were compiled in accordance with directive 2006/42/EC, Annex VII, Part B.

The supplied version of the device is consistent with the following directives and standards:

Directive / Standard	Title	Version	Comments
2006/42/EC	EC Machinery Directive	2006	
DIN EN ISO 12100	Safety of machinery - General principles for design - Risk assessment and risk reduction	2011-03	Harmonized standard
	Correction to DIN EN ISO 12100:2011-03	2013-08	

If any modifications are made to the device without our consent, this declaration shall lose its validity.

Commissioning is prohibited until it is determined that the overall system fulfills the provisions of the directives.

Hötensleben, Germany, 6. December 2016

Thomas Erhorn (CEO)

Person authorized to compile the technical documentation:
Armaturenwerk Hötensleben GmbH, Mr. A. Burgdorf; Schulstr. 5 - 6; 39393 Hötensleben, German

Notizen

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