

SECTION 02085  
EXTERIOR PAINT REMOVAL

PART 1 - GENERAL

1.01 DESCRIPTION OF WORK

- A. Remove existing exterior paint from masonry walls where indicated on Drawings and as specified herein.
- B. Remove paint by one or more of the following methods, subject to compliance with requirements and systems specified herein:
  - 1. Chemical stripping.
  - 2. Vacuum water blasting.
  - 3. Wet abrasive blasting.
- C. Paint removal methods shall be environmentally safe, and they shall be non-caustic unless otherwise approved in writing by the Authority. Procedures shall be effective without causing damage to masonry and other substrates.
- D. All work which disturbs painted surfaces shall be performed in accordance with the Occupational Safety and Health Administration (OSHA), 29 CFR 1926.62. The Contractor shall be familiar with the OSHA regulations and its requirements.
- E. In addition, all waste generated as part of the project shall be tested in accordance with the United States Environmental Protection Agency (USEPA) Resource Conservation and Recovery Act to determine the classification of the waste.
- F. All waste shall be contained, collected and properly disposed of.
- G. Removal contractor shall be trained and certified by the manufacturer of the removal system as specified in the paragraph below entitled "Training".

1. When the vacuum water blasting system of Valley Systems Inc. is being used a minimum of 2 Valley Systems employees shall be on site at all times.
- H. The Contractor shall provide all labor, equipment, tools and materials necessary to complete the Work. The Contractor shall provide all necessary worker safety equipment and material and environmental protection materials necessary to complete performance of the Work in accordance with all prevailing regulations.
- I. The surfaces on which paint removal activities are to take place may have a number of different existing coatings applied to various masonry materials. The Contractor shall determine which of the removal systems specified herein to use. Where the Contractor determines that a system which is not listed would be better suited to the project, the Contractor shall submit that proposed system to the Authority for approval. The contractor shall also arrange for a field demonstration of the proposed system at no cost to the Authority. If a substitute system is approved there will be no additional cost to the Authority. Manufacturer instructions and recommendations shall be strictly followed.
- J. Application of new paint, if required, shall be provided under Section 09900, PAINTING, and in accordance with paint manufacturers' recommended procedures. If the Authority determines that, in some cases, new paint will be applied to surfaces which have been stripped down to their original primer, rather than to bare substrate, the painting contractor shall be responsible for ascertaining the integrity of the old primer prior to the application of the new paint system.
- K. General clean up of the area, which includes the collection of all spent residues, cloth, and placement into proper drums for disposal as specified herein.
- L. The Work performed shall comply with all applicable federal, state and local laws, rules, codes and regulations.
- M. The following methods of paint removal shall not be used:

1. Dry abrasive blasting
2. Uncontained hydro-blasting
3. Open flame
4. Chemical strippers containing methylene chloride
5. Any other method deemed inappropriate or unsafe by the Authority.

#### 1.02 RELATED SECTIONS

- A. Masonry Cleaning.....Section 04510
- B. Masonry Restoration.....Section 04520

#### 1.03 SUBMITTALS

##### A. Medical Surveillance

1. The contractor shall submit proof of a Medical Surveillance Program in accordance with applicable OSHA standards.

##### B. Respiratory Protection Program

1. The Contractor shall submit for approval a written Respiratory Protection Program for employees throughout all phases of the Project, including make, model and National Institute of Occupational Safety & Health (NIOSH) approval number of the respirators to be used, as required by applicable OSHA standards.
2. The Contractor shall submit for approval proof of successful fit testing performed by a qualified individual within the previous six (6) months, for each employee to be used on this project along with the employee's name and social security number on each record.

##### C. Training

1. The Contractor shall submit certification that the job supervisor/foreperson and each worker has successfully completed a training course in accordance with applicable OSHA standards.

2. The Contractor shall submit proof that all workers have been trained in the use of the selected paint removal system. Proof of such training shall be in writing from the manufacturer of the selected system.

D. Written Compliance Program

1. The Contractor shall submit for approval a Written Compliance Program, as required by OSHA 29 CFR 1926.62, for all phases of the project.

E. Exposure Assessment

1. The Contractor shall provide the name of the individual(s) or firm conducting the exposure monitoring and laboratory providing analytical services. Such individual(s) or laboratory shall be ELAP certified by the NYS Dept. of Health.

F. Removal Procedure

1. Contractor shall submit for approval proposed removal procedure, including each step in the process, type of scaffolding, and type, size and location of equipment.

G. Disposal

1. Contractor shall submit a letter from a permitted Hazardous Waste Facility, stating that the facility has agreed to accept the waste generated by the work; is authorized to accept the waste under the laws of the State of residence; has the required capacity to treat and dispose of the material; and shall provide or ensure the ultimate disposal method indicated on Uniform Hazardous Waste Manifest.
2. Contractor shall submit a Waste Transported Permit, confirming the requirements of 6NYCRR Parts 371-376, to haul to the selected Waste Disposal Facility.

3. Contractor shall submit a statement from the selected Waste Disposal Facility that the waste containers proposed for use are acceptable to the facility.
4. Contractor shall submit a copy of the Hazardous waste manifest signed by the transporter and the Treatment, Storage and Disposal (TSD) facility accepting the waste.

#### 1.04 RECORD KEEPING

- A. Contractor shall maintain Record keeping of all exposure monitoring, medical surveillance and other data. These records be kept for 30 years in accordance with OSHA 29 CFR 1910.20 and also provides employees access to such records.

#### 1.05 HOUSEKEEPING

- A. All surfaces shall be maintained free of accumulation of dust generated during the removal of paint.
  1. Separate and deposit all waste, including sealing tape, plastic sheeting, filters, and disposable clothing in polyethylene bags of at least six (6) mils thick and seal each bag separately.
  2. No equipment, supplies or materials (except properly containerized waste materials) shall be removed from the project work area unless such equipment, supplies and/or materials have been cleaned free of debris.

#### 1.06 HYGIENE

- A. Contractor shall provide hygiene facilities and assure employee compliance with basic hygiene practices.

### PART 2 - PRODUCTS

#### 2.01 MATERIALS

- A. Contractor shall provide and utilize the following products for the project as specified.

1. Protective Covering (plastic): Six (6) mil polyethylene sheets in sizes to minimize the frequency of joints. Polyethylene shall be flame retardant.
2. Duct Tape: Duct Tape 2" or wider, or equal, and capable of sealing joints of adjacent sheets of plastic, and for attachment of plastic, and for attachment of plastic sheet to finished or unfinished surfaces of dissimilar materials, and capable of adhering under both dry and wet conditions, including use of amended water.
3. Protective Packaging: Appropriately labeled per US DOT; HM 181,126, clear, double six (6) mil sealable polyethylene bags as a minimum.
4. Impermeable drum containers for the disposal of waste, labeled per USEPA 40 CFR 61 NESHAP Rev. 11/20/90. Provide containers acceptable to the Waste Disposal Facility.
5. Warning Labels and Signs: As required by OSHA and in accordance with NESHAP Federal Regulations and US DOT Regulations.
6. Paint Stripper: Chemical stripper test patches shall be applied and evaluated by the manufacturer in order to determine the appropriate stripping compound and dwell time. Refer to the MSDS for all applicable protection and disposal precautions. (NOTE: The Contractor shall use a proven and effective chemical stripper that is safe to workers, public and the environment.)
  - a. Manufacturers/Products
    - 1) AmeriStrip, manufactured by Safe Alternative Corporation of America Inc., Ridgefield, CT. (203)438-8144.
    - 2) Back to Nature IV-S, manufactured by Blast Off Services Inc., Brooklyn, NY. (718)383-2998.
    - 3) Peel Away #7, manufactured by Dumond Chemicals, Inc., 1501 Broadway, New York, NY 10036 (212) 869-6350

2.02 TOOLS AND EQUIPMENT

- A. Provide suitable hand scraping tools.
- B. Hepa Vacuums: shall comply with ANSI 29.2-1979.
- C. Fall protection equipment, including harnesses, ropes and lanyards.
- D. Worker Protection Equipment in accordance with OSHA.
- E. Pump to be used for stripper application shall be either a Grace President Checkmate Air spray System Car. 965-193 or Spray-Quip, Houston, Modified Grace Bulldog or King Pump P/N 397-080, or an Authority approved equivalent.
- F. The Rinse Water Pump: Any paint pump typically 20:1 which can be fitted with a #621 tip so it delivers 1/3 G.P.M. @ 1000 P.S.I.
- G. Pumping equipment will not be permitted in or on the building.
- H. Scaffolding as specified under Part 3 - Execution.
- I. The vacuum water blasting equipment shall be manufactured by Valley Systems, Inc., P.O. Box 603, Canal Fulton, OH 44614. Alternatively, the Contractor may submit another vacuum water blasting system for review and approval by the Authority prior to use. The effectiveness of any proposed alternative system shall be field demonstrated to the Authority and its representatives at no cost to the Authority.

Look for 244 Rtin Part of KBF for the Authority Assigned

J. The wet abrasive blasting system shall be the Torbo System, manufactured by Keizer Technologies Americas, Inc., 10908 South Pipeline Road, Euless, Texas 76040. Alternatively, the Contractor may submit another wet abrasive blasting system for review and approval by the Authority prior to use. The effectiveness of any proposed alternative system shall be field demonstrated to the Authority and its representatives at no cost to the Authority. Rigid scaffolding is required at all areas where the wet abrasive blasting system is used.

  
Wet Abrasive Blasting Systems

  
BULLSEYE  
ENVIRONMENTAL CORP.

*"The Safety Supplier Targeting the Hazardous Environment"*

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„Manual“  
torbo<sup>®</sup> Micro JR und torbo<sup>®</sup> Junior  
1998, English



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## **Code of Practice**

(extract from the Instructions for Operation)

It must always be adhered to the rules and regulations valid for wet abrasive blasting and also to the valid rules and regulations for the prevention of accidents to be applied to the respective field of application; special attention must be paid to the following:

- Any and all recommendations and instructions, in particular the basic safety instructions included in the instructions for Operation !
- The machine must be operated by trained and skilled personnel only !
- The blasting lance should never be directed towards persons and/or animals !
- The magnetic clamp of the remote control must always be securely fixed at the wrist !
- Helmet, hearing- and breathing protection apparatus must always be worn !
- Protective clothing must always be worn !
- Before putting into operation make sure that the machine and its accessories are in perfect condition.
- The control cabinet of the machine must be opened only for adjustments, inspections or maintenance work.
- A regular maintenance of the machine is strongly recommended.
- The compressor must always be operated without tool lubricator.

## **Data of the machine**

## 1. Basic Instructions

### Instructions for application of the manual

A fundamental prerequisite for the safe and troublefree operation of this machine is the knowledge of the basic safety rules, regulations and instructions.

The manual includes the essential instructions for a safe operation of the machine.

The manual and in particular the safety instructions must be adhered to by all persons operating the machine.

Moreover, the instructions for the prevention of accidents during blasting as well as the rules and regulations for the prevention of accidents valid on site must be adhered to.

### Duties of the operator and of the personnel

The operator is obliged to have operated the machine only by those persons, who

- are familiar with the basic regulations for safety at work and for the prevention of accidents and who have been adequately instructed and trained for the operation of the machine and
- have read, understood and confirmed by their signature the content of the chapter on safety and the respective caution notes.
- At regular intervals, it has to be checked whether the safety instructions are adhered to by the personnel.

Before starting to work, all persons authorized to operate the machine shall commit themselves to

- strictly adhere to the basic rules and regulations regarding safety at work and prevention of accidents;
- read the chapter on safety and the caution notes in this manual and to confirm by their signature to have understood same.

### Dangers in operating the machine

The torbo wet abrasive blasting machine has been designed in accordance with the latest state of the art and in conformity with the approved safety requirements. In spite of that, the use of the machine may entail dangers to life and limb of the user or third parties resp. impairments for the machine or other material assets.

The machine must be operated only

- in a safe and perfect operating condition and
- for use to the intended purpose.

Any troubles which might impair the operational safety, must be eliminated immediately.

### Usage to the intended purpose

The torbo wet abrasive blasting machine has been designed exclusively for surface treatment of natural and artificial stones, ferrous and non-ferrous metals, wood and similar materials by the wet abrasive blasting process using blasting media and water.

Any other or exceeding use is not regarded as in conformity with the intended purpose. Messrs. torbo Engineering Keizers GmbH shall not be liable for any damages arising from such inappropriate use.

The 'usage to the intended purpose' also implies:

- the adherence to all instructions of the manual and
- the proper performance of all inspection and maintenance work.

Please also take into consideration that a loss of material of the various types of surfaces as well as a deformation or breakage of objects by wet abrasive blasting (in particular in case of wet abrasive blasting using hard and sharp-edged blasting media and a high jet pressure on thin sheet material and glass panes) cannot be excluded.

As blasting media all conventional and commercially available blasting media are suitable which are heavier than water and which, by the addition of water, do not lump or emit hazardous vapours or gases and which are approved for wet abrasive blasting on the surface to be treated.

### Warranty and liability

On principle, our "General Conditions for Sale and Delivery" shall apply which will be at disposal upon conclusion of the contract at the latest.

Warranty and liability claims in case of personal injury and damage to property are excluded if they are due to one or several of the reasons mentioned hereunder:

- usage of the machine not in conformity with the intended purpose;
- improper putting into operation, operation, maintenance and assembly of the machine;
- operation of the machine with defective or not properly fitted and/or not operational safety devices and protective guards;
- non-adherence to the advice and instructions of the manual regarding transport, storage, assembly, putting into operation, operation, maintenance and setting of the machine;

- accidents by the influence of foreign matter of Force Majeure.

### Copyright

The copyright regarding this manual remains with Messrs. torbo ENGINEERING KEIZERS GmbH, D-46325 Borken. This manual is intended exclusively for use by the operator and its personnel. It contains instructions and advice which - neither wholly nor partly - may be copied, divulged or otherwise disclosed. Any infringement may entail criminal prosecution.

## 2. Basic Safety Instructions

### Definition of symbols and references

In this manual, the following symbols and definitions of dangers are used:



Danger I

This symbol defines an **imminent danger** for life and health of persons. The non-adherence to these instructions will entail severe effects detrimental to health and even highly dangerous injuries.



Warning

This symbol defines a **possible danger** for life and health of persons. The non-adherence to these instructions may entail severe effects detrimental to health and even highly dangerous injuries.



Caution

This symbol defines a situation which **might become dangerous**. The non-adherence to these instructions may entail slight injuries or damages to property.



This symbol means essential instructions for a proper handling of the machine. The non-adherence to these instructions may entail troubles at the machine or in the environment.



This symbol refers to hints and recommendations for use and in particular to useful information. They will help you to make an optimal use of all functions of the machine.

### Organizational measures

The operator is obliged to place at disposal the required personal protective outfit (e.g. hearing- and breathing apparatus and face guards). The available protective and safety equipment must be checked at regular intervals.

### Safety devices

be properly installed and operable. Protective devices, guards etc. may be removed only at standstill of the depressurized machine which has been secured against re-start.

### Informal safety measures

The manual forms part of the machine and has always to be kept on site. Apart from the manual, the rules and regulations for the prevention of accidents during abrasive blasting as well as the locally valid rules and regulations for the prevention of accidents and for environmental protection must always be at disposal and adhered to. It must be ensured that the safety instructions and warning boards at the machine are always legible.

### Training of the personnel

The machine must be operated resp. put into operation only by trained and instructed personnel. Untrained personnel or personnel to be trained and instructed may operate the machine only under the supervision of experienced and skilled persons. The competence with regard to putting into operation, operating, maintenance, assembly, setting and repair must be clearly stipulated.

### Safety measures under normal service conditions

In normal operation of the blasting machine, the following points must be observed:

- The machine must be put into operation only if:
  - all protective devices are fully operable,
  - all connections have been made and secured,
  - the magnetic clamp of the remote control has been fixed at the wrist of the operator and does not contact the remote control and, if the operator keeps a firm hold on the manual blasting nozzle/lance.
- Before switching on or starting the machine it must be made sure that nobody can be jeopardized hereby.
- At least once per shift, the machine and its equipment must be checked for externally visible damages.



Danger !

- The blasting lance must never be directed to persons and/or animals !
- Never direct the blasting lance to objects which are not to be subject to surface treatment.
- The inspection of the machine also includes its equipment.

#### Dangers due to electric energy

- If works have to be performed at the electric supply system, this must be done by a skilled electrician only.
- The electric equipment of the machine must be checked at regular intervals. Loose connections and scorched cables must be eliminated immediately.
- The control cabinet must always be kept closed. Authorized personnel only shall have access to the control cabinet using a key or adequate tool.
- When working at live parts, a second person must assist who in case of need could actuate the main switch.

#### Dangers due to pneumatic energy

- Pneumatic equipment must be operated only by personnel disposing of special knowledge and experience in the field of pneumatics.
- Before tackling any repair work, sections of the pneumatic system and delivery conducts to be opened must be depressurized.
- At reasonable intervals, pneumatic hose pipes are to be exchanged even if no deficiencies impairing the safety are visible.

#### Special hazards

When operating the machine, special attention has to be paid to the following in order to avoid hazards:

- Never direct the blasting nozzle towards persons and/or animals !
- The blasting nozzle must not be directed towards objects which are not allowed to be blasted !
- Keep a tight hold on the blasting lance during start (back kick of the blasting lance!)
- Unauthorized starting of the machine in case of interruptions (also short interruptions) must be avoided.
- Machine to be made inaccessible for unauthorized people. Blasting nozzle and remote control to be made inaccessible for unauthorized people.
- During interruptions, magnetic clamp of the remote control to be put into jacket- or trouser pocket.
- When operating the machine, the control cabinet must be kept closed and made inaccessible for unauthorized people.

#### Dangers due to superfines as well as noxious gases and vapours

The concentration of fine dusts during operation of the machine is detrimental to health. The operators therefore have to be protected by an adequate protective outfit or protective measures against inhalation of superfines.

The addition of chemical or other agents must be clarified with the producer and/or supplier of the agents. If on account of these agents or by using these agents in combination with water and/or blasting media health risks should arise, adequate protective measures must be taken.

If by the use of these agents the functions of the machine should be impaired, a written confirmation must be obtained from torbo Engineering Keizers GmbH, D-46325 Borken, before using such agents.



Warning

- Adequate breathing protection is to be ensured when working on the machine.
- Adhere to the instructions of the producer when using other substances than water and/or commercially available blasting media.

#### Dangers due to the noise of the machine

During the operation of the machine, the continuous sound intensity level depending on the setting amounts to 105 dB(A) which might be higher on account of unfavourable local conditions.

The operating staff must be protected by an adequate outfit or protective measures against impairment of hearing.



Warning

- Adequate hearing protection is to be ensured when working on the machine.

**Maintenance, repair, trouble-shooting**

Regarding maintenance, repair and trouble-shooting the following requirements must be fulfilled:

- The specified maintenance and inspection work must be carried through according to schedule.
- The operating staff must be informed in time of any intended maintenance and/or repair.
- All plants, systems, machines, appliances upstream and downstream of the wet abrasive blasting machine, as well as all supply systems like current, compressed air and pressurized water are to be secured against accidental actuation.
- For all maintenance-, inspection- and repair works, the machine must be de-energized and depressurized and secured against re-start,  
attach warning board to prevent from restarting the machine;  
uncouple compressed-air- and pressurized-water hoses from the machine;  
disconnect cable from power source.
- After completion of the works check loosened screws and connections for tight fitting.
- After completion of the works check all safety devices for correct functioning.

**Alterations of the machine design**

No alterations, attachments or conversions of the machine are allowed without the approval of the manufacturer.

All conversion measures are subject to the written approval of Messrs. torbo Engineering Keizers GmbH, D-46325 Borken.

Any machine parts which are not in a perfect state and condition, must be exchanged immediately. Only original spare- and wear parts are to be used as in case of parts bought elsewhere it cannot be warranted that they have been designed and manufactured to fulfil the requirements regarding quality and safety.

**Disposal of substances/materials and cleaning of machine**

All substances and materials used have to be properly handled and disposed of. In particular, this applies to:

- Blasting media and water used in the performance of any works and jobs,
- Additives used, like e.g. rust retarding agents, solvents for cleaning the machine etc.

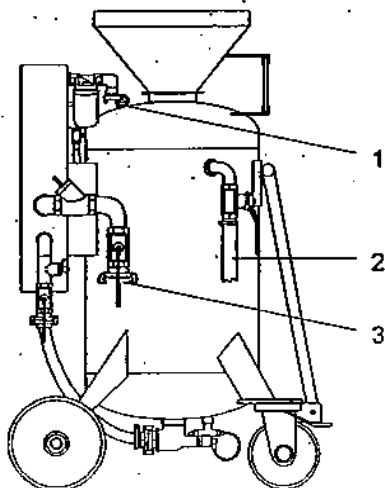
## 1. Instructions for Operation

### 1.1. Connections



Warning

- The technical data and requirements to be fulfilled by compressed-air hoses may be taken from the technical specification (look at chapter 4);
- Hoses and cable are to be checked for wear and damage and exchanged, if necessary;
- Couplings of compressed-air hoses must always be secured against loosening.



Chapt. 1, Figure 1: connections (part 1)

**Compressed-air supply (3):** The size of the compressed-air supply depends on the work to be performed and on the compressor to be connected.



- If the compressor is provided with a tool oiler, this must be closed!
- Use only clean pressure hoses; it will reduce the maintenance work.



- It is essential that the hose between compressor and machine has got a sufficiently large cross-section (look at chapter 3).

**Water supply (1):** Make sure that the machine is connected to a correct water supply (example water tank); connect upto 12 bar.



- Use only clean water and clean-up the water filter weekly, it will increase the service life of the pump.

**Overflow port (2):** This overflow has been designed to discharge excessive water when filling the machine, and after termination of the blasting, to relieve the pressure vessel from the hydraulic pressure.



- Use the torbo water tank 98 to re-use the water.

**Connection of the remote control (4):** Connect the remote control with extension cable. The cable must be long enough to connect the remote control next to the blasting nozzle.



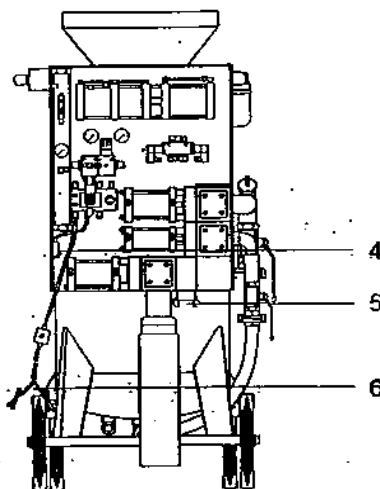
Warning

- Before connecting the remote control, the magnetic clamp must be fixed at the wrist of the operator and removed from the remote control!
- Use the small straps to fix the remote control at the blasting hose approx. 30 cm behind the nozzle.

**Power supply (6):** The pole tongs have to be connected via the socket-outlet at the compressor or at any other 12V-D.C.-source so that the black pole tonge is connected to (-) and the red pole tonge to (+).



- If so, the diode at the socket-outlet is illuminated green.
- If the diode is red, the power supply to the machine is interrupted and the pole tongs must be reversed at the poles.



Chapt. 1, Figure 2: connections (part 2)

**Blasting hose connection (5):** The cross-section and the length of the blasting hose must be adapted to the work to be performed and to the compressed-air supply connected.

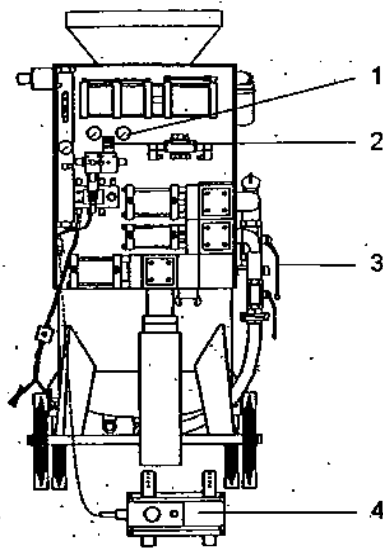


Caution

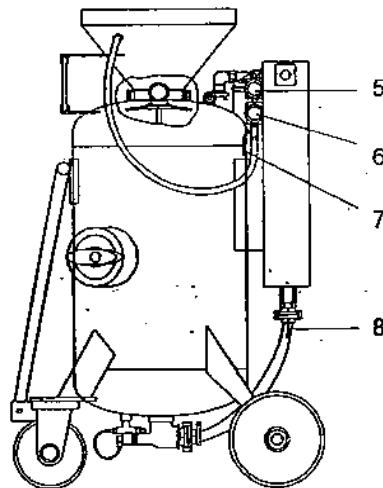
- The longer the blasting hose and the higher the blasting pressure and the smaller the cross-section of the blasting hose, the longer the delay of the turn off at the nozzle.



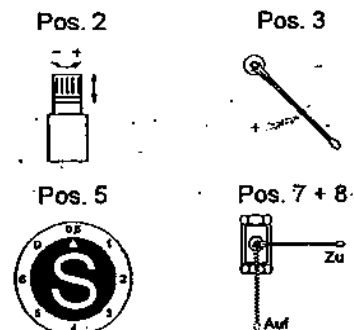
- Find examples for the right cross-section of the



Chapt. 1, Figure 3: operating (part 1)



Chapt. 1, Figure 4: operating (part 2)



Chapt. 1, Figure 5: operating (part 3)

## 1.2. Components for Operation

**Vessel pressure control (2):** For setting the pressure in the vessel.

To set the vessel pressure (1) lift (unlock) the black adjustment wheel; to increase the pressure turn wheel to the right (+), to reduce the pressure turn wheel to the left (-). After setting the pressure push the wheel down (lock).



- The pressure is shown at manometer (1).

**Blasting pressure control „P“ (3):** For setting the blasting pressure at the machine. For softcleaning, turn the hand bar (3) to the right to reduce the maximum pressure.



- The blasting pressure is shown during blasting at manometer (1) minus 0,5 bar.



- Examples for settings are shown in chapter 3 and table chapter 3.2..

**Remote Control (4):** For turn on and off the machine at the blasting nozzle.

To start: Put magnet on remote control and actuate push-button.

To switch off: Remove magnet from remote control.



Warning

- The magnet of the remote control must always be securely fixed at the wrist!
- Fix the remote control by means of the two straps approx. 30 cm behind the nozzle holder on the grip of the blasting lance.

**Blasting media dosage – handwheel „S“ (5):** Setting is effected by rotation of handwheel „S“ with the figure on the scale in volume of blasting mixture in litre per minute.

(blasting mixture = 80% blasting media and 20% water).



- Find examples for the right blasting media consumption at chapter 3 and table chapter 3.2..

**Extra Water dosage (6) – Equipment (506) and (507):** To increase the water proportion in the blasting mixture.

Setting is effected by rotation of handwheel „Z“ with the figure on the scale in volume of water in litre per minute.



- The extra water reduces the power of the blasting media for softcleaning.
- Look also at blasting media dosage (5).

**Switching ZW (8) – Equipment (511):** It allows to switch over from blasting to cleaning to drying at the machine (8).

Blasting = Blasting with blasting media mixture and air;

Cleaning = Blasting with water and air;

Drying = Blasting only with air.

**Water supply S95 (7) – Equipment (203):** To fill in the blasting media into the vessel with water.

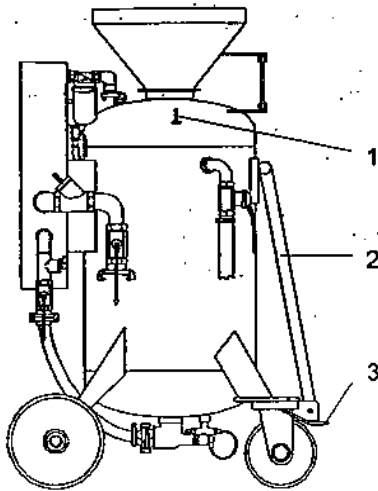


### 1.3. Instructions for Transport

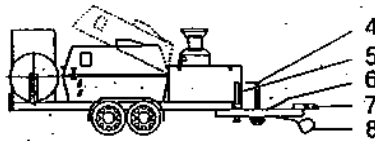


Caution

- For transporting it must be ensured that the pressure vessel is empty;
- The machine must be placed on a plane surface in order to avoid tilting or slippage;
- During transport, the machine must be secured in conformity with the rules and regulations for the prevention of accidents applicable to the transport of piece goods.



Chapt. 1, Figure 6: transporting (part 1)



Chapt. 1, Figure 7: transporting (part 2)

#### A. Transporting single machines

If the machine is to be displaced manually, the provided tow bar (2) is to be used in order to avoid a tilting of the machine.

When using the tow bar (2) it must be ensured that, before use, it is secured by a split pin at the lower end of the tow bar (2) and the brake (3) is released.

For towing the machine, use the rings (1) only.

#### B. Transporting torbocar-units

'torbocar-unit' means trailers on which the torbo machine with or without accessory equipment like compressors, hose reel, tool kit etc., is mounted and which can be moved by a tractor.

Before towing the torbocar-unit, the following must be checked respectively carried through:

- The trailer coupling of the tractor must correspond to the towing eyelet or the ball hitch coupling;
- The admissible values specified for the total weight and trailer-nose weight are to be observed;
- The support wheel of the torbocar-unit must be secured in its highest possible position during towing in order to avoid rotation during towing;
- Before start, the breakaway-braking device and the plug for the lighting at the tractor must be installed, and the hand brake lever at the unit is to be released;
- During towing, the unit must be kept horizontally;
- When parking the torbocar-unit it must be ensured that the unit is horizontally balanced by means of the supports and/or the support wheel, and that the hand brake is put on.

## 2. Operating Instructions

### 2.1. Connecting the Machine



- Read chapter 1.1. first for better understandability.

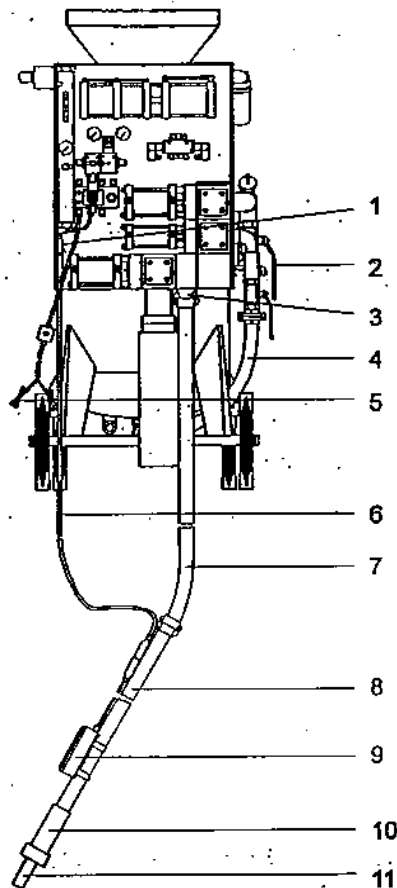
Connecting the machine as follows:

- Close hand bar „P“ (2) (turn left);
- If necessary, connect hose (4) at the vessel bottom and the control cabinet;
- Connect overflow hose (13) at the overflow;
- Connect water hose on coupling (12);
- Connect compressed air hose on coupling (14);
- Connect pole tongs (5) on 12 Volt DC;
- Connect remote control (9) with cable (6) on coupling (1);
- Connect blasting hose (7) on coupling (3);
- Screw the nozzle (11) into the nozzle holder (10) at the blasting lance;
- Connect the blasting lance (8) with extra blasting hose on coupling (3);
- Fix remote control (9) approx. 30 cm behind the nozzle holder (10) at the blasting lance (7);
- Check all connections for leakproofness.

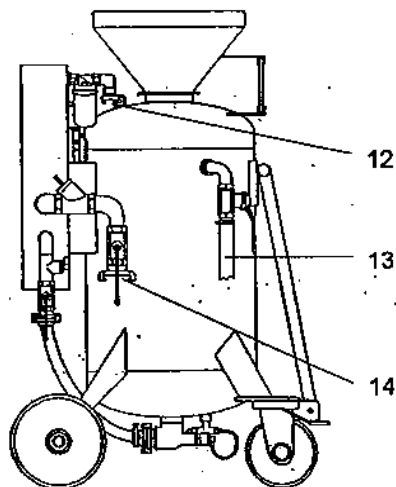


Warning

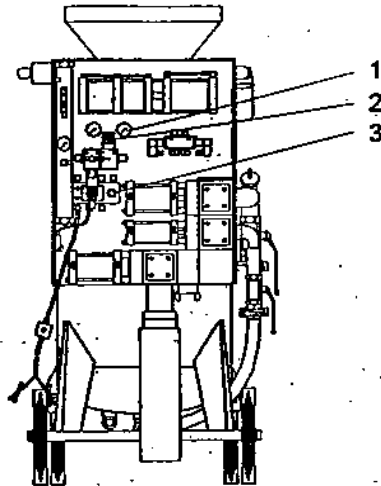
- The magnet of the remote control must always be securely fixed at the wrist!
- Connections must always be secured against loosening.



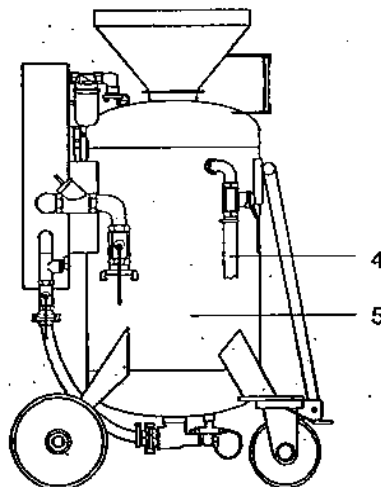
Chapt. 2, Figure 1: connecting (part 1)



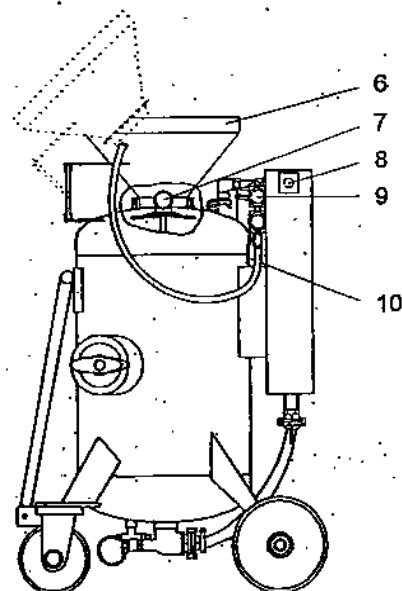
Chapt. 2, Figure 2: connecting (part 2)



Chapt. 2, Figure 3: Normal operation (Teil 1)



Chapt. 2, Figure 4: Normal operation (Teil 2)



Chapt. 2, Figure 5: Normal operation (Teil 3)

## 2.2. Normal Operation

### 2.2.1. Filling the machine



- Read chapter 1.2. first for better understandability.

#### A. First filling at location

Please proceed as follows:

- Select blasting media;
- Start air compressor and open compressed-air supply to the machine;
- Open water to the machine;
- Actuate main switch (3) (switch illuminated);
- Open ball valve (4) at overflow;
- Handwheel „S“ (9) to be set on position „D“ or on maximum value respectively;
- If necessary, open ball valve (10) for water flow;
- Fill blasting media through the sieve top (6) into the vessel until blasting media penetrates from the overflow hose;
- Close ball valve (4) on the overflow;
- Close ball valve (10) for water flow;
- Tip over sieve top (6) and wait until water penetrates on the top of the vessel;
- Pull up the vessel locking (7) by the ring until the pressure has built up;
- Place sieve top (6) back on the top of vessel;
- Set the pressure (1) with adjustment wheel (2) to 11 to 12 bar.



- Filling of the vessel can be accelerated by the addition of water at the upper opening of the vessel and/or pushing the handwheel „S“ (9).
- If the main switch (3) should not be illuminated after actuation, it must be checked whether the EMERGENCY-OFF-switch is unlocked.

#### B. Repeating the filling

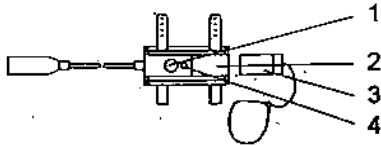
Please proceed as follows:

- Open ball valve (4) on overflow;
- Handwheel „S“ (9) to be set on position „D“ or on maximum value respectively;
- If necessary, open ball valve (10) for water flow;
- Fill blasting media through the sieve top (6) into the vessel until blasting media penetrates from the overflow hose;
- Close ball valve (4) on the overflow;
- Close ball valve (10) for water flow;
- Tip over sieve top (6) and wait until water penetrates on the top of the vessel;
- Pull up the vessel locking (7) by the ring until the pressure has built up;
- Place sieve top (6) back on the top of the vessel.



Warning

- When leaving the remote control unattended, the magnet must be secured so that the machine cannot be started by unauthorized people!



Chapt. 2, Figure 6: Operating with remote control FB S95


### 2.2.2. Operating with Remote control FB S95

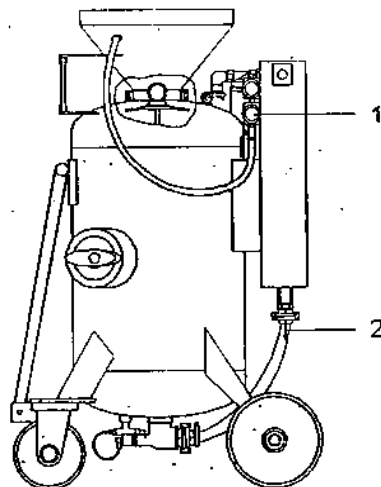


- Read chapter 2.1. and 2.2.1. first for better understandability.
- Put magnet (3) on position (2) at the remote control (diode (4) illuminated);
- To start/blasting: Actuate push-button (1) at the remote control (diode (4) goes out);
- To switch off: Remove magnet (3) from remote control. Each removing of the magnet (3) stops blasting. To restart with blasting, put the magnet (3) on position (2) at the remote control and actuate push-button (1).



Warning

- Any and all recommendations and instructions, in particular the basic safety instructions, must be paid attention to !
  - The blasting lance should never be directed towards persons and/or animals !
  - The higher the blasting pressure is, the higher is the recoil at the nozzle.
  - The longer the blasting hose is, the longer is the shut down time at the nozzle.
- 
- Before starting read chapter 3. to find the right setting.
  - If necessary, connect more blasting hose and extension cable and control the blasting pressure again.



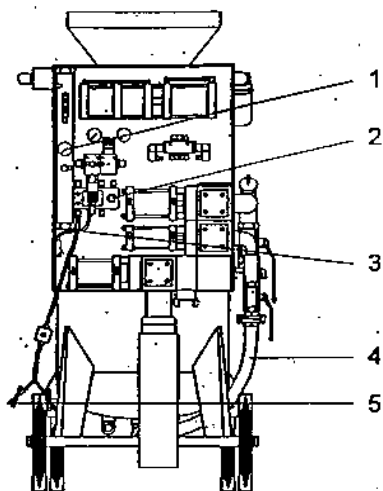
Chapt. 2, Figure 7: switching ZW

### 2.2.3. Switching ZW – Equipment (511)

The switching ZW will change the operating mode from blasting to cleaning/drying and back at the machine.

- For blasting: Set handwheel „S“ and open ball valve (2);
- For cleaning: Set handwheel „Z“ (1) and close ball valve (2);
- For drying: Set handwheel „Z“ (1) on position „0“ and close ball valve (2).

Machines without equipment (507) do not have a handwheel „Z“ (1). In this case there is an other ball valve assembled.



Chapt. 2, Figure 8: switch off (part 1)

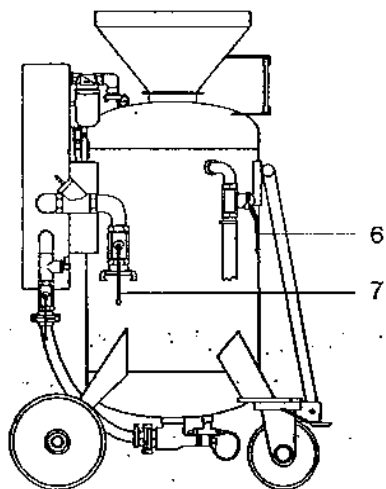
### 2.3. Switching off the Machine

If there is a longer break after removing the magnet from the remote control (for example lunch); please proceed as follows:

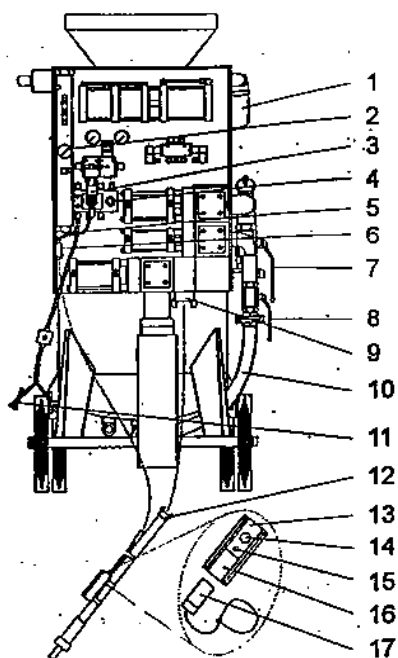
- Open ball valve (6) at overflow;
- Interrupt compressed-air to the machine and switch off the compressor.

If there is a longer break (for example overnight), please proceed as follows:

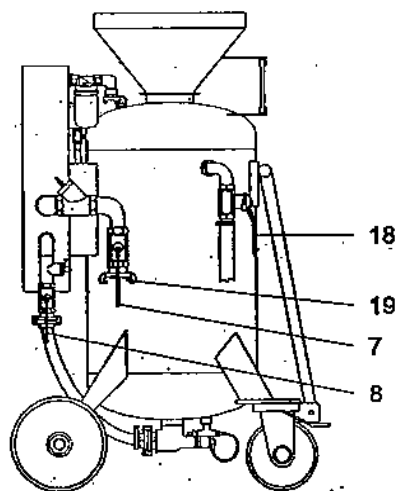
- Close hand bar „P“ (7) (turn left);
- Actuate main switch (2) (main switch goes out);
- Interrupt water feed to the machine;
- Uncouple hose (4) and empty the vessel;
- Push valve (3) until the pressure left out of the reserve tank (see manometer (1));
- Uncouple pole tongs (5), remote control and extension cable, water hose, compressed air hose, blasting hose and save these.



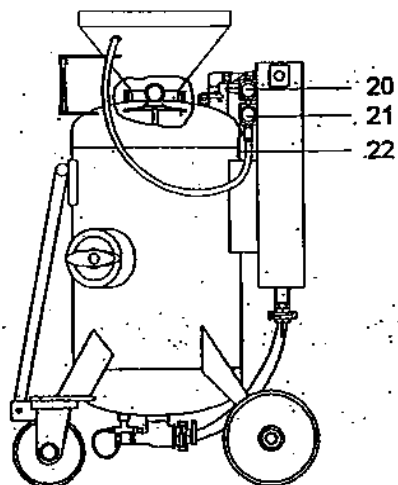
Chapt. 2, Figure 9: switch off (part 2)



Chapt. 2, Figure 10: Frost precaution (part 1)



Chapt. 2, Figure 11: Frost precaution (part 2)



## 2.4. Frost precaution in winter

In order to protect the machine from damage by frost following steps must be made:

- Close hand bar „P“ (7) (turn left);
- If necessary, connect hose (10) at the vessel bottom and the control cabinet;
- Remove the filter element at the water filter (1);
- Connect compressed air hose on coupling (19);
- Connect pole tongs (11) on 12 Volt DC;
- Connect remote control (13) with cable on coupling (6);
- Connect blasting lance (12) and blasting hose on coupling (9);
- Fix remote control (13) with cable approx. 30 cm behind the nozzle holder at the blasting lance (12);
- Open ball valve (18) at the overflow;
- Handwheel „S“ (20) and „Z“ (21) to be set on position „D“ or on maximum value respectively;
- If necessary, open ball valve (22) and (8);
- Actuate main switch (4) (switch illuminated)
- Put magnet (17) on position (16) at the remote control (diode (15) illuminated);
- Actuate push-button (14) at the remote control (13) (diode goes out);
- Let the machine run for about 30 seconds and remove magnet (17) from remote control (13);
- Actuate main switch (4) (switch goes out);
- Uncouple pole tongs (11), remote control (13) and extension cable, compressed-air hose and blasting hose;
- If necessary, uncouple hose (10) and empty the vessel;
- Open hand bar „P“ (7) (turn right);
- Push valve (5) until the pressure left out of the reserve tank (see manometer (2));
- Clean filter element in the air filter (3);
- Set the filter element into the water filter (1);
- Ensure dry storage of the machine !

### 3. Information for Practice

This chapter will help you to use the machine better for all the different possible works.

#### 3.1. Blasting result – optimization of the parameter

The setting of the machine depends on the result which is needed. The following settings influence the blasting result and have to be conformed to the result:

- blasting pressure;
- blasting hose;
- blasting nozzle;
- blasting media;
- quantity of blasting media and water.

There is no general solution for the setting because of always different working conditions. But there are some rules to exclude typical mistakes at the setting and to find a close optimized solution for the setting.

##### 3.1.1. Soft blasting

The target for soft blasting is to have an equable and clean result without respectively with low damage of the surface.

The most unnecessary mistakes during soft blasting are:

- Selection of the blasting media (hardness, grain),
- Setting blasting media consumption,
- Setting blasting pressure,
- Combination of blasting hose and blasting nozzle and
- Handling of the blasting nozzle.



- See table at chapter 3.2. for the best initial values.
- Information for the best handling of the blasting nozzle, look at chapter 3.3..

##### 3.1.2. Power blasting

The target for power blasting is to have a maximum on abrasion power.

This means not only that it is enough to have plenty of air volume and the right blasting media and setting for blasting media, but also to have low power losses.

Needless power losses arise when:

- The cross-section of the air hose between air-compressor and machine or the cross-section of the blasting hose is too small;
- The hoses are too long or have too much arcs;
- The nozzle has a wrong cross-section or -shape;
- The blasting media or the setting of blasting media is wrong.



- Examples for the initial setting, see table at chapter 3.2.

### 3.2. Adjustments and settings

In the first column of the first table „Material of object to be blasted“ the work to be done is to be stipulated. Following this, the approximate values for the selection of the blasting mixture, the required volume of blasting media, the pressure at the machine, the diameter of the blasting nozzle and of the blasting hose may be taken from the respective line.

After selecting the settings and the blasting nozzle by means of the first table you have to select the right air-compressor size, air hose between compressor and machine and the blasting hose size for the blasting nozzle by using the information shown in the second table.

The data in the tables are approx. values only and may differ from case to case.

**Table 1: Directional data for settings**

Material of the object to be blasted	Type of blasting media	Volume of blasting media ft. per min	Blasting pressure bar	Blasting nozzle mm
Softest cleaning	a)	0,4 / 0,6 / 0,8 / 1,0	0,5 to 1,5	8 to 10
Soft cleaning	a)	0,6 / 0,8 / 1,0 / 1,5	0,5 to 2,0	6 to 8
Cleaning	a) b)	0,6 / 0,8 / 1,0 / 2,0	1,0 to 5,0	10 to 12
Blasting up to 5 m <sup>3</sup> /min	b) c)	2,0 / 3,0	to 10,0	10 to 12
Blasting up to 7 m <sup>3</sup> /min	b) c)	3,0 / 4,0	to 10,0	12 to 14
Blasting up to 10 m <sup>3</sup> /min	b) c)	4,0 / 5,0	to 10,0	14 to 16
Blasting up to 15 m <sup>3</sup> /min	b) c)	4,0 / 5,0 / 6,0	to 10,0	14 to 16

**Information to the table 1****Column 2 „Type of blasting media“**

- a) Stone dust, calcite powder, basalt, finical and soft blasting media without sharp edges resp. soft media upto 0,4 mm and with a hardness upto 4 Mohs.
- b) Stone dust, glas powder and other fine blasting media upto 0,8 mm and a hardness upto 8 Mohs.
- c) Slag, granite powder, gamet and other blasting media upto 1,5 (2,0) mm and with hardness upto 8 (9) Mohs.
- d) Sodium bicarbonate, lime (suitable for the removal of paint coat without damaging the metallic surface) and other fine and soft blasting media of a very low hardness.



- In order to ensure a good flow of the blasting mixture it is recommended to use a blasting mixture containing superfines (disadvantageous e.g. a grainage from 1 to 2 mm; better: e.g. 0,4 to 2,0 mm).
- To get more soft cleaning, you may have to use additional water (handwheel „Z“ – equipment 507).

**Column 3 „Volume of blasting media“**

- For cleaning, always test soft blasting media first.
- The blasting media is already mixed with 20% water. If you need more water for soft cleaning, you may have to use additional water (handwheel „Z“ – equipment 507).
- For cleaning, the percentage of water may be increased in the case of machines with dosing facility for additional water (with dosing equipment ZW (506) resp. with handwheel „Z“ (507)) to achieve an optimum result in a still more gentle way.

**Column 4 „Blasting pressure“**

- For cleaning, always test with a low blasting pressure first.
- The blasting pressure at the machine and at the blasting nozzle may differ because of different length and different diameter of the blasting hoses.



Table 2: Max. compressor size required as a function of the blasting nozzle

Diameter blasting nozzle	mm	6	8	10	12	14	16
Compressor output	m <sup>3</sup> /min	1,8	3,2	5,0	7,2	9,8	12,8
Blasting hose and Compressed-air hose	mm Zoll	13/7; 19/7	19/7; 25/7	25/7; 32/8	32/8	32/8; 49/8	32/8; 49/8
		1/2; 3/4	3/4; 1	1; 5/4	5/4	5/4; 1 1/2	5/4; 1 1/2



- The shorter the hose and the bigger the diameter of the hose, the lower is the loss of blasting power. (This concerns the air hose between the compressor and the machine and the blasting hose).

### 3.3. Blasting nozzle and operating

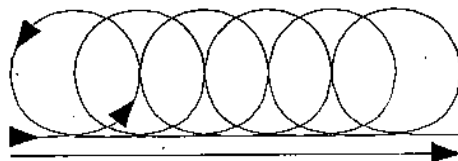
**A. The nozzle:** Standard nozzles are Cylinder- and Venturi-nozzles, but the Venturi-nozzle produces a higher speed of the blasting mixture at the nozzle. The result of the higher blasting mixture speed is a higher production efficiency of blasting power (upto 30%).

Also long blasting nozzles have upto 20% more blasting power in comparison to short nozzles.

**B. Handling of the blasting nozzle:** This is not a question of the machine or the equipment, but of the training of the operator. A well trained operator with experience get up to 50% more production efficiency than a operator without training.

The first step to get the maximum blasting performance is to have a good planning, the right blasting media and the right setting of the machine.

After planning, the operator has to know which result is required, so that the operator knows how to handel the nozzle.



Chapt. 3, Figure 3: movement of the nozzle

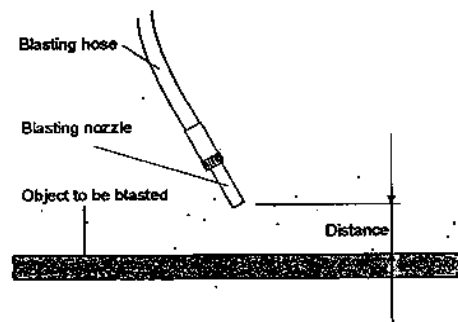
#### Movement of the nozzle

The best way to move the blasting nozzle on large objects is to circulating and side longe the nozzle at the same time.

If you don't circular the nozzle, the surface will look unintegrated.



- The faster the circulating and the side longe, the lower the wear on the surface.



Chapt. 3, Figure 1: distance of the nozzle

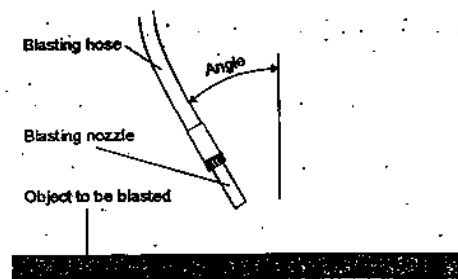
#### Distance of the nozzle

The normal distance between object to be blasted and blasting nozzle is approx. 20 to 25 cm.

One possibility to influence the aggressiveness of the blasting process, is to increase the distance between object and blasting nozzle.



- The nearer the blasting nozzle to the object, the stronger the aggressiveness of the nozzle and the smaller the surface simultaneously treated.



Chapt. 3, Figure 2: angle of the nozzle

#### Angle of the nozzle

The normal angle between object and blasting nozzle is 20 to 45°.

One possibility to influence the aggressiveness of the blasting process, is to increase the angle between object and blasting nozzle.



- The smaller the specified angle to the object, the stronger the aggressiveness of the nozzle and the smaller the surface simultaneously treated.

## 4. Maintenance

In order to ensure a correct maintenance of the machine it is compulsory that maintenance is performed only after having read these instructions and by trained personnel.

### 4.1. Maintenance work

look at  
section

#### Daily before connecting the machine

- cleaning of compressed-air connections
- cleaning of water connections

#### Weekly

- equipment cleaned externally
- cleaning of compressed air and water filter
- check gaskets of connecting couplings, if necessary, replace gaskets

#### Inspection I

- check non-return valves and clean if needed
- check stoppers and counterparts
- check blasting coupling at the machine
- check insulation of electric components incl. cable
- check hoses and couplings (pneumatic compressed-air and pressurized water hoses, air and water couplings)
- check connections and screwings for leakproofness
- check safety check-valve
- check piston pump for leakproofness and slightly grease it
- check dosing valve(s) and clean if necessary
- check manometer(s) for perfect functioning
- functional test of the machine

#### Inspection II

Includes all items of inspection I; in addition:

- replace filter elements of compressed-air and water filter
- replace dirty and bucked pneumatic hoses
- dosing valve(s) to be cleaned
- check electric connections for corrosion
- check function of control valves
- clean and check non-return valves at compressed-air connection
- check vessel for leakproofness
- grease hinges, spring in safety check valve and locks

In one-shift-operations the inspection I and inspection II are to be carried through at intervals of 3 to 6 months.

Any occurring troubles, faults etc. are to be eliminated immediately by adequately trained personnel; before starting the machine again, any defective parts are to be replaced by new original parts.

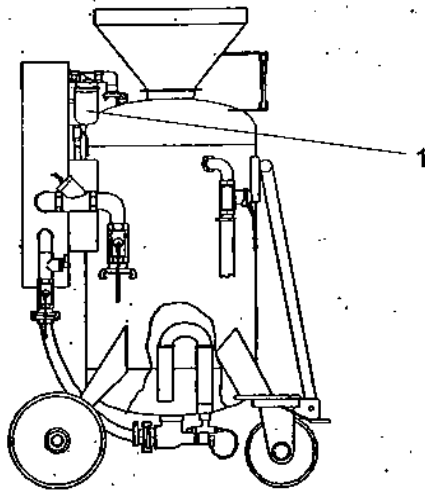


Warnung

- Before beginning any maintenance work, the power, compressed-air and water connections are to be detached and the machine is to be depressurized.
- The machine must be protected from re-start.
- Repairs and the inspection I and II may be carried through by adequately trained personnel only, being at disposal via the torbo-trading partners.
- For mobile units with compressors the inspections of the respective manufacturer must be adhered to for maintenance at the compressor or chassis respectively.
- For a safe operation and a long service life of the machine and its accessories, it must be



## 4.2. Information to the weekly maintenance



Chapt. 4, Figure 1: cleaning (part 1)

### Water filter

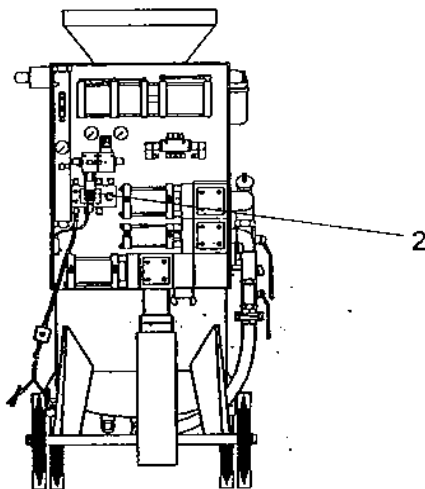
To clean the water filter (1) proceed as follows:

- Open the filter by undoing the screws at the upper side of the filter;
- Remove filter element from container and clean it with compressed air or water or resp. replace the filter element;
- Clean container with water;
- Insert filter element again – look at the gasket at the upper side;
- Tighten container with filter element and gasket by screwing.



Caution

- Switch off the machine and protect the machine from re-start.
- Look for the right position of the gasket.



Chapt. 4, Figure 2: cleaning (part 2)

### Compressed-air filter

To clean the compressed-air filter (2) proceed as follows:

- Screw off container (draft down lock cap and turn left);
- Screw off filter element and clean with compressed air; supersede if necessary;
- Screw in filter element again;
- Clean container with water;
- Screw in container again (Caution for O-ring at the container!).



Warning

- Before beginning, the power, compressed-air and water connections are to be detached and the machine is to be depressurized.
- The machine must be protected from re-start.

## 5. Trouble-shooting

To find the reason for a possible trouble proceed as follows:

1. Find range affected by trouble; see headings (sections) printed in bold faces.
2. Possible trouble to be chosen from the left column.
3. Possible sources of troubles to be checked item by item at the machine.
4. If the answer to the first question is „yes“, the next item has to be checked until the answer to one question is „no“.
5. This cause for the trouble has to be eliminated now.

### 1. Connection of the machine

Possible trouble	Possible source of trouble
No voltage at the machine	<ul style="list-style-type: none"> <li>• Are the pole tongs at the connecting cable clean ?</li> <li>• Does main switch light up ?</li> <li>• Does LED at socket-outlet show green light ?</li> <li>• Is interlock of EMERGENCY-OFF-switch deactivated ?</li> </ul>
Compressed air escapes from the blasting nozzle	<ul style="list-style-type: none"> <li>• Is the ball valve „P“ for the compressed air control closed ?</li> </ul>
Compressed air escapes from the drain bell at the quick-stop	<ul style="list-style-type: none"> <li>• Is the ball valve „P“ for the compressed air control closed ?</li> <li>• Are the plugs in the actuating units quick-stop and compressed air o.k. ?</li> </ul>

### 2. Filling of the machine

Possible trouble	Possible source of trouble
Filling requires too much time	<ul style="list-style-type: none"> <li>• Is the abrasive dry ? (applicable only to machines without flushing equipment in the sieve top – 203 or 205)</li> <li>• Are the flushing nozzles in the sieve top actuated and does water penetrate from the nozzle ?</li> <li>• Is the blasting media granulate correct ?</li> </ul>
Vessel cannot be closed	<ul style="list-style-type: none"> <li>• Is the ball valve „P“ for the compressed air control closed ?</li> <li>• Has the vessel lock been relieved from blasting media ?</li> <li>• Is the rubber seal on the locking-plate o.k. ?</li> <li>• Has the handwheel „S“ been set on „D“ resp. on maximum value ?</li> <li>• Is the pressure control open ?</li> <li>• Has the overflow been closed ?</li> <li>• Do the proximity switches of the piston pump light up alternatingly ?</li> <li>• Is the locking stopper of the switching unit „blasting mixture“ o.k. ?</li> </ul>

### 3. Operation of the machine

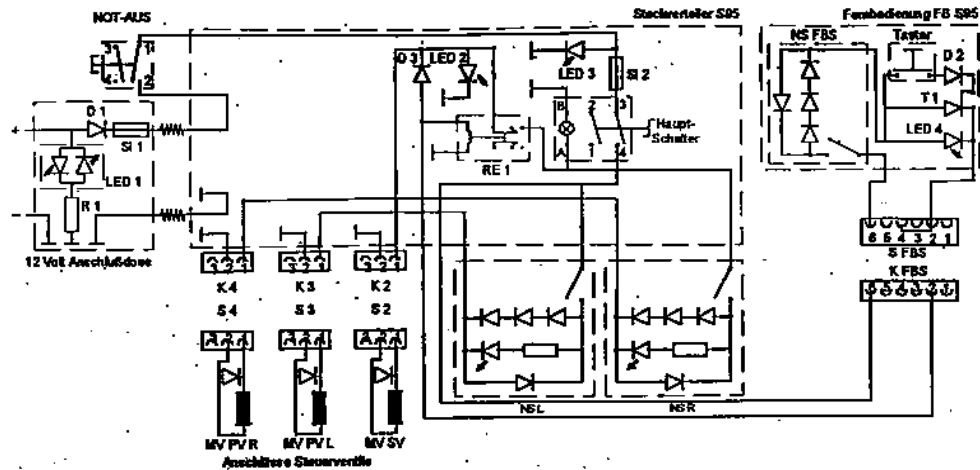
Possible trouble	Possible source of trouble
The blasting mixture does not regularly come out of the blasting nozzle	<ul style="list-style-type: none"> <li>• Has the blasting mixture got a sufficient percentage of superfines ?</li> <li>• Has the cross-section of the blasting hose and the nozzle diameter been chosen correctly ?</li> <li>• Is the interior of the blasting hoses and blasting nozzle free ?</li> <li>• Is the non-return valve in the pressure vessel o.k.?</li> </ul>
No blasting mixture comes out of the blasting nozzle	<ul style="list-style-type: none"> <li>• Has the machine been set for blasting ?</li> <li>• Is the blasting media fine enough ?</li> <li>• Does blasting mixture penetrate from the vessel, when the blasting mixture hose has been uncoupled ?</li> <li>• Does the switching unit "blasting mixture" open ?</li> <li>• Have the pneumatic hoses of the switching unit been checked ?</li> </ul>
The remote control does not work	<ul style="list-style-type: none"> <li>• Does the main switch light green ?</li> <li>• Are the extension cables of the remote control checked ?</li> <li>• Are the plugs at the control valves for the switching units checked ?</li> <li>• Are the coils at the control valves checked ?</li> <li>• Is the remote control checked ?</li> </ul>
Vessel opens during blasting process	<ul style="list-style-type: none"> <li>• Does the air pressure connected at the machine exceed 2 bar ?</li> <li>• Is the ball valve at the overflow closed and leak-proof ?</li> <li>• Is the filter element in the air filter controller checked and clean ?</li> <li>• Is the vessel locking plate at the vessel lock checked ?</li> <li>• Is the plug in the switching unit "blasting mixture" checked ?</li> <li>• Is the non-return valve in the vessel checked ?</li> </ul>
The safety valve „reacts“ more frequently	<ul style="list-style-type: none"> <li>• Is the connected water pressure (see manometer) less than 12 bar ?</li> <li>• Has the vessel pressure (see manometer) been set correctly (between 11 and 12 bar) ?</li> </ul>

## 6. Technical Data

### 6.1. General data

		<b>torbo® Micro JR</b>	<b>torbo® Junior</b>
Volume of vessel	l (dm <sup>3</sup> ) / Cu. ft	80 / 2,8	120 / 4,2
Vessel pressure (max.)	bar / PSI	12 / 170	12 / 170
Weight (empty)	kg lbs.	120 – 140 265 – 310	150 – 170 330 – 375
Dimensions (height x width x depth)	mm inches	1.080 x 550 x 780 42 x 22 x 30	1.290x880x780 51 x 37 x 31
Size Air-connection	mm / inches	19 / 3/4	25 / 1 38 / 1 1/2 (Option)
Air Connection (min. – max.)	m <sup>3</sup> /min Cu. ft. per min. bar PSI	2,0 – 4,5 70 – 160 4,0 – 8,0 56 – 115	2,0 – 7,0 70 – 250 4,0 – 10,0 56 – 140
Connected power	Volt / Watt	12 / 1,2	12 / 1,2
Pressurized water (min. - max.)	bar PSI	0,0 – 12 0,0 – 170	0,0 – 12 0,0 – 170
Connection blasting hose	mm / inches	32 / 1 1/4	32 / 1 1/4
Consumption of blasting media (min. – max.)	l/min cu. ft. per min.	0,32 – 2,4 0,01 – 0,08	0,48 – 4,8 0,02 – 0,17
Blasting time (100% period of use)	Std. / h	3,6 – 0,5	3,8 – 0,4
Average blasting time per filling	Std. / h	0,7	1,1
Standard blasting media mixture	Blasting media / water	80.% / 20 %	80 % / 20 %
Water consumption during blasting	l/min.. gals. per min.	0,08 – 0,6 0,02 – 0,15	0,12 – 1,2 0,03 – 0,30
Sieve top for: Dry blasting media Wet blasting media Fast filling device		Standard obtained not obtained	Standard obtained not obtained
At the remote control Safety magnetic-switch Function „blasting“ Function „cleaning“ Function „drying“		standard standard not obtained not obtained	standard Standard not obtained not obtained
At the machine Dosing for blasting media Function „additional water“ Setting for additional water Setting for cleaning water Switching blasting to cleaning Setting blasting pressure Setting vessel pressure Emergency-switch		standard obtained obtained not obtained obtained standard standard standard	standard obtained obtained not obtained obtained standard standard standard
Quick-stop (0 bar at the nozzle)	3 sec. per 100 m blasting hose	obtained	obtained
Safety air reserve tank		standard	standard
Filter for water and switching-air		standard	standard

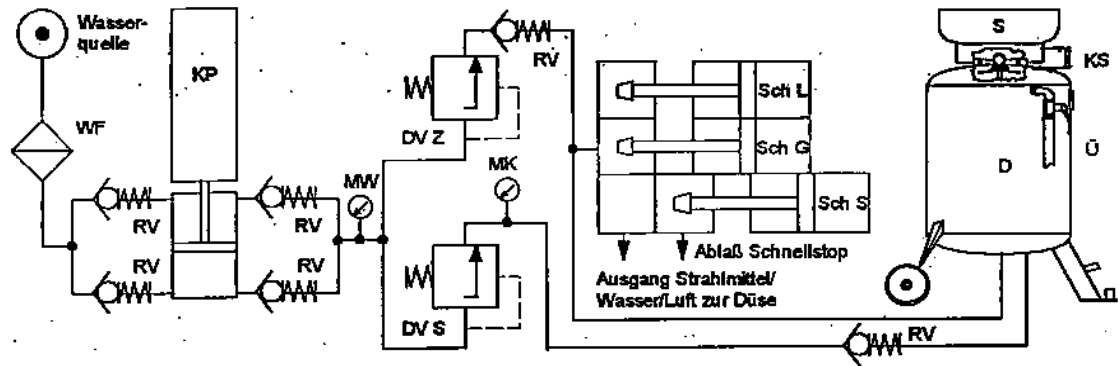
## 6.2. Wiring scheme



## Legend for wiring scheme

D 1	Diode 1 N 5400
D 2	Diode 1 N 4007
Hauptschalter	Main switch; 250 V AC, 5 A / with lamp (14 V, 1,12 W); IP 65
K FBS	Coupling, remote control FB S95; IP 65 in closed position according to DIN 40 050
K 2 – 4	Coupling control valve; IP 65
LED 1	LED (red/green), 4,5 V, 11 mA.
LED 2 + 3	LED (green), 12 V, 11 mA
MV PV L	Magnetic coil, control valve, piston pump, left; 12 V DC, 7,5 W, 0,62 A
MV PV R	Magnetic coil, control valve, piston pump, right; 12 V DC, 7,5 W, 0,62 A
MV SV	Magnetic coil, control valve, switching units; 12 V DC, 7,5 W, 0,62 A
NOT-AUS	Emergency-off; switch type RPV / KC / I; ICE 947 / EN 60 947 / VDE 0660 VI 500 V; IP 65
NS FBS	Proximity switch, remote control FB S95; 10 - 240 V DC/AC, max. 1A resp. 50 W / 50 VA
NS L	Proximity switch, piston pump, left; 10 - 240 V DC/AC, max. 1A resp. 50 W / 50 VA
NS R	Proximity switch, piston pump, right; 10 - 240 V DC/AC, max. 1A resp. 50 W / 50 VA
R 1	Resistor 560 Ohm, 1/4 W
RE 1	150 V DC/AC, 1,25 A, 30 W / 50 VA; relay, 2xUM
S FBS	Plug remote control FB S95; IP 65 in closed state acc. to DIN 40 050
S 2	Plug control valve (Plug at coil MV PV L, MV PV R resp. MV SV)
Si 1 – 2	Fuse, Poly-Switch, 50 V, $I_H = 1,6 A$ (= nominal current), $I_S = 2,4 A$
Taster	Push-button; 42 V, 100 mA (max. 3 VA); IEC 529
T 1	Thyristor C 106

### 6.3. Hydraulic (water) scheme

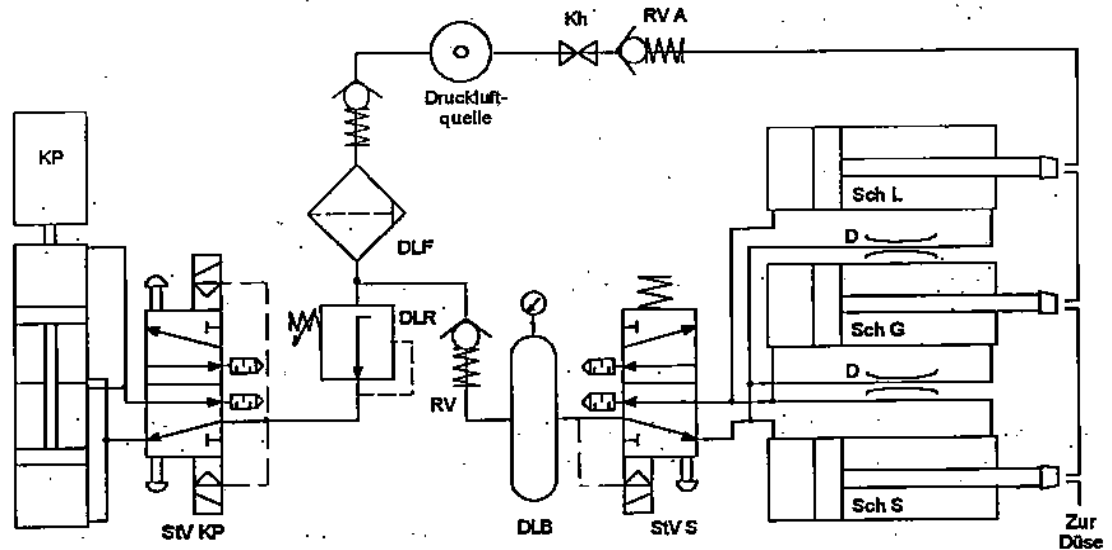


#### Legend for hydraulic (water) scheme

Ablaß Schnellstop	Drain quickstop
Ausgang Strahlmittel/ ...	Outlet blasting mixture, water, air to the nozzle
D	pressure vessel (vessel for blasting media and water)
DV S	Dosing valve – volume of blasting mixture
DV Z	Dosing valve – volume of water to be added
KP	Piston pump
KS	Vessel locker
MK	Gauge – vessel pressure
MW	Gauge – water admission pressure
RV	Non-return valve
Sch G	Switching unit – blasting mixture
Sch L	Switching unit – compressed air
Sch S	Switching unit – quick stop
Ü	Overflow
Wasserquelle	Water source
WF	Water filter



## 6.4. Pneumatic scheme



## Legend for Pneumatic

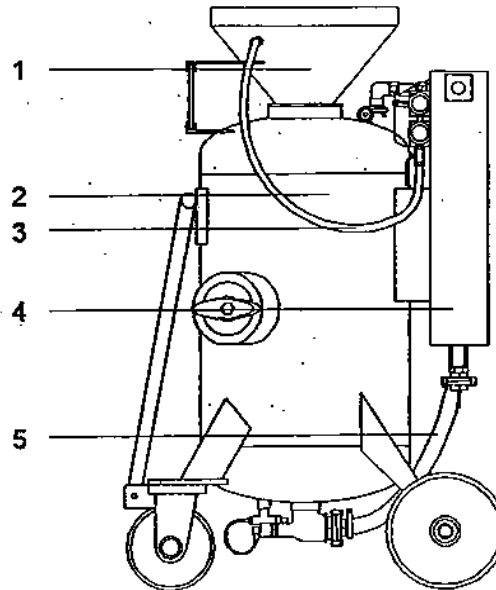
D	Throttle
DLB	Air reserve tank
DLF	Compressed air filter
DLR	Compressed air control
Druckluftquelle	Compressed air source
Kh	Shut-off valve
KP	Piston pump
RV	Non-return valve
RV A	Non-return valve for operating air (blasting air)
RV St	Non-return valve for control air
Sch G	Switching unit – blasting mixture
Sch L	Switching unit compressed air
Sch S	Switching unit quick stop
StV KP	5/3 port valve piston pump
StV S	5/3 port valve switching units
Zur Düse	To the nozzle

## 7. List of Spare Parts



- Listed articles with a denomination which is moved to the right side, are components of the respective articles mentioned before.

### 7.1. torbo® Micro JR / Junior

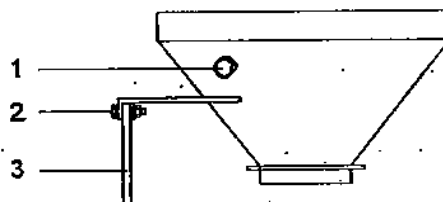


Item	Article	Denomination	Quantity
		torbo Micro JR torbo Junior	
1		Sieve top	look chap. 7.2.
2		Pressure vessel	look chap. 7.3.
3	21 568	Compressed water hose 3/4 – 1,8 m, compl. (for sieve top)	1
4		Control cabinet	look chap. 7.4.
5	21 055	Abrasive supply hose 19-660, compl.	1



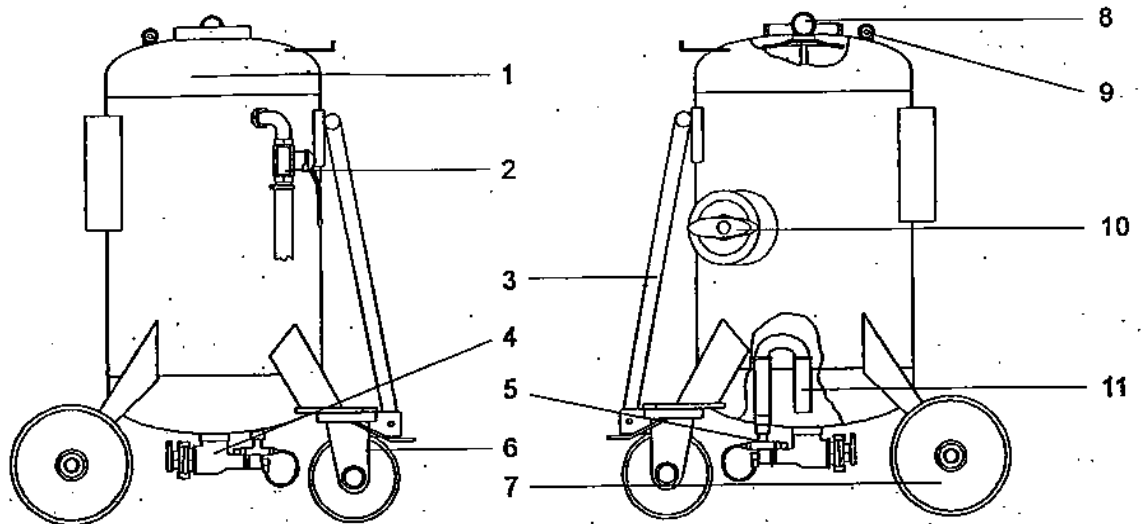
- Push-in's and pneumatic hoses, look chap. 7.6.

### 7.2. Sieve top S95



Item	Article	Denomination	Quantity
	21 149	Sieve top T95, compl. (torbo Micro JR)	
	21 294	Sieve top S95, compl. (torbo Junior)	
	21 295	Sieve top S95, compl. (with equipment (203) – water connection S95)	
1	21 296	Water connection, sieve top S95, compl.	1
	21 396	Rinsing nozzle 95	1
2	20 897	Fastening element 08-005	4+4

## 7.3. Pressure vessel (tank) 080 98 and 120 98

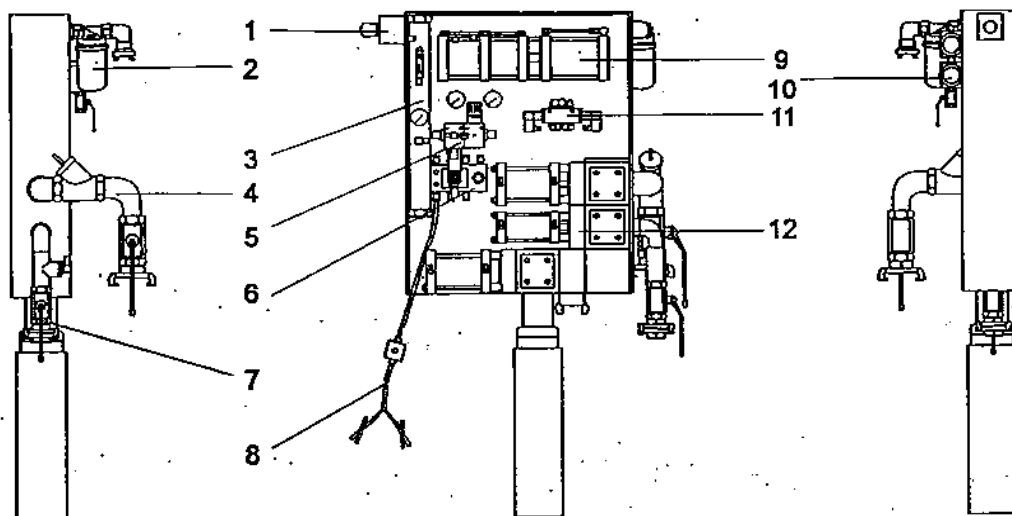


Item	Article	Denomination	Quantity
	21 089	Pressure vessel 080 98, compl. (torbo Micro JR)	
	21 533	Pressure vessel 120 98, compl. (torbo Junior)	
1	21 090	Pressure vessel 080 98, galvanized, powdercoated (torbo Micro JR)	1
	21 534	Pressure vessel 120 98, galvanized, powdercoated (torbo Junior)	1
2	21 057	Overflow 95 (part 1 – outside), compl.	1
	20 623	Handle, ball valve 1 1/2	
	20 647	Overflow 95 (part 2 – inside), compl.	1
3a	20 666	Tow bar 95, pressure vessel, compl. (torbo Micro JR)	1
	21 380	Fastening element AX-002	1
3b	21 535	Tow bar 98, pressure vessel, compl. (torbo Junior)	1
	21 388	Fastening element 10-001	1
4	20 529	Abrasive outlet, pressure vessel, compl.	1
	20 299	Non-return valve TEK 12-34 95	1
	20 201	Water-coupling (NW 40 mm) 1 1/2, M-thread	1
	20 684	Gasket, compressed water coupling (NW 40 mm)	1
5	20 650	Water feeding pipe 95, compl. (torbo Junior)	1
	20 228	Nozzle 1/8	1
6	20 328	Solid-rubber tire with brake and fastening elements (only torbo Junior)	2
7	20 315	Solid-rubber tire d=280 mm with fastening elements	2
8	20 636	Vessel sealing, compl.	1
	20 316	Gasket with stainless bottom, vessel sealing plate (155 mm)	1
9	20 582	Pressure relief valve, pressure vessel, compl.	1
	20 180	Safety valve 3/4 – 12 bar, M-thread	1
	20 242	Sieve, pressure relief valve	1
10	21 536	Vessel closure (lock)	1
11	20 638	Internal water, compl. (inside vessel)	1
	20 299	Non-return valve TEK 12-34 95	1



• If you need more detailed information, please ask your dealer !

## 7.4. Control cabinet (part 1 from 3)

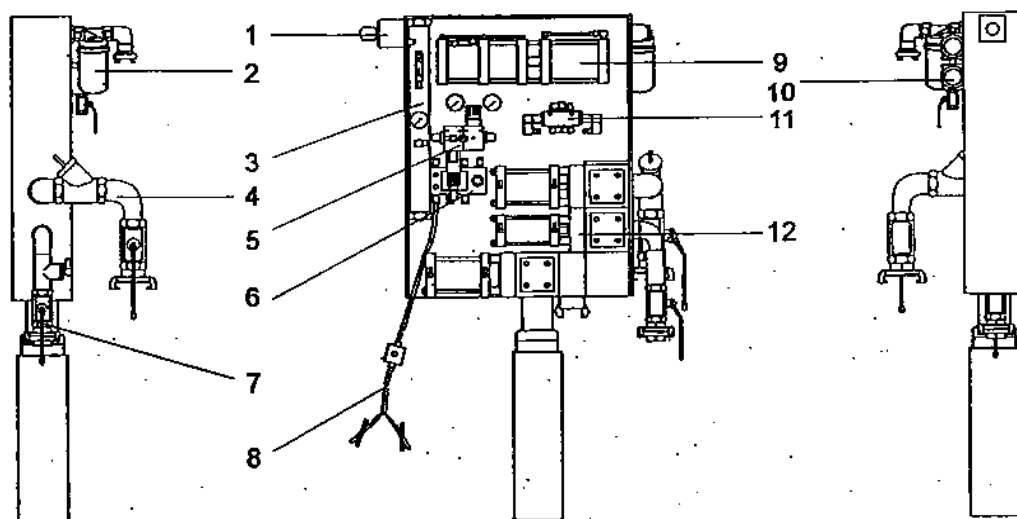


Item	Article	Denomination	Quantity
		Control cabinet torbo Micro JR Control cabinet torbo Junior	
1	21 141	EMERGENCY-OFF-SWITCH, compl.	1
	21 301	EMERGENCY-OFF-SWITCH	1
	21 302	Fastening element 04-003	2
2	21 537	Water connection 98, compl.	1
	20 187	Filter, water supply 1, F-thread, fine	1
	20 603	Filter, waterfilter 1, fine	1
	20 627	Container, waterfilter 1, fine	1
	20 629	Gasket, waterfilter 1, fine	1
3	20 774	Flask, reserve air J95, compl.	1
	20 775	Flask, reserve air J95	1
	20 211	Non-return valve 1/4, M-thread	1
	20 208	Gauge (16 bar/230 PSI) 1/8-40, M-thread (Connection in the back)	1
	20 193	Semi-Automatic valve 1/8, M-thread	1
4a	20 649	Compressed air connection and regulation J95 – 1	1
	20 982	Non-return valve 1, F-thread	1
	21 538	Gasket, non-return valve 1	1
	20 863	Ball valve 1, F-thread	1
	21 231	Handle, ball valve 1 (blue)	1
4b	21 540	Compressed air connection and regulation J98 – 1 1/2 (only possible at machines with equipment 423)	1
	20 212	Non-return valve 1 1/2, F-thread	1
	21 531	Gasket, non-return valve 1 1/2	1
	20 335	Ball valve 1 1/2, F-thread	1
	20 623	Handle, ball valve 1 1/2 (blue)	1



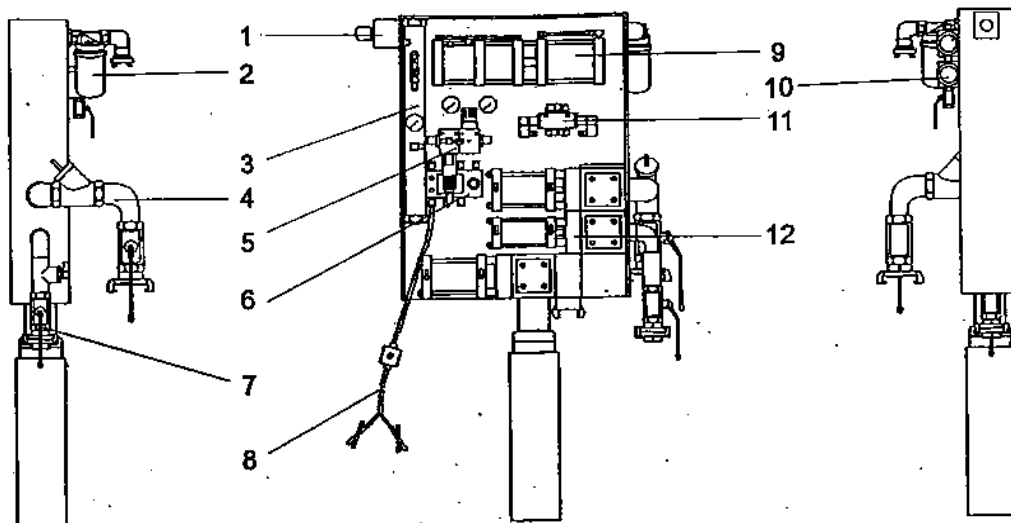
• If you need more detailed information, please ask your dealer!

## 7.4. Control cabinet (part 2 from 3)



Item	Article	Denomination	Quantity	
5	20 640	Airfilter/controller FR3895-J95, compl.	1	
	20 793	Distancer, airfilter/controller FR3895	1	
	21 391	Fastening element 04-002	2	
	20 192	Airfilter/controller FR3895	1	
	21 239	Air-control-element, airfilter/controller FR3895, compl.	1	
	21 506	Replacement set, air-control-element FR3895	1	
	21 224	Air-filter-element, airfilter/controller FR3895, compl.	1	
	21 306	Filter insert 40 µm, airfilter/controller FR3895, compl.	1	
	20 532	Filter insert 40 µm, airfilter/controller FR3895	1	
	20 958	Nut, airfilter/controller FR3895 (inside)	1	
	20 959	Screw, airfilter/controller FR3895 (inside)	1	
	20 613	Container, airfilter/controller FR3895, compl.	1	
	21 307	Semi-Automatic valve, airfilter/controller FR3895, compl.	1	
	20 957	Float, airfilter/controller FR3895	1	
	6	21 539	Powerbox J98, compl. (incl. Item 8)	1
		21 400	Fastening element 06-003	2
21 350		Casing, Powerbox J95 and J98, compl. (incl. screwings with strain relief)	1	
20 451		Screwing with strain relief PG 7	5	
21 136		Screwing with strain relief PG 9	2	
20 443		Micro switch (for piston pump)	2	
21 547		Coupling with LED and cable, port valve 98	3	
21 138		Mount-on coupling FB-S95 (F)	1	
21 124		LED 95 (green)	2	
20 455		Mainswitch 95 with protective hood and ring, compl.	1	
21 333		Mainswitch 95	1	
21 364		Cap (green), mainswitch 95	1	
21 365		Bulb (white), mainswitch 95	1	
21 244		Protective hood, mainswitch 95	1	
21 366		Ring, mainswitch 95	1	
7a		20 652	Connection S, switching unit S5095	1
7b	21 075	Connection S, switching unit S5095 / switching ZW (only possible at machines with equipment 511)	1	
	20 204	Ball valve 3/4, F-thread	1	
	21 130	Handle, ball valve 3/4 (blue)	1	
	20 198	Water-coupling (NW 40 mm), 3/4, M-thread	1	
	20 684	Gasket, compressed water couplina (NW 40 mm)	1	

## 7.4. Control cabinet (part 3 from 3)

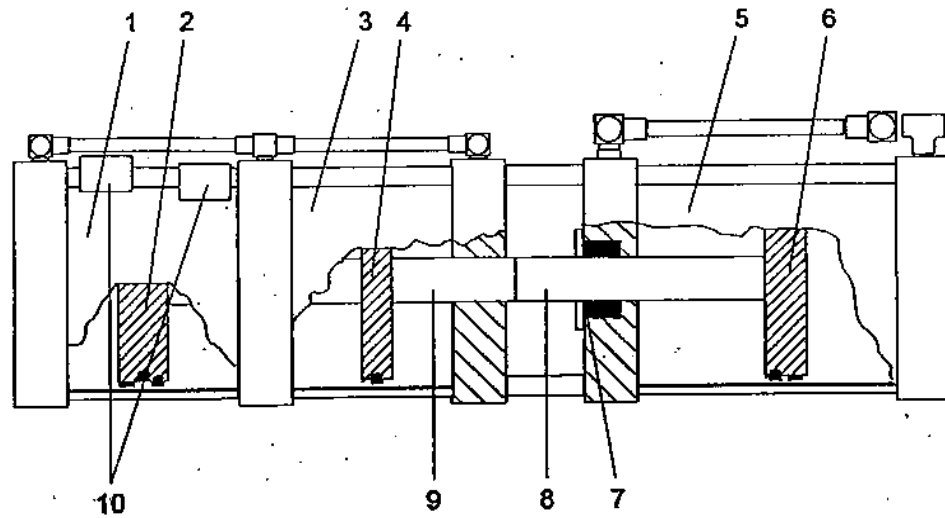


Item	Article	Denomination	Quantity
8	20 511	Socket with cable and pole tongs, 12,5 m	
	21 135	Socket with pole tongs	1
	21 125	LED 95 (red/green)	1
	20 683	Pole tongs, red	1
	20 682	Pole tongs, black	1
	21 142	Fuse (Poly-Switch) 50 Volt/1,6 A (inside socket)	1
	21 134	Cable 2x1 – 12,5 m	1
	21 136	Screwing with strain relief PG 9	2
9		Piston pump 3K/080/D, compl.	look chap. 7.4.1.
10		Dosing equipment	look chap. 7.4.2.
11		Port valves	
	21 393	Fastening element 04-005	2
		Port valve (valve in front – for switching units)	1
	21 543	Port valve 98-1/8-1	1
	21 546	Magnetic tape, port valve 98	1
	21 547	Plug, port valve 98	1
	20 225	Noise suppression 1/8	2
	21 542	Port valve 98-3K/080. (valve in back – for piston pump)	1
	21 544	Port valve 98-1/8-1	1
	21 546	Magnetic tape, port valve 98	1
	21 547	Plug, port valve 98	1
20 225	Noise suppression 1/8	2	
12		Switching units	look chap. 7.4.3.



• If you need more detailed information, please ask your dealer!

## 7.4.1. Piston pump

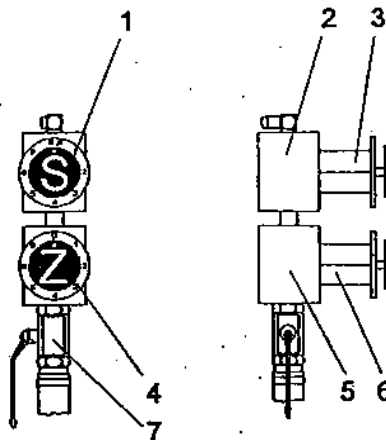


Item	Article	Denomination	Quantity
	20 730	Piston pump 3K/080/D, compl.	
	20 732	Exchange piston pump 3K/080/D	
1	21 439	Cylinder 3K/080/D (L), compl.	1
	20 716	Cylinder 3K/080/D (L)	1
	20 185	Gasket TEK 08095	2
2	21 252	Piston 3K/080/D (L), compl.	1
	20 713	Piston 3K/080/D (L)	1
	20 734	Gasket 80x64,5x6,3	1
	20 386	Magnetic tape 6x6 – 240 mm	1
	21 218	Guiding band 8x1,5 – 1.000 mm	0,25
3	21 440	Cylinder 3K/080/D (LM), compl.	1
	20 715	Cylinder 3K/080/D (LM)	1
	20 185	Gasket TEK 08095	2
4	21 253	Piston 3K/080/D (LM), compl.	1
	20 712	Piston 3K/080/D (LM)	1
	20 734	Gasket 80x64,5x6,3	1
5	21 441	Cylinder 3K/080/D (W), compl.	1
	20 717	Cylinder 3K/080/D (W)	1
	20 185	Gasket TEK 08095	2
6	21 254	Piston 3K/080/D (W), compl.	1
	20 714	Piston 3K/080/D (W)	1
	20 734	Gasket 80x64,5x6,3	1
	21 218	Guiding band 8x1,5 – 1.000 mm	0,25
7	20 181	Gasket 20x30x18,5	1
8	20 728	Piston rod 3K/08/D (W), compl.	1
9	20 727	Piston rod 3K/080/D (L), compl.	1
10	20 444	Bracket, micro switch 95	2



• If you need more detailed information, please ask your dealer !

## 7.4.2. Dosing elements



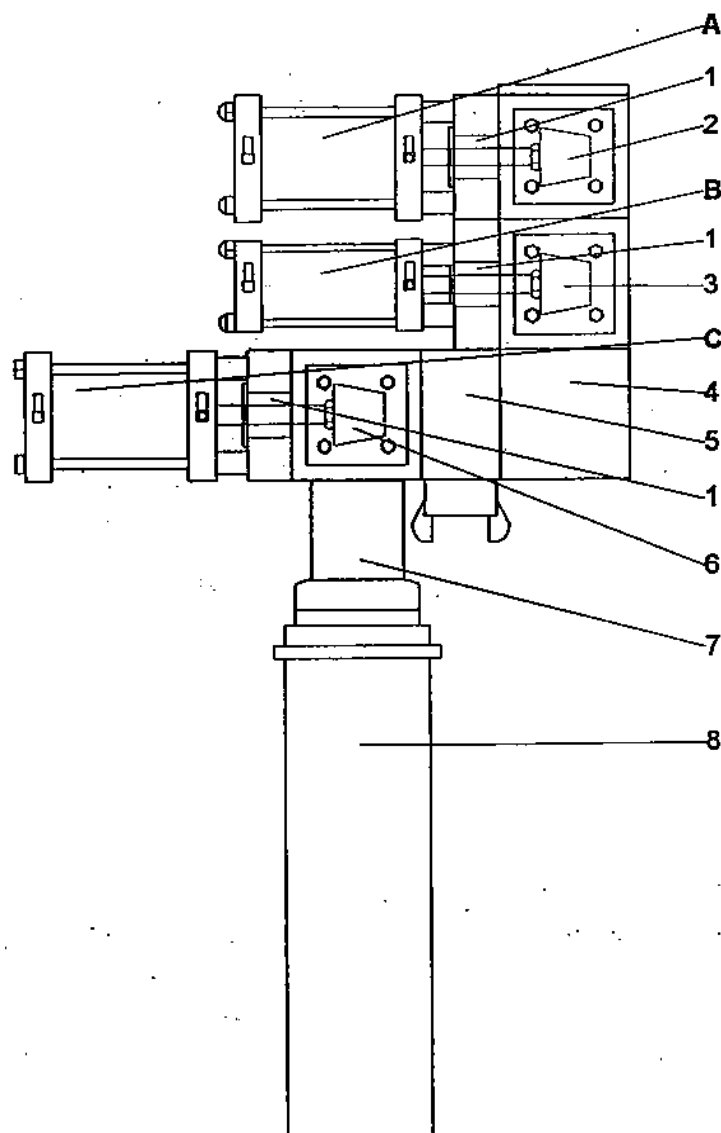
Item	Article	Denomination	Quantity
1	21 578	Dosing valve 6S98, compl.	1
	20 662	Insert, dosing valve 6S95, compl.	1
2	21 581	Block, dosing valve 98	1
3	20 662	Insert, dosing valve 6S95, compl.	1
4	21 579	Dosing valve Z98, compl.	1
	20 679	Insert, dosing valve Z95, compl.	1
5	21 581	Block, dosing valve 98	1
6	20 679	Insert, dosing valve Z95, compl.	1
7	20 202	Ball valve 3/8, F/M-thread	1
	21 129	Handle, ball valve 3/8 (blue)	1



• If you need more detailed information, please ask your dealer !



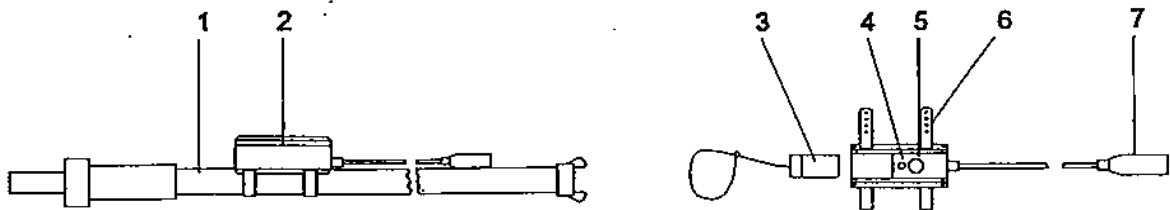
## 7.4.3. Switching units



Item	Article	Denomination	Quantity
A	20 333	Switching unit D5095, compl. (without equipment (423) 1 1/2 air connection)	1
	20 356	Switching unit D8095, compl. (with equipment (423) – 1 1/2 air connection)	1
1	20 181	Gasket 20 x 30 x 18,5	1
2	20 658	Locking stopper DS5095, compl. (without equipment (423))	1
	20 656	Locking stopper D8095, compl. (with equipment (423))	1
B	20 624	Switching unit S5095, compl.	1
1	20 181	Gasket 20 x 30 x 18,5	1
3	20 658	Locking stopper DS5095, compl.	1
C	20 626	Switching unit QS8095, compl. (with equipment (411) – torbo-quick-stop)	1
1	20 181	Gasket 20 x 30 x 18,5	1
4	20 245	Mainblock QS8095 (2)	1
5	21 291	Mainblock QS8095 (1), compl. (with coupling)	1
	20 607	Gasket, blasting coupling (NW 42 mm), 11 mm	2
	21 482	Gasket, blasting coupling (NW 42 mm), 20 mm	2
6	20 659	Locking stopper QS8095, compl.	1
7	21 000	Drain block QS8095 (block with drain bell)	1
8	20 242	Drain base QS8095, compl.	1

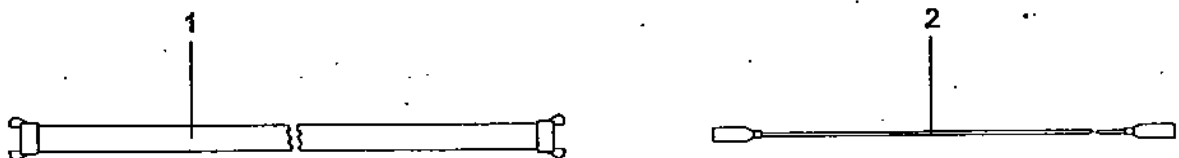
## 7.5. Standard accessories

### 7.5.1. Remote control and blasting lance



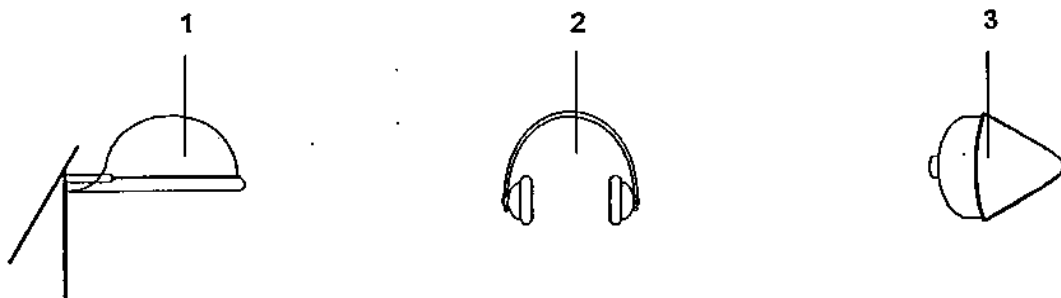
Item	Article	Denomination	Quantity
1		2,5 m blasting lance with nozzle holder and coupling	1
		13/7 – Article 21 184	19/7 - Article 21 185
		25/7 – Article 21 186	32/8 - Article 21 187
		Laval-nozzle	1
		6 mm – Article 21 179	8 mm – Article 21 180
		10 mm – Article 21 181	12 mm – Article 21 182
		14 mm – Article 21 183	16 mm – Article 20 528
		Nozzle holder for blasting hoses	1
		13/7 – Article 20 627	19/7 – Article 20 680
		25/7 – Article 20 429	32/8 – Article 20 610
		Blasting couplings (NW 42 mm)	2
		13/7 – Article 21 127	19/7 – Article 20 681
	25/7 – Article 20 435	32/8 – Article 20 583	
	20 607	Gasket, blasting coupling (NW 42 mm), 11 mm	
	21 482	Gasket, blasting coupling (NW 42 mm), 20 mm	
2	21 118	Remote control FB S95, compl.	1
3	20 184	Magnet with lanyard	
4	21 124	LED 95 (green)	
5	21 123	Switch with protective hood FB 95, compl.	
6	20 447	Belt, nylon, with buckle	
7	21 120	Plug FB S95 with strain relief	

### 7.5.2. Extension cable and blasting hoses



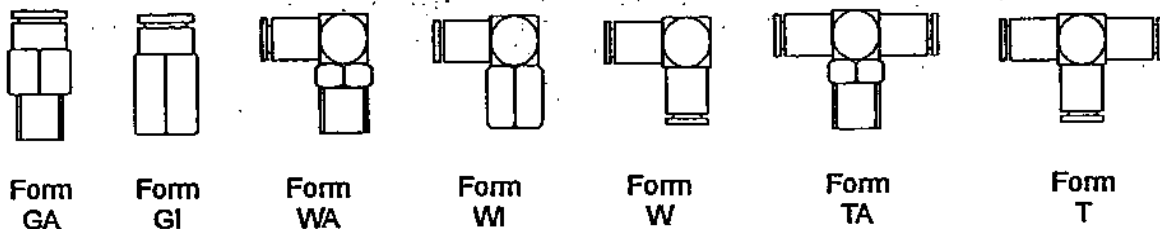
Item	Article	Denomination	Quantity
1		20 m blasting hoses with couplings	
		13/7 – Article 20 918	19/7 – Article 20479
		25/7 – Article 20 478	32/8 – Article 20 477
		Coupling for blasting hoses	
		13/7 – Article 21 128	19/7 – Article 21 128
		25/7 – Article 20 435	32/8 – Article 20 583
	20 607	Gasket, blasting coupling (NW 42 mm), 11 mm	
	21 482	Gasket, blasting coupling (NW 42 mm), 20 mm	
2	21 121	Cable FB S95 – 25 m (with plug/M and plug/F)	
	21 047	Mount-on coupling (male) FB S95 with strain relief	
	21 120	Plug (female) FB S95 with strain relief	
	20 583	Cable FB S95 – 25 m (without plug)	

## 7.5.3. Safety equipment



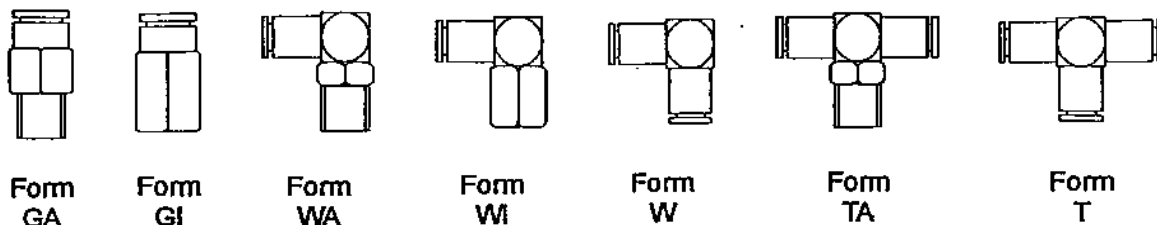
Item	Article	Denomination	Quantity
1	20 278	Helmet with double facial protection, compl.	1
	20 189	Helmet	1
	20 178	Bucket for protective panes	1
	20 179	Protective pane with wire cloth reinforcement	1
	20 247	Protective pane without wire cloth reinforcement	1
2	20 188	Capsule-type hearing protection	1
3	20 347	Micro-dust mask P2	1

## 7.6. Push-In's and pneumatic hoses (part 1 from 3)



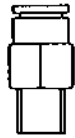
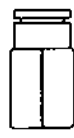
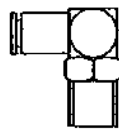
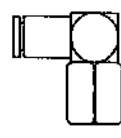
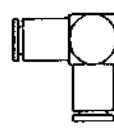
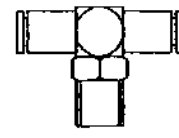
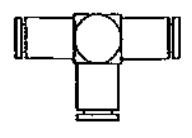
Item	Article	Denomination
		Push-In's, Form GA (straight, M-thread)
	21 550	M5-04 (thread – hose)
	21 147	1/8-05 (thread – hose)
	20 129	1/8-06 (thread – hose)
	20 428	1/8-08 (thread – hose)
	20 873	1/4-06 (thread – hose)
	20 128	1/4-08 (thread – hose)
	20 285	1/4-10 (thread – hose)
	21 552	1/4-08/06 (thread – hose)
	21 553	1/4-10/08 (thread – hose)
	20 872	3/8-08 (thread – hose)
	20 130	3/8-10 (thread – hose)
	20 820	3/8-12 (thread – hose)

## 7.6. Push-In's and pneumatic hoses (part 2 from 3)



Item	Article	Denomination
		<b>Push-In's, Form GI (straight – F-thread)</b>
	21 554	M5-04 (thread – hose)
	21 555	M5-05 (thread – hose)
	21 146	1/8-06 (thread – hose)
	21 560	1/8-08 (thread – hose)
	20 777	1/4-06 (thread – hose)
	20 131	1/4-08 (thread – hose)
	21556	1/4-10 (thread – hose)
	20 398	1/4-10/08 (thread – hose)
	21 557	3/8-10 (thread – hose)
	21 558	3/8-12 (thread – hose)
		<b>Push-In's, Form WA (elbow, M-thread)</b>
	20 739	M5-04 (thread – hose)
	21 411	M5-05 (thread – hose)
	21 148	1/8-05 (thread – hose)
	20 134	1/8-06 (thread – hose)
	20 135	1/8-08 (thread – hose)
	20 874	1/8-10 (thread – hose)
	20 288	1/4-06 (thread – hose)
	20 136	1/4-08 (thread – hose)
	20 137	1/4-10 (thread – hose)
	20 853	1/4-08/06 (thread – hose)
	20 854	1/4-10/08 (thread – hose)
	20 802	3/8-08 (thread – hose)
	20 566	3/8-10 (thread – hose)
	20 819	3/8-12 (thread – hose)
		<b>Push-In's, Form WI (elbow, F-thread)</b>
	20 855	1/8-06 (thread – hose)
	20 852	1/8-08 (thread – hose)
	20 143	1/4-06 (thread – hose)
	21 559	1/4-08 (thread – hose)
	20 439	1/4-10 (thread – hose)
	20 142	3/8-10 (thread – hose)
		<b>Push-In's, Form W (elbow)</b>
	20 817	06 (hose – hose)
	21 225	08 (hose – hose)
	20 818	10 (hose – hose)
		<b>Push-In's, Form TA (T-fitting, M-thread)</b>
	21 410	M5-05 (thread – hose – hose)
	20 292	1/8-06 (thread – hose – hose)
	20 380	1/8-08 (thread – hose – hose)
	20 856	1/4-06 (thread – hose – hose)
	21 561	1/4-08 (thread – hose – hose)
	20 396	1/4-10 (thread – hose – hose)
	21 562	3/8-08 (thread – hose – hose)
	21 563	3/8-10 (thread – hose – hose)

## 7.6. Push-In's and pneumatic hoses (part 3 from 3)

Form  
GAForm  
GIForm  
WAForm  
WIForm  
WForm  
TAForm  
T

Item	Article	Denomination
		<b>Push-In's, Form T (T-fitting)</b>
	20 742	06 (hose – hose – hose)
	20 602	08 (hose – hose – hose)
	20 741	10 (hose – hose – hose)
	21 564	Hose 04x0,75 – 1.000 mm, PA-nature
	21 565	Hose 04x1 – 1.000 mm, PA-nature
	21 010	Hose 05x1 – 1.000 mm, PA-nature
	21 014	Hose 06x1 – 1.000 mm, PA-nature
	21 015	Hose 06x1 – 2.000 mm, PA-nature
	21 016	Hose 06x1 – 5.000 mm, PA-nature
	21 018	Hose 08x1 – 1.000 mm, PA-nature
	21 032	Hose 08x1 – 1.000 mm, PA-yellow
	21 033	Hose 08x1 – 2.000 mm, PA-yellow
	21 019	Hose 08x1 – 2.000 mm, PA-nature
	21 020	Hose 08x1 – 5.000 mm, PA-nature
	21 022	Hose 10x1 – 1.000 mm, PA-nature
	21 023	Hose 10x1 – 2.000 mm, PA-nature
	21 024	Hose 10x1 – 5.000 mm, PA-nature

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