DKXN 1,00
Twin-Shaft Batch Mixer

Customer Documentation
B-32385-100-01

TRANSFORMING
MATERIALS
INTO VALUE

BHS-Sonthofen GmbH
An der Eisenschmelze 47
D-87527 Sonthofen

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Picture similar

Material / Material **902037008**
Description / Beschreibung **COVER SHEET KD B-32385-100-01**
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Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	902001099	OPERATING INSTRUCTIONS WITHOUT CE BEDIENUNGSANLEITUNG OHNE CE	1,000	ST
2	902035407	TECHNICAL DOCUMENTS TECHNISCHE UNTERLAGEN	1,000	ST
3	902037012	SPARE PARTS LIST ERSATZTEILLISTE	1,000	ST

Deckblatt
Cover page

DKX

BHS Nummer BHS Number	902001099
Beschreibung Description	BEDIENUNGSANLEITUNG OHNE CE OPERATING INSTRUCTIONS WITHOUT CE

Material / Material **902001099**
Description / Beschreibung **OPERATING INSTRUCTIONS**
BEDIENUNGSANLEITUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	900359300	USER INFORMATION BETREIBERINFORMATION	1,000	ST
2	900359400	SAFETY INSTRUCTIONS GENERAL SICHERHEITSHINWEISE ALLGEMEIN	1,000	ST
3	900369400	SUPPLY/INTERM. STORAGE LIEFERUNG/ZWISCHENLAG.	1,000	ST
4	900359700	MACHINE DESCRIPTION MASCHINENBESCHREIBUNG	1,000	ST
5	900359800	ASSEMBLY/ELECTR.CONNECTION MONTAGE/ELEKTROANSCHLUSS	1,000	ST
6	900359900	COMMISSIONING/OPERATION INBETRIEBNAHME/BETRIEB	1,000	ST
7	900360100	MAINTENANCE/INSPECTION WARTUNG/INSPEKTION	1,000	ST
8	900401500	LUBRICATION SCHMIERUNG	1,000	ST
9	900360500	MAINTENANCE INSTANDHALTUNG	1,000	ST

Edition: 08/2015

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BHS SONTHOFEN

Information for User

Operating Instructions

BHS SONTHOFEN

Machines and Plants

BHS-Sonthofen GmbH ◆ An der Eisenschmelze 47 ◆ D-87527 Sonthofen
Spare Parts: Phone +49 8321 6099 144 - 146 ◆ Fax +49 8321 6099 120

1. Instruction to Owner and Operators

- **Employ only**

- **instructed**
- **trained**
- **reliable**

  personnel for operation, maintenance and repair.

- **The operating instructions belong into the hands of the operating and maintenance personnel. The instructions contain important information the knowledge of which is indispensable for the operating and maintenance personnel to prevent maloperation, errors and portentous omissions.**

- Ask the operating and maintenance personnel to confirm that they will apply and observe the operating, maintenance and safety instructions.

- Use the machine/plant only for the proper use specified by the manufacturer.

2. Guarantee and Liability

► As a matter of principle, our "General Terms and Conditions for Sale and Delivery" shall apply, which have been sent to you on conclusion of the contract, at the latest.

► Claims for guarantee and liability for damage to people and property are excluded when they can be attributed to the following causes:

- Operation of the machine/plant with defective safety devices or removed safety and protective devices.
- Improper intermediate storage, erection, starting, and operation of the machine/plant.
- Professionally improper operation and maintenance of the machine/plant.
- Improper use of the machine/plant.
- Faulty feeding and discharge conditions.
- Unauthorized structural changes on the machine/plant.
- Unauthorized change of the driving conditions (power and speed).
- Poor surveillance of the parts which are subject to wear.
- Cases of disaster through influences of foreign bodies and force majeure.
- Professionally improper repair under your own responsibility.
- Use of spare parts which are not of BHS original.

3. Copyright

- The copyright in the Operating Instructions remains with the manufacturer of the machine/plant.
- These operating instructions are destined for operating, maintenance, monitoring, and repair personnel.
- The instructions include specifications and technical documentation which must not be reproduced, distributed, used for purposes of competition or handed over to any third party, neither completely nor partially, without authorization.
- Infringements may be prosecuted.

Edition: 08/15

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BHS SONTHOFEN

General Safety Instructions

Operating Instructions

BHS SONTHOFEN

Machines and Plants

BHS-Sonthofen GmbH An der Eisenschmelze 46 ◆ 87527 Sonthofen

BHS SONTHOFEN

General Safety Instructions

Operating Instructions

BHS SONTHOFEN

Machines and Plants

1. Basic Safety Requirements

1.1 Scope of application

These safety requirements generally apply for intended and specified use of machines by BHS. Descriptions and instructions apply to the standard designs. Special designs not covered in this chapter are subject to the general information of this installation and assembly instructions as well as all and any additionally supplied documentation.

1.1.1 Notes concerning ATEX Directive

The operating manual contains additional chapters concerning the Directive which shall be observed if the machine was ordered in accordance to ATEX. This is stated in the specifications.

1.2 Notes regarding personnel

- **Persons who are responsible for the**

- operation
- maintenance
- repair
- assembly

of the machine/plant have to

- read and observe the safety instructions carefully
- use safety equipment
- execute safety-technical requirements.
- know and observe the customer documentation.

- Not only the general safety information of this chapter but also respective specific safety information of the other chapters of this operating manual shall be observed.
- The technical documentation cannot cover all details of possible arrangement, equipment and production methods.
- For this reason it is recommended to contact a specialist of BHS customer service for planning, installation, commissioning and maintenance.

2. *Warning* Notes and Warning Signs

2.1 Markings in the Operating Instructions

► In these operating instructions all regulations, rules, and instructions concerning safety have been marked by warning signs and in addition by headings such as "**NOTE!**", "**ATTENTION!**", or "**DANGER!**".

► **NOTE!**
this heading refers to operating and maintenance instructions which must absolutely be followed and observed.

► **ATTENTION!**
indicates operating and maintenance procedures which must be strictly adhered to in order to prevent damage to and destruction of the machine/plant and other property.

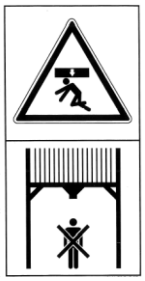
► **DANGER!**
indicates operating and maintenance procedures which must be strictly adhered to in order to protect life and limb of persons.

2.2 Markings on BHS machines and equipment

2.2.1 Prohibitory signs

► No access for unauthorized persons!

2.2.2 Warning signs



► Keep away from loading area!

CATION
HAZARDOUS AREA !

AUTHORIZED PERSONNEL ONLY

Unauthorized Persons

Keep out

Authorized personnel only

► Falling hazard!

► Risk of getting pinched!

► Slippery surface!

► Warning of hand injuries!

► Warning of suspended loads!

2.2.3 Signs giving orders

► Wear safety harness!

► Wear hearing protectors!

► Wear protective helmet!

3. Use of the ***Machine***/Plant

3.1 Proper Use

► The machine/plant may be used for its intended purpose only! The proper use of the machine/plant has been clearly stated in

- the group “Machine description”
- the Technical Specification.
- the Order Acknowledgement

Any other use, or any use beyond those specifications, is regarded as improper use. The manufacturer will not be liable for any damage involved. The risk will be solely with the operator.

The proper use also includes adhering to the operating instructions, and the inspection and maintenance instructions.

► The machine/plant shall be used in technically perfect condition only; be always aware of safety and danger!

3.2 Improper Use

► It is dangerous and not allowed to use the machine/plant improperly and not to specification.

► The machine/plant will not be reliable if it is not serviced to the maintenance instructions, or if it is not serviced at all.

► The machine/plant must not be operated by unauthorized personnel!

3.3 Dangers and Troubles

► The machine/plant has been manufactured according to the state of the art and the recognized safety regulations. Nevertheless, its use may cause danger for life and limb of its operator or other persons, or can cause damage to the machine/plant and other property.

► Malfunctions in the machine/plant which may affect the safety must be eliminated immediately!

4. Organizational Measures

4.1 Operating Instructions

- One copy of the operating instructions must always be kept ready on hand at the site.

- **NOTE!**
  The personnel working at the machine/plant must

  know the operating instructions in particular the chapters concerning safety

  During work it will be too late.

  This applies especially to personnel working only occasionally at the machine/plant, e.g. for maintenance and repair work.

4.2 Supplements to the Operating Instructions

- Observe the generally valid safety regulations and provisions of the competent trade association, and other obligatory regulations for accident prevention and environmental protection.
- Such responsibilities can also concern e.g. the handling of dangerous materials or the availability and use of protective equipment, as well as road traffic regulations
- Observe the regulations concerning special company conditions, including responsibilities for supervision and notification, e.g. with regard to organization of work, working sequences, and personnel employed.
- Make sure that the dates for possible recurrent safety checks of the machine/plant components by experts of technical surveillance association, trade association, or other authorities will be observed.

4.3 Working in Compliance with Safety Regulations

► The machine/plant must always be operated in its proper condition and for its proper use as specified.

► Mind all safety and danger indications at the machine/plant and keep them all in legible condition! For example:

- warning and instruction signs
- rotational direction arrow on the motor
- type label

► If necessary or specified by regulations, your personnel must wear personal safety clothing, or use protective equipment, during maintenance and repair work.

► The personnel must not wear loose and long hair, loose clothing, or jewelry (including rings). There will be danger of injury by being pulled in or getting caught!

► When carrying out maintenance work, an adequate tooling equipment is absolutely necessary!

4.4 Unauthorized Modifications

► Should the operational behavior change power down the machine and installation and report fault to the responsible office/person!

► Any modifications, attachments and conversions on the machine/plant which may affect the safety and function must not be made!

► Any changes of program (software) for programmable control functions on the machine/plant are permitted only after approval by the manufacturer!

5. Personnel Requirements

5.1 Selection and Qualification

- Work on/with the machine/plant must be made by reliable personnel only. Mind the legal minimum age! Make sure that only instructed personnel will work at the machine/plant.
- Employ only trained and instructed personnel and clearly define the responsibilities of the personnel for operation, set-up and shut-down, maintenance, and repair!
- Authorities, responsibilities, and the supervision of the personnel need to be precisely determined by the operator. In case the personnel does not have the necessary knowledge, they need to be instructed and trained. This can be done if necessary on behalf of the operator of the machine by the manufacturer/supplier.
- Furthermore the operator must make sure that the contents of the operating manual are fully understood by the personnel.
- Personnel just being trained, instructed or generally educated may work at the machine/plant only under the constant supervision of an experienced person!
- We recommend that the support and services offered by BHS technicians be called upon for planning, assembly, commissioning, and service tasks.

- **NOTE!**
  The instructions of this operating manual are not training materials and cannot replace training and professional experience required for these tasks!
  If required qualification (completed professional education as engineering fitter-machinist in accordance to German standards and several years of professional experience) cannot be met, it is recommended to entrust the manufacturer of the machine with the required duties.

- **NOTE!**
  Maintenance and repair work on electrical, mechanical, hydraulic and pneumatic equipment at the machine/plant shall be carried out only by a qualified expert having special knowledge and experience in the respective field and working in accordance with the existing regulations.

5.2 Responsibility for operation

► Define the responsibility of the machine/plant foreman, also with regard to road traffic regulations, and enable him to refuse the instructions of any third person if those instructions are contradictory to safety.

5.3 Responsibility for assembly

► **NOTE!**
If the assembly of the machine/plant is not included in the BHS scope of supply, the BHS specialist will be responsible only for supervising the assembly sequence. He is not responsible for observing the respective statutory provisions, training, instruction and watching the assembly personnel. Assembly shall be organized by the respective company.

6. Safety Equipment on the Machine/*Plant*

6.1 Safety Measures for Machine/Plant Motors

- As electric safety measures motor fuse protections, protective motor switches, possibly posistor temperature probes, and fault current circuit breakers are to be provided.

6.2 Main Switch

- It must be possible to shut off the supply of electric energy to the machine/plant by means of a lockable main switch in the control cabinet.

6.3 Repair Switch - if available

- For each machine/plant there must be an all-pole, lockable switch-off unit, in its immediate neighbourhood or on the machine/plant itself; the switch positions “Ein” (ON) and “Aus” (OFF) must be clearly visible.
- Starting the machine/plant from any other point must be possible only when switch position “Ein” (ON) is in permissive position.

6.4 Emergency-Off Switch - if available

- For each machine/plant there must be a noticeable red emergency-off switch in its immediate vicinity or on the machine/plant itself, by which in case of danger the machine/plant drive and the material supply to the machine/plant can be switched off.

6.5 Protection of Access or Maintenance Hatches

► The access or maintenance hatches must be protected by one of the following means:

- Electric safety limit switch and electromagnetic locking unit
- Combined switch for limit and locking connection
- Mechanical safety locks

  - The safety limit switches must be connected to the control in a way that the machine/plant cannot be started if the access or maintenance hatches are open.
    The locking unit must be connected to the control in a way that, when the machine/plant has been switched off, the access or maintenance hatches can be opened only after the moving parts have come to complete standstill.
    The time to be set on the time lag relay of the locking unit should at least correspond to the coasting period of the moving parts.

  - The keys for the safety locks must be kept under lock and key by the person responsible for the machine/plant.

6.6 Safety Devices

► For V-belt drives, couplings and working cylinders, safety devices are provided that are constructed according to the prevailing regulations for the prevention of accidents.

6.7 Working and Maintenance Platforms, Catwalks

► If these are necessary for operation reasons, then they must be designed in a way that they meet the requirements to be expected. They must be of adequate size.

► When there is risk of falling, safety devices must be provided in accordance with the prevailing regulations for the prevention of accidents.

7. Requirements for Machine/Plant *Operation*

7.1 Safety Instructions

- ► Observe the instructions and measures specified in the Operating Instructions, they apply to automatic as well as hand operation!
- ► Prior to switching on and starting the machine/plant make sure that nobody will be endangered by the starting of the machine/plant!
- ► Any method of operation that may affect safety must be avoided!
- ► Mind the control indications during the starting and stopping operations!
- ► Do not switch off or remove any extraction or ventilation equipment when machine/plant is running!

7.2 Safety Measures

- ► Set selector switch to Automatic or Manual Operation!
- ► Take measures to ensure that machine/plant will be operated in safe and proper condition only! Operate the machine/plant only if all safety and protection equipment, e.g. detachable protection devices, emergency-off devices, sound insulations, extraction systems are existing and operative!
- ► In case of malfunctions, stop and secure the machine/plant immediately! Have all malfunctions rectified as soon as possible!
- ► At least once per shift check machine/plant for any defect or failure that can be detected from outside! Report any deviations (also in operating performance) immediately to the responsible office/person! If necessary, stop and secure the machine/plant immediately!

8. *Requirements* for Working at the Machine/Plant

8.1 Safety Instructions

- ► The instructions and measures specified in the Operating Instructions for maintenance, inspection, and operation must be observed and adhered to!
- ► The adjusting, maintenance, inspection, and repair actions (including replacement of wearing and machine parts) specified in the Operating Instructions must be observed and carried out in compliance with the safety instructions!
- ► Inform the operating personnel prior to commencing any repair and maintenance work, and appoint a supervisor!
- ► For all work on the machine/plant concerning operation, change of control functions, conversion of the machine/plant and its safety equipment, as well as inspection, maintenance, and repair, the instructions regarding safety, starting and stopping operations, and proper repair must be observed and adhered to!
- ► Any fuel and process materials, as well as replaced parts must be discarded in a safe and environmentally harmless way.

8.2 Safety Measures

- ► Protect a wide area - when applicable - around the repair location!
- ► When the machine/plant has been completely switched off for inspection, maintenance or repair work, it must be secured against unexpected restarting:
  - Lock the main switch (also repair switch) and take key along.
  - Attach warning sign at the main switch.
- ► Clean the machine/plant prior to commencing maintenance and repair work! Prior to cleaning, e.g. with water or steam jet (low pressure) or other cleaning agents, cover or - if necessary - tape up all openings or devices, into which water / steam / cleaning agent must not penetrate for reasons of safety or proper function.
  - Electric motors, switches, valves, and switch cabinets are particularly susceptible!
  - Only dry cleaning for all dosing and feeding devices for dry aggregates!
  - Do not use aggressive cleaning agents!
  - Electric devices and installations without the necessary protection must not be treated with water or steam jet.

- After the machine/plant has been cleaned, remove again all coverings and tape seals completely!

- After having cleaned air and oil lines, check them for leakage, loose connections, abraded spots, and damage!
  Any defects detected must be repaired immediately!

- If the dismantling of safety devices is required during maintenance and repair work, those safety devices must be installed again after the completion of the work and their proper function be tested!

- Machine parts and large assemblies must be carefully fixed to the lifting devices and secured during replacement so that they will be no source of danger. Suitable and technically faultless lifting devices as well as load carrying means with adequate capacity must be used only.

  Do not stay or work under suspended parts!

- Experienced persons only must be engaged for the slinging of loads or the guiding-in of crane drivers! The guider must be within sight of the crane driver or be in speech contact with him.

- In case of assembly or repair work above body height use the intended or other safe ladders or work platforms.

- Do not use machine parts as climbing aids!

- Keep all handles, steps, railings, landings, platforms, and ladders free from dirt, snow and ice!

- **NOTE!**
  When working at greater heights use guard rails!

- Bolt connections loosened during maintenance and repair work must be tightened again after completion of the work, taking into consideration any specified tightening torques (see technical documentation)!

9. *Particular* Dangers

9.1 *Electric Power Supply*

► **ATTENTION!**
Work on electrical installations or equipment must be carried out only by an electrician or by instructed personnel under the supervision of an electrician in accordance with the rules of the electrical engineering industry!

► The electrical equipment of the machine/plant must be inspected and checked regularly. Any defects such as loose cable connections or scorched cables must be analysed and repaired immediately!

9.2 *Repair*

► Repair work on machine/plant to be carried out only after explicit approval!

► **NOTE!**
Work on electric, hydraulic, pneumatic, mechanic equipment must be executed only by persons who have special technical knowledge in the respective field and observe the prevailing rules!

► Prior to commencing repair, depressurize any system, sections and pipes for compressed oil or air which must be opened. For example, spurting oil may cause injuries or fire! Adequate feed/intake/uptake and disposal of substances must be ensured

► Prior to commencing welding and flame-cutting work, clean the working place of all dust and grease, and remove all flammable material around it. Make sure that adequate ventilation is provided; there may be fire or explosion hazard!

► During electric welding disconnect or remove the electronic insert cards to avoid possible damages by welding current. Also ensure very good bonding around the welding point (remove dirt and paint).

► During electric welding on the machine/plant, which has to be done in moist areas, there is danger of electric shock!

- Make sure that the welder's place is properly isolated, otherwise welding work must not be carried out under those circumstances!

► When working in confined spaces observe any prevailing national regulations!

9.3 Process Materials

- In the course of feeding suspension and/or possible required washing liquids emissions of product vapors may occur which in general should be vacuumed off by an in-plant air conditioning system. When using CIP liquids (acids, bases) for cleaning the required security precautions are obligatory (e.g. PSE).
- If your machine is equipped with parts made of plastic then it is not considered fire proof.
- The location type for installation (e.g. EX zone) is specified and stated on the machine plate. All materials in operation (e.g.filtrate and washing substances) are also determined in the specification.
  Observe respectively applicable fire prevention measures.
- When handling oil, fats and other chemical substances mind the applicable safety regulations for the respective product.
- Be careful when handling hot process materials; risk of burning or scalding!

9.4 High-pressure water, steam, hydraulics

- The applicable safety regulations must be observed for hose lines and connections, particularly with regard to the durability, checking and changing of hose lines. It is imperative to adhere to the checking and changing intervals.

- At control system level it is necessary to make sure that no hazards whatsoever are capable of occurring as a result of unintentional start-up.

- **ATTENTION!**
  Before starting any work on the system, always make sure that the electrical power is switched off and can't be switched on again!

- Accumulators must be completely depressurised before removing valves and pipe runs.

- Valve and equipment fastening screws must only be re-tightened in a non-pressurised state.

- Screw unions must only be re-tightened in a non-pressurised state.

- Pre-filling an accumulator on the gas side must only be done using the prescribed medium.

- Leaks from the unit, pipe runs and user may cause significant damage to the environment

9.5 Thermal Hazards

Thermal hazards exist in case of contact with hot machine parts or surfaces such as housing or piping. This may result in burns of the skin for contact with surfaces exceeding 50°C temperature.
The operating temperature of your machine can be found in the technical specifications.

9.6 Hazards as result of disregarding safety instructions

Disregarding safety instructions may result in danger to life and pose a hazard to equipment or environment. Disregarding safety instructions can result in loss of liability claims. As concrete examples disregarding safety instructions result in following risks:

- Failure of important/relevant machine functions
- Failure of specified maintenance and service procedures/processes
- Hazard to health and life by electrical, mechanical and chemical influences
- Environmental hazard as result of discharge of hazardous substances

9.6.1 Unauthorised Reconstruction and Spare Part Manufacturing

► **NOTE!**
The operator assumes responsibility for safety when he reconstructs or changes the machine/plant unauthorised.
The warranty given by BHS-Sonthofen GmbH is cancelled in such a case!

► Original spare parts and accessories authorised by the manufacturer serve safeness. Using other parts can cancel the manufacturer's liability for resulting consequences.

10. Mobile Machines/Plants

- The following refers to machines/plants that frequently change sites.
- Use only lifting devices and load carrying means with adequate capacity and experienced guiders for the process of loading.
- Sling, lift with lifting devices and load the machine/plant only in accordance with the Operating Instructions, Group: Delivery and Intermediate Storage.
- Only use suitable vehicles with sufficient capacity for transport!
- The load must be reliably protected with the recommended or delivered devices against lengthwise and crosswise slipping; the suitable sling points must be used!
- Use warning signs in case of surpassing the loading gauge!
- Before recommissioning carefully mount those parts or part groups which had to be dismantled for reasons of transport!
- For recommissioning proceed only in accordance with the operating instructions.

BHS SONTHOFEN

Delivery and temporary storage

Operating instructions

BHS SONTHOFEN

Machines and plant

1. Delivery condition

1.1 Delivery scope

► The delivery scope complies with the order confirmation or the dispatch note that also includes details of the packing units.

► At the incoming goods inspection, the delivery must be checked for:

- Completeness
- Damage in transit
- Missing parts

► Report defects to the transport company immediately.

The transport company is obliged to record and report damage in writing to the insurance company responsible and/or to those who took out the insurance cover.

1.2 Extent of disassembly

► Normally the machine/plant is supplied in an assembled condition.

It is, however, possible to supply it in several assembly modules.

► The extent of disassembly ('knock-down') depends upon the

- transport conditions
- local construction site conditions
- available lifting equipment

1.3 Operational readiness

► Test run on manufacturer's premises independently of subsequent delivery condition and level of disassembly.

► With plant that cannot be assembled for test purposes, no test run is conducted.

2. Transport

2.1 Mode of transport

► The mode of transport depends upon the

- transport routes
- instructions from the customer.

► Possible modes of transport are:

- truck
- train
- ship

► The required mode of transport will be agreed with the customer in good time prior to delivery.

► **NOTE!**
Report damage in transit to the transport company and to the insurance company in writing (see scope of delivery).

► For transport purposes, the load must be secured to prevent it from slipping.

2.2 Type of packaging

► The transport route is a co-determining factor for the type of packaging.

► The types of packaging:

- Open loading
- Container loading
- Crate packaging

shall comply, unless otherwise contractually stipulated, with the HPE packaging directives of the *Deutscher Bundesverband Holzmittel, Paletten, Exportverpackung e. V.* and by the Association of German Mechanical Engineering Institutions (the VDM).

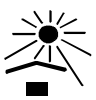
► The type of packaging shall be defined in the order confirmation document.

► Pay attention to the symbols attached to the packaging:


Oben


Zerbrechliches Gut


Vor Nässe schützen


Vor Hitze schützen


Handhaken verboten


Schwerpunkt

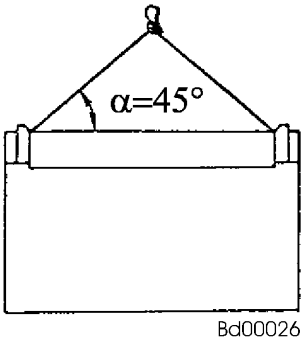

Anschlagen hier

2.3 Dimensions and weight

- ► Transport dimensions and machine/plant weights - refer to the technical specification and to the technical documentation: Installation drawing.
- ► See dispatch papers for precise weight of shipment.

2.4 Attach for transport purposes

- ► **CAUTION!**
  Open loading.
  Attach the machine using the eyelets provided.
  The suspension equipment must not be at an angle of less than 45° to the horizontal plane!



- ► Excessive torsion must be avoided when suspending the machine/plant, as this might cause damage due to deformation.
- ► Pay attention to specific instructions governing the transport of the entire machine and/or individual parts of it (see chapter 5 Assembly and Electrical Connection)!
- ► Crate packaging
  Attach the crate at the points indicated by symbols.

2.5 Loading

- ► For loading purposes, the load must be secured to prevent it from slipping.
- ► The load surface must be flat and as torsionally rigid as possible.

2.6 Transport operation

- **In all cases, observe all notice symbols on the transport packaging during all transport operations.**
- **During transport operations, and with storage of the rotary pressure filter, fit caps to all flange connections to protect them.**
- **While transporting a load, maintain a suitable safety distance.**
- **Only use permitted lifting gear that is in good operational condition.**
- **Adjust the length of lifting gear until the machine is suspended in a horizontal position.**
- **Do not remove any supports or documents that are attached to the machine.**

► Crane equipment, lifting gear and transport cables must be appropriately dimensioned.

► Before you lift the machine, please note the weight indicated on the type plate. Please only use cranes and lifting gear with sufficient lifting capacity.

When transporting the machine/plant, proceed carefully to prevent damage caused by the application of force or careless loading and unloading.

3. Temporary storage

3.1 Storage prior to installation

► Requirements for the storage location of the machine/plant:

- protected
- free from mechanical vibration (shaking)
- free from the effects of dust and humidity
- free from the influence of aggressive chemical substances
- Lower temperature limit - 30°C
- Flat and firm installation surface

► Type of temporary storage:

- Best temporary storage in temperature-controlled buildings
- Avoid unprotected storage in the open air. If unavoidable, then only

  - for short periods.
  - Adopt protective measures against inclement weather conditions, e.g. fit a flat wooden cover over the top, covered by plastic sheeting
  - Set up the machine/plant properly on a flat and stable surface. If necessary, place the machine/plant on wooden beams.
  - Protect plastic and rubber components from direct sunlight.

3.2 Preservation measures for temporary storage

► Carry out if no specific preservation measures have been agreed contractually. (after a storage time of approx. 5 months).
► Please also note the manufacturer's instructions on storage in the operating manual for the individual components.
► Please monitor the preserved condition on a regular basis throughout the time in storage.

3.2.1 External conservation for protected, dry and temperature-controlled storage inside buildings

- Spray all bolt connections, joints, stud bearings and untreated turned components with rust-stripping or corrosion-inhibiting oil (do not spray rubber components such as V-belts, springs and coupling elements!).
- Repeat the external preservation in accordance with requirements (no later than after 12 months).

3.2.2 External preservation for protected storage in the open air

- If stored under cover in the open-air, spray all bolt connections, joints, stud bearings and untreated turned components with rust-stripping or corrosion-inhibiting oil (do not spray rubber components such as V-belts, springs and coupling elements). Do so for the first time when these items are placed into storage.
- Repeat the external preservation in accordance with requirements (no later than after 6 months).

3.3 Preserving measures for drive elements

3.3.1 Components installed in rotary mountings

► At 3-month intervals, rotate through 2-3 complete turns

3.3.2 Gearbox

► Please note the instructions for storage in the manufacturer's operating instructions (see Technical Documentation)

3.3.3 Motors

► Please note the manufacturer's instructions on storage in the operating instructions

3.3.4 Pneumatic cylinders, valves, grease pump lubricating unit

► Please note the manufacturer's instructions on storage in the operating instructions

3.3.5 Hydraulic cylinders, hydraulic unit

► Please note the manufacturer's instructions on storage in the operating instructions

3.4 Preserving measures for control unit

► Please note the manufacturer's instructions on storage in the operating instructions

3.5 Preserving measures for plant components from sub-contractors

► Please note the manufacturer's instructions on storage in the operating instructions

4. Temporary storage after completion of commissioning process

4.1 Extended downtime inside buildings

- ► The storage location is temperature-controlled and dry.
- ► Clean machine/plant inside and outside, then leave to dry.
- ► Carry out preserving measures on assemblies in accordance with manufacturer's specifications (operating instructions).
- ► Repeat these preserving measures after about 9 months.
- ► **Other instructions**
  - Refer to temporary storage for this group
  - Refer to technical documentation
- ► If recommissioned, refer to Group. Commissioning & Operation.
- ► Please also note the manufacturer's instructions on storage in the operating manual for the individual components.

4.2 Extended downtime in open-air locations

- ► Machine/plant must be protected against inclement weather conditions.
- ► Must not be kept unused for longer than two years.
- ► Clean machine/plant inside and outside, then leave to dry.
- ► When the machine/plant is running, fill all bearings and gasket seals with grease.
  When the machine/plant is stationary, pack the motor bearings with grease. On all shaft access points and motor connection box covers, seal with rolling bearing grease. Refer to Group: Lubrication.
- ► All gearboxes and oil-filled assemblies must be filled with the correct grade of oil in accordance with the operating instructions.
- ► Please also note the manufacturer's instructions on storage in the operating manual for the individual components.
- ► **NOTE!**
  - Refer to temporary storage.
  - Refer to technical documentation: Refer to operating instructions.

5. Measures after temporary storage

5.1 Gearboxes and oil-filled assemblies

- ► Replenish oil in all gearboxes and assemblies in accordance with the stipulations in the manufacturer's operating instructions.
- ► Check seals and gaskets for signs of ageing.
  Unfavourable storage conditions can cause premature ageing of the sealing elements.
- ► During the commissioning process, observe the sealing elements and replace them if they leak.

- ► **NOTE!**
  For commissioning after a longer break, see the section: Commissioning and Operation.
- ► Refer to technical documentation: separate operating instructions.
- ► Please also note the manufacturer's instructions on storage in the operating manual for the individual components.

5.2 Motors

- ► Please also note the manufacturer's instructions on storage in the operating manual for the individual components.

6. Guarantee and warranty claims

- ► For damage that occurred inside and outside on the machine/plant that is the result of incorrect temporary storage, no guarantee or warranty claims can be enforced.

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BHS SONTHOFEN

Machine Description

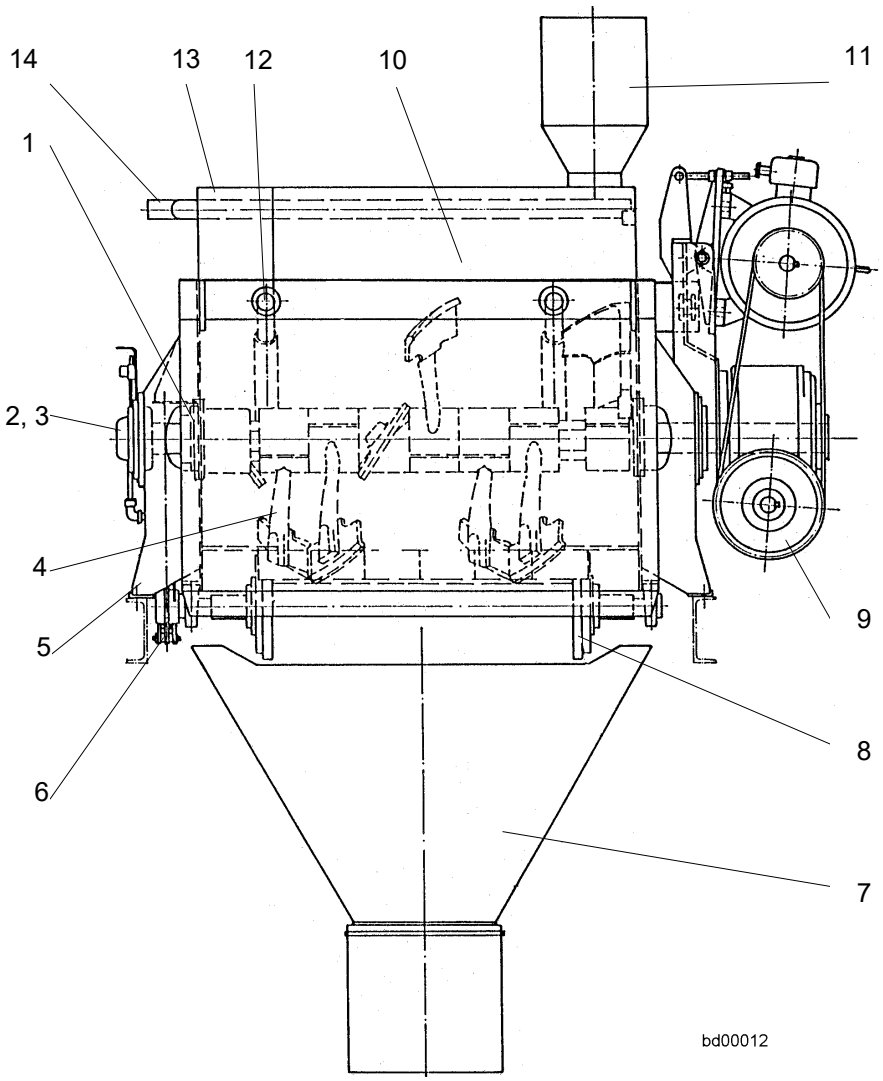
Operating Instructions

BHS SONTHOFEN

Twin-Shaft Batch Mixer

BHS-Sonthofen GmbH ◆ An der Eisenschmelze 47 ◆ D-87527 Sonthofen
Spare Parts: Phone +49 8321 6099 144 - 146 ◆ Fax +49 8321 6099 120

1. General View



Pos.	Description
1	Trough sealing
2	Bearings
3	Mixing shafts
4	Mixing tools
5	Supporting claws
6	Discharge door/flap operation
7	Discharge hopper
8	Discharge door /Discharge flap
9	Mixer drive
10	Mixing trough, trough wearing parts
11	Filter, airbag (optional)
12	Steam blowing (optional)
13	Trough cover
14	Water spraying

2. Design

The mixer has been designed according to the modular principle and may thus be supplied in different executions

2.1 Basic Equipment

► **Mixing Trough**
- welded design
- 4 supporting claws for fixing in the steel structure or on convenient concrete foundation
- 4 suspension eyes
- exchangeable wear protection for front and bottom sides
- symmetric wearing elements, exchangeable to each other, with patented
  design and increased service life
- special lining (ceramic, rubber, plastic material, composite sheets, etc.) is possible

► **Mixing tools**
- 2 horizontal mixing shafts with self-aligning roller bearings
- mixing arms arranged in helical line, which is advantageous for the mixing process and energy saving
- central and lateral arms of special steel casting
- mixing technically optimized design of mixing arms
- mixing blades and exchangeable wearing elements made of highly wear resistant special hard casting
- special blades (plastic/steel, composite sheet, etc.) are possible.

► **Mixing Trough Sealing**
- reliable axial face sealing

► **Discharge Door /Discharge Flap in the trough bottom**
- revolving seating
- adjustable sealing ledges

► **Discharge Door/ Discharge Flap Operation**
- opening and closing via pneumatic cylinder. Optionally this can be carried out by hydraulic cylinders or electrically with a gear motor
- protective hood over the working cylinders

► **Mixer Drive**

- Slip on drive units, consisting of:
  - > slip-on worm gear
  - > torque support
  - > motor console
  - > motor
  - > V-belt drive

- synchronization of drive unit via coupling
- speed control (optional)
- small mixers are provided with single motor drive, bigger ones with double motor drive
- protective hoods on V-belt drive and synchronous coupling
- A drive unit can be installed on each lateral side at selected mixer sizes.

2.2 Additional Equipment (optional)

► **Trough Cover**

- welded design
- electrically protected maintenance doors
- water spraying
  - > admission of metered water quantity
  - > used and clean water design

- central entries for aggregates and binders
- connecting sleeve for filter and airbags

► **High-Pressure Cleaning Plant**

- mixer cleaning to reduce manual attendance
- nozzles installed in the trough cover
- high-pressure aggregate with control

► **Central Grease Lubrication or oil-air**

- Different variants of design
  - > for the 4 lubricating points of the inner sealing chamber of the mixing trough
  - > all lubricating points of the mixer
  - > oil or grease lubrication or combinations interval control and manual release optional

- Installation of the lube unit on the mixing trough or near the mixer

► Exact description: see group „Lubrication“

► Device for Steam Blowing
to produce heated concrete

- steam lances on both sides in the upper trough area

3. Mode of Operation

- The Twin-Shaft Batch-Mixer is, from the function's point of view, a batch mixer, e.g. for fresh concrete, to which aggregates, binding agent, water and special additives are supplied from above in certain feeding intervals.
- The counter-rotating and synchronously running mixing shafts, equipped with the mixing tools, effect true compulsory mixing.
- In the mixing trough the material is compulsorily mixed horizontally and vertically, and moved in a circle by the rotating tools, working in opposite direction. This results in optimum homogeneity of the mix within shortest possible mixing time.

3.1 Feeding of the Mixer

- The mixer can be fed in automatic or manual operation. For the most important instructions for mixer feeding refer to Commissioning and Operation

- For the most important instructions for mixer feeding, refer to “Commissioning and Operation”

3.2 Discharge of the Mixer

- Discharge of the mixer can be made in automatic or manual operation.
- The mixer discharges through a discharge door/ flap with adjustable opening positions directly into the discharge hopper. The width of the opening and the opening time depend on the vehicles to be charged (truck mixers or trucks) and the concrete consistency. For the most important instructions for mixer discharge refer to Commissioning and Operation

- For the most important instructions for mixer discharge, refer to “Commissioning and Operation”

3.3 Mixing Capacity

► The efficiency of the mixer depends on the volume of the product to be mixed during feeding and during the mixing process and on the amount of filling.
The admissible values are indicated in the technical specification.

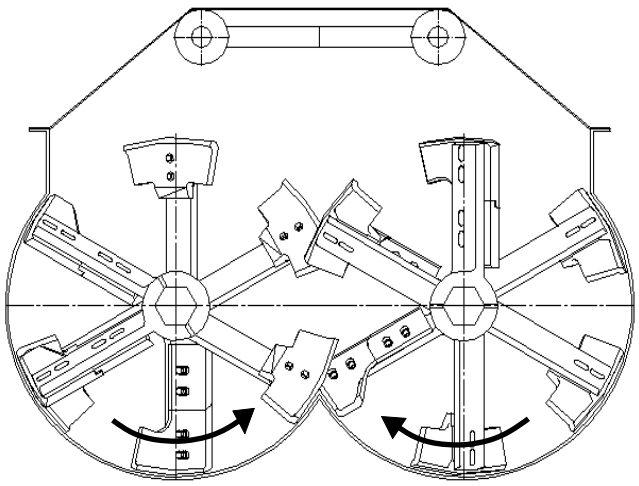
► The required settings of feeding time and sequence as well as discharge time are plant-specific parameters. Basically, all ingredients of the mix must be metered individually (e.g. steel fibers isolated to prevent balling of the fibers)

► It may be necessary to reduce the degree of filling or to reinforce the drive unit in case of:
- high share of fines in the mix
- very stiff consistency
- using chemical additives
- Using special additives (such as steel fibers)
- Feeding sequences deviating from the recommended specifications (see group Commissioning and Operation)
- Mixing special products

► In order to avoid machine overload, the proportions of the mix design should be changed.
- selectively with reduced degrees of filling and
- under observation of the current consumption/drive power

3.4 Sense of Rotation of the Mixing Shafts

► The synchronously rotating mixing shafts are moving in counter rotation and the sense of rotation of both mixing shafts must be such that the mixing tools between both shafts run upward, according to the sketch on the right.



Sketch: Sense of rotation of mixing shafts

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BHS SONTHOFEN

Assembly and Electrical Connection

Operating Instructions

BHS SONTHOFEN

Twin-Shaft Batch Mixer

BHS-Sonthofen GmbH ◆ An der Eisenschmelze 47 ◆ D-87527 Sonthofen
Spare Parts: Phone +49 8321 6099 144 - 46 ◆ Fax +49 8321 6099 120

1. General Instructions

► **NOTE!**
For safety instructions and safety requirements, see
> Group: User information
> Group: General safety instructions

► Proper assembly plays a crucial part in ensuring optimum machine operation.

► **NOTE!**
Many years of experience have shown that it is recommended to use the machine manufacturer's skilled personnel to assemble the machine.
This is not only advisable for warranty reasons but also beneficial from the aspect of the professional advice given and checks performed:
- Identification of transit damage
- Observation of control instructions and measures at the assembly stage
- Information on operating the machine

► **NOTE!**
Before using the machine for its intended purpose after a prolonged intermediate period in storage, see chapter:
"Delivery and Intermediate Storage"

2. Assembly Instructions

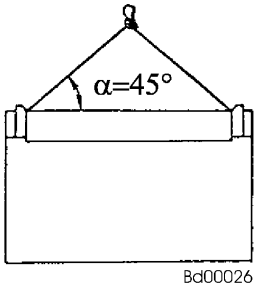
2.1 Mechanical work

► Technical Documentation: Installation Drawing

- connecting dimensions
- machine weight
- static and dynamic load indications

► **ATTENTION!**
> Open loading.
> Only attach the machine to the special eyelets
> The pull direction of the suspension gear to the horizontal may not fall bwlow an angle of 45°!

When suspending the machine take care not to twist the machine/system too much to avoid deformation damage



► **Installation**
- Horizontal and even
- On adequately rated steel or concrete foundation

ATTENTION! Welding Work
> connect the ground cable always directly near the treated component
> welding current must never flow through the rolling bearings

► Ensure good **accessibility** for following maintenance and repair work:
- opening of maintenance doors in the trough cover
- change of mixing arms
- mixing shaft dismantling and mounting
- removal and installation of wearing parts
- maintenance work on the drive
- cleaning of the mixing trough interior space

► For space required, see Technical Documents: Installation drawing

2.2 Testing operations before tightening the mixer fixing screws

► The mixing tools should be rotated several times by hand on the V-belt drive to make sure that the lateral arms do not touch the front wall. Should this be the case, the mixing trough has got distorted while it has been placed on the steel structure. in this case, shims must be inserted under the supporting claws of the mixer.

► Check the synchronizing coupling at the mixer drive (between both gear units) in vertical and horizontal direction for true alignment. If any unacceptable alignment errors are found, these must be attributed to uneven installation of the mixer, see group: Maintenance and Inspection.

► Procedure for Mixer Alignment:
- drive in slim steel wedges between supporting claws of the mixer and steel structure
- repeated checks of the above mentioned controls

► Good alignment has been achieved when the lateral arms no longer touch the front walls and when the misalignment of the synchronizing coupling has been reduced to admissible tolerances.

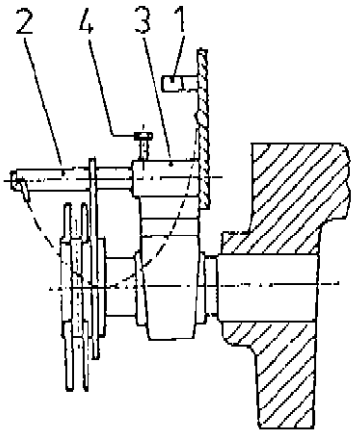
► **NOITE!**
Proper alignment of the mixer will prevent failures of the discharge door/ flap and the mixer drive

2.3 Transport safety

2.3.1 Safety of the discharge door

► **ATTENTION!**
The discharge door is locked by socket pin safety..

► Loosening of locking
- release locking screw (4)
- pull socket pin (2) from locking pipe (3)
- insert socket pin (2) in safekeeping eye (1)



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► **DANGER!**
For all repair work, e.g. replacement of wearing parts (mixing blades, tiles, etc.) or machine parts, insert the discharge door safety in reverse order to avoid accidents in the zone of the discharge door.

2.3.2 Safety of the discharge flap

► **ATTENTION!**
Mixers with discharge flap have in the reach of the discharge hopper a transport safety

► **DANGER!**
After connecting the discharge flap control (pneumatic or hydraulic) close the discharge flap so that the transport safety can be dismantled without danger of jamming or squeezing

► **DANGER!**
For all work during which the discharge flap cannot be held safely in all positions because of missing pressure in the cylinders or disconnected current, the discharge flaps open due to dead weight up to the cg position. For jamming effect the flap could stop even before reaching the cg position

► **ATTENTION!**
When working in the mixer suitable safety measures must be taken (e.g. Maintenance platforms under the mixer, safety belt for the fitter)

2.4 Welding work

ATTENTION!
Connect the ground cable always directly to the treated component

Welding current must never flow through the rolling bearings

3. Electric Connection

3.1 General prescriptions

► **DANGER!**
Admissible connected load (service/control voltage and frequencies) of motors, valves, limit switches, locking switches, central lubricating unit, must be observed, as otherwise damages and malfunctions may occur!

► **NOTE!**
The regulations of the local electric supply company must be observed.

Regulations (e.g. EN 57100 (VDE 0100), or EN 60204 (VDE 0113) must be observed.

3.2 Mixer motor

► Motor data see Technical Specification and Technical Documentation

► **ATTENTION!**
Check if motor bearing safety device has been unlocked / removed

► When connecting the mixer motor firmly tighten all cable connections and also check proper fit of all cables inside the mixer.

► For electrical installation consider that the mixer operates continuously at 100% connecting time.

► It is required that the nominal filling the mixer starts under load.
- Therefore, besides of the normal start in star-triangle (to start the mixer at no load), a switch for direct start under load must be provided in the control.
- The time lag relay of the star-triangle combination has to be set to 2.5 – 3.0 sec.

► The design of the electric installation for the mixer motor must be adjusted to the a.m. loads.

► Full motor protection via thermistors with posistor temperature probes.

► We recommend installing in the control desk an ammeter for the mixer motor.

3.3 Check and adjust direction of rotation of mixing shafts

3.3.1 Rotation of mixing shafts

- ► Check the direction of rotation of mixing shafts at no-load operation.
- ► The mixing tools must rotate towards the discharge door.

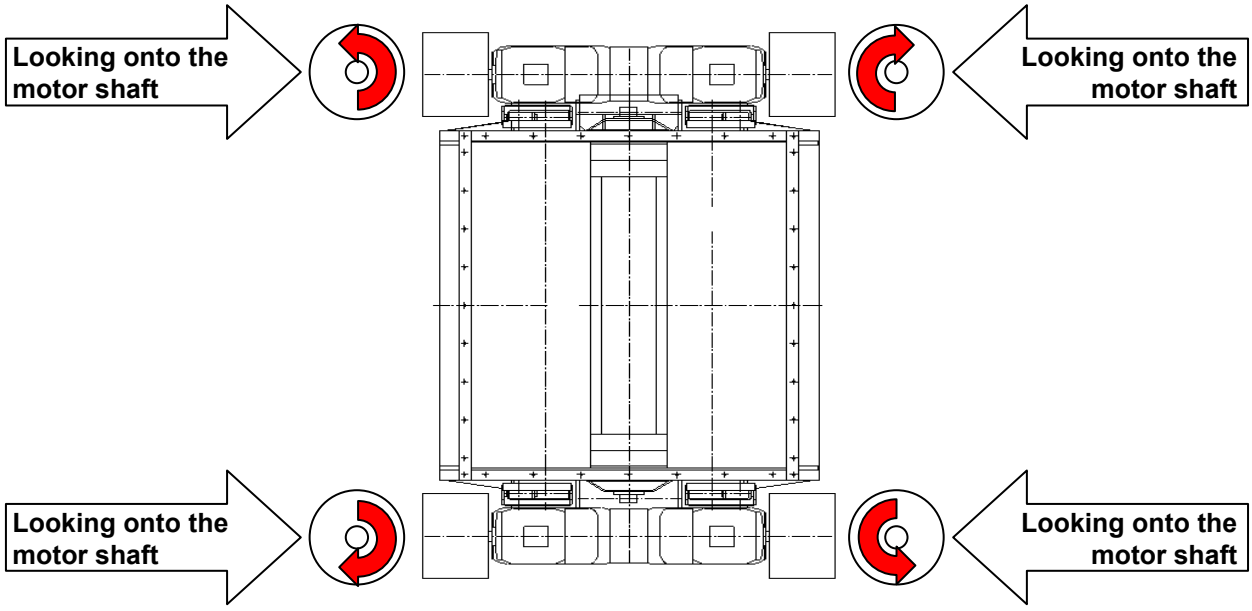
3.3.2 Checking the direction of rotation in case of a double-motor drive

- ► **ATTENTION!**
  Prior to starting the motors together first start each motor separately and check the direction of rotation
- ► Only when both motors are rotating in the same direction as the mixing shafts they are allowed to be started simultaneously!

3.3.3 Checking the direction of rotation in case of a four-motor drive

- ► **ATTENTION!**
  Check direction of motor rotation only after V-belts have been removed.
- ► Only when all motors are rotating in the correct direction, they are allowed to be started simultaneously!

- ► **ATTENTION!**
  When starting the mixer after having installed all V-belts**, turn on all motors simultaneously!**



3.4 Access/maintenance doors in the trough cover

► **DANGER!**
The access/maintenance doors are protected by a safety limit switch and a safety locking switch, see group: General Safety Instruction, Item: Safety Installation on the machine/plant - Safety of Access/ Maintenance doors

► Before commissioning, correctly connect the safety limit switch and the safety locking switch and check their function.

► Data for the safety limit switch and the safety locking switch (electromagnetic locking unit) see Technical Documentation.

3.5 Hydraulic drive

► see Technical Documents

3.6 Central lubrication

► see Technical Documents

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BHS SONTHOFEN

Commissioning and Operation

Operating Instructions

BHS SONTHOFEN

Twin-Shaft Batch Mixer

BHS-Sonthofen GmbH ◆ An der Eisenschmelze 47 ◆ D-87527 Sonthofen
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BHS SONTHOFEN

Commissioning and Operation

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1. General Instructions

► **NOTE!**
For safety instructions and safety requirements, see
> Group: User information
> Group: General safety instructions

► Start-up is understood to mean all operating statuses in which a machine is to be used for the first time or re-used after a prolonged break; also see group: Delivery and Intermediate Storage.

► Initial start-up plays a crucial part in ensuring optimum machine/system operation.

► **NOTE!**
Due to the many different influencing factors that need to be taken into consideration, it is recommended to use the machine manufacturer's skilled personnel to start up the machine. This is not only advisable for warranty reasons but also beneficial from the aspect of the professional advice given and checks performed:
- Identification of assembly damage and errors made in setting up the machine
- Observation of control instructions and measures during start-up
- Additional advice on operating the machine (starting-up, feeding, mixing, discharging, etc.)

► Observe warning signs on the machine!

► **DANGER!**
Shut down the machine immediately if:
> severe vibration occurs
> serious safety deficiencies are identified
> hazards occurs as a result of hurled-out material
> critical operating statuses, e.g. resulting from overload, are to be anticipated

► **ATTENTION!**
If the emergency off switch is actuated, first:
> identify the cause
> remedy the cause
before putting the machine back into operation.
•
► Execute start-up control measures prior to
- initial start-up,
- re-use after prolonged shutdown (winter break or repair work)
•

► **ATTENTION!**
Only commence control measures in/on machine and only remove guards once:
> repair switch has been set to "Off" ("Aus") and locked,
> key is kept in a safe place protected from unauthorised access,
> "Maintenance work" ("Instandhaltunsarbeiten") sign is attached to the repair switch.

2. Checks prior to Starting

2.1 Erection of the Mixer

► For assembly and connection of the machine refer to group: Assembly and Electric Connection.

2.2 Screw Connections

► All screws at the mixing trough, mixing tools, mixer drive and discharge door/flap, etc. must be checked for tight fit and tightened if necessary!
For screw tightening moments refer to Technical Documentation.

2.3 Mixing Trough

► Check:
- horizontal alignment of the casing
- distortion of mixing trough by measuring the radial displacement on the synchronizing coupling, refer to group: Maintenance and Inspection.
- tight connection of input and outlet components (e.g. trough cover)
- correct and safe installation of all feed and discharge devices
- correct seating of wear lining so that mixing plates cannot get caught
- if all rotating and moved parts (e.g. V-belt drive) have protective devices installed
- if all doors and covers are closed and locking screws, quick acting closures, resp., are a tight and safe fit
- correct installation of safety limit switches and safety locking switches on the maintenance doors
- all screw connections, screw tightening moments: refer to Technical Documentation
- weld seams (visual crack control)

2.4 Discharge Door / Discharge Flap

► Correct removal of maintenance and transport safety devices off the discharge door /flap(s), refer to group: Assembly and Electric Connection.

2.5 Mixing Tools

► Check:
- if mixing tools are correctly fixed
- gap width of blade outer edges to the mixing trough (approx. 3 mm)
- if mixing shaft if rotating freely

2.6 Drive

2.6.1 V-Belt Drive

► **NOTE!**
For V-belt tension and screw tightening torques, see Technical Documents

- Correct seating and alignment of V-belts between drive pulley and driven pulley
- Tight fit of the Taper-Lock Collets, the end disk of the V-belt pulleys, resp., refer to Technical Documentation: Screw Tightening Moments
- **Guards** of V-belt drive(s) and synchronizing coupling for proper attachment and condition.

► **ATTENTION!**
V-belts under insufficient tension may present a fire hazard!

2.6.2 Motor

► **NOTE!**
> Remove motor guard, see Technical Documents: Three-phase motor
> Motor connected loads
> Direction of rotation, see group: Assembly and Electrical Connection
> Motors with re-greasing facility: as a precautionary measure, both bearings should be re-greased immediately after start-up while motor is running
> For re-use after prolonged break, see group: Delivery and Intermediate Storage

2.6.3 Synchronizing Coupling

► For alignment, see group: Assembly and Electrical Connection and group: Service and Inspection.

2.7 Lubrication

► Check:
- Oil level in the gearboxes with stopped mixer
  - oil level till the center of the sight glass (straight bevel gear)
  - oil level till approx. 20 mm below the upper edge of the overflow connection (worm gear)

- leakage on all hose and line connections for oil, grease and compressed air supply, retighten if necessary
- oil level in the oil tank (hydraulic aggregate)
- the oil level must reach the center of the sight glass
- grease level in the grease tank (lube pump)
- the tank must be filled completely

3. Function Tests without Load

3.1 Controls before Connection of the Machine

► **ATTENTION!**
Make sure that:
> no parts may get into the machine
> personal cannot be endangered by switching on the machine!

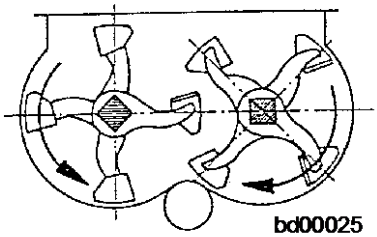
► Switch off **material input**.

► Machine empty and not under load.
- It must be possible to turn V-belt drive freely by hand.

3.2 Controls after Connection with empty Machine

► **No-load operation:** 20 - 30 min.

► **Switch-over time** from star to triangle: 2.5 - 3 sec.
Refer to group: Erection and Electric Connection



► **Note the sense of rotation of the mixing shafts**
Refer to group: Assembly and electrical connection

► **Unbalance of Mixing Shafts**

► remarkable **Running Noise** of
- motor, gearbox, bearings,
- mixing tools

Remark:
A swiveling running noise in the rhythm of the mixing shaft speed (overrunning noise) is harmless. Reason: unbalance of the mixing tools.

► **Tightness** of all hose connections

► Function and adjustment of all **Control Units** on the mixer (emergency switch, limit switch, locking unit, ...)

► **Emergency Switch**
For safety favorable installation and function

3.3 Discharge Door or Discharge Flap(s)

► **DANGER!**
When performing adjustment work at the discharge door or discharge flap operation make sure that nobody is inside the mixing trough.

► Functional check of discharge door /flap position
- final positions "open" and "closed"
- intermediate positions "1/2 open" or "1/3 open" and "2/3 open"

► Reset limit switches, if necessary.
For contactless inductive proximity switches the correct switching distance is of approx. 5-7 mm.

3.3.1 Discharge Door/ Flap Operation, Pneumatic

► **DANGER!**
When performing adjustment work at the discharge door or discharge flap operation make sure that nobody is inside the mixing trough.

► **Air pressure:** 8 bars required.

► **Check of Tightness**
on all hose and line connections, e.g. apply soapy water on the connections.

► **Adjust Maintenance Unit**
it comprises: water separator, pressure governor and oil atomizer and it will supply prepared, i.e. dewatered and oiled compressed air for the pneumatic cylinders, refer to group: Maintenance and Inspection.

► **Pneumatic Cylinders**
- check function by opening and closing them several times.
- if necessary, readjust final damping.
- refer to group: Maintenance and Inspection.

3.3.2 Discharge Door/ Flap Operation, Hydraulic

► **DANGER!**
When performing adjustment work at the discharge door or discharge flap operation make sure that nobody is inside the mixing trough.

► **ATTENTION!**
Check and adjust function of hydraulic unit, refer to Technical Documentation

3.4 Central Lubrication

► Installation and functional test as per design (grease or oil/air lubrication) refer to Technical Documentation.

► Check grease outlet on axial face seal in mixing trough.

► Check tightness on all hose and line connections.

3.5 Hydraulic Couplings

► Check **Performance** during mixing operation.
If an increased temperature (approx. 70°C, 158°F, resp.) is found during continuous operation, check the oil filling.

► Refer to: Technical Documents

3.6 Electric Switch Gears

► Functional testing and adjustment of all switchgears on the mixer.

► Check function of **Safety Limit Switches and Locking Units** at the access hatches of the trough cover. For instructions on the functional test refer to Group: Maintenance and Inspection.

► Check function of **Repair and Emergency Switches** on the mixer.

► Setting of **Over speed Monitor** and check proper functioning.
- The mixer drive must be switched off, if speed drops to 10-15% below idling speed.
- Start bridging is to be set to 10 seconds.
- Functional test: Slowly turn up the knob for precise impulse adjustment at idling. When reaching the idling speed the mixer motor will be switched off. The switch-off point under load is 10-15 % below the idling speed.
- For explanations on the over speed monitor refer to Technical Documentation.

► **Voltage Control** (cos -monitor) for mixer motor. The value to be set corresponds to the power factor (cos) of the motor in no-load operation.

4. Commissioning and Continuous Operation

4.1 Break-in Regulations for slip-on Gear Units

► **No-Load Operation:** 30 minutes (without mix)

► **Break-In Rhythm**
1st batch filling = approx. 1/2 nominal filling 60 sec.
2nd batch filling = approx. 1/2 nominal filling 60 sec.
3rd filling = nominal filling 60 sec.

This break-in rhythm must be repeated 20 times.

4.2 Break-in Regulations before Commissioning the Mixer, after change of Trough Lining

► **ATTENTION!**
The first **10 mixing operations** shall be run with **very liquid** concrete consistencies and a particle size of max. 4 mm. Thus; the tiles of the trough lining are backfilled with concrete laitance, which will give additionally support to the tiles after hardening.
After this start-up procedure clean the mixer carefully to not rinse out the backfilling of the trough lining and allow it to harden

4.3 Mixer Feeding

4.3.1 General Instructions

► **ATTENTION!**
Before starting, make sure that the mixer and feeding units are free from foreign **matters** which could cause a blockade of the mixing tools.

► **NOTE!**
Keep the data agreed by the Technical Specification and the Order Acknowledgement:

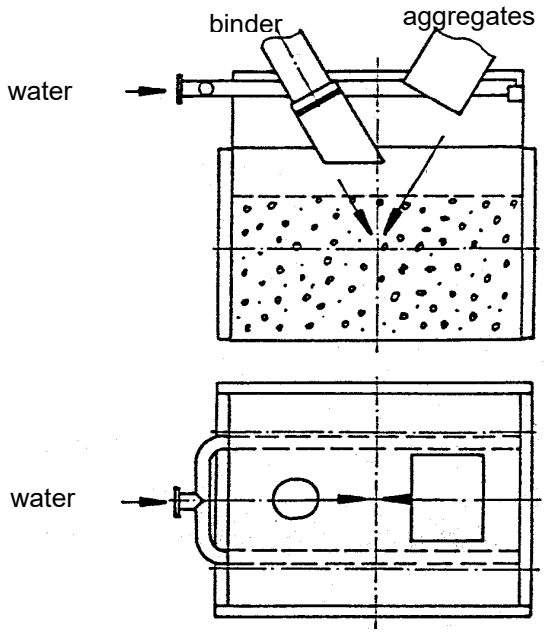
This concerns in particular the following points:
- throughput
- type of feed material
- size of feed material
- drive power

► Deviations only after agreement with the machine manufacturer!
- For proper feeding and feeding sequence refer to Technical Documentation.

► Insert **Material feeding** only if mixing tools have reached the operating speed

► **Feeding unit**
In regular intervals, special during breaking-in, check for obstruction.

4.3.2 *Correct feeding*



- ► Position and direction of binder and aggregate inlets are decisive for short mixing times and good mixing. They, moreover, will avoid deposits on the mixing tools.
  Recommended arrangement of the feeding devices refer to Technical Documents, installation drawing

- ► The water spraying system consists in an U-shaped pipe with rows of holes and nozzles. Liquid admixtures should be added to the water.

- ► The rubber tube fixed on the cement inlet must be cut parallel to the mixing shaft so that it will be slightly touched by the mixing blades at any revolution (self-cleaning).

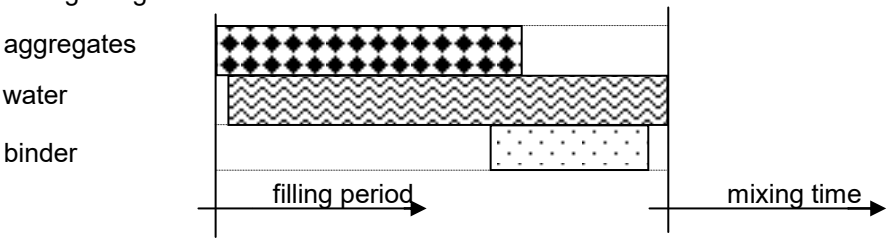
4.3.3 *Sequence of feeding*

- ► Feeding of the additive scale and intermediate vessel must be effected such that during discharge the coarser fractions enter the mixer at first followed by the finer fractions (sands)

- ► Feeding of the mixer with aggregates, binders and water must be made in a determined and timed sequence.

- ► The Twin-Shaft Batch Mixer normally does not require dry mixing times. The water will generally be called off together with the aggregates or 1-2 seconds later.

- ► It is important that the aggregates are advanced against the binder. When calling off the binder 80-90 % of the aggregates must already be in the mixing trough.



4.4 Discharge of Mixer

► The discharge of the mixer is made through a discharge hopper on to the transport vehicles or receiving points

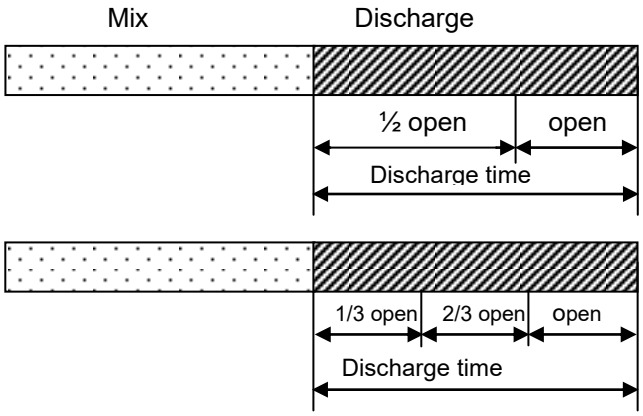
► **NOTE!**
It must be assured that with nominal filling capacity and stiff consistency of the mix approx. 95-96 % of the mixing trough is emptied. If this is not the case the discharge time must be extended.
Instructions on discharge door and discharge flap actuation for various discharge situations refer to Technical Instructions

4.4.1 Discharge into Truck Mixers

a) On Twin-Shaft Batch Mixers with "standard discharge door or discharge flap" an intermediate position "1/2 open" is provided, as a rule. For exception, however, two intermediate positions "1/3 open" and "2/3 open" may be provided.

b) On Twin-Shaft Batch Mixers with "large discharge door" two intermediate positions "1/2 open" and "2/3 open" are provided, as a rule.

► **NOTE!**
Control of these intermediate positions, and their holding times, should be adapted to the receiving capacity of the truck mixer, and to the consistency



4.4.2 Discharge on to Trucks

► On Twin-Shaft Batch Mixers with "standard and large discharge doors" discharge will directly take place through the discharge opening "open"; intermediate positions are not used.

4.5 Continuous Operation

► Upon termination of the break-in rhythm, start of continuous operation with nominal filling, refer to Technical Specification.

► Temperature check of slip-on gear units

- The external temperature on the slip-on gear units must be measured by contact thermometer in the input shaft area during the first 10 full load operating hours after commissioning.

► **ACHTUNG!**
Depending on the load, normal gear temperatures are in continuous operation approx. 25°C to 45°C (77°F to 113°F) higher than the respective ambient temperature; however the maximum temperature of 90°C (194°F) must not be exceeded. If higher temperatures are found, reduce the batch filling to half the nominal filling and inform the mixer manufacturer immediately.

4.6 Replacement Gear Units

► When the mixer drive is equipped with a new slip-on gear unit, the break-in regulations must be repeated.

4.7 Temperature check on Hydraulic Aggregate

► refer to Technical Documentation: Operating Instructions for Hydraulic Aggregate

4.8 Mixing Operation

4.8.1 Automatic Operation

► The mixer drive runs continuously, only for pauses it is switched-off by hand.

► The automatic control function and functional control of a mixing cycle comprises:

- feeding
- mixing
- discharge

► The mix components for each mixing batch will be prepared automatically.

► The first mixing cycle begins with time lag after switching the mixer on with control functions "Discharge door/ flap closed", "Aggregate scale open".

► All other control functions for calling water and binder, for mixing and discharge time, run off program controlled.

► The first mixing cycle will be completed with the function message "Discharge door/flap closed".
For several batches in succession, the cycles are automatically controlled. They begin each time when electrical interlocking is released by the message that all weigh- batchers are full and the discharge door/flap is closed.

4.8.2 Manual Operation

► The mix components for each mixing batch can be provided either by automatic or manual actuation.

► After switching on the mixer the mixing cycle begins with the control function "Discharge door/ flap closed", "Aggregate scale open".

► All other control functions for calling water and binder, for mixing and discharge time, run off program controlled.

► The mixing cycle will be completed with the function message "Discharge door/flap closed".

4.8.3 Stopping the Mixer

► Stopping is made as follows:
- stop weighing of mix components.
- open discharge door/ flap and empty the mixing trough with mixing tools running.
- cut off mixer drive, central lubrication and hydraulic unit.
- prior to short production breaks (45-60 min.) clean the interior of the trough and discharge door/ flap with a high-pressure water jet, if the mix requires this. Thus, deposits of mix may far-reaching be avoided.
- prior to extended interruption and at shift end, clean the mixer - refer to group: Maintenance and Inspection.
- lubricate inner axial face seal.

► **DANGER!**
> Check V-belt pre-tension, see group: Service and Inspection;
> if necessary, re-tighten, see Technical Documents.

V-belt slippage presents risk of fire and poisoning!

For further notes refer to group: Maintenance and Inspection

4.9 Extraordinary Operating Conditions

4.9.1 Extended Mixing Time

► Mixing times of more than 2 minutes mean:
- increased wear
- additional thermal stress on the drive, particularly in conjunction with stiff mix consistency.

4.9.2 Operation in Winter

► **NOTE!**
> At ambient temperatures of approx. - 10°C (14°F), run mixer at no load for a minimum of 30 minutes prior to commencing work.
> At even lower temperatures, gear units and motors should be heated from outside with hot air from a heater blower.

4.9.3 Heavy-Load Starts with full Mixer

► **NOTE!**
Star-delta start:
> Mixer drive **with** hydraulic coupling: When mixer is filled with rated charge, high-inertia starting always takes place in star-delta mode.
> Switchover from star to delta in 2.5 to 3 seconds.

► **NOTE!**
Direct start-up:
> Mixer drive **without** hydraulic coupling:
> When mixer is filled with rated charge, high-inertia starting always takes place in star-delta mode (direct activation).

4.9.4 Heavy-Load Start with Overfilled Trough (Emergency Start)

► **NOTE!**
With overfilling by a second batch due to control failure
> open discharge door or flap
> empty the mixing trough and, if required, rinse with water.

► Clearing of the mixing trough may be accelerated by jerkily starting of the mixer drive, but only when both mixing shafts have become visible. However, observe that the type of heavy-load start depends on the design of the mixer drive.

► If the mixer drive does not draw through for clearing the mixing trough,
- the duration of switching on the motors must not exceed 2 seconds
- the frequency of switching-on is limited to max. 3 times one after the other.

4.9.5 Emergency Standstill during Mixing Operation

► **ATTENTION!**
If the Emergency Off switch is actuated, first
> identify the cause,
> remedy the cause.
Before putting the machine back into operation!

► Normally, this means that the mixer will stop while filled with mixing material.

► **NOTE!**
If, within a short period of time (appr. 10 min.), e.g. with concrete mix, the cause of the standstill cannot be eliminated, the discharge door/flap must immediately be opened and the mix be discharged

4.9.6 Mechanical Defect

► Knock out the bolt of the fork head connection discharge door/flap - pneumatic/hydraulic cylinder.

► Swing out sideways the pneumatic/ hydraulic cylinder.

► Open discharge door/flap by means of a bar (lever action).

► **DANGER!**
Discharge door/flap could open suddenly

4.9.7 Power Failure - Manual Opening of Discharge Door

► **NOTE!**
In case of a power failure manual opening has to be done according to the existing discharge door operation.

► Manual opening of the discharge door/flap should be trained before an emergency occurs already; in case of an emergency it will be too late!

► **Manual Opening of Discharge Door with Pneumatic Actuation**

- Discharge door/flap can be actuated on one or both sides with pneumatic cylinders, where the compressed air for either side will be controlled by a 5/3 ways solenoid valve.
- Each solenoid valve has two manual emergency controls for switching functions "open" and "close", which will be actuated by turning or pressing.
- Procedure for opening:

- Turn or press manual emergency actuation "open" on the 5/3 ways solenoid valve. When two valves are provided, both must be actuated simultaneously.
- The compressed air available in the compressor will be sufficient for actuation.
- When the trough is empty the manual emergency actuations should be returned to their zero positions.

► **Manual Opening of Discharge Door with Hydraulic Actuation**

► refer to Technical Documentation: Operating Instructions for Hydraulic Aggregate

► **Manual Opening of Discharge Door with Electrical Actuation**

► **DANGER!**
Attention! Isolate the motor and brake from the power supply before starting work, safeguarding them against unintentional power-up!!

- Remove the Cover from the Fan-Wheel at the Motor
- Discharge the Brake of the Motor manually (see Manual Servo-Motor)
- Revolve the Motor by Hand with the Fan-Wheel, until Discharge Door is opened.
- When the trough is empty, it must be closed again and everything should be returned to its zero-position
- **Important!** Don't forget to mount the Cover of the Fan-Wheel at the Motor.

4.9.8 Actions prior to and after Extended Standstill

► Actions prior to extended standstill
Refer to group: Delivery and Intermediate Storage

► Commissioning after extended standstill
Refer to group: Starting and Operation

5. Failures and Malfunctions

5.1 Safety and Protective Devices

► **NOTE!**
For safety instructions and safety requirements, see
> Group: User information
> Group: General safety instructions

► **DANGER!**
> **Dismounted protective devices constitute a considerable safety hazard; they must be re-installed after termination of work and before starting the machine.**
> **Safety devices must not be dismounted for troubleshooting during machine operation.**
> **To find the causes of failures with running machine, the existing safety and protective devices must not be removed**

5.2 Trouble Shooting in case of anomalous Operating Performance

Symptom	Reason	Action
Running noise on motor	- Bearing defective - Fan blade grazes at fan hood	- Replace bearing - Align or replace deformed fan blade
Mixer does not start when empty (often during commissioning)	- Motors are running in opposite directions in case of two-motor drive - Hydraulic clutch without oil	- Change sense of rotation of one motor (observe correct rotation of mixing shafts!) - Refill oil
Periodic running noise on gear units when idling	- Overriding noise in the gearing, caused by unbalance of the mixing tools	- None - harmless
Running noise on gear units when idling	- Bearing damage or beginning gearing damage	- Contact BHS
Running noise on hydraulic coupling(s) filling	- Bearing damage - Too much oil	- Replace bearing - Check oil
Unsteady running of mixer drive	- Bearing damage of hydraulic coupling - Cement sticking to coupling and V-belt pulley	- Replace bearing - Clean hydraulic coupling and V-belt pulley
Discharge door/flap closes abruptly screw	- Damping on cylinders too soft. - Throttle back valve opened too far	- Adjust damping harder. Turn adjusting to the right. - Reset.
Discharge door/flap jams when closing	- Sealing gap too big - Damping on cylinders too hard - Water in the pneumatic cylinder. - Air in the hydraulic cylinder.	- Reset sealing ledges. - Adjust damping softer. Turn adjusting screw to the left. - Dewater compressed air. - Remove water from cylinder. - De-aerate pipes.
Discharge door (pneumatic) does not open	- Stones jammed between discharge door ledge and drum protection - Pressure of pneumatic supply line below 8 bar	- **Attention:** Depressurize pneumatic cylinders - Release screws at pedestal bearings of discharge door drum and lower discharge door by approx. 2 mm. - Increase pressure of the pneumatic line
Intermediate positions for discharge door/flap overrun	- Cylinders, valves or line connections are leaking. - Limit switch defective.	- Replace cylinder seals and valves. - Tighten connections or replace sealing rings. - Replace limit switch.

Symptom	Reason	Action
Mixer stops	- V-belt tension insufficient. - Not enough oil in hydraulic coupling - Electrical reason. - Wrong feeding of mixer resp. proportioning	- Re-tension V-belts. - Check oil filling. - Check electric supply, fuses, voltage, etc. - Check feeding of mixer and proportioning quantity
Formation of deposits on mixing shafts, mixing tools and trough cover	- Wrong feeding of mixer, e.g. cement called too early, water called too late, aggregate and cement inlet not optimal - Cement inlet pipe without rubber hose.	- Set cement and aggregate call correctly. - Maybe change inlet situation. - Mount rubber hose.
Clogging in the discharge hopper	- First intermediate discharge position (e.g. for stiff concrete) too big (capacity of truck mixer insufficient)	- Reduce first intermediate discharge position.
Loud mixing noise	- Blade gap too big	- Readjust lateral and central blades
Excessive wear on mixing and wearing tools	- Blade gap too big. - Sealing gap on discharge door/flap too large. - Mixing time too long. - Broken and abrasive additives.	- - Readjust lateral and central blades. - Reset sealing ledges. - Reduce mixing time. - Optimize feeding and discharge in order reduce time
Cement slurry leaking outside at mixing shaft sealing	- Axial face seal damaged due to insufficient lubrication	- Replace axial face seal
Hydraulic clutch drains oil	- Overload of coupling due to surcharge or starting with full mixer - Increased slipping because of insufficient oil filling	- Open discharge door and remove material (refer to starting under load with surcharged mixer) - Check oil filling

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Servicing and Inspection

Operating Instructions

BHS SONTHOFEN

Twin-Shaft Batch Mixer

BHS-Sonthofen GmbH ◆ An der Eisenschmelze 47 ◆ D-87527 Sonthofen
Spare Parts: Phone +49 8321 6099 144 - 146 ◆ Fax +49 8321 6099 120

1. General Instructions

► **NOTE!**
For safety instructions and safety requirements, see
> Group: User information
> Group: General safety instructions

► **ATTENTION!**
Only commence checking and maintenance work and only remove cover doors, guards and other machine parts once:

> Repair switch has been set to “Off” (“Aus”) and locked
> key is kept in a safe place protected from unauthorised access,
> “ Maintenance work“ ("Instandhaltungsarbeiten“) sign is attached to the repair switch
> stopping times have been observed for moving machine parts.

► **DANGER!**
Check machine before switching on and eliminate sources of danger
> Guards must be in place
> Housing closed and locked
> Remove tools from inside and around the machine
> Service work hazards in machine environment and from the machines insalled in the process chain

► **NOTE!**
Inadequate or poor servicing and maintenance will increase susceptibility to malfunctions and repair and reduce warranty cover.

► **NOTE!**
The following service and maintenance schedule applies to:
> single-shift operation
> treatment of mixing materials that cause normal wear

► **NOTE!**
The user must define or amend the service and maintenance schedule to suit operating conditions.

Service and maintenance schedule may diverge from the following schedule if:
> highly abbrasive feeding material is processed
> the machine is used in adverse climatic contitions
> the machine is operated round the clock

► **ATTENTION!**
Electrical installation, control cabinets, motors, gears, auxiliary units such as centralized lubrication, drives, hydraulic and pneumatic installations may not be cleaned by pressure washers.

► **NOTE!**
Once removed, replace fixing elements, such as screws, nuts, bolts, with new ones of the same quality (material, strength) and design.

For screw connection torque values, see Technical Documents

► **NOTE!**
It is imperative, even after start-up, to continue monitoring all screw connections on the mixer for proper seating, and to re-tighten them to the appropriate torque if necessary. In particular, check all moving parts, e. g. drive, mixing mechanism

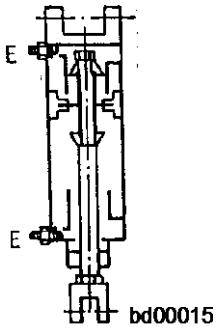
Observe warning signs on the machine!

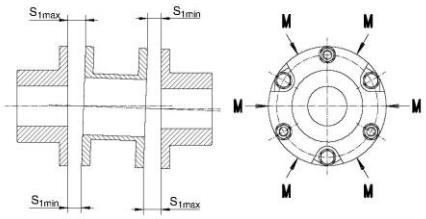
► **DANGER!**
Install a safeguard against rotation!
If for maintenance operations personnel is in the mixing space, all mixing shafts and the discharge door/discharge flap must be safeguarded against rotation:

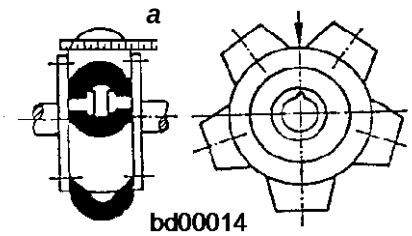
> place wedges between the mixing blades and trough walls or
> put one wedge on each side of the V-belt pulley on the gearbox to block the V-belt drive (only where synchronous coupling is installed)
> install discharge door/discharge flap safety device, refer to group: Maintenance
> remove anti rotation element after completing the service work

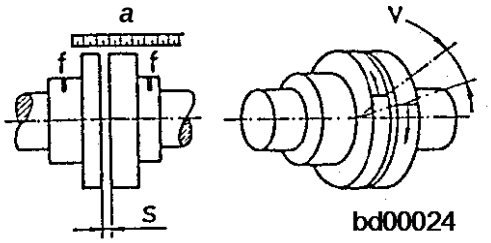
2. Service and Inspection Plan

Checking period hours from h	to h	Item	Subassembly	Maintenance unit	Scope of control or maintenance
8	10		Drive	V-belts (new)	- Check V-belt tension see Technical Documentation - Short inspection algorithm and retightening until there are no more setting phenomena
8	10		Hydraulic plant	Aggregate	- see Technical Documentation
8	10		Mixer	Trough interior Mixing tools Discharge door/flap Trough cover	- Cleaning of mixing trough in dependence of mix properties - Short intermediate Cleaning is more efficient and cheaper than one cleaning at shift end. - Cleaning with press-water jet (50-80 bar) - At cleaning open and close discharge door/flap several times. - With wet mixes after cleaning the trough interior, mixing tools, discharge door/flap, trough cover spray with concrete solvent. - Electric devices (motor, solenoid valve, limit switch, pumps, etc.) do not pressure clean with steam or water jet. - Let V-belts dry. **NOTE** Only fill floating ring seal with grease after having cleaned the interior of the trough
8	10		Central lubrication grease	Pump Control Pipings	- Functional test - Tightness - see Technical Documentation
40	50		Drive	Gearbox	- Gearbox temperatures measured with contact thermometer at drive shaft: · 25 °C - 45 °C higher than ambiance · maximum temperature 90 °C
40	50		Drive	Motor Gearbox Coupling	- Noise - Unbalance - Wear - Correct fixing - Grease, oil leakage - Temperature - Clean cooling ribs - Further indications see Technical Documentation

Checking period hours					
from h	***to h***	***Item***	***Subassembly***	***Maintenance unit***	***Scope of control or maintenance***
40	50		Drive	V-belts	- For prolongated use check tension see Technical Documentation. - Replace V-belts not individually, but in sets only (assorted lengths).
40	50		Discharge door/flap		- Functional test
40	50		Discharge door/flap operation	Cylinders	- Check: · Tightness · Correct fixing - Functional test · Open and close several times · If end position is jerkily reached end damping „E“ of the cylinders is set too hard. Turn the setscrew left to set it softer. · If the end of a stroke is indicated by a metallic blow end damping „E“ must be harder. Turn the setscrew right to set it harder. - After having adjusted the damping, tighten the counter nut of the setscrews. 
40	50		Discharge door/flap	Pedestal bearings	- Clean outside
40	50		Discharge door/flap operation	Limit switch solenoid valve	- Functional test - Switching position - Eliminate defects
40	50		Discharge door/flap	Hydraulic plant	- see Technical Documentation
40	50		Discharge door/flap	Hydraulic cylinder	- Check: · Function · Tightness · Correct fixing · Open and close several times
40	50		Mixer	Feeding Discharge	- Feeding sequence - Trough discharge (95-96 %)

Checking period hours from h	to h	Item	Subassembly	Maintenance unit	Scope of control or maintenance
40	50		Mixing tools	Mixing blade Mixing arm Mixing shaft	- Remove cement adherences. - Check wear condition, see Technical Documentation - Replace used parts, if necessary - Tight fit of mixing arms on shaft (screw tightening torque see Technical Documentation) - Tight fit of mixing blades on arms. - Gap between mixing blades and trough wall approx. 5 mm. Adjust mixing blades, if necessary
40	50		Mixing trough	Wearing tiles Dust cover Wearing ring	- Check wear condition, replace if necessary. - Parts items see spare parts list
40	50		Trough cover	Safety limit switch	- Functional test: With open access hatches of the trough cover it must not be possible to start the mixer.
40	50		Trough cover	Safety locking switch	- Functional test: This switch locks the access hatches of the trough cover while the mixer is running. Locking ends only with the electric signal „mixer switched off“.
40	50		Trough cover		- Wear - Correct fixing of feed devices.
200	300		Mixer-Drive	Arpex-Multi-Disc-Clutch 	- Check discs for cracks. If there are any cracks discoverable, the disc-pack must be replaced immediately. - Afterwards check the alignment. - **ATTENTION!** Before decoupling the Multi-Disc Clutch, you have to secure the Mixing-Shafts to avoid turning out of Position.. The correct Position of the Mixing-Mechanism is marked at the End of the Mixing-Shafts. Check the correct Position of the Mixing-Mechanism before and afterwards of the Replacement. - Recheck interspace S_{min} 14,5mm, S_{max} 15,5mm at the positions M! In addition please consider the mounting-instructions for the Arpex-Clutch. 

Checking period hours from h	to h	Item	Subassembly	Maintenance unit	Scope of control or maintenance
200	300		Drive	Synchronous coupling Typ: MCF	- Check rubber elements for cracks. - If cracks are found, replace rubber elements immediately. - Check alignment. - **ATTENTION!** Before uncoupling the synchronous coupling secure mixing shafts against twisting. The correct position of mixing tools is marked on the shaft ends. Before and after coupling check correct mixing tools position. - Check mismatch "***a***" in two planes with a ruler, max. mismatch ± 1 mm 
200	300		Drive	Bellows coupling	- In case of drives with 4 gears, one side is equipped with a bellows coupling. - Check alignment - **ATTENTION!** If the coupling on the opposite side is also loosened before decoupling the synchronous coupling, secure mixer spiral against twisting. The right mixer position is identified at the mixer spiral ends. Check the right mixer position before and after coupling. - Check eccentricity "***a***" with a ruler in two levels, max. misalignment: ± 1 mm

Checking period hours from h	to h	Item	Subassembly	Maintenance unit	Scope of control or maintenance
200	300		Drive	Synchronous coupling Type: N-Eupex	- Check circumferential backlash, if it exceeds 3 mm, replace rubber set. - Check alignment. - **ATTENTION!** Before uncoupling the synchronous coupling secure mixing shafts against twisting. The correct position of mixing tools is marked on the shaft ends. Before and after coupling check correct mixing tools position. · gap: s = 2 - 4 mm · check mismatch in two planes with a ruler: a_{max} = ± 0,15 mm · circum. Backlash: v_{max} = 3 mm · tighten locking screws f. 
200	300		Dischare door/flap	Sealing gap	- Check: · Sealing function · Wear - Readjust sealing, if necessary
200	300		Mixing trough		- Wear check - Deformations - Untighten junctions
200	300		Protective hoods	Drive V-belt drive Pneumatic/ Hydraulic cylinders	- All-round protection of rotating and moved parts against touching - Safe fixing - Cleanness
1.000	1.500		Hydraulic plant	Return filter Air filter	- Check - Change if necessary - see Technical Documentation
1.500	2.000		Hydraulic plant	Hand pump	- Operate
1.500	2.000		Central grease lubrication	Grease tank	- Clean - see Technical Documentation
4.000	5.000		Drive	Motor	- Antifriction bearings to be checked and cleaned by motor specialist - Replace bearings, if necessary.

Lubrication

Operating Instructions

Twin-Shaft Batch Mixer

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1. General Instructions

► **NOTE!**
For safety instructions and safety requirements, see
> Group: User information
> Group: General safety instructions

► **NOTE!**
Inadequate or poor lubrication will increase susceptibility to malfunctions and repair and reduce warranty cover.

► Specific lubrication charts may deviate from the following chart if:
- operation is made under unfavourable climatic conditions
- low-consistency mixtures are processed
- high-temperature products are mixed
- the machine works in multi-shift operations
- if strongly abrasive materials are processed (adjustment of sealing gap)

► **NOTE!**
The user has to determine and, if necessary, amend the Lubrication Chart to suit individual operating conditions.

► Lubrication schedule may deverge from the following schedule if:
- the machine is used in adverse climatic conditions
- the machine is operated in several shifts

► Observe warning signs on the machine

► Lubricants such as oils and greases must be kept in clean, sealed containers (tins, cans, hobbocks, barrels) to prevent the penetration of dust and humidity and to minimise the effect of oxidation caused by air. They should be stored in a cool, dry place.

► **NOTE!**
Lubrication work must be performed after cleaning the mixer since lubricants may otherwise be flushed out or washed off.
Hardened mix components at the inner mixing trough seal may cause the destruction of the axial face seal!

► **NOTE!**
For the additional units attached to the machine and maintenance units, such as gear unit, hydraulic coupling, oil/air central lubrication unit, hydraulic system, use the recommended lubricants only, see Technical Documents.

► **NOTE!**
Using a central lubrication system shall not release you from carrying out inspections! In case of a machine breakdown the manual lubrication stated in the lubrication chart under item 2.1 refers.

► When using central lubrication systems make regular checks to verify whether warning signals (e.g. grease tank empty) are shown and transmitted correctly to the control unit

2. Types of Lubrication

2.1 Manual grease lubrication of all lubrication points

- All lubrications points are greased by hand.
- With the new mixer line, the most important lubrication points are combined on two central points.

2.2 Central lubrication-grease, manual grease lubrication of all lubrication points

- to supply grease to the inner sealing chamber of the mixing shaft seal during operation of the mixer!

- **NOTE!**
  After cleaning the mixer, greasing of these lubricating points must still be effected manually.
- Use if a particularly high share of low-viscosity concrete types shall be mixed.

2.3 Central lubrication- grease with control unit, manual grease lubrication of subordinate lubrication points

- to supply lubricant to the internal sealing chamber of the mixing shaft seal during operation of the mixer!

- **NOTE!**
  These lubrication points are greased after cleaning the mixer. The lubrication process is actuated manually through the pump control unit
- The personnel is relieved from the most time-consuming lubrication process.

2.4 Central lubrication-grease with control unit to supply all lubrication points

- to supply lubricant to all important grease lubrication points during operation of the mixer!
- Depending on the design, the system may consist of one or two pumps

- **NOTE!**
  Lubrication of the inner grease chamber after cleaning of the mixer is effected by manual actuation of the lubrication process via the pump control unit.
- Owing to this system the machine requires very little maintenance in the field of lubricant supply.

Subject to correct integration of the control unit and maintenance of the system the working reliability of the machine and service life of the parts is increased.

2.5 Central lubrication oil-air with control unit, manual grease lubrication of subordinate lubrication points

► to supply the internal sealing chamber of the mixing shaft seal with an oil-air mixture.

► **NOTE!**
Lubricating the internal sealing chamber after cleaning of the mixer is to be ensured by a slowing down time of the oil-air application to the sealing points.
Slowing down time: approx. 30 min

► **NOTE!**
The oil filling devices and oil storage tanks must enable an absolutely contamination-free transfer of the oil into the storage vessel.

► Lubricant consumption is very small as compared to grease lubrication.

2.6 Central lubrication-oil-air with control unit, combined with grease pump with control unit to supply all lubrication points

► to supply the internal sealing chamber of the mixing shaft seal with an oil-air mixture.

► to supply all important grease lubrication points with lubricant during operation of the mixer!

► The system comprises a central oil-air lubrication unit and a central grease lubrication unit.

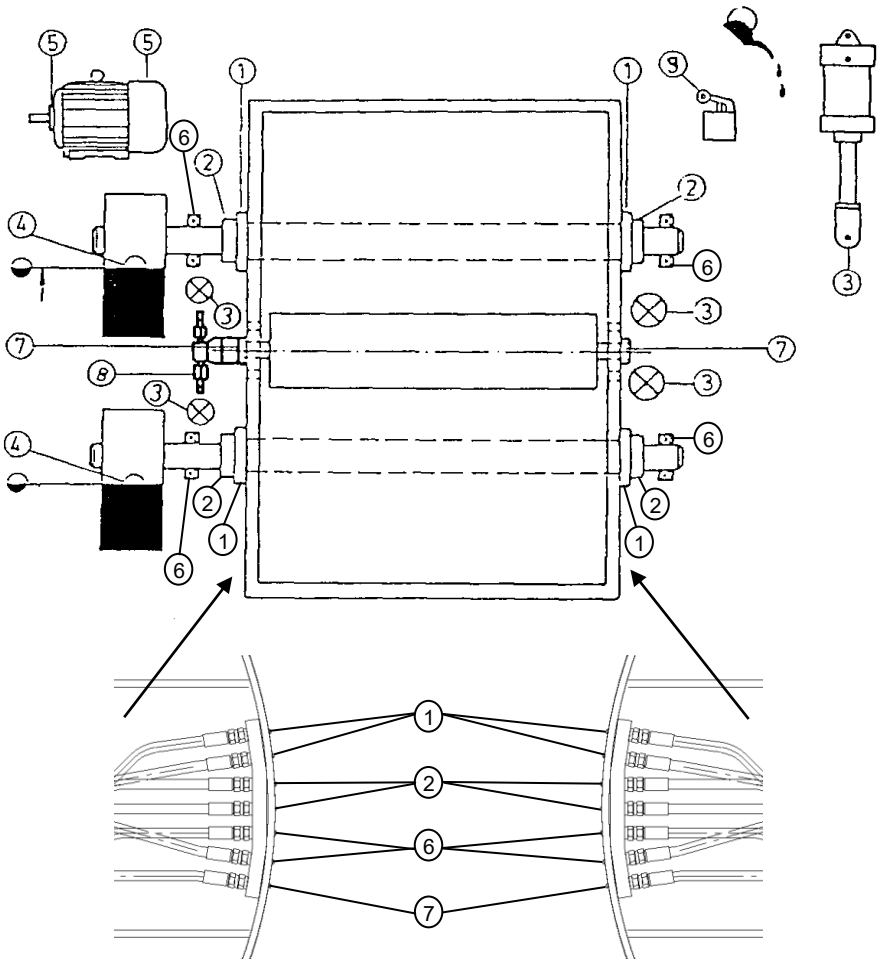
► **NOTE!**
Lubricating the internal sealing chamber after cleaning of the mixer is to be ensured by a slowing down time of the oil-air application to the sealing points.
Slowing down time: approx. 30 min

► **NOTE!**
The oil filling devices and oil storage tanks must enable an absolutely contamination-free transfer of the oil into the storage vessel.

► Lubricant consumption is very small as compared to grease lubrication

► Owing to this system the machine requires very little maintenance in the field of lubricant supply.
Subject to correct integration of the control unit and maintenance of the system the working reliability of the machine and service life of the parts is increased.

3. Lubrication chart



1. **Internal sealing chamber of the mixing shaft seal**
   Sealing point to the interior space of the mixing trough – most highly stressed sealing point.
   Grease filling prevents mix components from entering the sealing chamber – red lubricating nipples
2. **External sealing chamber of mixing shaft seal**
   Supplies sliding faces of the seal with grease – yellow lubricating nipples
3. **Hinges of discharge door operation**
4. **Gear oil level**
5. **Motor bearing**
6. **Mixing shaft bearing** – blue lubricating nipples
7. **Discharge door bearing** – blue lubricating nipples
8. **Ball joints at the torque support**
9. **Limit switches / hinges at the trough cover**

Inspection period from h	until h	Pos.	Type of lubrication 2.1	2.2	2.3	2.4	2.5	2.6			Subassembly	Maintenance unit	Scope of inspection and maintenance work	Amount of grease g		
8	10		X	X	X	X	X	X			Discharge door operation hydraulic (option)	lubrication unit	- oil level - oil temperature - check lines and screw connections for oil leakages - see Technical Documents			
8	10	1	X	X							Mixing trough seal	inner sealing chamber of shaft sealing 	- clean lubricating nipples - regrease until clean grease comes out on the inside of the mixing trough - **NOTE!** Fill grease into the sealing chamber only **after** having cleaned the interior of the trough			
8	10	1			X	X	X				Mixing trough seal	internal sealing chamber of shaft sealing 	- actuate the central lubrication at the control unit - Check (commissioning phase) whether clean grease comes out on the inside of the mixing trough - **NOTE!** Fill grease into the sealing chamber only **after** having cleaned the interior of the trough			

Inspection period			***Type of lubrication***											
from	***until***	***Pos.***	***2.1***	***2.2***	***2.3***	***2.4***	***2.5***	***2.6***			***Subassembly***	***Maintenance unit***	***Scope of inspection and maintenance work***	***Amount of grease***		
h	***h***													***g***		
8	10				X	X	X	X			Central lubrication	lubrication / control unit	- proper function unless the devices are integrated in the control unit of the plant. (warning signals see Technical Documents -			
8	10			X	X	X		X			Central lubrication grease	grease vessel	- check grease level, refill if necessary			
8	10						X	X			Central lubrication oil-air	oil tank	- check oil level, refill if necessary			
40	50	2	X	X	X		X				Mixing trough seal	external sealing chamber of shaft seal (labyrinth design)	- clean grease nipples - regrease until clean grease comes out on the outside			
40	50	2	X	X	X		X				Mixing trough seal	external sealing chamber of shaft seal (shaft sealing ring design)	- clean grease nipples - regrease	10		
40	50	3	X	X	X	X	X	X			Discharge door operation pneumatic	hinges pneumatic cylinder	- oil - spray (e.g. using MoS_2-spray)			

Inspection period from h	Inspection period until h	Pos.	Type of lubrication 2.1	2.2	2.3	2.4	2.5	2.6			Subassembly	Maintenance unit	Scope of inspection and maintenance work	Amount of grease g		
40	50	3	X	X	X		X				Discharge door operation hydraulic (option)	hinges hydraulic cylinder	- clean grease nipples - regrease	5		
40	50	4	X	X	X	X	X	X			Drive	gear unit	- check: . gear oil level, refill oil if required . gear temperature - see Technical Documents			
200	300	7	X	X	X		X				Discharge door/ discharge flap	pedestal bearing	- clean grease nipple - regrease	5		
200	300			X	X	X	X	X			Central lubrication	lubrication unit(s), lines	- proper connection of lines - tightness - function			
200	300						X	X			Mixing trough seal	internal sealing chamber of shaft sealing	- check slowing-down time to spray the oil-air mix (until approx. 30 minutes after the mixing trough cleaning has ended)			

Inspection period			***Type of lubrication***											
from	***until***	***Pos.***	***2.1***	***2.2***	***2.3***	***2.4***	***2.5***	***2.6***			***Subassembly***	***Maintenance unit***	***Scope of inspection and maintenance work***	***Amount of grease***		
h	***h***													***g***		
200	300	1			X	X					Mixing trough seal	internal sealing chamber of shaft sealing 	- check whether clean grease comes out on the inside of the mixing trough - **NOTE!** Owing to wear in the labyrinth are the amount of grease may increase during the service life. The cycle time of the pump must then be adapted accordingly (see Technical Documents).			
200	300		X	X	X	X	X	X			Discharge door operation hydraulic (option)	lubrication unit	- **First** oil change (oil type and amount see Technical Documents)			
200	300	6	X	X	X		X				Mixing shaft bearings		- clean grease nipples - regrease	20		
200	300	8	X	X	X		X				Drive	ball joints on torque support	- clean grease nipples - regrease	5		
200	300	9	X	X	X	X	X	X			Trough cover	limit switches hinges	- oil			
200	300		X	X	X	X	X	X			Discharge door operation hydraulic (Option)	lubrication unit	- check return line filter, replace if required - check air filter, replace if required			

Inspection period		***Pos.***	***Type of lubrication***								***Subassembly***	***Maintenance unit***	***Scope of inspection and maintenance work***	***Amount of grease***		
from	***until***		***2.1***	***2.2***	***2.3***	***2.4***	***2.5***	***2.6***								
h	***h***													**g**		
1000	1500		X	X	X	X	X	X			Drive	gear unit	- **first** oil change (oil type and amount see Technical Documents) -			
1500	2000	5	X	X	X	X	X	X			Drive	motor bearing with regreasing device	- clean lubricator nipples - regrease	45		
6000	9000	4	X	X	X	X	X	X			Drive	gear unit	- oil change - see Technical Documents			
10000	15000		X	X	X	X	X	X			Drive	fluid coupling (option)	- oil change (oil type and amount see Technical Documents)			
20000	22000	5	X	X	X	X	X	X			Drive	motor bearings without regreasing device	- rinse bearings - replace defective bearings - change grease (see maintenance instructions on motor) - see Technical Documents			
20000	22000		X	X	X	X	X	X			Discharge door operation hydraulic (option)	lubrication unit	- oil change - see Technical Documents			

BHS SONTHOFEN

Maintenance

Operating Instructions

BHS SONTHOFEN

Twin-Shaft Batch Mixer

BHS-Sonthofen GmbH ◆ An der Eisenschmelze 47 ◆ D-87527 Sonthofen
Spare Parts: Phone +49 8321 6099 144 - 146 ◆ Fax +49 8321 6099 120

1. General Instructions

► **NOTE!**
For safety instructions and safety requirements, see
> Group: User information
> > Group: General safety instructions

► **ATTENTION!**
Only commence checking and maintenance work and only remove cover doors, guards and other machine parts once:

> Repair switch has been set to “Off” and locked
> key is kept in a safe place protected from unauthorised access,
> “ Maintenance work“ sign is attached to the repair switch
> stopping times have been observed for moving machine parts.

► **DANGER!**
Check machine before switching on and eliminate sources of danger
> Guards must be in place
> Housing closed and locked
> Remove tools from inside and around the machine
> Service work hazards in machine environment and from the machines insalled in the process chain

► **NOTE!**
Inadequate or poor servicing and maintenance will increase susceptibility to malfunctions and repair and reduce warranty cover.

► In relation to operating conditions, the user must define:
- interval and scope of service and maintenance work
- Service and maintenance schedule

► **NOTE!**
Carrying out service and maintenance work:
> Changing of wearing parts and performance of simple repair work (e.g. housing seal) by the user´s qualified, skilled personnel
> Major repairs by machine manufacturer’s skilled personnel

► For welding work, see Group: Assembly and Electrical Connection

► **DANGER!**
Install a safeguard against rotation!
The mixing shafts must be prevented from turning if personnel is inside the mixing compartment while service work is being carried out:
> place wedges between the mixing blades and trough walls or material bed or
> place a wedge on each side of the gear belt wheel to block the V-belt drive (only where synchronous coupling is installed)
> remove anti rotation element after completing the service work

► **IMPORTANT!**
If electrical connections of the drive motors had been removed for repair work then:
> Check the turning direction before putting into service again. Refer

to Group: Assembly/Electrical Connection

- Replace fixing elements, e.g. screws, nuts, bolts, by new ones of identical quality (material, strength) and design.
- For tightening torques of screw connections see Technical Documentation.

- **NOTE!**
  For figures for Maintenance Instructions see Spare Parts List

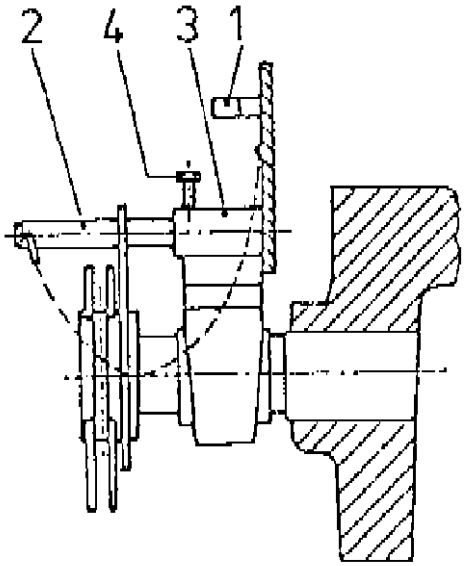
- **NOTE!**
  After each disconnecting of the mixer motor(s) checking of the turning direction before putting into service again. Refer to Group: Assembly/Electrical Connection

2. Discharge Door Safety

► **ATTENTION!**
The discharge door is arrested with a socket pin.

► Installation of the locking:

- Take socket pin (2) from the keeping eye (1)
- Insert socket pin (2) into locking tube (3)
- Tighten locking screw (4).



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► **DANGER!**
The discharge door must be fastened with the socket pin during all repair and maintenance works executed on the mixer, e.g. when replacing wearing parts (mixing blades, tiles, etc.) or machine parts. It serves to avoid accidents in the discharge door zone.

3. Discharge Flap Safety

► **DANGER!**
For all work during which the discharge flap cannot be held safely in all positions because of missing pressure in the cylinders, disconnected current, resp., the discharge flaps open due to dead weight up to the cg position. For jamming effect the flap could stop even before reaching the center of gravity position.

► **ATTENTION!**
When working in the mixer suitable safety measures must be taken (e.g. Maintenance platforms under the mixer, applying the full body harness)!

4. Trough Wearing Parts

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **DANGER!**
Install a safeguard against rotation!
The mixing shafts must be prevented from turning if personnel is inside the mixing compartment while service work is being carried out:
> place wedges between the mixing blades and trough walls or material bed or
> place a wedge on each side of the gear belt wheel to block the V-belt drive (only where synchronous coupling is installed)

► Remove wear lining by unscrewing the fastening elements, preferably by means of an impact screw driver

► Clean the stripped inner trough surfaces, remove any deposits of the mix.

► Mount the new parts, or old parts with one-side wear, which, however, must be mounted the other way round.

► Tighten screw connections.

► Steps of more than 3 mm at the joints of the mounted plates or tiles must be evenly ground.

► When replacing discharge door covers, discharge door ledges, wearing ledges and wearing plates make sure that discharge door/flap remains floating.

► **ATTENTION!**
After termination of the maintenance operations remove the safeguard against rotation.

► **NOTE!**
see group: Starting and Operation - Break-in Prescriptions before starting the mixer, after change of trough lining, resp.

5. Wearing parts of the Discharge Door

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **DANGER!**
Install a safeguard against rotation!
The mixing shafts must be prevented from turning if personnel is inside the mixing compartment while service work is being carried out:
> place wedges between the mixing blades and trough walls or material bed or
> place a wedge on each side of the gear belt wheel to block the V-belt drive (only where synchronous coupling is installed)

► **DANGER!**
Consider following, while working on discharge door:
> to avoid unauthorized starting of the discharge door
> to take precautions against getting squeezed
> to work under the mixer only with permissible maintenance scaffolds
> see Discharge Door Safety

► Remove lateral discharge door covers and discharge door ledges along discharge door.

► Remove fastening nuts on the lower side of the discharge drum, remove cylinder protection and clean the supporting faces on the discharge door cylinder

► Mount the new cylinder protection, discharge door ledges and discharge door cover.

► Make sure that the discharge door remains floating.

► **ATTENTION!**
After termination of the maintenance operations remove the safeguard against rotation.

6. Replacement of Cylinder Protection

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **DANGER!**
Consider following, while working on discharge door:
> to avoid unauthorized starting of the discharge door
> to take precautions against getting squeezed
> to work under the mixer only with permissible maintenance scaffolds
> see Discharge Door Safety

► Remove lateral discharge door covers and discharge door ledges along discharge door.

► Remove fastening nuts on the lower side of the discharge drum, remove cylinder protection and clean the supporting faces on the discharge door cylinder

► Mount the new cylinder protection, discharge door ledges and discharge door cover.

► Remove socket-pin safety from the discharge door.

► Make sure that the discharge door remains floating.

7. Replacement of Pedestal Bearings

► **NOTE!**
This repair should not be executed by the user alone, but always with the assistance of an expert of the mixer manufacturer, who will make available also the necessary tools and technical documentation

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **ATTENTION!**
Discharge door/flap can turn or open. Secure opposite side at first

► Remove discharge door/flap operation and lever.

► Secure discharge door/flap against falling down.

► Release setscrew on the bearing tension ring and open by means of beating in anticlockwise direction.

► After removing the pedestal bearing fastening screws, take bearing off in axial direction.

► Mount new bearing, fasten tension ring by beating in clockwise direction and tighten setscrew.

► Remount lever and discharge door/flap operation.

8. Wearing Parts of Discharge Door Flap

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► see Discharge door safety!

► Remove wearing ledges along discharge flap.

► Release fastening elements on the lower side of the discharge flap, remove flap wearing parts and clean supporting faces on the flap.

► Mount new flap wearing parts and wearing ledges.

► Make sure that the discharge flap remains floating!

9. Replacement of Discharge Door or Discharge Flap

► **NOTE!**
This repair should not be executed by the user alone, but always with the assistance of an expert of the mixer manufacturer, who will make available also the necessary tools and technical documentation

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **ATTENTION!**
Discharge door/flap can turn or open. Secure opposite side at first

► Removal is always to be made downwards.

► Remove discharge hopper under the mixer or swing it downward.

► Remove discharge door or discharge flap operation or drive.

► Hang up lifting cables to the left and to the right around the axles.

► Release screw connections on pedestal bearings and lower discharge door or flap.

► Remove sealing and wearing ledges in the mixing trough and clean supporting faces.

► Install new discharge door(s) of flap(s).

► Same proceeding as for removal, however in reverse order.

► Mount new sealing and wearing ledges.

► Make sure that the discharge door/flap remains floating!

10. Replacement of Cylinders

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► If possible, remove cylinder when the piston rod is drawn in. Arresting of the discharge door or flap lever is necessary. Thus the mounting length remains fixed.

► Unscrew hose lines and bolts (on cylinder and piston rod side).

► When mounting the new cylinder observe the correct mounting length and alignment. The bolts must be well greased!

11. Replacement of Cylinder Seals

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **NOTE!**
The required spare part kits should be kept on stock or ordered well in time from the mixer manufacturer

► For replacing the cylinder seals, dismantle the cylinder.

12. Replacement of Mixing and Lateral Blades

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **DANGER!**
see Discharge Door Safety /Discharge Flap Safety

► Clean mixing tools and remove deposits of the mix, particularly in the area of the blade fastening nuts.

► Release fastening nuts. If this is not possible, then burn away hexagon nuts.

► Remove blades and clean supporting faces on the mixing arm. Remove deposits of mixed material.

► **NOTE!**
Mount new mixing and lateral blades with simultaneous setting of the radial and axial blade gap.
Minimum gap width = 2 mm in radial and axial direction

► Setting of the blade gap with simultaneous rotation of the mixing tools by hand and check of the blade gap. The narrowest radial blade gaps should always be measured at the upper blade entry, at the trough wear protection.

► Upon adjustment of all mixing and lateral blades the screw connections must be firmly tightened and the mixing tools rotated by hand on the V-belt drive. If the blades touch the wear protection they must be reset

► For tightening torques refer to Technical Documentation

► **ATTENTION!**
Make sure that all blade screws are firmly tightened. If blade screws are not firmly tightened, blades will come loose. This will cause the mixing mechanism to block, the mixing shafts to bend and ultimately high repair costs.

13. Replacement of Mixing Arms

► **ATTENTION!**
Switch off the machine
> Set repair switch “OFF" and lock.
> Keep the key in a safe place protected from unauthorised access.
> Attach "Maintenance Work" sign to the repair switch.
> Observe stopping times for moving machine parts.

► **ATTENTION!**
Wait until mixing shaft is stationary (check mixing shaft between bearing housing and machine housing) and locking unit is unlocked.

► **DANGER!**
Install a safeguard against rotation!
The mixing shafts must be prevented from turning if personnel is inside the mixing compartment while service work is being carried out:
> place wedges between the mixing blades and trough walls or material bed or
> place a wedge on each side of the gear belt wheel to block the V-belt drive (only where synchronous coupling is installed)

► **DANGER!**
see Discharge Door Safety /Discharge Flap Safety

► Clean mixing tools and remove deposits of the mix, particularly in the area of the fastening elements.

► Release fastening nuts. If this is not possible, then burn away fixing screws in the gap between arm hub and counterpiece.

► Remove mixing arm and counterpiece and clean shaft supporting face. Remove deposits of mixed material

► Install new mixing arm, counterpiece and mixing blade.

► **NOTE!**
The screw connection for fastening the mixing arms comprises a hexagonal head screw, hexagon nut and spherical disk, with the latter located below the hexagon nut

► For torque values, see Technical Documents

► **ATTENTION!**
Make sure, that all mixing arms and blade fastening screws are firmly tightened

► **ATTENTION!**
After mounting the new mixing arms, the mixing tools must be rotated by hand on the V-belt drive. If the blades touch the wear protection, then they must be reset

► **ATTENTION!**
Make sure that all blade screws are firmly tightened. If blade screws are not firmly tightened, blades will come loose. This will cause the mixing mechanism to block, the mixing shafts to bend and ultimately high repair costs.

► **ATTENTION!**
Remove anti rotation safeguard after completing maintenance work.

14. Replacement of V-Belts on externally arranged V-Belt Drive

► **ATTENTION!**
Switch off the machine
> Set repair switch “OFF" and lock.
> Keep the key in a safe place protected from unauthorised access.
> Attach "Maintenance Work" sign to the repair switch.
> Observe stopping times for moving machine parts.

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit

► Remove V-belt protection device.

► Release V-belts by displacement of the motor rocker.

► Remove V-belts and mount new set of V-belts.

► Only use high-capacity narrow V-belts, see Spare Parts List.

► Tension V-belts and mount V-belt protection device!

► For V-belt tensioning, see Technical Documents

15. Replacement of V-belts on internally arranged V-Belt Drive

► **ATTENTION!**
Switch off the machine
> Set repair switch “OFF" and lock.
> Keep the key in a safe place protected from unauthorised access.
> Attach "Maintenance Work" sign to the repair switch.
> Observe stopping times for moving machine parts.

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit

► Remove V-belt protection device.

► **DANGER!**
Install a safeguard against rotation!
The mixing shafts must be prevented from turning if personnel is inside the mixing compartment while service work is being carried out.

► For MFC coupling: remove rubber components by means of cranked double ratchet ring spanner.

► For N-Eupex coupling: release screws on claw ring and move claw ring horizontally until uncoupled. Release screws on female part of coupling, remove female part.

► Release V-belts by displacement of the motor rocker.

► Remove V-belts and mount new set of V-belts.

► Only use high-capacity V-belts, see Spare Parts List.

► Observe the instructions for coupling and uncoupling, refer to Group: Maintenance and Inspection.

► Couple synchronous coupling again. Same proceeding as for uncoupling, however in reverse order.

► Check correct adjustment of mixing tools to each other!

► Tension V-belts and mount V-belt protection device.

► **ATTENTION!**
Remove anti rotation safeguard after completing maintenance work.

► **For V-belt tensioning, see Technical Documents**

16. Replacement of Motor(s)

► **NOTE!**
This repair should not be executed by the user alone, but always with the assistance of an expert of the mixer manufacturer, who will make available also the necessary tools and technical documentation

► **ATTENTION!**
Electrical work must only ever be performed by authorized skilled personnel!!

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► Remove V-belt guard, detention V-belts and remove V-belts.

► Remove motor V-belt pulley and hydraulic coupling, resp.
Hydraulic coupling see Technical Documentation.

► Place a lifting device over the motor to be removed. Then put two ropes around the motor at the drive and the fan side, hang them into the lifting device and pull until the ropes are uniformly tight.

► Remove motor fastening screws. Afterwards attach a second lifting device laterally at the motor and by pulling at an angle put the motor in its lowering position. Then lower the motor onto the platform.

► Mount the new motor. Same proceeding as for removal, but in reverse sequence.

► Mount the motor V-belt pulley, or hydraulic coupling, resp. Check alignment of V-belt pulleys to each other. Move motor in axial direction, if necessary.
Hydraulic coupling see Technical Documentation.

► Attach and tension V-belts. Mount V-belt guard.

► **NOTE!**
Before putting into service again check the turning direction. Refer to Group: Assembly/Electrical Connection.

17. Replacement of Slip-On Gear Units

► **NOTE!**
This repair should not be executed by the user alone, but always with the assistance of an expert of the mixer or gearbox manufacturer. Special knowledge and technical documentation is required.

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► **DANGER!**
Install a safeguard against rotation!
The mixing shafts must be prevented from turning if personnel is inside the mixing compartment while service work is being carried out:
> place wedges between the mixing blades and trough walls or material bed or
> place a wedge on each side of the gear belt wheel to block the V-belt drive (only where synchronous coupling is installed)

► Dismount motor and V-belts.

► **DANGER!**
Prevent gear unit you are removing from tipping to side, before releasing torque support and synchronous coupling!

► Suspend the gear unit vertically upward by means of a lifting device.

► Loosen drive support by knocking out a bolt on the hinge head.
The bolt has been bonded by means of metal adhesive, e.g. Loctite; therefore heat the butt straps shortly to approx. 180-200 °C.

► Turn drive support (turnbuckle with hinge head) downwards.

► Separate synchronizing coupling.

► After removing the gearbox cover and end disk, attach extracting device with light metal hollow piston cylinder (Lukas) and extract the gear unit by actuating the piston hand pump. If no Lukas cylinder is available then insert several spacer pieces instead of the cylinder into the extracting device and withdraw the gear unit by hand by uniform tightening of all 4 nuts.

► **ATTENTION!**
When setting down the gear unit, make sure that oil is unable to escape from vent.

► After removal clean the shaft by means of petrol and emery cloth, and apply some grease.

► The mounting of the slip-on gear unit to the shaft is made by hand by means of a threaded spindle.

- Thread diameter = M 24 for mixer sizes 1,25 - 4,00 m³
- Thread diameter = M 36 for mixer sizes 5,00 - 6,00 m³

► Mount the motor, put on and tension V-belts.

► Mount drive support again, provide bolt with metal adhesive, e.g. Loctite, install it and put on V-belts.

► Remount synchronous coupling:

► **Remove the safeguard against rotation.**

► **ATTENTION!**
Adjust mixing mechanisms to correct mutual setting:
> Mark on shaft ends must be aligned with marks on hollow gear unit shafts.
> Correctly position both drive-end lateral arms in relation to each other, see Spare parts list, Group: Mixing mechanism

► Couple synchronous coupling.

► Adjust coupling alignment in two planes:
- vertically: by adjusting the turnbuckle
- horizontally: by placing a fitting ring between gear unit and spacer bushing

► Screw end disk and gearbox cover on, fill gear oil in.

► Prior to starting, rotate the mixing tools one full revolution by hand on the V-belt drive to check the adjustment of the mixing tools.

► **NOTE!**
Before putting into service again check the turning direction. Refer to Group: Assembly/Electrical Connection.

► Mount protective guards.

18. Repair on Slip-On Gear Units

► **NOTE!**
This repair should not be executed by the user alone, but always with the assistance of an expert of the mixer or gearbox manufacturer. Special knowledge and technical documentation is required.

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► The sealing rings may be replaced by the operator, provided that the sealing lip has not left traces of running-in on the sealing faces of the shaft.

19. Replacement of Rubber Components in Synchronous Couplings

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► Remove V-belt protecting device.

► Uncouple synchronous coupling.

► For MFC coupling: remove rubber components by means of cranked double ratchet ring spanner and mount new rubber components.

► For N-Eupex coupling: Release screws on claw ring and move claw ring horizontally until uncoupled. Press out rubber components by means of a screw driver and press in new rubber components.

► Instructions for coupling and uncoupling must be observed, refer to Group: Maintenance and Inspection, Maintenance and Inspection Plan.

► Couple synchronous coupling again. Same proceeding as for removal, but in reverse sequence.

► Tension V-belts and mount V-belt protection device.

► **IMPORTANT!**
Adjustment of mixing tools see Spare Parts List
Check if mixing tools are rotating freely

20. Replacement of Mixing Shafts

► **NOTE!**
This repair operation should not be performed by the user without assistance. It is recommended that repairs be carried out by an expert engineer who can provide necessary tools and technical documents.

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► bearing case and machine housing) and opening of locking unit.

► see Discharge Door Safety /Discharge Flap Safety

► Remove slip-on gear units, see Replacement of slip-on Gear Units.

► Dismount mixing tools.

► Remove bearing cover, dust cover and wearing rings on either side.

► Support shaft in the trough on both sides.

► Pull off bearing bodies with self-aligning roller bearings by means of jacking screw.

► Release and pull-off locating ring and shaft bush.

► Remove shaft to the side.

► Mount new shaft as well as seals, bearing bodies, bearings and bearing cover
- Mounting instructions:

see: Replacement of Axial Face Seals
see: Replacement of Mixing Shaft Bearings

- The following illustration shows the design of the shaft sealing.

20.1 Non-adjustable axial face seal

► The shaft bush (2) is fixed on the mixing shaft (1) in its axial position to the connecting flange (3). The bipartite axial face seal (5) is seated in the locating ring (4) and the shaft bush (2) by means of O-rings. For the proper functioning of the axial face seal it is important that it is prestressed in installed condition Therefore mind the following proceeding for assembly:

- Before mounting the split ring seals (8 + 9) the mixing shaft must be aligned and dimension 's' between shaft bush (2) and mixer housing must be set. s = 2 ± 0,5 mm.
- In case of deviations levelling plates are slipped onto the shaft, or corresponding rework is required on shaft bush (2).
- With locating ring (4) pulled out, the distance X measured between contact surface of connecting flange (3) and shaft bush (2) must be checked.

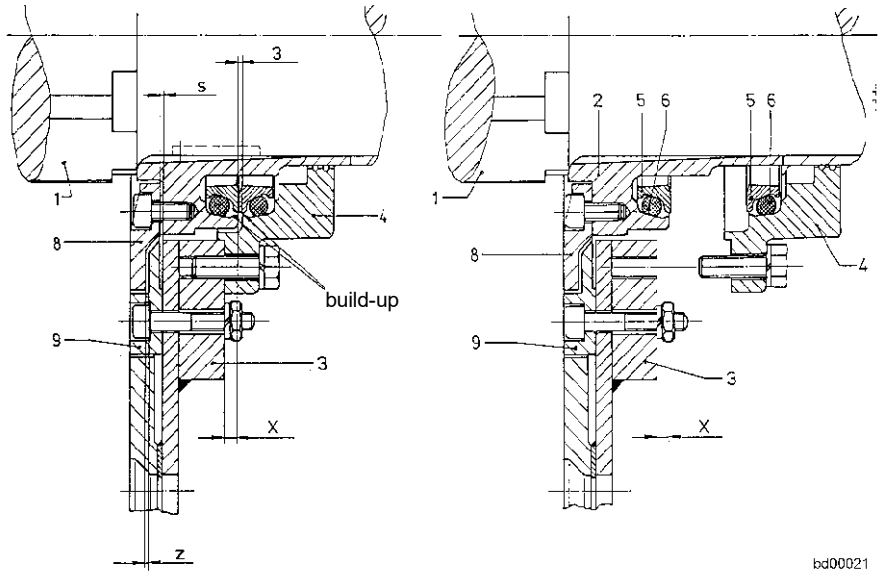
Correct distance (X):

for mixer sizes:	1,25	-	1,67	m³	X	=	-5 ±	0,5 mm (set back)
	1,85	-	3,0	m³	X	=	7 ±	0,5 mm
	3,5	-	4,0	m³	X	=	10 ±	0,5 mm
	5,0	-	7,0	m³	X	=	3 ±	0,5 mm

Check of gap size 'z' between dust cover (8) and wearing ring (9)
z = 2,0 ± 0,5 mm.
If the gap size is inferior, it is to be adjusted by means of shims (shim to DIN 127 or tooth lock washer to DIN 17222) between dust cover (8) and shaft bush (2) depending on the deviation.

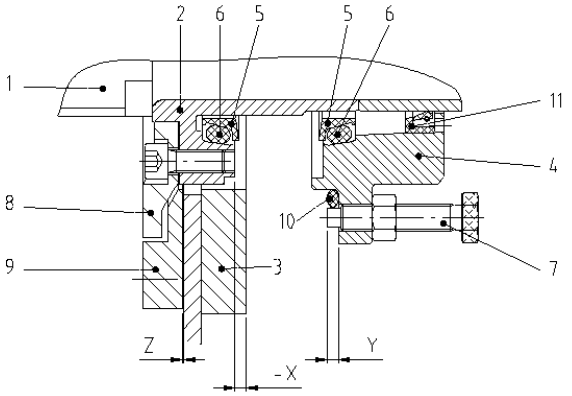
► When replacing the drive side seals mount slip-on gear, refer to: replacing of the gearbox (for mixing tool position refer to spare part list).

► **IMPORTANT!**
Check if mixing tools are rotating freely



20.2 Adjustable axial face seal

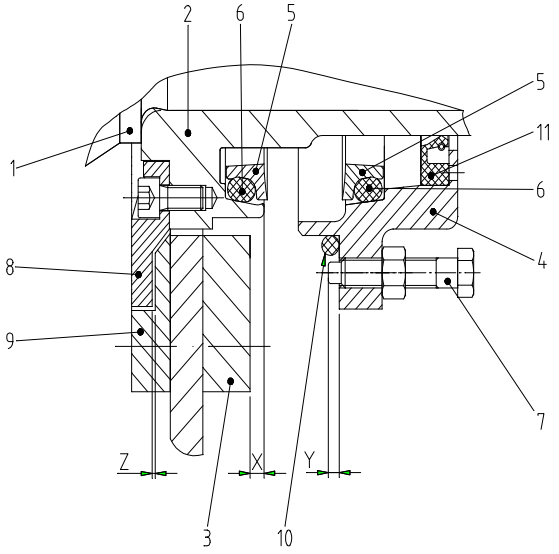
► The shaft bush (2) is fixed on the mixing shaft (1) in axial position to the connecting flange (3). The bipartite axial face seal (5) is seated in the locating ring (4) and the shaft bush (2) by means of O-rings. For poper functioning of the axial face seal it is important that it is prestressed in installed condition. Therefore mind the following proceeding for assembly.



► Dismount the locating ring (4).

► Clean locating ring and shaft bush; then check if parts are still ok.

► You should be able to mount the axial face seals with O-rings in the locating ring applying slight pressure only, to get a pretension to hold the rings.



► The sealing faces must be smooth without any grooves!

► **ATTENTION!**
Dimension X must be mediated on the drive side and opposite drive side depending on the mixer size

- **Mixer size: 1.00 to 1.67**
  calculated nominal size: X = - 5 mm
  Y must be set and fixed by means of the forcing screws (7) in dependence on the measured value X (refer to table).

X measured	-	3	3,25	3,5	3,75	4	4,25	4,5	4,75	5	5,25	5,5	5,75	6	6,25	6,5	6,75	7
Y set	+	7	6,75	6,5	6,25	6	5,75	5,5	5,25	5	4,75	4,5	4,25	4	3,75	3,5	3,25	3

- **Mixer size: 1.85 to 3.00**
  calculated nominal size: X = 7 mm
  Y must be set and fixed by means of the forcing screws (7) in dependence on the measured value X (refer to table).

X measured	5	5.25	5.5	5.75	6	6.25	6.5	6.75	7	7.25	7.5	7.75	8	8.25	8.5	8.75	9
Y set	5	5.25	5.5	5.75	6	6.25	6.5	6.75	7	7.25	7.5	7.75	8	8.25	8.5	8.75	9

- **Mixer size: 3.50 to 4.00**
  calculated nominal size: X = 10 mm
  Y must be set and fixed by means of the forcing screws (7) in dependence on the measured value X (refer to table).

X measured	8	8.25	8.5	8.75	9	9.25	9.5	9.75	10	10.25	10.5	10.75	11	11.25	11.5	11.75	12
Y set	3	3.25	3.5	3.75	4	4.25	4.5	4.75	5	5.25	5.5	5.75	6	6.25	6.5	6.75	7

- **Mixer size: 4.00 to 7.00**
  calculated nominal size: X = 3 mm
  Y must be set and fixed by means of the forcing screws (7) in dependence on the measured value X (refer to table).

X measured	1	1.25	1.5	1.75	2	2.25	2.5	2.75	3	3.25	3.5	3.75	4	4.25	4.5	4.75	5
Y set	3	3.25	3.5	3.75	4	4.25	4.5	4.75	5	5.25	5.5	5.75	6	6.25	6.5	6.75	7

► Check if O-ring (10) and sealing ring (11) have been inserted correctly.

► Check gap size between dust cover (8) and wearing ring (9):
z = 2.0 ± 0.5 mm.
If the gap size is inferior, it is to be adjusted by means of shims (shim to DIN 127 or tooth lock washer to DIN 17222) between dust cover (8) and shaft bush (2) depending on the deviation.

► When replacing seals on the drive side, mount slip-on gear unit;
refer to: replacing of the gearbox (for setting of mixing tools refer to spare part list).

► **IMPORTANT!**
Check if mixing tools are rotating freely

► **NOTE!**
Before putting into service again check the turning direction. Refer to Group: Assembly/Electrical Connection.

21. Replacement of Mixing Shaft Bearings

► **NOTE!**
This repair operation should not be performed by the user without assistance. It is recommended that repairs be carried out by an expert engineer who can provide necessary tools and technical documents.

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► In case of drive side bearing, remove slip-on gear unit proceeding see Replacement of slip-on Gear Units.

► Support shaft on both sides of the trough.

► Then unscrew bearing cover and bearing body and withdraw bearing body with self-lager aligning roller bearing by means of jacking screw.

► Clean bearing body, bearing cover and shaft.

► Mount again bearing body, self-aligning roller bearing and bearing cover.

► Remount slip-on gear unit and adjust correct position of mixing tools, see Replacement of Mixing Arms.

22. Replacement of Axial Face Seals

► **NOTE!**
This repair operation should not be performed by the user without assistance. It is recommended that repairs be carried out by an expert engineer who can provide necessary tools and technical documents.

► **ATTENTION!**
Switch off the machine:
> Repair switch to position "OFF" and locked by key
> Keep key safely against unauthorized use
> Put warning sign "Maintenance Work" on repair switch
> Wait for slow-down period of moving machine parts

► **ATTENTION!**
Wait for immobilization of mixing shaft (check on the mixing shaft between bearing case and machine housing) and opening of locking unit.

► In case of drive side seal, remove slip-on gear unit, see: Replacement of slip-on Gear Units.

► Support shaft on both sides of the trough.

► Then unscrew bearing cover and bearing body and with-draw bearing body together with self-aligning roller bearing by means of jacking screw.

► Before removing the fixed bearing or replacing the shaft seal on the fixed bearing side (non-drive end) measure alignment between gear coupling halves and note down.

► Support the shaft in the trough, unscrew and withdraw locating ring.

► Dismount axial face seals.

► Clean locating ring and shaft bush, check if parts are OK

► Builds-up - see fig. Replacement of Mixing Shafts - must still exist, so the axial face seals with O-rings can only be mounted with corresponding pressure.

► Sealing faces must be smooth without any striae.

► Insert new axial face seals and mount locating ring, bearing body and bearing cover. Check distance between contact surface of locating ring and shaft bush.

► **IMPORTANT!**
Correct distance measure refer to: Replacement of Mixing Shafts

► Readjust the alignment measured on the gear coupling (only applicable when replacing the seals on the non-drive end).

► In case of drive side seal replacement mount slip-on gear unit and adjust correct position of mixing tools, refer to Replacement of slip-on Gear Units.

Material / Material **902035407**
Description / Beschreibung **TECHNICAL DOCUMENTS**
TECHNISCHE UNTERLAGEN

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	902024942	TECHNICAL SPECIFICATION TECHNISCHE SPEZIFIKATION	1,000	ST
2	902026089	INSTALLATION DRAWING EINBAUZEICHNUNG	1,000	ST
3	902027443	TECHNICAL INSTRUCTIONS TECHNISCHE HINWEISE INKL. KHW MITTELARM	1,000	ST
4	902028304	MAINTENANCE REGULATION ZH WARTUNGSVORSCHRIFT ZH	1,000	ST
5	902014691	WORM GEAR SCHNECKENGETRIEBE	1,000	ST
6	902005092	OPERATING INSTRUCTIONS MOTOR ABB BETRIEBSANLEITUNG MOTOR ABB	1,000	ST
7	902028599	DISCHARGE DOOR OPERATION PNEU. 10-36 V D ENTLEERSCHIEBERBETAETIG. PNEU. 10-36 VDC	1,000	ST
8	902025138	CENTRAL LUBRICATION GREASE ZENTRALSCHMIERUNG FETT	1,000	ST

Deckblatt
Cover page

BHS Nummer BHS Number	902035407
Beschreibung Description	TECHNISCHE UNTERLAGEN TECHNICAL DOCUMENTS

BHS SONTHOFEN	Technical Specification	902024942	
	Twin Shaft Batch Mixer DKXS1,25	Edition	08/15
		page	1 - 1

Process Data

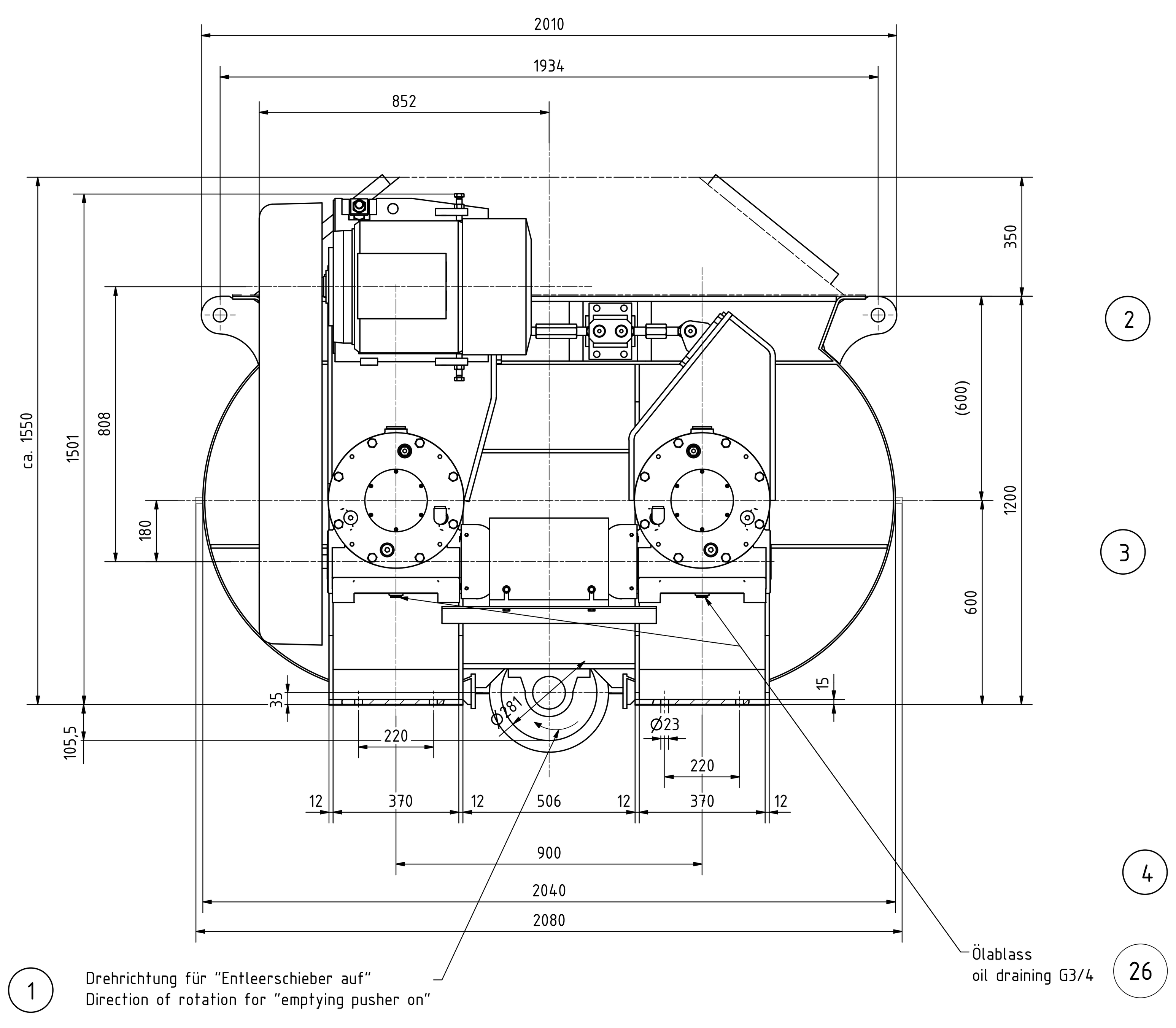
Batch volume	compacted concrete	**1,25 m^3**
	dry charge	**1,88 m^3**
Batch weight	max.	**3000 kg**
Truck mixer discharge[2)]	mixing cycles per hour	**53**
	compacted concrete	**66 m^3/h**
Mixture[1)]		**Transport concrete,**
Aggregate size	from/to	**0 – 64 mm**

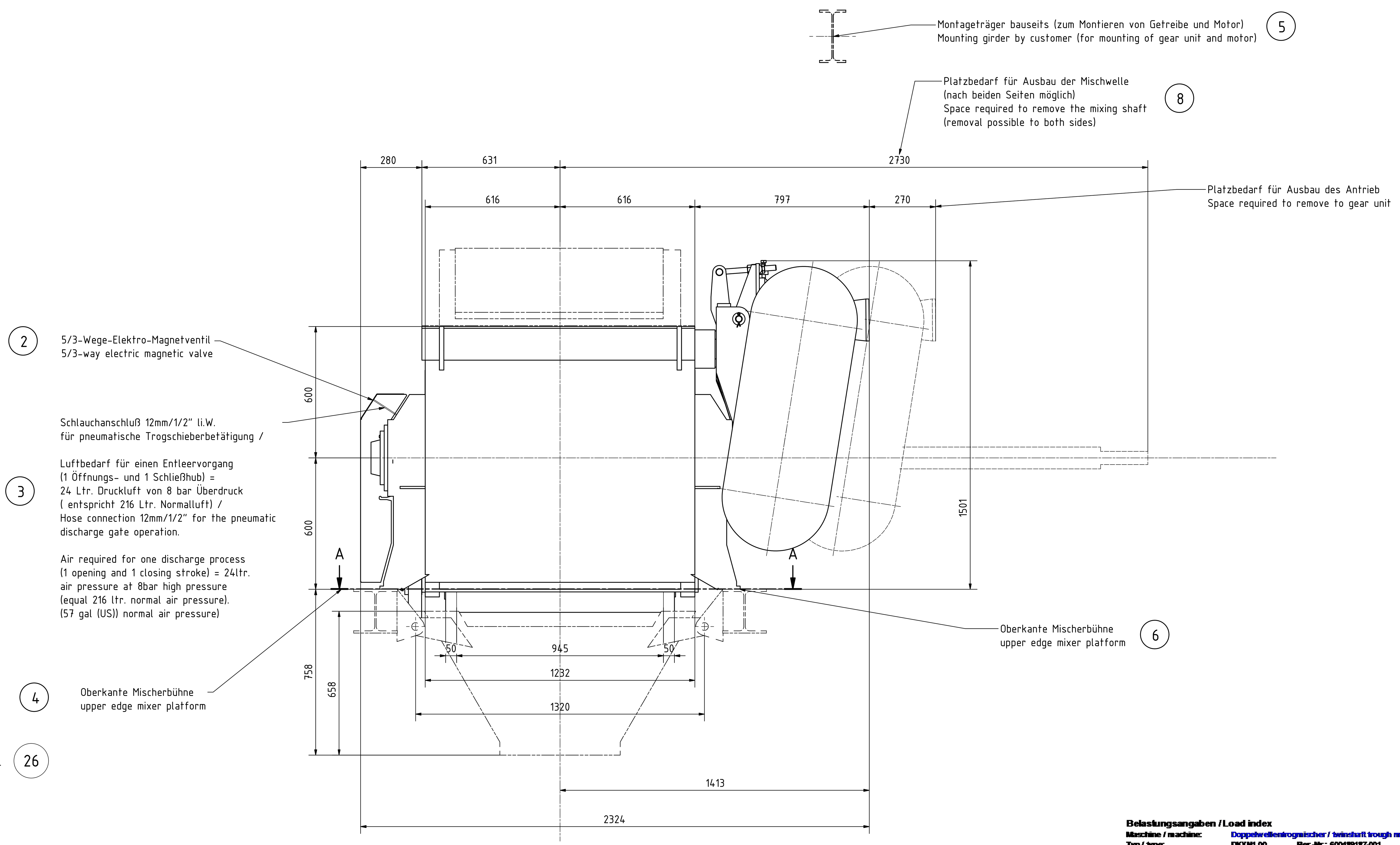
Technical Data

Drive output and mixer equipment	See order confirmation received
Machine weight	See type label
Dimensions	refer to installation drawing

1) Special variants for individual applications can be provided on request

2) 30 sec. mixing time and truck mixer input performance of 0,12m^3 fresh concrete per sec.





Belastungsangaben / Load index

Maschine / machine: Doppelwellentrogmischer / twinshaft trough mixer
Typ / type: DKXN1,00 **Ber.-Nr.:** 600489187-001

Vertikalkräfte aus / Vertical forces resulting from:

Eigenmasse / dead weight:	F(E) =	36.800 N
Füllungsmasse / filling mass:	F(F) =	24.000 N
Überschüttung / surcharge:	F(Fmax) =	48.000 N

Erschütterungsfaktoren / Vibration factors:

X-Richtung / X-direction:	f(X) =	15%
Y-Richtung / Y-direction:	f(Y) =	10%
Z-Richtung / Z-direction:	f(Z) =	25%

Betriebskräfte (F(B;...) / Service forces:

Normalbetrieb: / standard service: F(B;X;Y) = f(X;Y) * F(F)
F(B;X) = 3.600 N
F(B;Y) = 2.400 N
F(B;Z) = F(E) + F(F) + f(Z) * F(F)
F(B;Z) = 66.800 N

Überschüttung / surcharge: F(Bmax) = F(E) + F(Fmax)
F(Bmax) = 84.800 N

Erregerfrequenzen / Exciter frequencies:

Erreger exciter	Frequenz frequency	Frequenz frequency	Richtung direction
Netzfrequenz	50 Hz	60 Hz	
Elektromotor / electric motor	1470 min-1	1764 min-1	± X; ± Z
Schneckenwelle / worm shaft	867 min-1	751 min-1	± X; ± Z
Mischwelle / mixing shaft	26 min-1	22 min-1	± Y; ± Z
Mischwerkzeuge / mixing tools	153 min-1	133 min-1	± X; ± Y; ± Z

Vertikalkräfte bezogen auf die Auflagepunkte:
Vertical forces referred to points of support:

Auflager support	Kraftrichtung / power direction ± X	± Y	Z Eigenmasse dead weight	Z Normalbetrieb material bed	Z Überschüttung surcharge
A	900 N	600 N	8.200 N	15.700 N	20.200 N
B	900 N	600 N	7.500 N	15.000 N	19.500 N
C	900 N	600 N	12.200 N	19.700 N	24.200 N
D	900 N	600 N	8.900 N	16.400 N	20.900 N
Summe / total	3.600 N	2.400 N	36.800 N	66.800 N	84.800 N

Hinweis zu den Erschütterungskräften und Erregerfrequenzen:

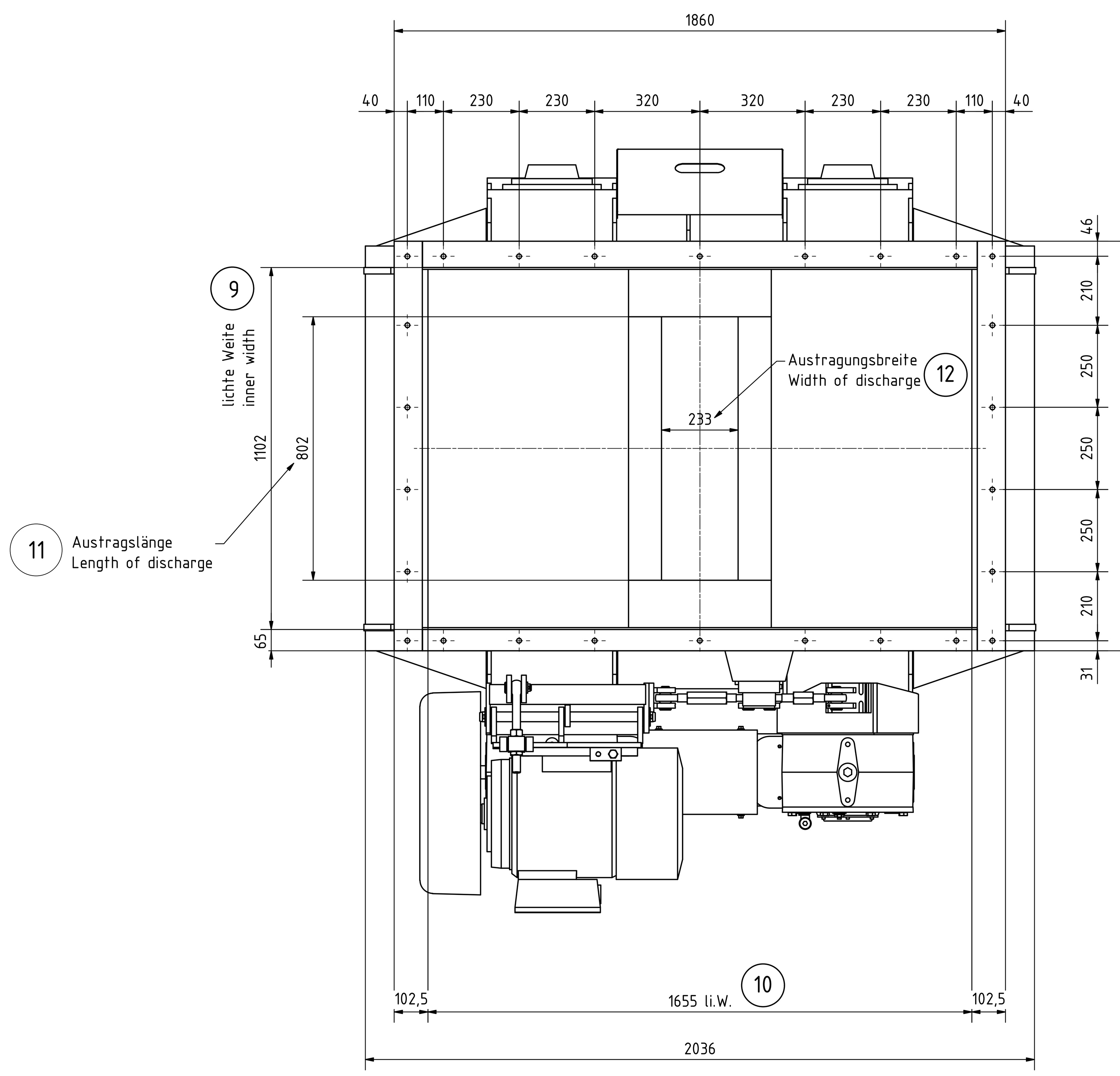
Für eine schwingungstechnisch sichere Auslegung ist es unerläßlich, die Eigenfrequenzen des Stahlbaus so auszulegen, daß sie außreichend außerhalb der Erregerfrequenzen der Maschine liegen!

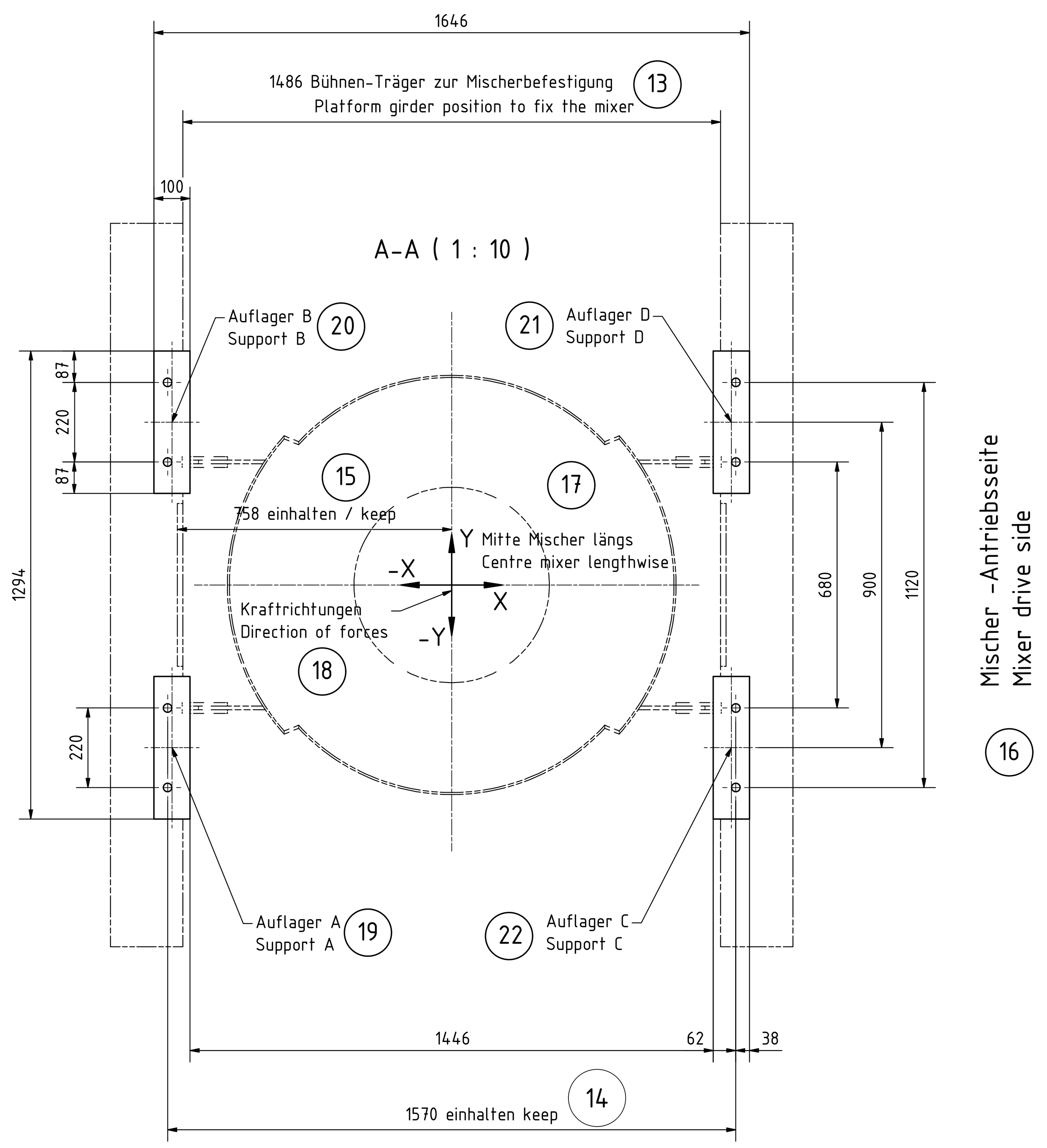
Als Ersatzkräfte zur überschlägigen Auslegung des Stahlbaus unter Berücksichtigung dynamischer Vorgänge werden die Erschütterungskräfte in X-, Y-, und Z-Richtung aus dem Produkt von Erschütterungsfaktor und Füllungsmasse ermittelt.

Comment to vibration forces and exciter frequencies:

For vibration technical secure design it is imperativ to design the natural frequency of steel construction so that it will be sufficiently outside the natural frequency of the machine!

As substitute forces for an approximate design of steel construction under consideration of dynamic processes are determined the vibration forces in X-, Y-, and Z direction from the product of vibration forces and filling mass.





Transportmaße / Transport dimensions einschließlich Transporthölzer, jedoch ohne Trogabdeckung / including wooden transport planks, but without trough cover	
Länge / length	2 350 mm
Breite / width	2 080 mm
Höhe / height	1 800 mm

Hinweis:
Bei der Auslegung des Stahlbaus sind noch das Eigen- und Füllgewicht des Auslauftrichters sowie das Gewicht des kompletten Trogverdecks zu berücksichtigen!

Note:
When disigning the steel construction, the dead weight and filling weight of the discharge hoper as well as the weight of the complete trough cover must also be taken into concideration!

A	29.06.2017	Dünnebacke	Erstzustand
Stand/state	Datum/date	gezeichnet/drawn	Bemerkung/notice

CAD-Zeichnung/CAD-Drawing
Oberflächen/surface DIN-ISO 1302
Kanten/edge ISO 13715 Innenkanten/inside edge +0.8 Außenkanten/outside edge -0.5
Für Maße ohne Toleranzangabe / for dimensions without a tolerance DIN ISO 2768 mL
Maßstab/scale 1:10
Werkstoff/material
Gewicht/weight 0.00 kg
BHS SONTHOFEN
Erstauftrag Nr.
Ähnlich Zeichg. Nr. 902025665
Mat.-Text 1 EINBAUZEICHNUNG
Mat.-Text 2 DOPPELWELLENCHARGENMISCHER
mat.-desc 1 INSTALLATION DRAWING
mat.-desc 2
Maschinen-Typ / machinen-type DKXN1,00
Abmessung / dimension
Material-Nr.: / material-no.: 902026089
Dokument-Nr.:/document-no.: 600472013-001
Stand A
Format A0

Material / Material **902027443**
Description / Beschreibung **TECHNICAL INSTRUCTIONS**
TECHNISCHE HINWEISE INKL. KHW MITTELARM

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	900302500	CONTROL INSTRUCTION WEARING PARTS KONTROLLHINWEISE VERSCHLEISSTEILE	1,000	ST
2	900035600	CONTROL INSTRUCTION KONTROLLHINWEISE MITTELARM 1,0 - 1,67	1,000	ST
3	900356300	TIGHTENING MOMENT ANZIEHDREHMOMENTE	1,000	ST
4	900361200	V-BELT TENSION KEILRIEMENSPANNUNG	1,000	ST
5	900360600	LUBRICANT OIL SCHMIERSTOFF OEL	1,000	ST
6	900360700	LUBRICANT GREASE SCHMIERSTOFF FETT	1,000	ST

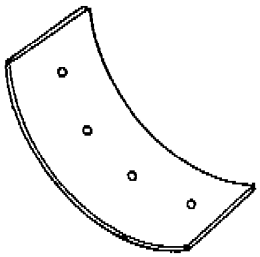
Deckblatt
Cover page

BHS Nummer BHS Number	902027443
Beschreibung Description	TECHNISCHE HINWEISE INKL. KHW MITTELARM TECHNICAL INSTRUCTIONS

ATTENTION:
All wearing parts in the mixing trough must be checked at monthly intervals.
Wearing parts must be changed before they start to damage the base structure of the mixing trough, discharge gate or discharge door.

NOTE:
The useful life of wearing parts may vary widely. This will be governed by different parameters, such as charging situation, type and nature of additives, consistency of the materials being mixed and not least by the gap between the mixing tools and the anti-wear lining which must be as close as possible.

1. Mixing trough protection

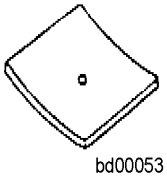


1.1 Sheet metal plates

Although these plates can be reversed and are economical to use, plate thickness in the wear zone must not be allowed to fall below 3 mm.

1.2 Tiles of special hard cast material

These can be used to replace the metal plates without corrective work. Tiles last approximately 3 times longer than metal plates. The tiles must be renewed when they have worn down to a thickness about 6 mm (risk of breaking). As a rule, you will only need to replace the lower rows.



1.3 Ceramic / steel tiles

These can be used to replace the metal plates or hard cast tiles without the need for corrective work.
Ceramic tiles with a steel base structure last at least twice as long as hard cast tiles and can be worn down as far as the steel base structure.
Plastic-type mixing blades should be selected.

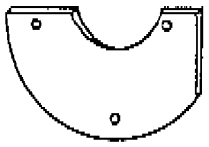
1.4 Ceramic lining cemented directly in place

Special measures are required for installing this ceramic lining. Please consult our Customer Service Department for further details. Plastic mixing blades must be selected for this lining type as well.

2. Trough end-wall protection

2.1 Sheet metal plates

Although individual segments may be reversed, plate thickness in the wearing zone must not be allowed to fall below 6 mm.



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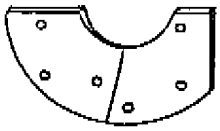
2.2 Tiles of special hard cast material

For casting reasons, the segments are of different design.
This may be replaced by the metal sheet version without reworking

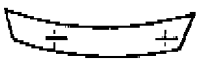


bd00055

2.3 Sealing plates and lateral wearing plates for the discharge doors

In view of the necessity for the discharge doors to form a tight seal, these metal plates must only be allowed to wear down to such an extent that adjusting the sealing plates still ensures that the discharge doors form a tight seal at the sides.
To adjust the sealing plates, refer to spare parts list.

bd00056



bd00057

2.4 Ceramic / steel tiles

The tiles are the same shape as the sheet metal plates, and are otherwise structured as described in 1.3.

2.5 Ceramic lining cemented directly in place

As described in 1.4.

3. Mixing blades, central

3.1 Mixing blades of special hard cast material

must be adjusted at the latest when the distance from the trough protection in the lower part of the mixing trough has reached 10 mm.
The normal radial gap setting is approx. 2 mm at the narrowest point.
Turn mixer and check the gap widths.

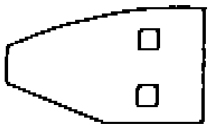
3.2 Plastic mixing blades

must be checked frequently to ensure that the gap setting remains as small as possible since any major gap will result in increased wear, particularly at the plastic edge facing the trough protection. As far as the radial gap setting is concerned, the plastic blade may contact the trough lining at the tightest point.
Turn mixer and check gap widths and points of contact.

For type: LESX or DKX

bd00058

For type: LES or DK



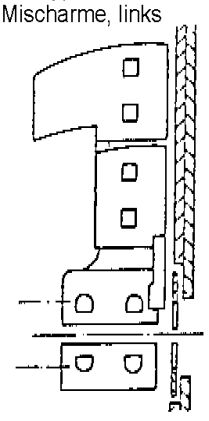
bd00059

4. Mixing arms, lateral

4.1 are provided with mixing blades and lateral plates of **special-hard cast material** that can be adjusted in both the axial and radial direction, permitting compensation for wear on the scraping edges. If the side shovel is readjusted the side panel must also be readjusted flush-aligned to the side shovel. The arm protection must not be spaced more than 5 mm from the end-wall. The normal radial and axial gap setting is approx. 1 mm at the tightest point.
Turn mixer and check gap widths.

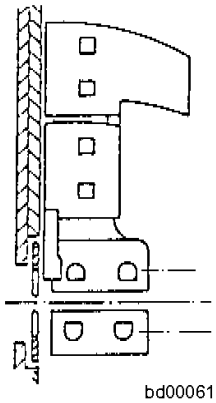
4.2 provided with mixing blades and lateral plates in **plastic** must be frequently checked to ensure that the gap setting remains as small as possible since any major gap will result in increased wear, particularly at the plastic edge facing the trough and end-wall protection. These plastic blades and plates can also be adjusted in both the axial and radial direction, and may contact the anti-wear lining when the gap is adjusted to the tightest setting. If the side shovel is readjusted the side panel must also be readjusted flush-aligned to the side shovel.
Turn mixer and check gap widths and points of contact.
With ceramic lining the distance between arm protection and end-wall should be as small as possible (although there must be no contact) and may be adjusted by fitting a washer between arm protection and side arm.

Für Typ: LESX oder DKX
Mischarme, links



bd00060

Für Typ: LESX oder DKX
Mischarme, rechts



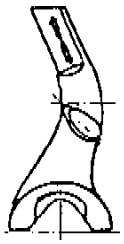
bd00061

bd00023

ATTENTION!

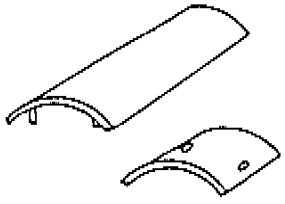
Small gap widths -> low wear
Large gap widths -> high wear

5. Mixing arms, central



Refer to Technical Documentation for details on checking for wear: Instructions on inspecting central arm.

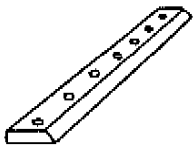
6. Cylinder protection at discharge gate



bd00065

This must be renewed when it has worn down as far as the base structure at the beater arms. To do this, the closed discharge gate must be secured by the locking bolt, refer to Operating Instructions, Group: General Safety Instructions.

7. Gate strips and sealing strips



bd00067

Must be replaced when it is not longer possible to move them closer than 1 mm to the discharge door, anti-wear plates or gate cylinder at the fixing slots. (Discharge gate or discharge door can then no longer be sealed.)

8. Gate cover

bd00068

Located at the bottom of the gate valve covers/housings are grooves/markings/indentations which serve for wear monitoring. If these become visible from above the covers/housings require replacement.

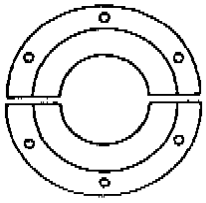
9. Coarse grain seal (Dry materials mixer DMX)

The seals must be replaces as soon as these cannot be adequately readjusted. For the sealing panels at the side cf. to 2.3

10. Fine grain seal (Dry materials mixer DMX)

In case of tightness issues examine the gab and the sealing hose for damages and replace if required

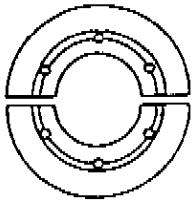
11. Dust cover made of special white iron



bd00070

This is the inner closure of the shaft seal. The wear depends upon the radial parallelism of the gap against the end wall protection. Replace the dust cover when the gap size exceeds 5 mm.

12. Wear ring of the dust cover made of special white iron



bd00069

The wear ring is located between the dust cover and the end wall tile and must be replaced together with the dust cover

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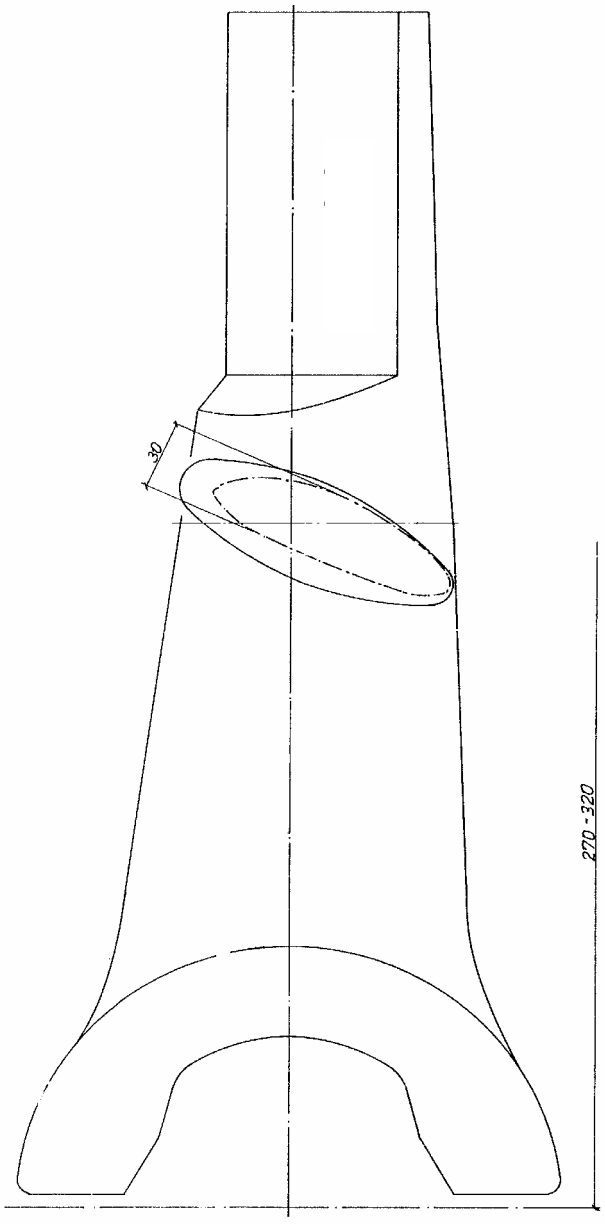
ATTENTION!

If, due to wear, the cross-section at the weakest point has reached the dimension indicated, the mixing arm can no longer be used and must be replaced for safety reasons.



1. Tensioning torque for bolt connections

Dimension	M 8	M 10	M 12	M 16	M 20	M 24	M 27	M 30	M 36	M 42
Property class 8.8 Nm 1)	21	42	72	174	340	580	855	1160	2030	
Property class 10.9 Nm 1)	29	58	100	245	476	824	1201	1636	2850	
Property class 8.8 and hexagon all-metal nut with clamping part Nm 1) + 5)	27	52,5	87,5	206	394	660	949	1268		
Property class 8.8 and NORD LOCK self-locking washers Nm 2)	24	48	82	200	391	667	1018	1334	2335	
Property class 10.9 and NORD LOCK self-locking washers Nm 4)	32	60	108	263	515	888	1290	1750	3050	
Property class 12.9 and NORD LOCK self-locking washers Nm 4)	38	75	128	311	610	1052	1533	2091	3420	4560
Property class A 4 stainless steel screw Nm 3) + 6)	15,3	31,0	52,0	126	245	235	402,2 Friction µges = 0,14	549 Friction µges = 0,14		
Property class A 4-80 stainless steel screw and NORD LOCK self-locking washers Nm 4)	19,8	38	67	164	321	553	805	1090	1900	

1) Specification are suitable for the friction µges = 0,10
For non treated surface lubricated with MoS_2-paste (Molykote) and cadmium electroplated surface non oiled or slightly oiled.

2) Specification are suitable for the friction µges = 0,11
For cadmium electroplated surface lubricated with MoS_2-paste (Molykote).

3) Specification are suitable for the friction µges = 0,12
For non treated surface lubricated with MoS_2-paste (Molykote).

4) Specification are suitable for the friction µges = 0,14
For non treated surface lubricated with MoS_2-paste (Molykote).

5) Hexagon all-metal nut with clamping part - DIN 6925 - property class 8

6) up to M 20 cold rolled, as of M 22 cut

1.1 Installation of the NORD-LOCK self-locking lock washers

As shown in Fig. 1-4 the lock washers are installed in pairs with the inclined plane to one anothers. Upon tightening the washer pair is braced against the supporting surface, and the radial ribs on the outside of the lock washer pair enter a positive engagement.

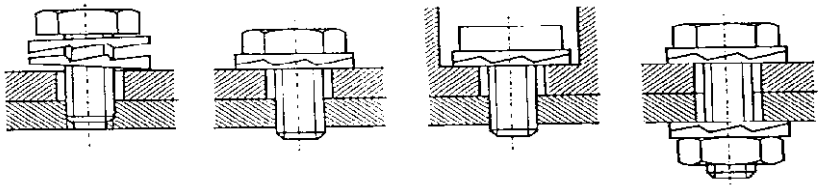


Bild 1 Bild 2 Bild 3 Bild 4

bd00043

2. Tensioning torque for bolt connections used in Taper-Lock spring collets

Type of Taper Lock spring collet	2012 2017	2517 2525	3020 3030	3525 3535	4040	4545	5050	
Tensioning Torque Nm 7)	31	48	90	113	170	192	271	

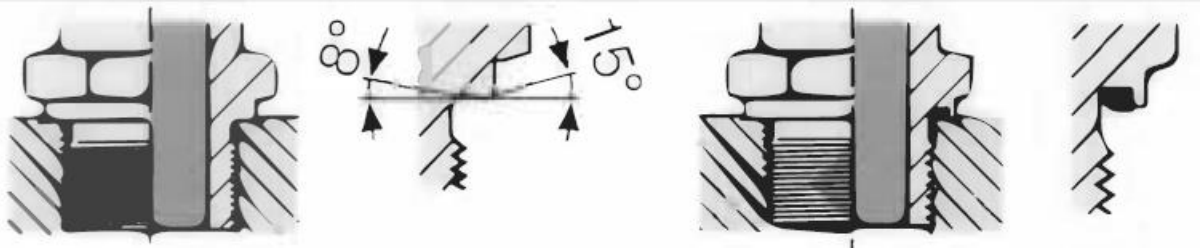
3. Tensioning torque for bolt connections used in tensioning sets

Part no. (see List of Spare Parts)	Tensioning Torque Nm 7)
910017100	125
910131600	235
910181700	145
910185700	145
910187500	145
910245200	235
910270200	84
910299300	43
910334700	18
910339000	84
910473700	14
910519600	145
910550500	83
910577500	84
910612500	365
910612600	720

Part no. (see List of Spare Parts)	Tensioning Torque Nm 5)
910797600	43
920001846	125
920004795	230
920004808	1600
920004810	930
920004812	355
920004880	365
920004881	1220
930212400	145
930394100	70
920008590	83

7) **Specification are suitable for the friction no. µges = 0,14 B**
Bolts are slightly oiled.

4. Tensioning torques for straight male stud couplings



Series	Tube OD	Thread size in inches	Tensioning torque Sealing type DIN 3852 T2 Type B/ISO 1179-4 Sealing edge	Tensioning torque Sealing type DIN 3852 T11 Type E/ISO 1179-2 PEFLEX ring	Thread size metric	Tensioning torque Sealing type DIN 3852 T1 Type B/ISO 9974-3 Sealing edge	Tensioning torque Sealing type DIN 3852 T11 Type E/ISO 9974-2 PEFLEX ring
L	6	G 1/8	25	20	M 10 x 1,0	25	15
L	8	G 1/4	55	50	M 12 X 1,5	35	25
L	10	G 1/4	55	50	M 14 x 1,5	55	50
L	12	G 3/8	95	80	M 16 X 1,5	80	70
L	15	G 1/2	185	100	M18x1,5	100	90
L	18	G 1/2	185	100	M 22 X 1,5	170	130
L	22	G 3/4	250	180	M 26 x 1,5	230	180
L	28	G1	400	130	M 33 x 2,0	400	230
L	35	G 1 1/4	670	330	M 42 X 2,0	700	330
L	42	G 1 1/2	800	500	M 48 x 2,0	900	500
S	6	G 1/4	95	60	M 12 x 1,5	60	50
S	8	G 1/4	95	60	M 14 X 1,5	90	60
S	10	G 3/8	180	90	M 16 x 1,5	120	80
S	12	G 3/8	180	90	M18x1,5	190	90
S	16	G 1 /2	160	150	M 22 x 1,5	300	130
S	20	G 3/4	350	200	M 27 x 2,0	420	200
S	25	G 1	700	150	M 33 x 2,0	600	250
S	30	G 1 1/4	850	500	M 42 x 2,0	700	500
S	38	G 1 1/2	1.000	600	M 48 x 2,0	900	600

1. Preliminary Work

- Determining the V-belt profile and the diameter of the small V-belt pulley
- Determining the static strand force (N) at initial assembly or for V-belts that have been run-in (table 1)
- Selecting an appropriate method for determining the initial tension of the V-belt

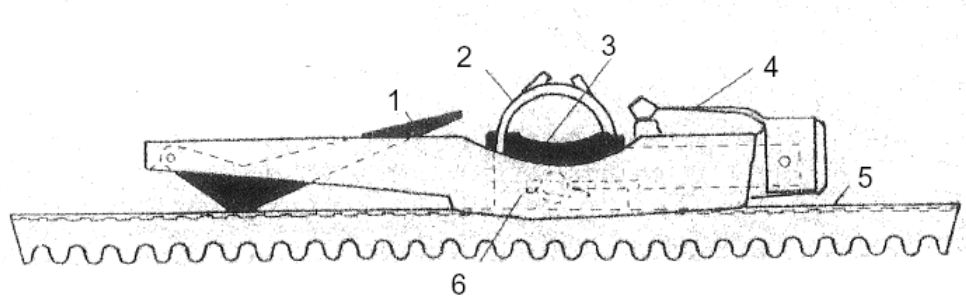
  a) Inspection procedure using “Optikrik” device for measuring initial tension, can be used for all shaft centre distances but not for power belts
  b) Length addition factor

2. Procedure for Determining Initial V-belt Tension

2.1 Optikrik Initial Tension Measuring Device

The Optikrik II measuring device – with a measuring range from 500 to 1400 N – is available as an option (order no. 920001545).
It is not suitable for measuring power belts.

View



1 Display arm
2 Rubber finger loop
3 Pressure area
4 Pocket clip
5 Belt
6 Compression spring

1. Place the measuring device in the middle between the two pulleys along the back side of the belt. If a set of belts is being used, it should be placed on the middle belt, if possible.
   (Push the display arm fully into the scale area beforehand)

2. Lay the device loosely along the belt to be measured and slowly apply pressure to the pressure area (3) with one finger.

3. Avoid contacting the device with more than one finger during the measuring process.

4. As soon as you hear or feel a distinct ‘click’, immediately stop applying pressure and the display arm will remain at the measured position.

5. Carefully pick up the device without moving the display arm. Read the value for the static strand force at the intersection between the upper edge of the display arm and the scale area.

6. Decrease or increase the belt tension depending on the measurement result until you are within the desired tension range.
   The required strand force is given in table 1.

2.2 Determining Initial Tension Using Length Addition Factor

This procedure is appropriate for single belts and power belts.

1 Take the value for the strand force from table 1

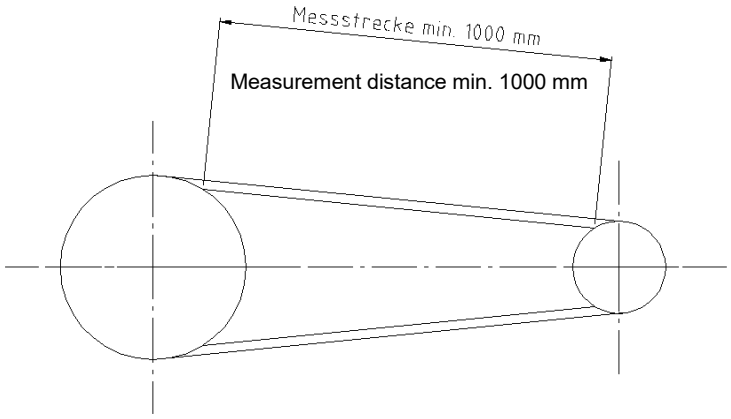
2 The measurement section “M” of the power belt or single belt is measured in the slack state along the cover plate of the power belt or the back of the single belt.
The measurement can also be made on the drive side with *no* tension applied.

3 Procedure:

a) Lay the power or single belts on the drive and tension them briefly in order to adapt the belt to the pulley profile.

b) Next, slacken the power or single belts completely.

c) Mark the measurement section “M” along the open strand length (min. 1000 mm)
WARNING: The larger the measurement section, the better the measurement accuracy



4 Compute the length addition factor A using the formula

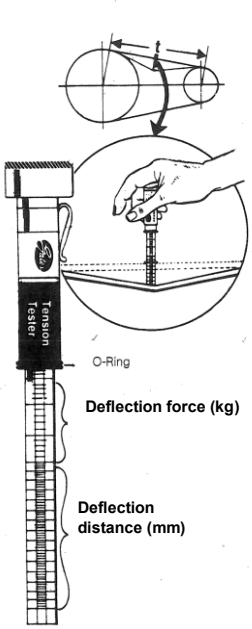
$$A = \frac{M \times R}{1000\ mm}$$

R = elongation factor or stretched distance from table 2

5 The power or single belts are placed under tension until they have stretched to the value computed in step 4. This places the proper initial tension on the drive.

6 If the drive is restretched, the belts have to be loosened first so that they can be measured and marked in the slack state. Next, proceed as described in steps 3 to 5.

2.3 Measuring the initial tension by using a tension gauge (spring balance type)



1. Measure the span length

2. Use the bottom ring to set the deflection force a calculated by using the formula a= t/100 on the distance scale.
   The top ring should be at zero on the deflection scale.
   Press on a V-belt or a power belt with the tension tester (approx. in the center of the distance t) until the lower O-ring (adjusted to deflection a) is at the same level as the unstressed belt next to it (see illustration).

3. Read the deflection force on the top part of the tension gauge. The movable O-ring marks this point to facilitate reading.
   Please take the reading on the top side of the ring (bring the ring to its initial position before using the tension gauge again)

4. Compare the deflection force to the values indicated in the table under section 3.3. If the measured deflection force reads lower than desired, the drive must be tightened, if the value reads higher the drive must be loosened.

When tensioning power belts multiply the deflection (see table 3.3) by the number of straps of the power belt. When using the tension gauge place a metal rod or small plate on the back of the belt, so all straps are deflected uniformly.

The device can be ordered through our spare part department.
For the order number please refer to the spare parts list: Drive

2.4 Measuring the initial tension using a belt tension meter (frequency measurement)

After installation, the drive should be turned several times by hand to set the belt completely and to compensate for possible tension differences in the span before measuring.

1. Hold the measuring sensor above the back of the belt (about 10 mm). Measurements should always be taken in the middle of the free span length. Unlike “free strings”, belts have a certain cross-sectional rigidity depending on the belt width. This may lead to values which are higher than the actual existing tension, especially at very short span lengths. For this reason, measurements should preferably be taken at span lengths which are longer than 20 times the pitch of the belt.
2. Start to swing the belt by hand or with an appropriate tool (e.g. screwdriver, hammer handle); the instrument will begin taking measurements.
3. The measured value is displayed after measurement is completed successfully. Further information about the measurement is additionally displayed. The quality of the result is evaluated with a figure between 1 and 4. 1 means that only one measuring cycle was carried out successfully. Several measurements should be made.
4. If a 2 or more is shown, several measurements were successfully carried out and averaged statistically. These measurements are very accurate and safe. As long as the sensor continues to receive a signal, additional measurements will be carried out automatically. If an E is shown behind the figure, one of the measuring cycles was beyond the tolerance limit. This measurement should be repeated. To clear the display, press the reset key (on).

Tension measurement on special belts:
Measuring the initial tension on special belts in special constructions (e.g. reinforced back, special rubber mixture, fibre-reinforced belts (e.g. Predator)) may lead to inaccurate results if the calculation of the frequency is based on the unit weight of standard belts. A simple calibration method can be used in these cases:
mount the belt between two tension plates and apply different tensions to it (e.g. by hanging weights).
It is possible to illustrate the frequency as a function of the tension values by measuring the span frequency at different tensions. These data may then be used to convert the measured span oscillation frequencies into the corresponding belt tensions. The values determined in this way are specific for the belt and must not be transferred to drives with other belts or span lengths.

Problems during measurement:
Wind may influence the result of the tension meter adversely, since it may cause excessive background noise. The sensor should be protected (e.g. by the use of a windscreen) when measuring in a windy environment. Very long free spans lead to low oscillation frequencies (<10 Hz) with high amplitudes which are very difficult to measure and which may lie beyond the measuring range.
In such cases, the belt should be fixed to a defined length of 1 m (for example) using suitable support elements in order to reduce the oscillating length and amplitude, and increase the frequency.

Several causes exist if there no readout shown, despite attempting to induce vibration several times:

- The belt oscillation is outside of the specified frequency range.
- There is an acoustic noise source within the measuring range of the instrument which is in the frequency range of the measurement.
- The belt is not able to oscillate, or only to a very slight extent.

3. Tables

3.1 Table 1 Static Strand Force (N)

V-belt Profile	Diameter of Small V-belt Pulley	Static Strand Force in N At Initial Assembly	Static Strand Force in N After Run-in Phase
SPB XPB	≤160	650	500
	>160 ≤224	700	550
	>224 ≤355	900	700
	375	1100	850
	400	1200	900
SPC XPC	≤250	1000	800
	>250 ≤355	1400	1100
	>355 ≤560	1800	1400
Power Belt SPB	≤160	850	650
	>160 ≤224	900	700
	>224 ≤355	1200	900
	<355 ≥375	1400	1100
	400	1600	1200

3.2 Table 2 Length Addition Factor per 1000 mm Belt Length

Static Strand Force	Elongation Factor or Stretched Distance in mm	
	V-belt Profile	
	SPB	SPC
400	2.0	
450	2.4	
500	2.7	
550	3.1	
600	3.4	2.0
650	3.8	2.2
700	4.1	2.4
800	4.8	2.8
850	5.2	3.1
900	5.5	3.3
1000	6.2	3.7
1100	6.9	4.1
1200	7.6	4.5
1200	8.3	5.0
1400	9.0	5.4
1500	9.87	5.8
1600	10.4	6.3
1700	11.1	6.8

3.3 Table 3 Deflection forces using the spring balance principle

Profile	Diameter small pulley in mm	Recommended deflection force daN*	
		min.	max.
SPB/5V	160 – 200	2,9	4,4
	212 – 280	3,6	5,0
	300 - 400	3,8	5,8
SPC	250 - 355	5,1	7,5
	375 - 530	6,0	9,0
XPB/5VX	112 - 118	2,4	3,6
	125 - 140	2,7	4,1
	150 - 170	3,0	4,7
	180 - 200	3,6	5,3
	212 - 280	3,8	5,5
	300 - 400	4,1	6,4

* 1 daN = 1,02 kg

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	Service unit for Oil-Air Lubrication	Fluid coupling		Gear unit		
	Oiler Spindle oil VG 10 to DIN 51524 and DIN 51517	Part of V-belt pulley Gear oil VG 220 to DIN 51517	Part of coupling Hydraulic oil VG 22 to DIN 51524	Worm gear Synthetic gear oil VG 460 PG to DIN 51517-3		
ARAL		**Degol BG 220**	**Vitam GF 22**	**Degol GS 460**		
SHELL	**Morlina 10**	**Omala Oil 220**	**Tellus S 22**	**Omala S4 WE 460**		
BP	**Energol HLP-HM 10**	**Energol GR-XP 220**	**Energol HLP-HM 22**	**Enersyn SG-XP 460**		
EXXON MOBIL	**Mobil DTE 21**	**Mobilgear 600 XP 220**	**Mobil DTE 22**	**Glygoyle 460**		
CASTROL	**Hyspin AWS 10**	**Optigear BM 220**		**Optiflex A460**	**Alphasyn PG460**	**Alphasyn GS460**
ESSO	refer to MOBIL	refer to MOBIL	**Nuto H 22**	refer to MOBIL		
KLÜBER		**Klüberoil GEM 1-220N**		**Klübersynth GH6-460 CLP PG 460**		
FUCHS				**RENOLIN PG 460**		
BECHEM			**STAROIL NR 22**	**BERUSYNTH EP 460**		

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	Hydraulic unit				
	Ambient temperature above + 30 °C Hydraulic oil VG 68 to DIN 51524	**Ambient temperature 0 bis + 30 °C** Hydraulic oil VG 46 to DIN 51524			
ARAL	**Vitam GF 68**	**Vitam GF 46**			
SHELL	**Tellus S 68**	**Tellus S 46**			
BP	**Energol HLP-HM 68**	**Energol HLP-HM 46**			
MOBIL	**Mobil DTE 26**	**Mobil DTE 25**			
CASTROL	**Hydro E 68**	**Hydro E 46**			
ESSO	**Nuto H 68**	**Nuto H 46**			

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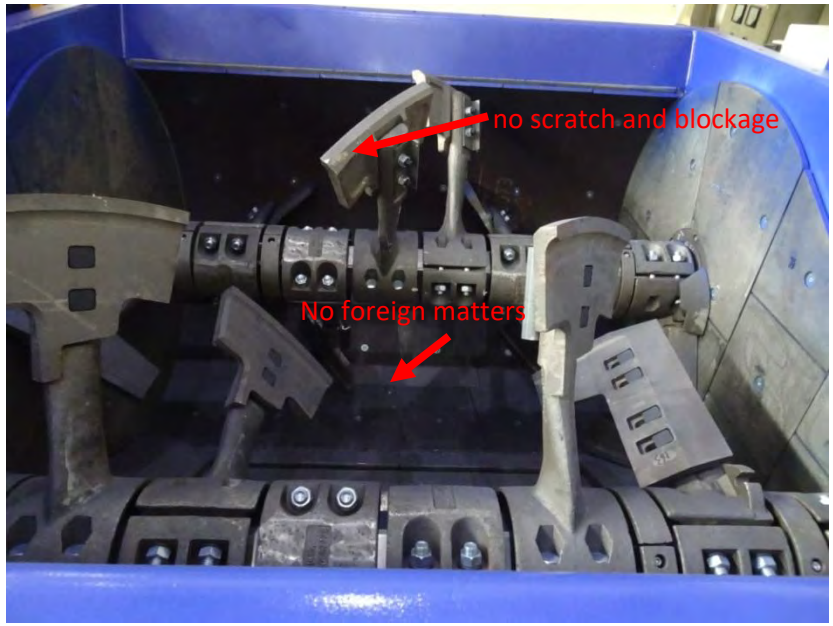
	For all bearings and seals with grease nipples, as well as for automatic lubrication systems		For hauling ropes	Articulations and limit switches	
	a) Temperature of lubricating points up to 60 °C	b) Temperature of lubricating points above 60 °C	⚠ **Attention:** The percentage content of solid lubricants such as graphite, MoS2… shall not exceed 5 % by weight.	Penetrating or rust preventing grease with MoS_2 addition	
ARAL	**Aralub HL 2**	**Aralub HTR 2**			
SHELL	**Gadus S2 V220 2**				
BP	**Energrease LS 2**	**Energrease HTG**			
MOBIL	**Mobilux EP 2**				
CASTROL	**Olit 2 EP**	**Optitemp HT 2**	**Optimol-Spray EPL SHF**		
Prinz-Schulte		**Aero-Line MPG 1000 E**			
ELKALUB	**GLS 135/N2**	**GLS 962/N2**	**Elkalub-Spray FLC 367**	**GLL 10/N2**	
DOW CORNING				**Molykote Polygliss N**	
BECHEM	**HIGH-LUB L2**				

BHS SONTHOFEN

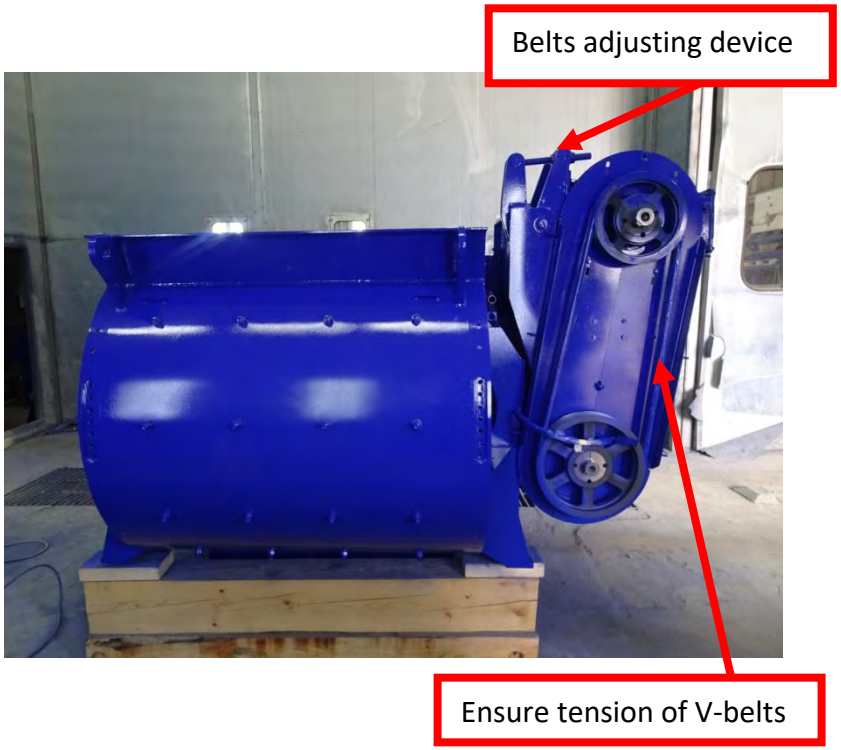
Concise manual for commissioning and maintenance of mixer

1. Before commissioning:

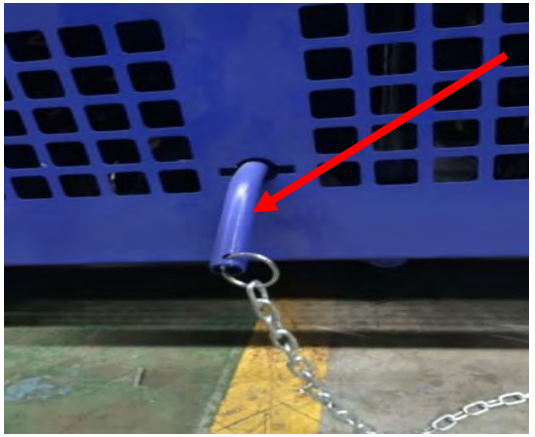
- The operator must study the user's manual firstly, then check the screw connection, all the screws of mixing blades and the joint head etc. Must be checked and tightened if necessary. Cleaning the inside of the mixing trough to make it free of foreign matters (like steel plate or so)



- Clean the grease or oil on the v-belts and check the pre-tension of the v-belts. Rotating the main shaft by hand on the pulley side. Make sure there is no scratch and blockage of mixing tools。

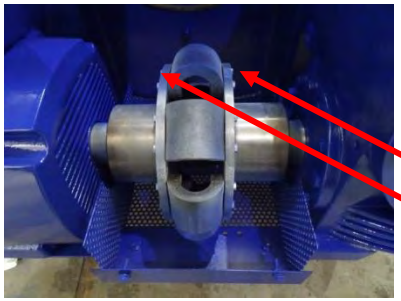


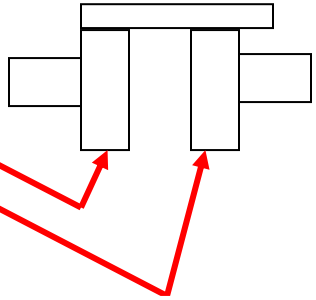
- remove the safety bolt of the discharge door. during service or transportation, please lock the door with it to prevent the door unexpectedly rotating.



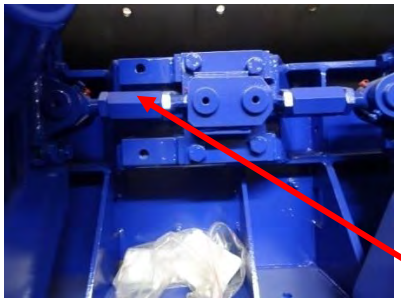
during operation, take out the pin and put into a pinhole.

- Measure the displacement on the synchronizing coupling to keep the casting horizontal alignment，after operation of mixer, at each month please deviation if the figure is more than 1 mm, then which must be readjusted to prevent the unnecessary damages of rubber elements due to misalignment of coupling hubs





less than 0.5mm

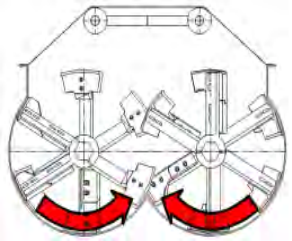


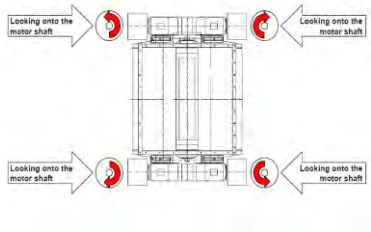
readjust the turnbuckle when it`s necessary.

- Grease once again all the lubrication points
- the air pressure should be in the range of 7~9Bar

2. The motor and gearbox

Keep the two/four motors run in same rotation and start at the same time





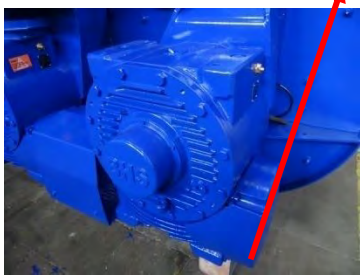
Pay attention to the position of inlet,oil level and outlet

inlet

oil level

outlet

Check the breather, keep vent open



- Requirements of gear oil

Properties of gear oil：

- Viscosity grade：ISO460
- must be Synthetic gear oil

The brands recommended

- BECHEM: Berusynth EP460 (BHS provide)
- MOBILE: Glygoyle HE460
- SHELL: Tivela S460
- CASTROL: Optiflex A460
- ESSO: Glycolube 460
- BP: Glygoyle HE460

General notes on maintenance：

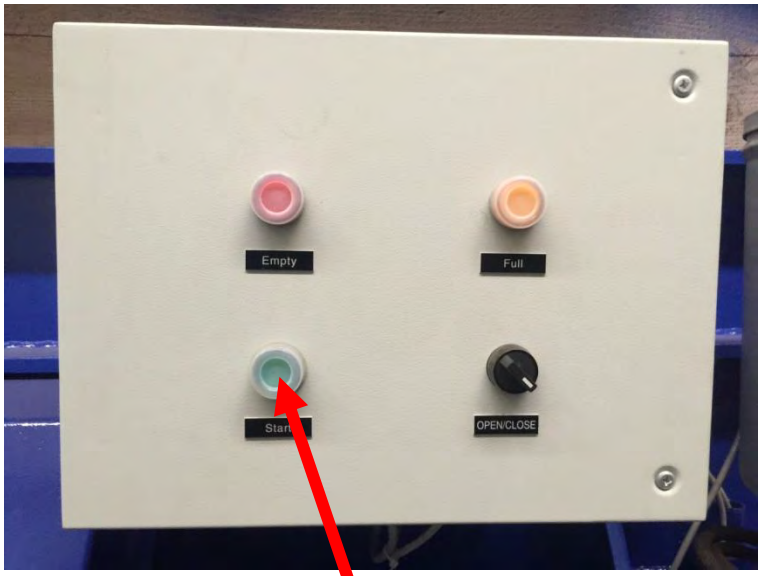
- First oil change: after approx.1000 operating hours
- Subsequent oil change: after approx.6000 operating hours.

the level should be 20mm below the top of bent tube(oil indicator)

3. Maintenance of the mixer shaft end seals

- before and after operation, and after every cleaning of mixer , please push the button for additional lubrication
- refilling grease until see clean grease from dust covers in mixing trough.

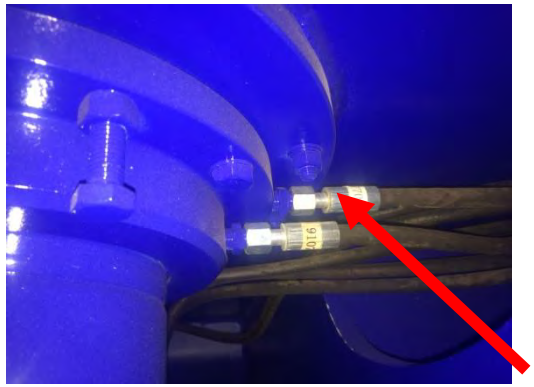
- Checking functioning of greasing system daily .



Manual button

- See clean grease coming out from mixing trough inside

- lubrication pipes for the trough seals (inside)



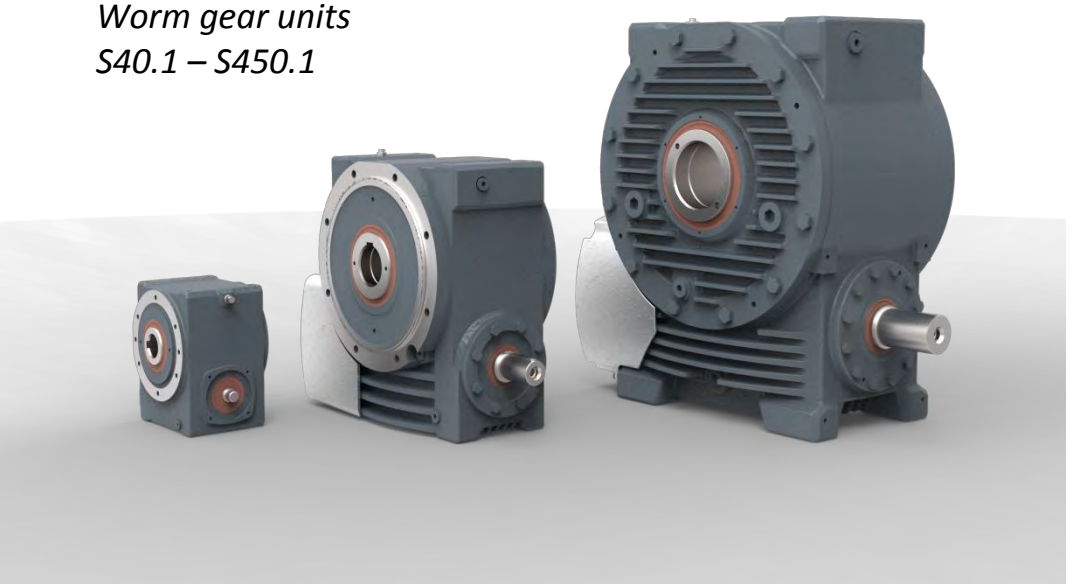
- to refill the grease to the tank from the connection at the bottom to avoid the contamination of grease due to unexpected foreign matters(such as sand ,cements ,water etc.)
- ***Use the proper grease***（2# **lithium based grease**）**!**

GFC

Translation of the

Original operation instructions

Worm gear units
S40.1 – S450.1



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BA_S40.1-450.1_EN_05.2015

Table of contents

1. Introduction

The present operation instructions are part of the scope of supply and should be stored, if possible, near the gear unit where it can easily be accessed. Installation, commissioning and maintenance work may only be performed by qualified personnel who have both read and understood these operation instructions. GFC shall not be held liable for any damage or failure incurred by non-observance of these instructions.

GFC worm gear units have been designed in accordance with recognised standards, directives and safety regulations and correspond to the technical status at the time of printing of these operation instructions. We reserve the right to perform technical alterations on the products.

In case of questions and to request further information, please contact the GFC Service department.

GFC Service
Phone: +49 (0) 3523 94 623
service@gfc-drives.com

2. Safety instructions

2.1. Intended use

GFC worm gear units have been designed and developed in accordance with recognised standards, directives and safety regulations and are supplied ready to operate. Machinery Directive 2006/42/EC applies to GFC worm gear units. They are partly completed machinery which are to be installed into a machine. The required Declaration of Incorporation of Partly Completed Machinery is included in section 12 of these operation instructions. The machine manufacturer or the machine operator must ensure that all legal requirements, directives, guidelines, national regulations and recommendations with respect to assembly, commissioning and operation are met at the place of installation.
Installation, commissioning and maintenance work must be exclusively performed by qualified personnel. Qualified personnel are persons, who, because of their training, experiences and position as well as their knowledge of appropriate standards, regulations, health and safety requirements and working conditions, are authorised by the person responsible for the safety of the equipment to perform the required duties and are therefore aware of, and can report, possible hazards. (Definition of qualified employees according to IEC 364)

GFC worm gear units may only be operated within the limits and conditions defined in the delivery contract.

Intended use includes observance of the operation instructions or observance of the instructions and specifications included. Furthermore, fulfilment of the legal provisions on occupational health and safety and the prevention of accidents, as well as heeding of safety instructions and warning signs attached to the product to avoid both personal injuries and property damage.

2.2. Inappropriate or unintended use

Any uses other than those indicated in section 2.1 are either inappropriate or unintended. GFC shall not assume any liability for personal injuries or property damage incurred from this use.

Inappropriate or unintended used includes among others:

- Use in potentially explosive atmosphere
- Use outside technically and contractually agreed limits (output speeds, power, torques, ambient conditions)

Improper use furthermore includes:

- Operation without oil filling or with lubricants other than those specified
- Opening the gear unit when installed. During the warranty period, gear units may only be opened with prior consent of the manufacturer, otherwise any warranty claim will be void.
- Any modifications on the gear unit and in particular those impairing operational safety and reliability

2.3. Warnings and notes, symbols and their signification

Symbol	Signification
	Indicates safety instructions which have to be observed to avoid personal injuries (injuries death).
CAUTION!	Indicates safety instructions which have to be observed to avoid damage at the gear unit.
	General instructions, hints.

Table 2.3: Warnings and symbols

2.4. Important instructions, basic duties, warranty and liability

- The machine manufacturer/operator have to ensure that the all specifications and instructions have been read, understood and heeded to:

  - avert threats to life or physical condition
  - ensure operational safety of the gear unit and
  - avoid both installation downtimes and damage to the environment

- The manufacturer of the equipment is obliged to include these operation instructions in the operation instructions of the equipment.
- The machine manufacturer/operation shall be held liable for expert installation (assembly), maintenance and operation of the GFC worm gear unit. This work may only be performed by qualified and trained personnel.
- Work always has to be performed while the gear unit is switched off and protected against accidental start-up (key switch, sign).
- In case of detected defects as well as for malfunctions such as increased noise levels, oil leakage, rising operating temperature, etc., the gear unit must be shut down immediately. All defects must be remedied before restarting the equipment.
- During the warranty period the gears may only be opened with GFC's consent.

- Spare parts must generally be ordered with GFC.
- Prior to using the gear unit, the data on the name plate has to be checked against that of the accompanying documents (delivery note, order acknowledgement, test report, etc.) for compliance.
- Welding at the gear unit is not permitted and the gear unit must not be used for protective earth connection.
- Revolving and rotating parts must be protected against accidental contact.
- The plant manufacturer or plant operator are responsible for implementing required protective measures on site, such as enclosures, barriers, or personal protective equipment for the staff.
- Under certain operation conditions, the surface temperature of the gear unit may rise up to 110°C. Danger of burns!
- Danger of burns due to hot oil when changing oil.
- Cleaning with a high pressure cleaner is not permitted.

Failure to observe the specifications indicated entails complete exclusion of liability and warranty expires. Consequential damage of inappropriate use can included property damage and personal injuries and even death.

3. Technical description

GFC gear units of the S.1 series are single-stage worm gear units. GFC gear units of the S.1 series are single-stage worm gear units, characterised by extremely low noise, high efficiency, utmost reliability and long service life.

GFC worm gear units are generally not self-locking.

Self-locking exists, if the start of the worm shaft is not possible in spite of the driving worm wheel. Internal impacts such as vibration may limit and under certain conditions even cancel the self-locking effect. Among others, self-locking depends on the transmission ratio (or the pitch angle of the splines), the lubricant as well as the operating and ambient temperatures. For actuation applications for which the self-locking effect is required, it should always be verified whether the installation of a return block or a brake is the more practical solution. An automatic self-locking gear unit cannot replace a brake. If self-locking is required, please contact GFC.
Section 3.1 provides a schematic description of the GFC worm gear unit design. Major sub-assemblies are designated.

3.1. Design

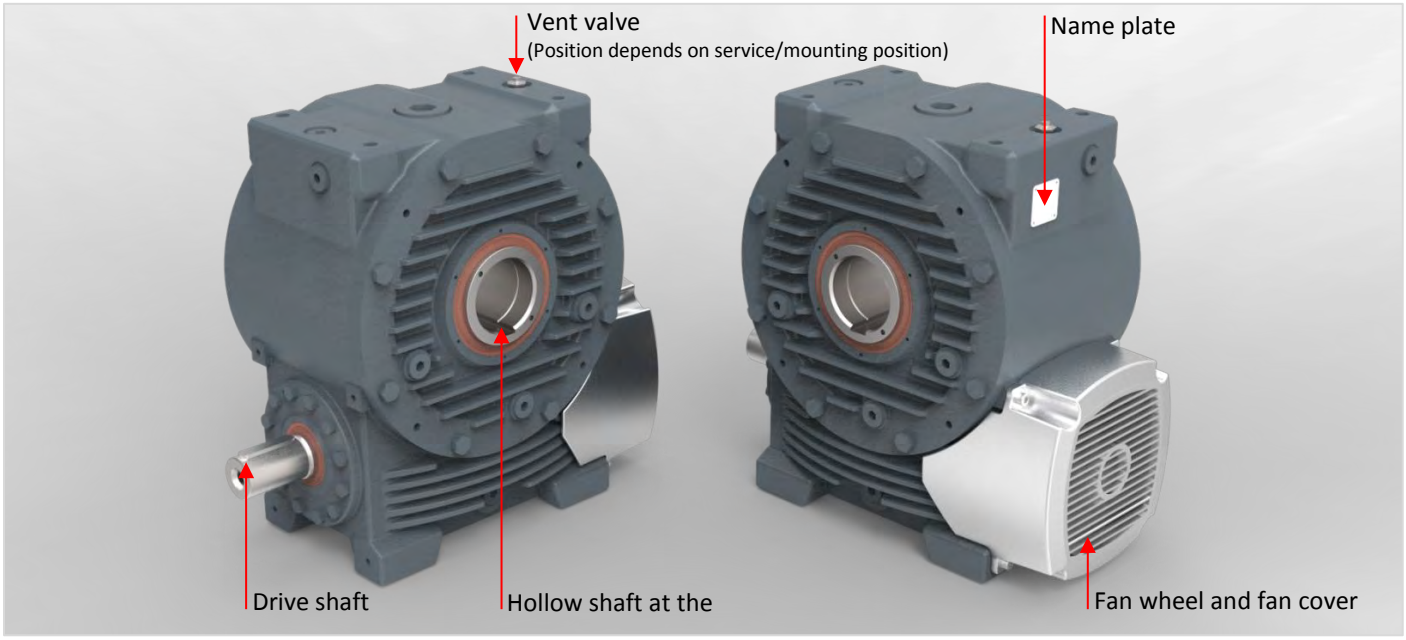


Fig. 3.1-1: Design of basic version (shaft at input, hollow shaft at output), using the example of S250.1 in service position B3

In addition to the basic versions, specific equipment for the plants such as flanges, output drive shafts, torque reaction levers, etc. are available as an option.

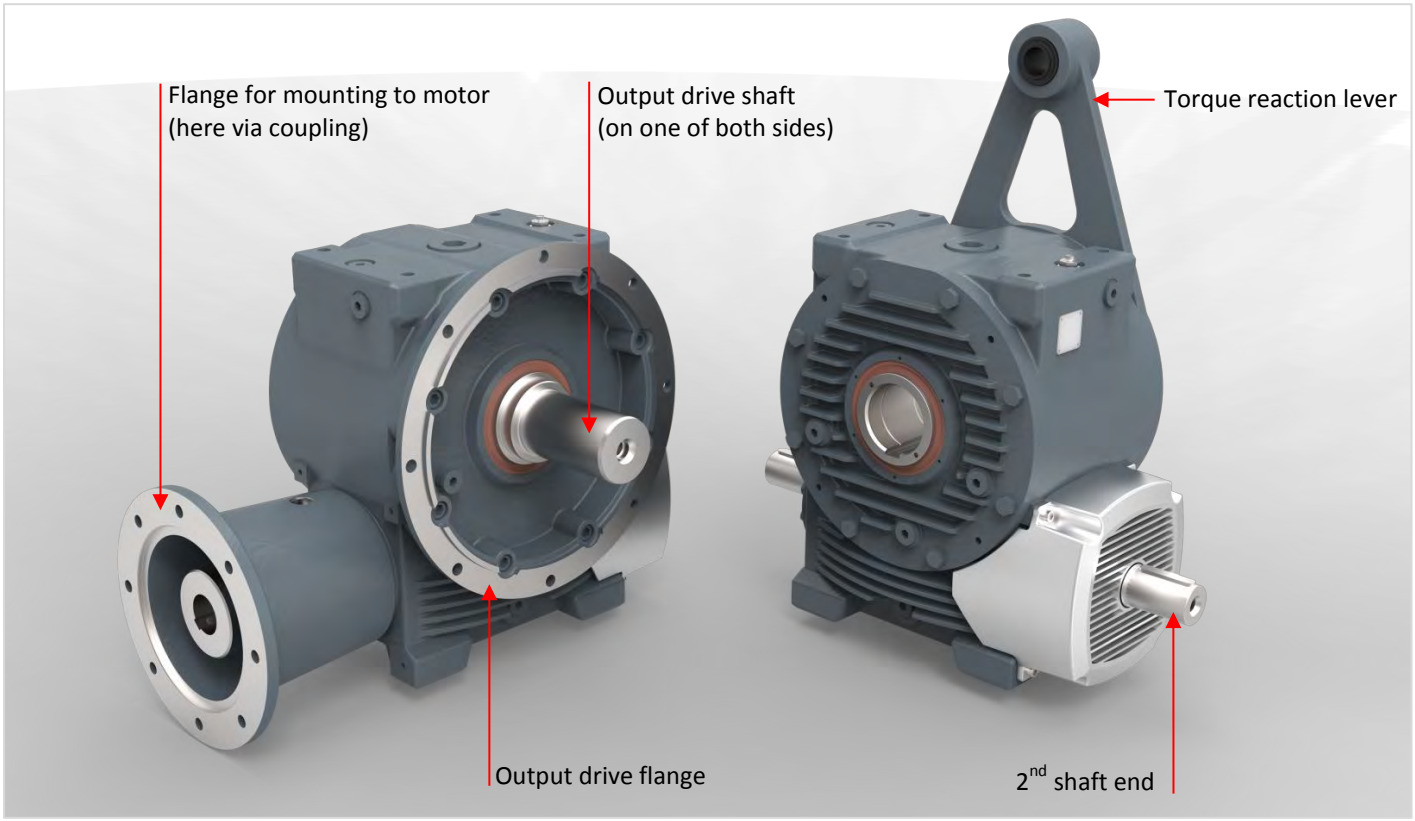


Fig. 3.1-2: Mounting options (extract), using the example of S250.1

3.2. Name plate

The following data is provided on the name plate attached to the gear unit.

Fig. 3.2: Name plate

Furthermore, other data such as customer article numbers may be included.

3.3. Technical data

3.3.1. Service positions S40.1 – S80.1

The illustrations below show possible service positions and the pertaining positions of the vent valve and the oil draining screw plug. For the lubricant quantities required refer to table 3.3.5-2.

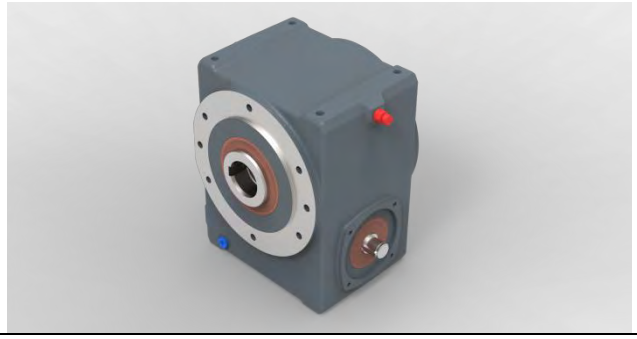
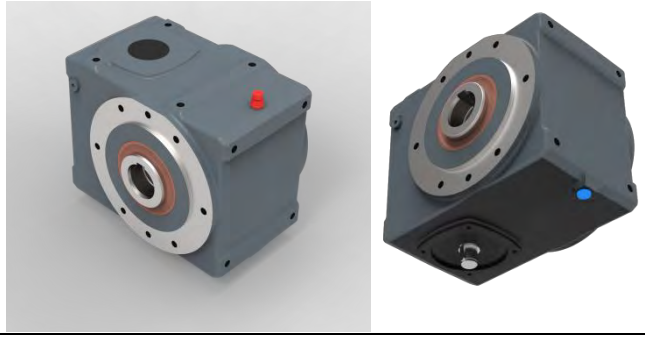
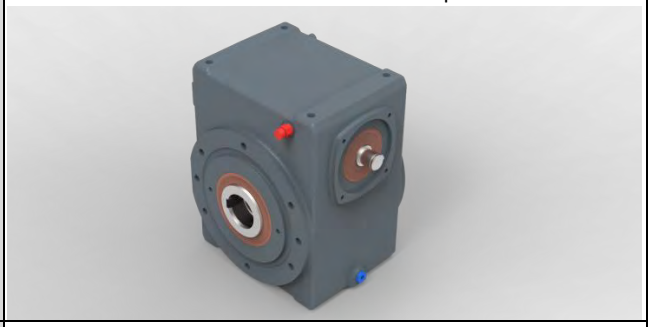
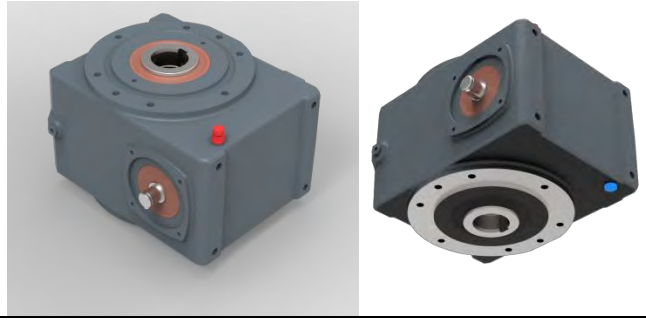
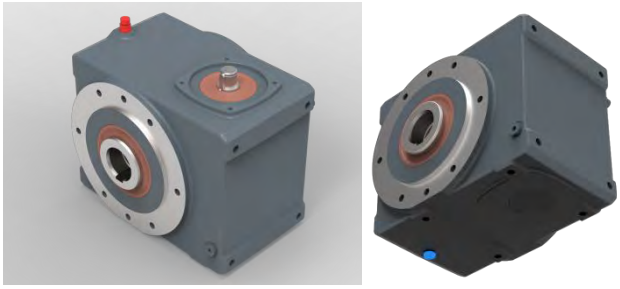
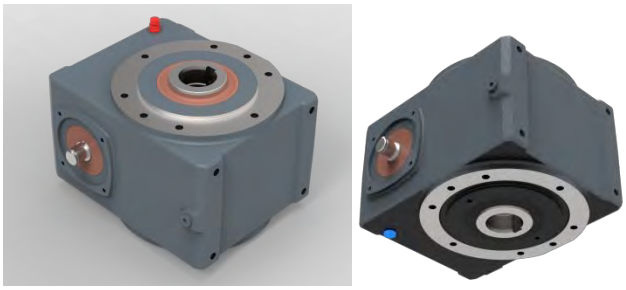
B3	Horizontal output drive shaft Horizontal drive shaft - bottom 	**B6**	Horizontal output drive shaft Vertical drive shaft - bottom 
B8	Horizontal output drive shaft Horizontal drive shaft - top 	**V5**	Vertical output drive shaft - bottom Horizontal drive shaft 
B3I	Horizontal output drive shaft Vertical drive shaft - top 	**V5II**	Vertical output drive shaft - top Horizontal drive shaft 
	●**Vent valve and oil filling** ●**Oil drain**		

Figure 3.3.1: Service positions S40.1-S80.1

3.3.2. Service positions S100.1 – S160.1

The illustrations below show possible service positions and the pertaining positions of the vent valve, as well as the oil level checking and the oil draining screw plug. In some cases, an oil dipstick at the vent valve will take over the function of the oil level checking screw plug. For the lubricant quantities required refer to table 3.3.5-2.

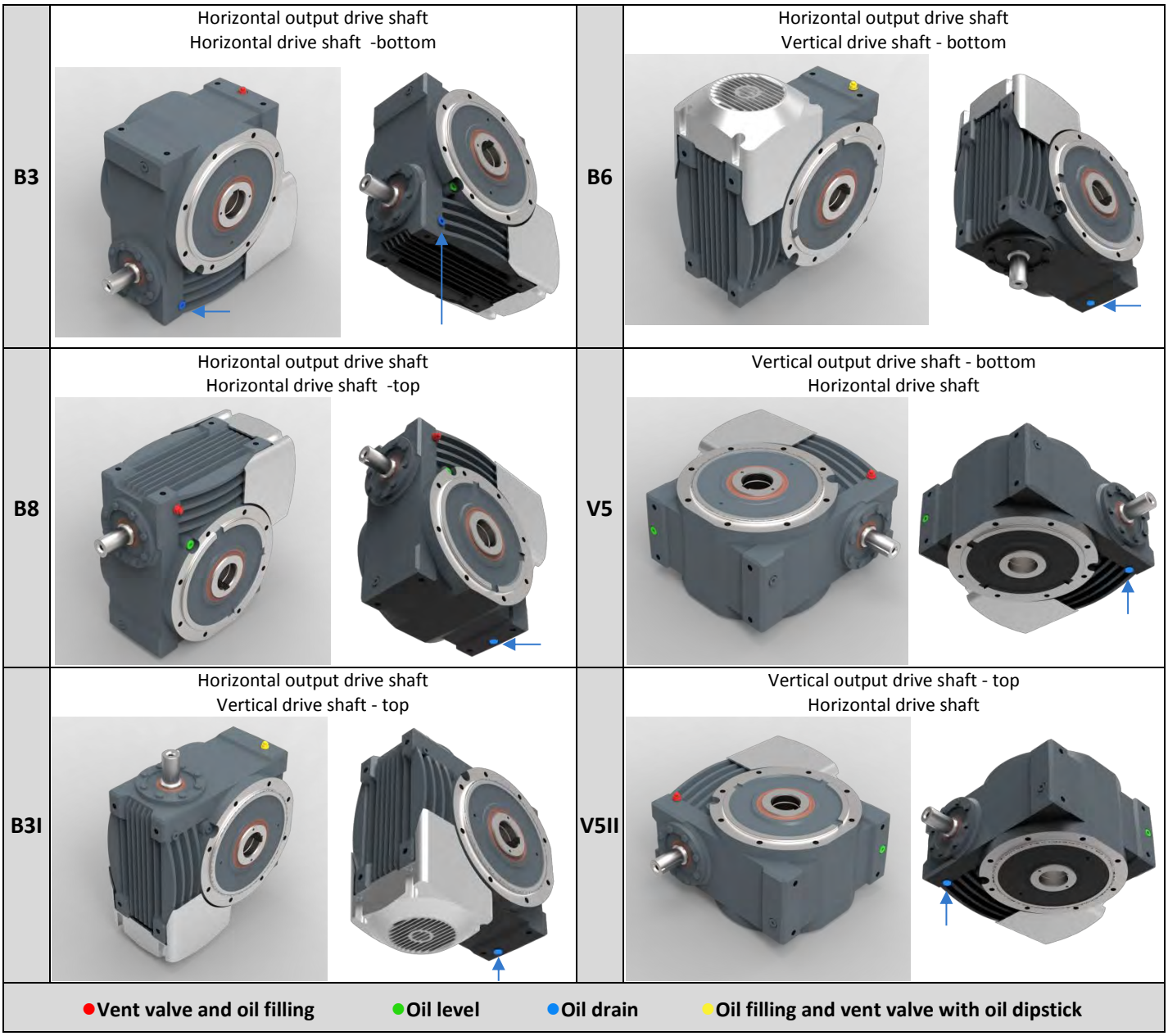


Fig. 3.3.2: Service positions S100.1-S160.1

CAUTION!

Depending on application and service conditions, an oil quantity or oil level different from the indications of these operation instructions may be required. For the pertaining information, refer to the contractual documents as well as to the name plate. In these cases, the position of the oil filling screw plug and the oil level checking screw plug may differ from this representation.

3.3.3. Service positions S200.1 – S450.1

The illustrations below show possible service positions and the pertaining positions of the vent valve, as well as the oil level checking and the oil draining screw plug. For the lubricant quantities required refer to table 3.3.5-2.

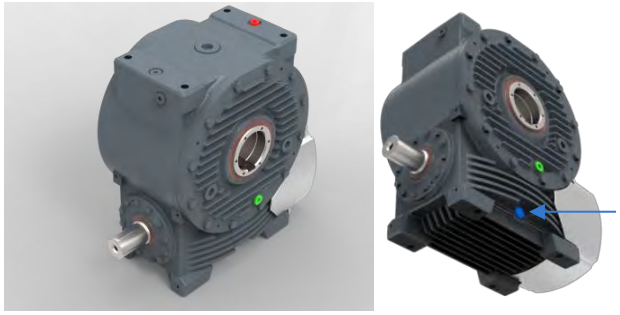
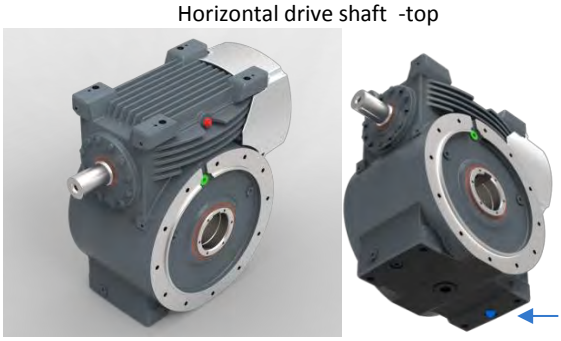
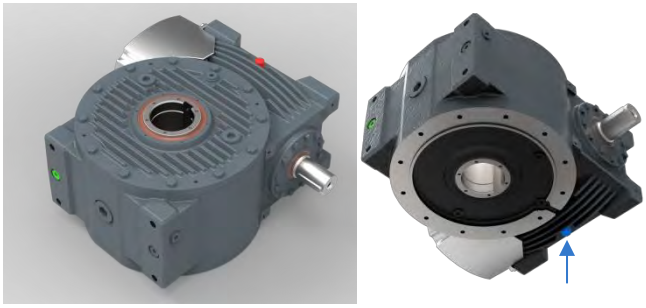
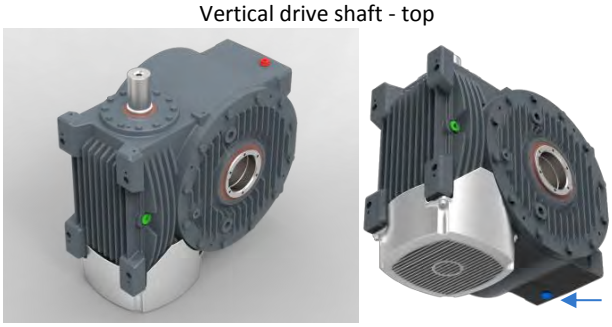
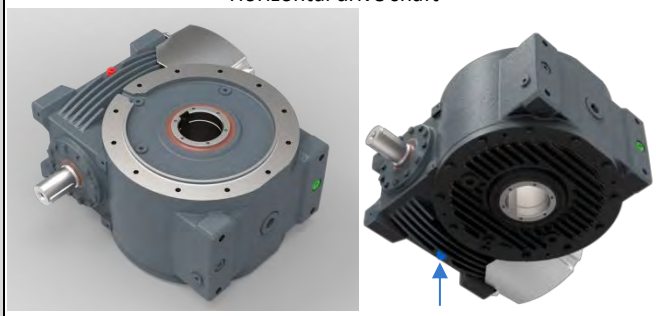
B3	Horizontal output drive shaft Horizontal drive shaft -bottom 	**B6**	Horizontal output drive shaft Vertical drive shaft - bottom 
B8	Horizontal output drive shaft Horizontal drive shaft -top 	**V5**	Vertical output drive shaft - bottom Horizontal drive shaft 
B3I	Horizontal output drive shaft Vertical drive shaft - top 	**V5II**	Vertical output drive shaft - top Horizontal drive shaft 
	●**Vent valve and oil filling** ●**Oil level** ●**Oil drain**		

Figure 3.3.3: Service positions S200.1-S450.1

CAUTION!

Depending on application and service conditions, an oil quantity or oil level different from the specifications of these operation instructions may be required. For the pertaining information, refer to the contractual documents (for example drawings) as well as to the name plate. In these cases, the position of the oil filling screw plug and the oil level checking screw plug may differ from this representation.

3.3.4. Gear unit weight

The weights below does not include oil filling and are reference values. Casting tolerances as well as different transmission ratios and equipment variants result in different weights Due to the large number of variants, complete representation of all equipment is not possible. For the weight of the configuration delivered, refer to the name plate (including oil).

Size	SVA basic version without oil [kg]
S40.1	5.2
S50.1	11.0
S63.1	14.5
S80.1	26
S100.1	46 1)
S125.1	84 1)
S160.1	157 1)
S200.1	210 1)

Size	SVA basic version without oil [kg]
S225.1	336 1)
S250.1	380 1)
S280.1	525 1)
S315.1	700 1)
S355.1	960 1)
S400.1	1,300 1)
S450.1	1,710 1)

Table 3.3.4: Gear unit weights 1) incl. vent valve

3.3.5. Lubricant

The splines of the GFC worm gear units are lubricated by splash lubrication. Unless agreed otherwise, the gear units are supplied with oil filling when leaving the factory. We use CLP-PG oils (according to DIN 51517-part 3) as standard. These fully synthetic oils (polyglycoles) have outstanding temperature-viscosity behaviour and excellent characteristics with regard to corrosion protection, resistance to ageing and wear reduction. For ambient temperatures between –10 °C and +40 °C, oils of ISO viscosity class VG460 must be used. For other ambient conditions, a suitable lubricant has to be selected by GFC. The table below lists lubricants by different manufacturers. The lubricant used is indicated on the name plate. Gear units without grease filling in the factory have a DIN compliant indication relating to the lubricant to be used and the required viscosity class.

Marking according to DIN 51517-3 and DIN 51519	Klüber	ARAL	Shell	Mobile	Bechem	Castrol
CLP PG / ISO VG 460	Klübersynth GH 6-460 (1)	Degol GS 460	Omala S4 WE 460	Glygoyle HE 460	Berusynth EP 460	Optiflex A 460

Table 3.3.5-1: Lubricants 1) Standard lubricants used in the factory

CAUTION! **GFC can assume no warranty for the perfect suitability of all listed lubricants.**

For certain applications, different lubricants (mineral oils, lubrication greases) can be used. Refer to the name plate or the contractual documents (e.g. drawings), for the actually used lubricant.

Mixing oils of various classes, types and manufacturers is not permissible. Refer to the name plate for the lubricant actually used.

CAUTION!

The table below shows the required oil quantities. These values are reference values. The filling level (of the cooled down oil) within the gear unit, defined by oil level screw plugs or markings (max. and min.) on the oil dipstick, is relevant - refer to sections 3.3.1 to 3.3.3

Size	Service position					
	B3	B8	B3I	B6	V5	V5II
S40.1	0.18	0.28	0.30	0.30	0.20	0.20
S50.1	0.45	0.75	0.65	0.65	0.55	0.55
S63.1	0.63	1.10	1.00	1.00	0.75	0.75
S80.1	1.30	2.50	2.00	2.00	1.50	1.50
S100.1	1.70	3.80	3.00	3.00	3.00	3.00
S125.1	2.00	6.50	4.00	4.00	4.00	4.00
S160.1	4.20	12.30	8.50	8.50	7.70	7.70
S200.1	8.00	22.00	15.00	15.00	13.50	13.50
S225.1	11.00	26.00	19.00	19.00	19.50	19.50
S250.1	14.00	42.50	29.00	29.00	29.00	29.00
S280.1	18.50	58.00	41.00	41.00	39.50	39.50
S315.1	27.00	75.00	53.00	53.00	53.00	53.00
S355.1	36.00	110.00	75.00	75.00	75.00	75.00
S400.1	44.00	148.00	98.00	98.00	98.00	98.00
S450.1	68.00	219.00	141.00	141.00	144.00	144.00

Table 3.3.5-2: Lubricant quantity

CAUTION!

Depending on application and service conditions, an oil quantity or oil level different from the specifications of these operation instructions may be required. For the pertaining information refer to the contractual documents and the name plate.

4. Delivery, transport, handling & storage protection

4.1. Delivery, transport, handling

Prior to delivery, all GFC worm gear units are subjected to final inspection and leave GFC in perfect condition and suitable packaged according to their destination. Upon receipt, the delivery has to be inspected for completeness and possible transport damage. Advise the forwarding company or the customer service of GFC of any possible defects. Commissioning the gear unit might not be permitted.

CAUTION!

All GFC worm gear units are supplied with screwed in vent valve. For some versions, the gear unit must always be stored and transported in service position (refer to Notes in sections 3.3.1 to 3.3.3). In this case, the gear units are marked with special notice signs.

Only use lifting appliances and load suspension equipment with sufficient bearing capacity for transport! For the overall weight of the gear unit, refer to the name plate. Reference values can also be found in section 3.3.4. **The load is borne by two suitable eye bolts. Ensure that they have been firmly screwed to the housing. Fig. 4.1 shows the example of using the ring bolts for transport in service position B3. For other service positions, further threaded holes have been cut into the housing.**

CAUTION!

The gear unit must not be handled via the threaded holes in the drive shafts and output drive shafts on the face side or the fan housing. Handle and transport with care to prevent damage. **Hits and blows to the shaft ends might cause damage within the gear unit.**

Figure 4.1: Anchor points

Size	Thread size for transport eyebolts
S40.1	M6
S50.1-S63.1	M8
S80.1	M10
S100.1	M12
S125.1-S160.1	M16

Size	Thread size for transport eyebolts
S200.1	M20
S225.1-S250.1	M24
S280.1-S315.1	M30
S355.1-S450.1	M36

Table 4.1: Thread sizes for transport eyebolts

4.2. Storage and protection

The storage or protection periods start immediately after delivery of the gear unit.

Unless agreed otherwise, GFC worm gear units are supplied with oil filling when leaving the factory. All inside parts are protected for 24 months. Inside parts of gear units supplied without oil filled are provided with corrosion protection sufficient for 12 months. Outer parts with metallic uncoated surface such as shaft ends, hollow shafts and mounting surfaces of flanges have been treated with corrosion protection, providing protection for six months. Once the period has expired, the corrosion protection has to be renewed.

CAUTION!

Prior to assembly or installation remove corrosion protection agent from the outer parts using commercial cleaning agents. The cleaning agent must not come into contact with radial seals.

Ensure sufficient ventilation while removing the corrosion protection agent. Due to potentially explosive atmosphere, open fire is not permitted.

The standard outer coating (finish coating based on polyurethane) provided in the factory is resistant to weak chemicals such as oils, resistant to mechanical impacts and temperature resistant up to 150 °C. Damage to the coating layers leads to failure of the corrosion protection and has to be touched up immediately. Sand blasting of the gear unit is not permitted.

The gear units should only be stored in closed and dry rooms. The impact of solvents, solvent vapours, fuels, acids, rubber solvents and other solvents should be avoided as well as exposure to direct sunlight, relative humidity >70% and major temperature fluctuations. The use of plastic film containing plasticizers is not recommendable.

Gear units must be stored on levelled base plates, protected against vibration, and must not be stacked on top of each other.

Should the storage locations or room be subject to major temperature fluctuations, should the relative humidity exceed 70% or gear units be stored for a longer period (>24 months), we recommend the following measures:

- Fill gear unit completely with oil (refer to table 3.3.5-1)
- Check oil quality (water contents) on a regular basis
- Seal gear units hermetically using VCI film and enclose water absorbing desiccants.
- Regular visual inspection of gear unit with regard to corrosion on the outer metallic uncoated parts
- Regular check of gear units for leakage on radial seals

CAUTION!

After longer storage periods, the lubricant quality (refer to section 8.1.1) and the condition of the radial seals are to be checked prior to commissioning, and be replaced if required. Prevent any damage to the sealing ring seat on the shaft. Furthermore, the oil level must be checked (refer to section 8.1.1) and possibly be adjusted to the required filling level (refer also to table 3.3.5-2). When using other corrosion protection oils than those specified (table 3.3.5-2) for protection, thoroughly rinse gear unit prior to lubricant filling.

5. Assembly

5.1. Gear unit assembly

The safety instructions in section 2 must be observed.

The following conditions must be met for installing the worm gear unit:

- These operation instructions were completely read and understood by the assembly personnel.
- Suitable lifting devices are available in sufficient quantity.
- The data on the name plate and the application must correspond to the contractually agreed values (transmission ratio, output speed, etc.)
- The gear unit must not be damaged
- Unless agreed otherwise, the ambient temperature must be between –10 °C and +40 °C.
- The environment of the installation site must be free of chemicals, acids, gases, etc. unless stipulated otherwise in the contractual documents.
- The gear unit must not be exposed to heat accumulation and waste heat from other devices.
- Vent valve (including oil dipstick) and oil draining screw plug must be freely accessible for maintenance work
- The corrosion protection agent must be removed from shaft ends and mounting faces (flanges).
- Machine frame:
  The machine frame must be designed to support the specified weights and torques so that no additional loads resulting from distortion or twisting can act on the gear unit. Ensure that all mounting faces are flush on the machine frame. Non-observance might cause damage on and within the gear unit.

Welding at the gear unit is not permitted and the gear unit must not be used for protective earth connection!

Should any questions or problems arise during installation, please contact the GFC service (for contact details refer to cover page of these operation instructions).

5.1.1. Gear unit with free shaft ends (at drive or output drive)

CAUTION!

Gear units with free shaft end have to be placed on a suitable basis together with the drive. **The shafts must be aligned very carefully to ensure safe working conditions and low-noise operation. Avoid housing and shaft jamming. As an alternative, we recommend the use of elastic couplings and universal joints.**
Gear units with output drive flange can directly be connected to the driven machine. However, mounting the gear unit to a solid basis at the same time is not possible.
Use screws according to property class 8.8 to fasten the gear unit. All screws have to be fitted applying the required torque (refer to table 9.1).

When mounting couplings, observe the pertaining operation and mounting instructions of the coupling manufacturer. We recommend the use of flexible couplings to compensate for small inaccuracies in assembly. Couplings require static balancing at peripheral speeds of up to 20 m/s and dynamic balancing at peripheral speeds exceeding 20 m/s.

CAUTION!

Consideration must be given to the permissible radial forces at the input shaft and output shaft ends when using rigid coupling units and elements which generate radial force, such as pulleys, toothed wheels, etc. The drive and output elements can be mounted by means of a fitting tool (refer to fig. 5.1.1) or by heating (≤120°C; wear heat-resistant gloves!) the appropriate part. **Do not under any circumstances attempt to mount by striking with a hammer as this would cause damage to the tooth profiles, roller bearings, housing, and shaft.** Prior to assembly, thoroughly clean gear shaft and holes of the drive or output drive element.

We recommend applying a corrosion protection agent (e.g. Gleitmo800 by Fuchs) to the shaft(s) of the gear unit to prevent tribocorrosion.

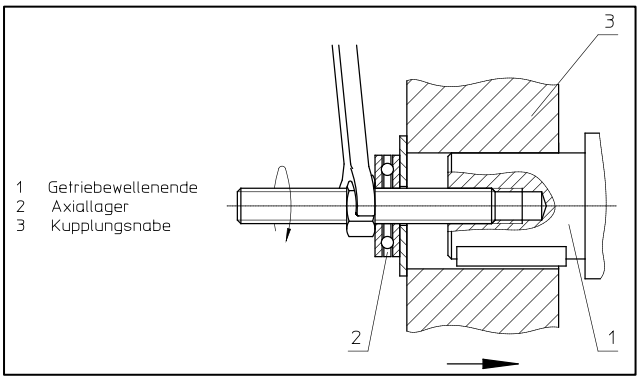


Figure 5.1.1: Fitting tool

5.1.2. Gear unit with hollow shaft at output drive (slip-on gear)

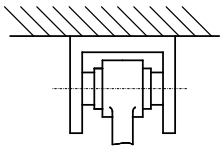
Gear unit with hollow shaft at the output drive can be placed directly on the shaft of the driven machine and be axially secured.

CAUTION!

For gear units fastened and axially secured via output drive flange, ensure that the machine side mounting face is perpendicular to the drive shaft to avoid distortion of gear unit and driven machine as well as resulting additional bearing loads. Use screws according to property class 8.8 to fasten the gear unit. All screws have to be fitted with the required torque (refer to table 9.1). Fastening the gear unit to the base plate while the machine shaft is located near the gear unit should by all means be avoided.

CAUTION!

For gear units whose reaction torque is not absorbed by flange but a torque reaction lever, we recommend installing the torque reaction lever on the driven machine side to avoid additional bending stress. Use screws according to property class 8.8 to fasten the torque reaction lever to the gear unit housing. All screws have to be fitted with the required torque (refer to table 9.1). We recommend using elastic sockets to protect against torque impulses and distortion. The fastening bolt should be fixed on both sides.



Axial securing of the gear unit on the shaft of the driven machine is either done via circlip and/or end disc with screw. Furthermore, shrink discs can also be used for axial positioning. Clamping screws may not be tightened without an inserted shaft as this can lead to plastic

CAUTION! **deformation in the hollow shaft**. **Heed the fitting instructions of the shrink disc manufacturer and observe the steps below:**

Mounting the shrink disc:

1. Remove spacers between the outer rings (if available)
2. Manually tighten screws slightly, so that the inner ring can still be turned.
3. Slightly grease the seat of the hub section for the shrink disc.
4. Carefully remove the grease from the hollow shaft hole and the driven machine shaft in the press section.
5. Fit shaft or slip-on gear on the driven machine shaft while fully using the shrink connection section.
6. Tighten clamping screws one after the other in clockwise direction but not crosswise. Several turns are required before reaching the required screw tightening torque.
7. The position between the solid shaft of the driven machine and the hollow shaft of the gear unit has to be marked to be able to detect a possible racing effect.

Dismounting the shrink disc:

1. Loosen clamping screws evenly one after the other to prevent the inner ring from jamming.
2. Loosen the flanges from the cone of the inner ring.
3. Dismount the shaft or pull off the slip-on gear from the driven machine.

We recommend applying a corrosion protection agent (e.g. Gleitmo800 by Fuchs) to the shaft of the driven machine to prevent tribocorrosion.

5.2. Mounting the motor

CAUTION! **The motor is mounted using motor flange and coupling. We recommend using flexible couplings to compensate for small inaccuracies in assembly. When mounting couplings, observe the pertaining operation and mounting instructions of the coupling manufacturer. Use screws according to property class 8.8 to fasten the motor to the gear unit. All screws have to be fitted applying the required torque (refer to table 9.1.**

CAUTION! **When mounting the motor via a hollow gear drive shaft, ensure that the motor shaft and the mounting faces of the motor flange are perpendicular to avoid distortion and the resulting bearing load. For this reason, GFC recommend motors whose design and position tolerance are reduced by 50 % in accordance with table 3 of EN 50347:2001. Prior to assembly, both motor shaft and hollow bore of the gear input shaft must be thoroughly cleaned. Use suitable anti-seizing compound (e.g. Gleitmo800 by Fuchs) to prevent friction corrosion. Use screws according to property class 8.8 to fasten the motor to the gear unit. All screws have to be fitted applying the required torque (refer to table 9.1).**

CAUTION! **Do not apply hammer blows for assembly. This might damage the splines, roller bearings and the shafts.**

Heed operation instructions of the motor manufacturer for electrical connection!

6. Commissioning

The safety instructions in section 2 must be observed.

Commissioning of the gear unit is only permitted once the machine manufacturer/operator have integrated the gear unit in the machine, when complying with product specific Europeans directives by affixing the CE mark on the machine and after confirming the safety of the system put on the market.

CAUTION! **Prior to and during commissioning, the following steps have to be performed:**

- In compliance with statutory requirements, revolving and rotating parts must be protected against accidental contact.
- Check vent valve for clogging or contamination, e.g. by paint residues. During operation, insufficient or insecure ventilation generates increased internal pressure and finally results in leakage.
- Check oil filling level → section 8.1.1
- Check oil quality → section 8.1.1
- Check radial seal
- Check tightening torques of the fastening screws
  Screws that can no longer be used have to be replaced by new ones of the same property class and type.
- During test run, check for unusual noise and vibration, formation of smoke or vapour as well as to the service temperature (gear unit surface up to approx. 70 °C).

GFC worm gear units achieve their full performance and optimum efficiency in well run-in condition and at service temperature. We recommend running in each gear unit with no load for some time first and then at approx. 50% of the rated load for several hours. If operation at partial load is not possible, the gear should be repeatedly stopped and cooled down once an oil temperature of approx. 80 – 90°C is reached. During running in, check for unusual noise and vibration, formation of smoke or vapour as well as to the service temperature (gear unit surface up to approx. 70 °C). Gear units to be operated in both directions should be run in in both directions of rotation. After running in, check gear unit for leakage.

7. Operation, malfunctions, causes, troubleshooting

Gear units must be monitored during operation. Special attention should be paid to unusual running noise, increased service temperatures and possible oil leakage.

CAUTION! **In case of irregularities and when eliminating malfunctions, the gear unit must be shut down immediately and the safety instructions of section 2.4 have to be observed. The equipment has to be protected against accidental start-up.**

During the warranty period, maintenance work may exclusively be carried out by GFC. If malfunctions occurring at a later date cannot be located or the effort required for repair would be excessive, please contact the GFC service technicians.

Fault	Possible causes	Remedy
Unusual running noise/vibration	• Damage to splines or bearing • Changed bearing backlash • Oil level too low	• Please contact GFC service • Please contact GFC service • Refill oil and check gear unit for leakage
Unusual blows/vibration	• Defective motor coupling • Gear support worked loose	• Replace coupling • Tighten fastening screws according to section 5.1
Increased service temperature	• Heat accumulation and /or waste heat from other devices • Oil level too low • Outdated/contaminated oil • Impaired passive cooling	• Please contact GFC service • Check oil level at room temperature and check in accordance with section 3.3.5, if applicable • Change oil • Clean both housing surface and fan cover
Oil leaks at gear unit	• Damaged radial seals • Clogged vent valve	• Contact GFC service and replace radial seal • Clean vent valve (refer to table 8) Vent valve are pressure relief valves. They open to the outside at approx. 0.3 bar and protect the gear unit against excessive internal pressure and possible leakage.
Oil leaks at vent valve (oil infeed)	• Incorrect service position • Oil level too high • Wrong lubricant (foam formation)	• Correct service position in accordance with section 3.3 • Check oil level at room temperature and check in accordance with section 3.3.5, if applicable • Change oil, refer to section 8.1.2
Oil leaks at screw plugs (oil drain)	• Screw plugs not properly fastened	• Check radial seals and tighten screw plugs according to table 8.1.1

Table 7: Malfunctions- causes-remedy

8. Servicing and maintenance

GFC gear units will reliable operate for several years in nominal operation. However, regular checks, cleaning and maintenance are recommended after commissioning.

The stipulated inspection intervals (table 8) mentioned above are part of the conditions of warranty.

All service work may only be performed by qualified and trained personnel.

Work on the gear unit always has to be performed while the gear unit is switched off and protected against accidental start-up (key switch, sign).

CAUTION!

Only use original GFC spare parts for repair and maintenance tasks; otherwise a safe function of the gear unit cannot be guaranteed. All warranty and liability claims are void if the maintenance work has not been carried out correctly or if unapproved spare parts have been used.

Measure	Maintenance interval	Remarks/notes
Check gear temperature	Every 3 months	Max. permissible temperature at housing: 110°C In case of higher temperatures, refer to section 7.
Check running noise	Every 3 months	In case of changes, refer to section 7.
Check oil level	Every 3 months	Refer to sections 8.1.1 and 3.3.5
Check oil quality	Every 3 months	Refer to sections 8.1.1 and 3.3.5
Check gear unit for tightness	Every 3 months	
Visual inspection of painting	Every 3 months	Damage to the coating of the outer gear unit parts leads to failure of the corrosion protection and has to be touched up immediately.
Clean vent valve	Every 3 months	Clean unscrewed vent valve with petroleum ether and dry or blow with compressed air. Ensure sufficient ventilation (explosion hazard)!
First oil change	After 2,000 operation hours	Refer to section 8.1.2
Further oil changes	After further 15,000 operating hours or 60 months	Refer to section 8.1.2
Clean gear unit	Every 12 months	Excessive water pressure and concentrated cleaning agents are not permitted for eliminating possible contamination.
Check fastening screws for tight fit	Every 12 months	Refer to section 5

Table 8: Corrective action and intervals

CAUTION!

The indications on oil change intervals only apply to polyglycoles according to section 3.3.5. Depending on the application and the service conditions, other lubricants with different maintenance intervals can be used in some cases. For information, refer to contractual documents (e.g. drawings) or contact GFC service.

8.1. Description of maintenance work

8.1.1. Oil level and status monitoring

Oil and oil filling level may only be checked once gear unit has cooled down and is at standstill.

Checking the lubricant status:

Open screw plug at oil drain (for position, refer to section 3.1) and drain a small quantity. Once the lubricant has been drained, seal oil drain according to specified tightening torque (table 8.1.1) (Caution: Fit sealing ring again!). Check oil quality with regard to colour and for the quality of solid particles or contamination contained.

If required, an external service or laboratory shall perform the quality checks. Lubricant manufacturers also offer these tests. If required, change oil (refer to section 8.1.2).

Oil level monitoring:

Remove vent valve with oil dipstick (refer to section 3.1), unscrew and wipe remaining oil of the oil dipstick. The oil can only be read off again, once the vent valve has been completely screwed in and removed again (refer to section 3.3.5). Check oil level in case of deviations.

Exclusively use lubricant of the same type (refer to name plate!) for refilling. Mixing oils of various types and manufacturers is not permissible (for selection, refer to table 3.3.5-1). Mineral oils in particular must not be used without prior explicit approval by GFC.

Finally, the vent valve has to be screwed in again, refer to tables 8.1.1 and 9.2 for the required tightening torque. Replace damaged sealing rings.

Size	Width across flats of the vent valve (oil infeed) [mm]	Tightening torque of the vent valve (oil infeed) [Nm]	Width of hexagon socket of the screw plug at the oil drain [mm]	Tightening torque of screw plug at the oil drain [Nm]
S40.1-S80.1	12	10	5	10
S100.1-S125.1	13	20	6	20
S160.1	17	34	8	34
S200.1-S355.1	24	85	12	85
S200.1-S450.1	27	130	17	130

Table 8.1.1: Tightening torques of screw plugs and vent valve

8.1.2. Oil change

Oil change has to be performed shortly after shut-down while still **at service temperature** (housing surface is hand warm). Otherwise complete draining cannot be ensured due to lack of viscosity.

Heat resistant gloves must imperatively be worn to avoid burns due to hot draining oil!

1. Place collecting basin underneath the oil draining screw plug.
2. Unscrew oil draining screw plug and vent valve.

3. Drain oil completely. If required, rinse gear unit with low-viscosity (and compatible) oil.
   Possible bronze flakes are uncritical.
4. Seal oil drain: Tighten oil drain screw plug and sealing ring with tightening torque according to tables 8.1.1 and 9.2 .
5. Refill new oil (refer to section 3.3.5) via threaded hole of vent valve up to required filling level (refer to section 8.1.1 "Oil level monitoring“).
6. Screw in vent valve including oil dipstick (for tightening torque, refer to table 8.1.1 and 9.2)
7. Contain spilled oil using a suitable agent and dispose of used oil according to national regulations.

9. Screw tightening torques

9.1. Standard screw thread

Fastening screw	Tightening torque [Nm]		
	8.8	**10.9**	**12.9**
M4	3.1	4.5	5.25
M5	6.1	9	10.4
M6	11	15	18
M8	25	37	43
M10	51	75	87
M12	87	128	150
M16	214	314	365
M20	431	615	710
M24	742	1057	1220
M30	1489	2121	2450
M36	2594	3695	4280

Table 9.1: Tightening torques for standard thread screws

9.2. Screw plugs

Screw plug St		Tightening torque [Nm]	Screw plug St		Tightening torque [Nm]
Metric fine thread in accordance with DIN 13	Pipe threads in accordance with EN ISO 228		Metric fine thread in accordance with DIN 13	Pipe threads in accordance with EN ISO 228	
M10 x 1.0	-	10	-	G 1/2	60
-	G 1/8 A	10	M22 x1.5	-	60
M12 x 1.5	-	20	M26 x 1.5	-	70
-	G 1/4 A	26	M27 x 2.0	-	85
M14 x 1.5	-	30	-	G 3/4 A	85
M16 x 1.5	-	34	M33 x 2.0	-	130
-	G 3/8 A	34	-	G 1 A	130
M18 x 1,5	-	42	M48 x 1.5	G 1 1/2 A	150
M20 x 1.5	-	50	M60 x 2.0	G 2 A	170

Table 9.2: Tightening torques for screw plugs

10. Spare parts

CAUTION!

Only use original spare parts by GFC for maintenance work! GFC will not assume any liability or warranty for damage incurred when using non-GFC spare parts. Furthermore, use of such products might impair the both characteristics and operational reliability and safety of the gear unit.

10.1. Spare parts for sizes S40.1 - S80.1

The spare parts indicated below are only valid for the basic version with shaft at drive, hollow shaft at output drive, passive fan and service position B3. Deviating versions, service conditions and gear units for special application and ambient conditions require other components. Please indicate the order number or serial number of the gear unit (refer to name plate) when ordering spare parts.

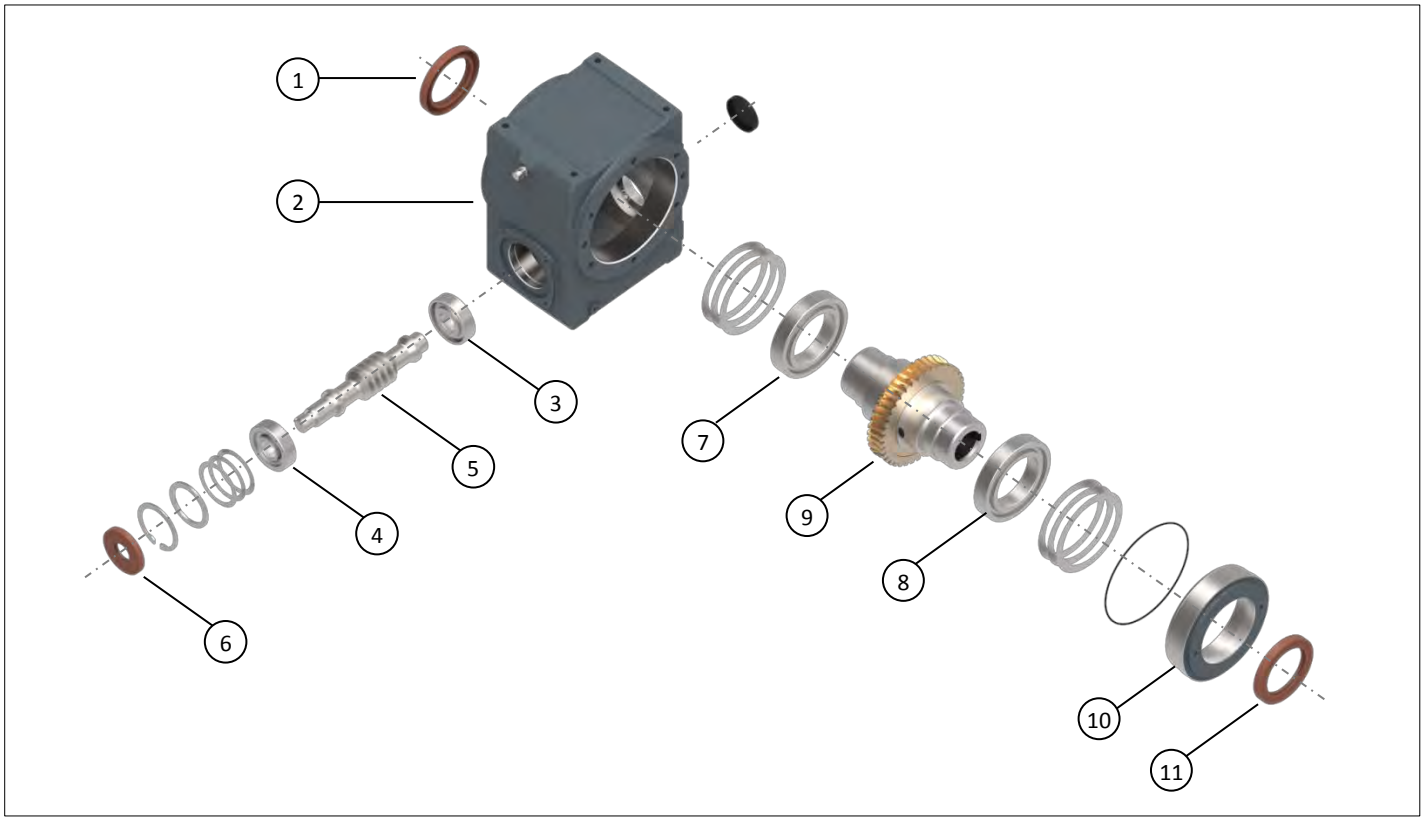


Fig. 10.1: Exploded view of sizes S63.1 and S80.1 (deviating design without bearing cover SR for sizes S40.1 and S50.1!)

No.	Spare part designation		S40.1	S50.1	S63.1	S80.1
1	Radial seal	DIN3760-	AS35x52x7-FPG	AS50x72x8-FPG	AS50x72x8-FPG	AS65x90x10-FPG
2	Housing					
3	Ball bearing		DIN720-32004X-J	DIN720-32005X-J [1] DIN628-7204-B-TN [2]	DIN720-30205X-J [1] DIN628-7304-B-TN [2]	DIN720-31305X-J [1] DIN628-7305-B-TN [2]
4	Ball bearing		DIN720-30203-J	DIN720-32005X-J DIN628-7204-B-TN	DIN720-30205X-J DIN628-7304-B-TN	DIN720-31305X-J DIN628-7305-B-TN
5	Worm shaft					
6	Radial seal	DIN3760-	AS20x42x7-FPG	AS20x47x7-FPG	AS20x52x8-FPG	AS25x62x7-FPG
7	Deep groove ball bearing	DIN625-	16007-J	6010-J	6011-J	6014-J
8	Deep groove ball bearing	DIN625-	16008-J	6011-J	6011-J	6014-J
9	Worm wheel					
10	Bearing cover SR		*n/a*	*n/a*		
11	Radial seal	DIN3760-	AS40x68x8-FPG	AS50x90x10-FPG	AS50x72x8-FPG	AS65x90x10-FPG

Table 10.1: Wear parts S40.1-S80.1

[1] for i=12.75 (13); 25 (25.5); 51 (53); 61 (62); 82 (83)
[2] for i=5 (4.83); 7.5 (7.25); 10 (9.5 & 9.75); 15 (14.5); 20 (19 & 19.5), 30 (29); 40 (38 & 39)

10.2. Spare parts for sizes S100.1 – S160.1

The spare parts indicated below are only valid for the basic version with shaft at drive, hollow shaft at output drive, passive fan and service position B3. Deviating versions, service conditions and gear units for special application and ambient conditions require other components. Please indicate the order number or serial number of the gear unit (refer to name plate) when ordering spare parts.

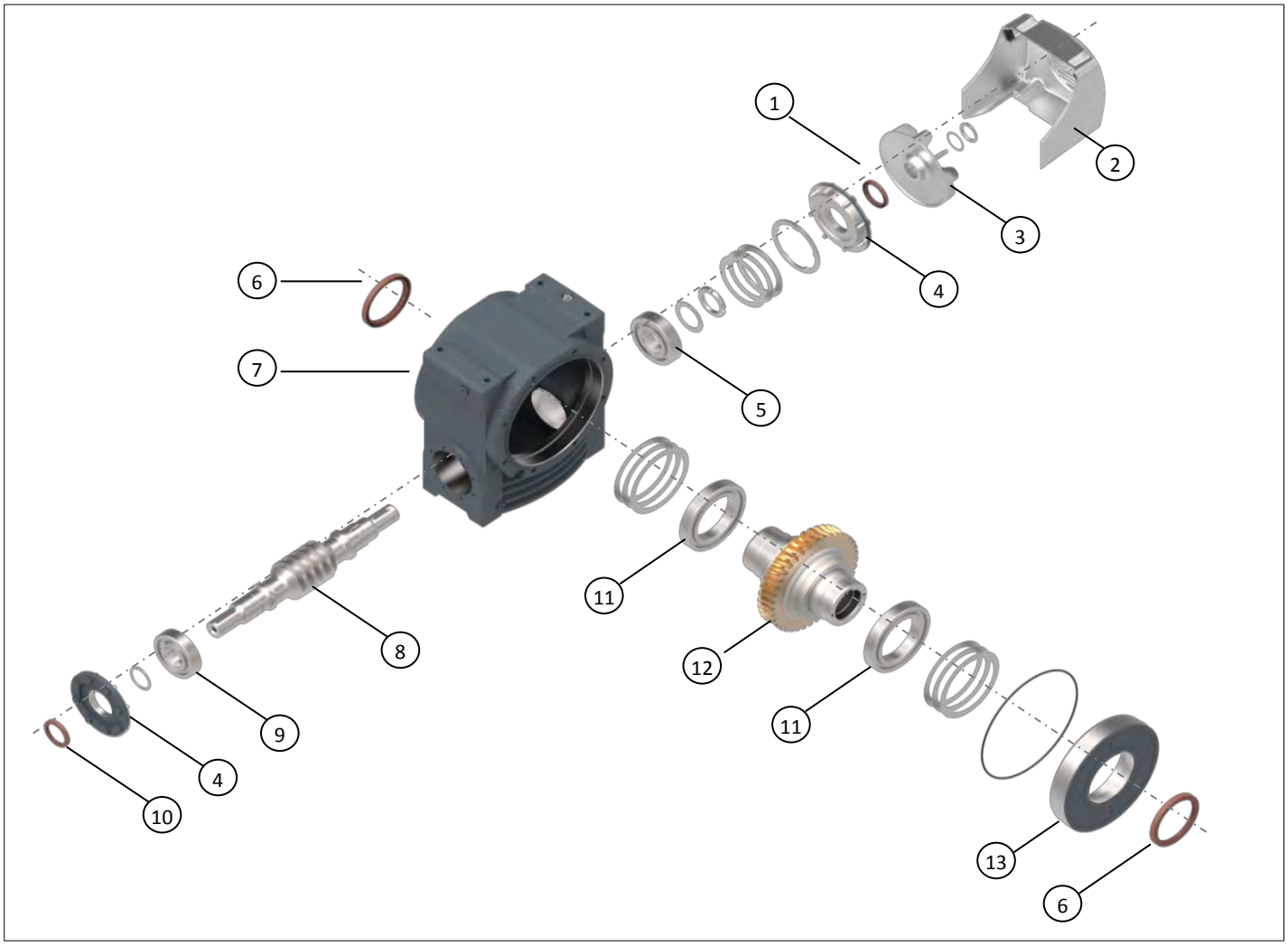


Fig. 10.2: Exploded view of sizes S100.1 – S160.1

No.	Spare part designation		S100.1	S125.1	S160.1
1	Radial seal	DIN3760-	AS35x62x12-70…80FPM	AS42x72x8-FKM-G	AS55x72x8-FP-G
2	Fan cover				
3	Fan wheel				
4	Bearing cover SW				
5	Angular ball bearing	DIN628-	QJ 308-TN	QJ 309-TN	QJ 312-PHAS
6	Radial seal	DIN3760-	AS85x110x12—FP-G	AS95x120x10-FPM-G	AS115x140x12-FP-G
7	Housing				
8	Worm shaft				
9	Deep groove ball bearing	DIN625-	6308-J	6309-J	6311-J
10	Radial seal	DIN3760-	AS35x62x12-70…80FPM	AS45x72x8-FKM-G	AS55x72x8-FP-G
11	Deep groove ball bearing	DIN625-	6017-J	6020-J	6024-J
12	Worm wheel				
13	Bearing cover SR				

Table 10.2: Wear parts S100.1-S160.1

10.3. Spare parts for sizes S200.1 - S450.1

The spare parts indicated below are only valid for the basic version with shaft at drive, hollow shaft at output drive, passive fan and service position B3. Deviating versions, service conditions and gear units for special application and ambient conditions require other components. Please indicate the order number or serial number of the gear unit (refer to name plate) when ordering spare parts.

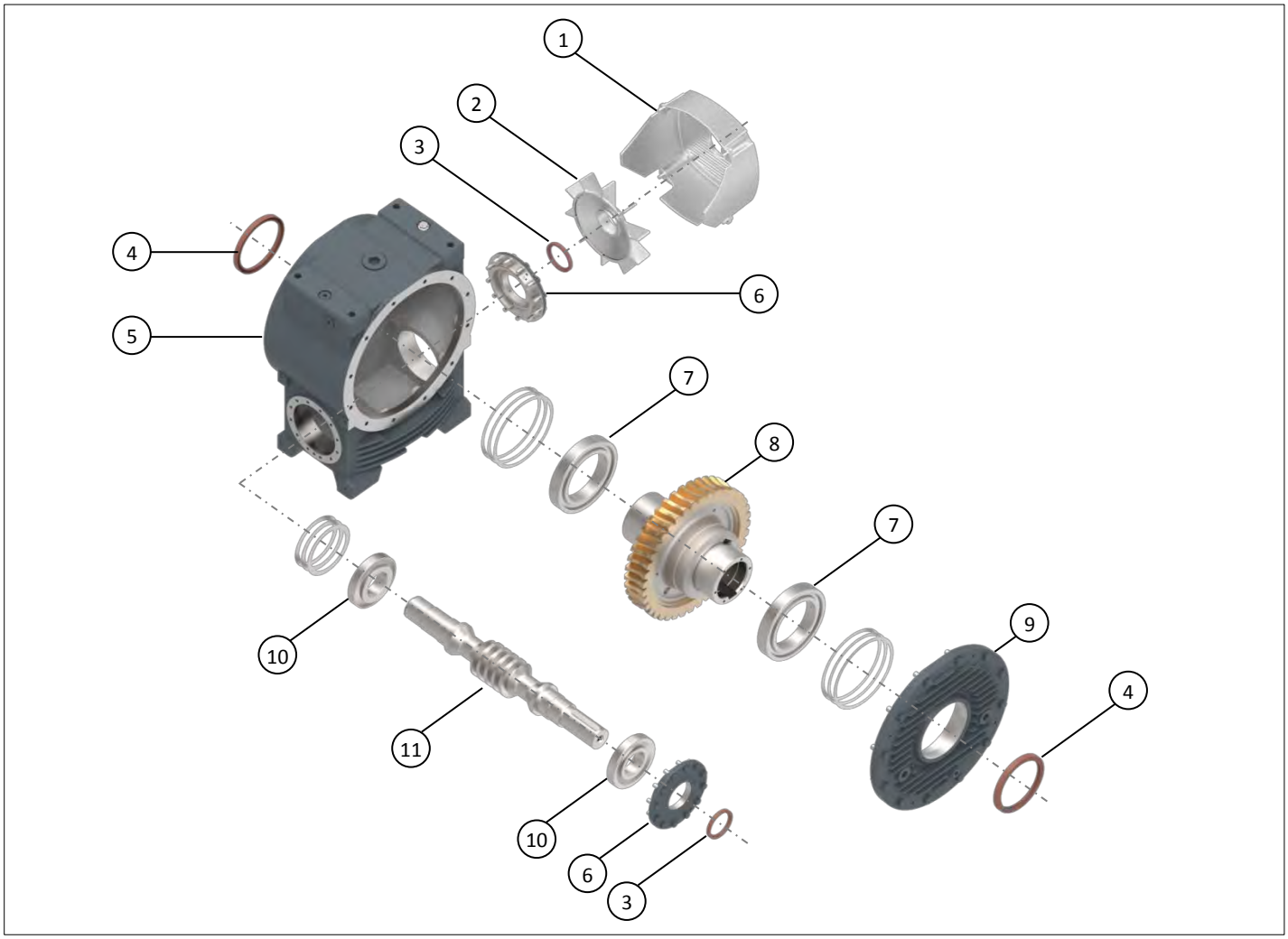


Fig. 10.3: Exploded view of sizes S200.1 - S450.1

No.	Spare part designation	S200.1	S225.1	S250.1	S280.1	S315.1	S355.1	S400.1	S450.1
1	Fan cover								
2	Fan wheel								
3	Radial seal DIN3760-	AS60x85x8-FKM-G	AS75x95x10-FKM-G	AS75x95x10-FKM-G	AS85x120x12-FKM-G	AS95x120x12-FKM-G	AS95x120x12-FKM-G	AS105x140x12-FKM-G	AS115x140x12-FKM-G
4	Radial seal DIN3760-	AS130x160x12-FKM-G	AS160x190x15-FKM-G	AS160x190x15-FKM-G	AS180x210x15-FKM-G	AS200x230x15-FKM-G	AS220x250x15-FKM-G	AS260x300x20-FKM-G	AS280x320x20-FKM-G
5	Housing								
6	Bearing cover SW								
7	Deep groove ball bearing DIN625-	6026-J	6032-J	6032-J	6036	6040-J	6044-M	6052-M	6056-M
8	Worm wheel								
9	Bearing cover SR								
10	Tapered roller bearings DIN720-	31313-J	31316-J	31316-J	31320X-J	31320X-J	31320X-J	31322X-J	31324X-J
11	Worm shaft								

Table 10.3: Wear parts S200.1-S450.1

11.Disposal

Our gear units have a long service life. However, they have to be replaced at one point in time. Individual components have to be disposed of as follows:

- Housing parts, worm shaft, shafts and roller bearings are to be disposed of as scrap steel
- Parts made of cast iron are also to be handled as scrap steel, in case there is no separate collection.
- Worm wheels made of bronze have to be disposed of separately.
- Greases and oils are hazardous to water and must not be released into the environment. They have to be collected and disposed of according to the relevant environmental provisions (national regulations for waste disposal and directives, e.g. ISO 14001).

12.Appendix I: Declaration of Incorporation

GFC AntriebsSysteme GmbH
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EG-Einbauerklärung

gemäß der EG-Maschinenrichtlinie 2006/42/EG vom 17. Mai 2006, Anhang II B

Der Hersteller

GFC AntriebsSysteme GmbH
Grenzstraße 5
D-01640 Coswig

erklärt hiermit, dass die nachstehend bezeichneten Getriebe in ihrer Konzeption und Bauart sowie in der in Verkehr gebrachten Ausführung den grundlegenden Sicherheits- und Gesundheitsanforderungen der EG-Richtlinie 2006/42/EG entsprechen, insbesondere dem Anhang I, Ziffern 1.1.2, 1.1.3, 1.1.5, 1.3.1, 1.3.7, 1.7.1., 1.7.3, 1.7.4.

Der Hersteller verpflichtet sich, die Unterlagen zur unvollständigen Maschine der zuständigen nationalen Behörde auf begründetes Verlangen elektronisch zu übermitteln. Die zur unvollständigen Maschine gehörenden speziellen technischen Unterlagen nach Anhang VII Teil B wurden erstellt.

Die Inbetriebnahme der unvollständigen Maschine ist solange untersagt, bis festgestellt wurde, dass die Maschine, in die das GFC-Getriebe eingebaut ist, den Bestimmungen der Richtlinie (2006/42/EG) entspricht.

Beschreibungen der unvollständigen Maschinen:

Schneckengetriebe
Stirnradgetriebe
Schnecken-Stirnradgetriebe
Stirnrad-Schneckengetriebe
Doppelschneckengetriebe
Drehwerksgetriebe
Spindelhubgetriebe
Schraubradgetriebe
Kegelradgetriebe
Planetengetriebe

Angewandte harmonisierte Normen:

DIN EN ISO 12100:2011 Sicherheit von Maschinen
Allgemeine Gestaltungsleitsätze - Risikobeurteilung und Risikominderung

Bevollmächtigter für die Technische Dokumentation:

Michael Eleser, Grenzstraße 5, D-01640 Coswig

Coswig	2014-03-11	
Ort	**Datum**	**Jürgen Riester, Geschäftsführer**

Y050.082/DE

Diese Erklärung beinhaltet keine Garantien. Die Sicherheitshinweise der mitgelieferten Produktdokumentation sind zu beachten. Bei einer nicht abgestimmten Änderung der Maschinenkomponenten verliert diese Erklärung ihre Gültigkeit.

Plant/place of installation:	
Gear unit serial number:	

Date	Performed action(s)	Comment	Signature

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Low voltage motors
Installation, operation, maintenance and safety manual

More languages – see web site www.abb.com/motors&generators > Motors > Document library

Power and productivity
for a better world™

Low voltage motors

Installation, operation, maintenance and safety manual

Contents **Page**

1. Introduction

NOTE!
These instructions must be followed to ensure safe and proper installation, operation and maintenance of the motor. They should be brought to the attention of anyone who installs, operates or maintains the motor or associated equipment. The motor is intended for installation and use by qualified personnel, familiar with health and safety requirements and national legislation. Ignoring these instructions may invalidate all applicable warranties.

1.1 Declaration of Conformity

The conformity of the end product according to Directive 2006/42/EC (Machinery) has to be established by the commissioning party when the motor is fitted to the machinery.

1.2 Validity

These instructions are valid for the following ABB electrical machine types, in both motor and generator operation:

series MT*, MXMA,
series M1A*, M2A*/M3A*, M2B*/M3B*, M4B*, M2C*/M3C*, M2F*/M3F*, M2L*/M3L*, M2M*/M3M*, M2Q*, M2R*/M3R*, M2V*/M3V*
in frame sizes 56 - 450.

There is a separate manual for e.g. Ex motors ‘Low voltage motors for explosive atmospheres: Installation, operation and maintenance and safety manual (3GZF500730-47)

Additional information is required for some machine types due to special application and/or design considerations.

Additional manual is available for the following motors:
– roller table motors
– water cooled motors
– smoke extraction motors
– brake motors
– motors for high ambient temperatures
– motors in marine applications for mounting on open deck of ships or offshore units

2. Safety considerations

The motor is intended for installation and use by qualified personnel, familiar with health and safety requirements and national legislation.

Safety equipment necessary for the prevention of accidents at the installation and operating site must be provided in accordance with local regulations.

WARNING!
Emergency stop controls must be equipped with restart lockouts. After emergency stop a new start command can take effect only after the restart lockout has been intentionally reset.

Points to be observed:

1. Do not step on the motor.
2. The temperature of the outer casing of the motor may be hot to the touch during normal operation and especially after shut-down.
3. Some special motor applications may require additional instructions (e.g. when supplied by frequency converter).
4. Observe rotating parts of the motor.
5. Do not open terminal boxes while energized.

3. Handling

3.1 Reception

Immediately upon receipt, check the motor for external damage (e.g. shaft-ends, flanges and painted surfaces) and, if found, inform the forwarding agent without delay.

Check all rating plate data, especially voltage and winding connections (star or delta). The type of bearing is specified on the rating plate of all motors except the smallest frame sizes.

In the case of a variable speed drive application check the maximum loadability allowed according to frequency stamped on the motor's second rating plate.

3.2 Transportation and storage

The motor should always be stored indoors (above –20 °C), in dry, vibration-free and dust-free conditions. During transportation, shocks, falls and humidity should be avoided. In other conditions, please contact ABB.

Unprotected machined surfaces (shaft-ends and flanges) should be treated against corrosion.

It is recommended that shafts are rotated periodically (once per quarter) by hand to prevent grease migration.

Anti-condensation heaters, if fitted, are recommended to be used to avoid water condensing in the motor.

The motor must not be subject to any external vibrations at standstill so as to avoid causing damage to the bearings.

Motors fitted with cylindrical-roller and/or angular contact bearings must be fitted with locking devices during transport.

3.3 Lifting

All ABB motors above 25 kg are equipped with lifting lugs or eyebolts.

Only the main lifting lugs or eyebolts of the motor should be used for lifting the motor. They must not be used to lift the motor when it is attached to other equipment.

Lifting lugs for auxiliaries (e.g. brakes, separate cooling fans) or terminal boxes must not be used for lifting the motor. Because of different output, mounting arrangements and auxiliary equipment, motors with the same frame may have a different center of gravity.

Damaged lifting lugs must not be used. Check that eyebolts or integrated lifting lugs are undamaged before lifting.

Lifting eyebolts must be tightened before lifting. If needed, the position of the eyebolt can be adjusted using suitable washers as spacers.

Ensure that proper lifting equipment is used and that the sizes of the hooks are suitable for the lifting lugs.

Care must be taken not to damage auxiliary equipment and cables connected to the motor.

Remove eventual transport jigs fixing the motor to the pallet.

Specific lifting instructions are available from ABB.

WARNING!
During lifting, mounting or maintenance work, all necessary safety considerations shall be in place and special attention to be taken that nobody will be subject to lifted load.

3.4 Motor weight

The total motor weight can vary within the same frame size (center height) depending on different output, mounting arrangement and auxiliaries.

The following table shows estimated maximum weights for machines in their basic versions as a function of frame material.

The actual weight of all ABB's motors, except the smallest frame sizes (56 and 63), is shown on the rating plate.

Frame size	Aluminum Weight kg	Cast iron Weight kg	Add. for brake
56	4.5	–	–
63	6	–	–
71	8	13	5
80	14	20	8
90	20	30	10
100	32	40	16
112	36	50	20
132	93	90	30
160	149	130	30
180	162	190	45
200	245	275	55
225	300	360	75
250	386	405	75
280	425	800	–
315	–	1700	–
355	–	2700	–
400	–	3500	–
450	–	4500	–

If the motor is equipped with a separate fan, contact ABB for the weight.

4. Installation and commissioning

WARNING!
Disconnect and lock out before working on the motor or the driven equipment.

4.1 General

All rating plate values must be carefully checked to ensure that the motor protection and connection will be properly done.

When starting the motor for the first time or after it has been in storage more than 6 months, apply the specified quantity of grease.

See section “7.2.2 Motors with re-greasable bearings” for more details.

When fitted in a vertical position with the shaft pointing downwards, the motor must have a protective cover to prevent foreign objects and fluid from falling into the ventilation openings. This task can also be achieved by a separate cover not fixed to the motor. In this case, the motor must have a warning label.

4.2 Motors with other than deep groove ball bearings

Remove transport locking if employed. Turn the shaft of the motor by hand to check free rotation, if possible.

Motors equipped with cylindrical roller bearings:

Running the motor with no radial force applied to the shaft may damage the roller bearing due to “sliding”,

Motors equipped with angular contact ball bearing:

Running the motor with no axial force applied in the right direction in relation to the shaft may damage the angular contact bearing.

WARNING!
For motors with angular contact bearings the axial force must not by any means change direction.

The type of bearing is specified on the rating plate.

4.3 Insulation resistance check

Measure insulation resistance (IR) before commissioning, after long periods of standstill or storage when winding dampness may be suspected. IR shall be measured directly on the motor terminals with the supply cables disconnected in order to avoid them affecting the result.

Insulation resistance should be used as a trend indicator to determine changes in the insulation system. In new machines the IR is usually thousands of Mohms and thus following the change of IR is important so as to know the condition of the insulation system. Typically, the IR should not be below 10 MΩ and in no case below 1 MΩ (measured with 500 or 1000 VDC and corrected to 25 °C). The insulation resistance value is halved for each 20 °C increase in temperature.

Figure 1, in chapter 11, can be used for the insulation correction to the desired temperature.

WARNING!
To avoid risk of electrical shock, the motor frame must be grounded and the windings should be discharged against the frame immediately after each measurement.

If the reference resistance value is not attained, the winding is too damp and must be oven dried. The oven temperature should be 90 °C for 12-16 hours followed by 105 °C for 6-8 hours.

If fitted drain hole plugs must be removed and closing valves must be opened during heating. After heating, make sure the plugs are refitted. Even if the drain plugs are fitted, it is recommended to disassemble the end shields and terminal box covers for the drying process.

Windings drenched in seawater normally need to be rewound.

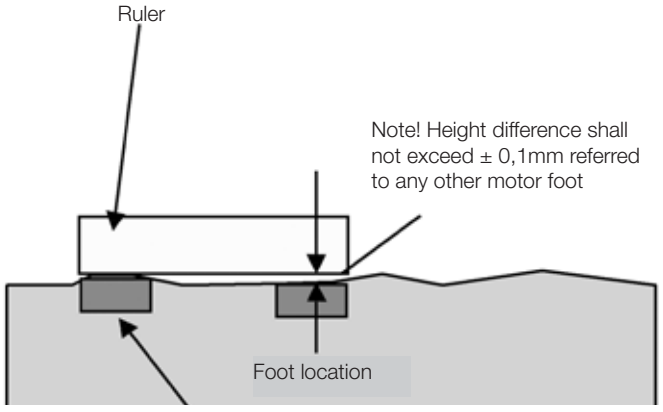
4.4 Foundation

The end user has full responsibility for preparation of the foundation.

Metal foundations should be painted to avoid corrosion.

Foundations must be even and sufficiently rigid to withstand possible short circuit forces.

They must be designed and dimensioned to avoid the transfer of vibration to the motor and vibration caused by resonance. See figure below.



4.5 Balancing and fitting coupling halves and pulleys

As standard, balancing of the motor has been carried out using half key.

Coupling halves or pulleys must be balanced after machining the keyways. Balancing must be done in accordance with the balancing method specified for the motor.

Coupling halves and pulleys must be fitted on the shaft by using suitable equipment and tools which do not damage the bearings and seals.

Never fit a coupling half or pulley by hammering or removing it by using a lever pressed against the body of the motor.

4.6 Mounting and alignment of the motor

Ensure that there is enough space for free airflow around the motor. It is recommended to have a clearance between the fan cover and the wall etc. of at least ½ of the air intake of the fan cover. Additional information may be found from the product catalog or from the dimension drawings available on our web pages: www.abb.com/motors&generators.

Correct alignment is essential to avoid bearing, vibration and possible shaft failures.

Mount the motor on the foundation using the appropriate bolts or studs and place shim plates between the foundation and the feet.

Align the motor using appropriate methods.

If applicable, drill locating holes and fix the locating pins into position.

Mounting accuracy of coupling half: check that clearance b is less than 0.05 mm and that the difference a1 to a2 is also less than 0.05 mm. See figure 2.

Re-check the alignment after final tightening of the bolts or studs.

Do not exceed permissible loading values for bearings as stated in the product catalogs.

Check that the motor has sufficient airflow. Ensure that no nearby objects or direct sunshine radiate additional heat to the motor.

For flange mounted motors (e.g. B5, B35, V1), make sure that the construction allows sufficient air flow on the outer surface of the flange.

4.7 Radial forces and belt drives

Belts must be tightened according to the instructions of the supplier of the driven equipment. However, do not exceed the maximum belt forces (i.e. radial bearing loading) stated in the relevant product catalogs.

WARNING!
Excessive belt tension will damage bearings and can cause shaft damage.

4.8 Motors with drain plugs for condensation

Check that drain holes and plugs face downwards. In vertical position mounted motors, the drain plugs may be in horizontal position.

Motors with sealable plastic drain plugs are delivered in an open position. In very dusty environments, all drain holes should be closed.

4.9 Cabling and electrical connections

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal.

In addition to the main winding and earthing terminals, the terminal box can also contain connections for thermistors, heating elements or other auxiliary devices.

Suitable cable lugs must be used for the connection of all main cables. Cables for auxiliaries can be connected into their terminal blocks as such.

Motors are intended for fixed installation only. Unless otherwise specified, cable entry threads are metric. The IP class of the cable gland must be at least the same as those of the terminal boxes.

Certified conduit hub or cable connector has to be used at the time of installation.

NOTE!
Cables should be mechanically protected and clamped close to the terminal box to fulfill the appropriate requirements of IEC/EN 60079-0 and local installation standards.

Unused cable entries must be closed with blanking elements according to the IP class of the terminal box.

The degree of protection and diameter are specified in the documents relating to the cable gland.

WARNING!
Use appropriate cable glands and seals in the cable entries according to the type and diameter of the cable.

Earthing must be carried out according to local regulations before the motor is connected to the supply voltage.

The earth terminal on the frame has to be connected to PE (protective earth) with a cable as shown in Table 5 of IEC/EN 60034-1:

Minimum cross-sectional area of protective conductors

Cross-sectional area of phase conductors of the installation, S, [mm^2]	Minimum cross-sectional area of the corresponding protective conductor, S, [mm^2]
4	4
6	6
10	10
16	16
25	25
35	25
50	25
70	35
95	50
120	70
150	70
185	95
240	120
300	150
400	185

In addition, earthing or bonding connection facilities on the outside of electrical apparatus must provide effective connection of a conductor with a cross-sectional area of at least 4 mm^2.

The cable connection between the network and motor terminals must meet the requirements stated in the national standards for installation or in the standard IEC/EN 60204-1 according to the rated current indicated on the rating plate.

NOTE!
When the ambient temperature exceeds +50 °C, cables having permissible operating temperature of +90 °C as minimum shall be used. Also all other conversion factors depending on the installation conditions shall be taken into account while sizing the cables.

Ensure that the motor protection corresponds to the environment and weather conditions. For example, make sure that water cannot enter the motor or the terminal boxes.

The seals of terminal boxes must be placed correctly in the slots provided to ensure the correct IP class. A leak could lead to penetration of dust or water, creating a risk of flashover to live elements.

4.9.1 Connections for different starting methods

The terminal box on standard single speed motors normally contains six winding terminals and at least one earth terminal. This enables the use of DOL- or Y/D –starting.

For two-speed and special motors, the supply connection must follow the instructions inside the terminal box or in the motor manual.

The voltage and connection are stamped on the rating plate.

Direct-on-line starting (DOL):

Y or D winding connections may be used.

For example, 690 VY, 400 VD indicates Y-connection for 690 V and D-connection for 400 V.

Star/Delta (Wye/Delta) starting (Y/D):

The supply voltage must be equal to the rated voltage of the motor when using a D-connection.

Remove all connection links from the terminal block.

Other starting methods and severe starting conditions:

In cases where other starting methods e.g. converter or soft starter will be used in the duty types of S1 and S2, it is considered that the device is “isolated from the power system when the electrical machine is running” as in the standard IEC 60079-0 and thermal protection is optional.

4.9.2 Connections of auxiliaries

If a motor is equipped with thermistors or other RTDs (Pt100, thermal relays, etc.) and auxiliary devices, it is recommended they be used and connected by appropriate means. For certain applications, it is mandatory to use thermal protection. More detailed information can be found in the documents delivered with the motor. Connection diagrams for auxiliary elements and connection parts can be found inside the terminal box.

The maximum measuring voltage for the thermistors is 2.5 V. The maximum measuring current for Pt100 is 5 mA. Using a higher measuring voltage or current may cause errors in readings or a damaged temperature detector.

The insulation of thermal sensors fulfills the requirements of basic insulation.

4.10 Terminals and direction of rotation

The shaft rotates clockwise when viewing the shaft face at the motor drive end, and the line phase sequence – L1, L2, L3 – is connected to the terminals as shown in figure 3.

To alter the direction of rotation, interchange any two connections on the supply cables.

If the motor has a unidirectional fan, ensure that it rotates in the same direction as the arrow marked on the motor.

5. Operation

5.1 General

The motors are designed for the following conditions unless otherwise stated on the rating plate:

- Motors are to be installed in fixed installations only.
- Normal ambient temperature range is from –20 °C to +40 °C.
- Maximum altitude is 1000 m above sea level.
- The variation of the supply voltage and frequency may not exceed the limits mentioned in relevant standards. Tolerance for supply voltage is ±5 %, and for frequency ±2 % according to the figure 4 (EN / IEC 60034-1, paragraph 7.3, Zone A). Both extreme values are not supposed to occur at the same time.

The motor can only be used in applications for which it is intended. The rated nominal values and operation conditions are shown on the motor rating plates. In addition, all requirements of this manual and other related instructions and standards must be followed.

If these limits are exceeded, motor data and construction data must be checked. Please contact ABB for further information.

WARNING!
Ignoring any instructions or maintenance of the apparatus may jeopardize safety and thus prevent the use of the motor.

6. Low voltage motors in variable speed operation

6.1 Introduction

This part of the manual provides additional instructions for motors used in frequency converter supplies. The motor is intended to operate from a single frequency converter supply and not motors running in parallel from one frequency converter. Instructions given by the converter manufacturer shall be followed.

Additional information may be required by ABB to decide on the suitability for some motor types used in special applications or with special design modifications.

6.2 Winding insulation

Variable speed drives create higher voltage stresses than the sinusoidal supply on the winding of the motor. Therefore, the winding insulation of the motor as well as the filter at the converter output must be dimensioned according following instructions.

6.2.1 Selection of winding insulation for ABB converters

In the case of ABB e.g. AC_8_ _-series and AC_5_ _-series single drives with a diode supply unit (uncontrolled DC voltage), the selection of winding insulation and filters can be made according to table 6.1.

6.2.2 Selection of winding insulation with all other converters

The voltage stresses must be limited below accepted limits. Please contact the system supplier to ensure the safety of the application. The influence of possible filters must be taken into account while dimensioning the motor.

6.3 Thermal protection

Most of the motors covered by this manual are equipped with PTC thermistors or other type of RTD's in the stator windings. It is recommended to connect those to the frequency converter. Read more in chapter 4.9.2.

6.4 Bearing currents

Insulated bearings or bearing constructions, common mode filters and suitable cabling and grounding methods must be used according to the following instructions and using table 6.1.

6.4.1 Elimination of bearing currents with ABB converters

In case of ABB frequency converter e.g. AC_8_ _- and AC_5_ _-series with a diode supply unit, the methods according to table 6.1 must be used to avoid harmful bearing currents in motors.

	P_N < 100 kW	**$P_N \geq$ 100 kW or IEC315 ≤ Frame size ≤ IEC355**	**$P_N \geq$ 350 kW or IEC400 ≤ Frame size ≤ IEC450**
$U_N \leq$ 500 V	Standard motor	Standard motor + Insulated N-bearing	Standard motor + Insulated N-bearing + Common mode filter
500V > $U_N \leq$ 600V	Standard motor + dU/dt –filter (reactor) OR Reinforced insulation	Standard motor + dU/dt –filter (reactor) + Insulated N-bearing OR Reinforced insulation + Insulated N-bearing	Standard motor + Insulated N-bearing + dU/dt –filter (reactor) + Common mode filter OR Reinforced insulation + Insulated N-bearing + Common mode filter
500V > $U_N \leq$ 600V (cable length > 150 m)	Standard motor	Standard motor + Insulated N-bearing	Standard motor + Insulated N-bearing + Common mode filter
600V > $U_N \leq$ 690V	Reinforced insulation + dU/dt –filter (reactor)	Reinforced insulation + dU/dt –filter (reactor) + Insulated N-bearing	Reinforced insulation + Insulated N-bearing + dU/dt –filter (reactor) + Common mode filter
600V > $U_N \leq$ 690V (cable length > 150 m)	Reinforced insulation	Reinforced insulation + Insulated N-bearing	Reinforced insulation + Insulated N-bearing + Common mode filter

Table 6.1 Selection of winding insulation for ABB converters

Please contact ABB for more information on resistor braking and converters with controlled supply units.

NOTE!
Insulated bearings which have aluminum oxide coated inner and/or outer bores or ceramic rolling elements are recommended. Aluminum oxide coatings shall also be treated with a sealant to prevent dirt and humidity penetrating into the porous coating. For the exact type of bearing insulation, see the motor's rating plate. Changing the bearing type or insulation method without ABB's permission is prohibited.

6.4.2 Elimination of bearing currents with all other converters

The user is responsible for protecting the motor and driven equipment from harmful bearing currents. Instructions described in chapter 6.4.1 can be used as guideline, but their effectiveness cannot be guaranteed in all cases.

6.5 Cabling, grounding and EMC

To provide proper grounding and to ensure compliance with any applicable EMC requirements, motors above 30 kW shall be cabled by shielded symmetrical cables and EMC glands, i.e. cable glands providing 360° bonding.

Symmetrical and shielded cables are highly recommended also for smaller motors. Make the 360° grounding arrangement at all the cable entries as described in the instructions for the glands. Twist the cable shields into bundles and connect to the nearest ground terminal/bus bar inside the terminal box, converter cabinet, etc.

NOTE!
Proper cable glands providing 360° bonding must be used at all termination points such as motor, converter, possible safety switch, etc.

For motors of frame size IEC 280 and above, additional potential equalization between the motor frame and the driven equipment is needed, unless both are mounted on a common steel base. In this case, the high frequency conductivity of the connection provided by the steel base should be checked by, for example, measuring the potential difference between the components.

More information about grounding and cabling of variable speed drives can be found in the manual "Grounding and cabling of the drive system" (Code: 3AFY 61201998).

6.6 Operating speed

For speeds higher than the nominal speed stated on the motor's rating plate or in the respective product catalog, ensure that either the highest permissible rotational speed of the motor or the critical speed of the whole application is not exceeded.

6.7 Motors in variable speed applications

6.7.1 General

With ABB's frequency converters, the motors can be dimensioned by using ABB's DriveSize dimensioning program. The tool is downloadable from the ABB website (www.abb.com/motors&generators).

For application supplied by other converters, the motors must be dimensioned manually. For more information, please contact ABB.

The loadability curves (or load capacity curves) are based on nominal supply voltage. Operation in under or over voltage conditions may influence on the performance of the application.

6.7.2 Motor loadability with AC_8_ _ – series of converters with DTC control

The loadability curves presented in Figures 5a – 5d are valid for ABB AC_8_ _-series converters with uncontrolled DC-voltage and DTC-control. The figures show the approximate maximum continuous output torque of the motors as a function of supply frequency. The output torque is given as a percentage of the nominal torque of the motor. The values are indicative and exact values are available on request.

NOTE!
The maximum speed of the motor and application may not be exceeded!

6.7.3 Motor loadability with AC_5_ _ – series of converter

The loadability curves presented in Figures 6a – 6d are valid for AC_5_ _ -series converters. The figures show the approximate maximum continuous output torque of the motors as a function of supply frequency. The output torque is given as a percentage of the nominal torque of the motor. The values are indicative and exact values are available on request.

NOTE!
The maximum speed of the motor and application may not be exceeded!

6.7.4 *Motor loadability with other voltage source PWM-type converters*

For other converters, with uncontrolled DC voltage and minimum switching frequency of 3 kHz (200…500 V), the dimensioning instructions as mentioned in chapter 6.7.3 can be used as guidelines. However, it shall be noted that the actual thermal loadability can also be lower. Please contact the manufacturer of the converter or the system supplier.

NOTE!
The actual thermal loadability of a motor may be lower than shown by guideline curves.

6.7.5 *Short time overloads*

ABB motors can usually be temporarily overloaded as well as used in intermittent duties. The most convenient method to dimension such applications is to use the DriveSize tool.

6.8 Rating plates

The usage of ABB's motors in variable speed applications do not usually require additional rating plates. The parameters required for commissioning the converter can be found from the main rating plate. In some special applications, however, the motors can be equipped with additional rating plates for variable speed applications. Those include the following information:

– speed range
– power range
– voltage and current range
– type of torque (constant or quadratic)
– and converter type and required minimum switching frequency.

6.9 Commissioning the variable speed application

The commissioning of the variable speed application must be done according to the instructions of the frequency converter and local laws and regulations. The requirements and limitations set by the application must also be taken into account.

All parameters needed for setting the converter must be taken from the motor rating plates. The most often needed parameters are:

– nominal voltage
– nominal current
– nominal frequency
– nominal speed
– nominal power

NOTE!
In case of missing or inaccurate information, do not operate the motor before ensuring correct settings!

ABB recommends using all the suitable protective features provided by the converter to improve the safety of the application. Converters usually provide features such as (names and availability of features depend on manufacturer and model of the converter):

– minimum speed
– maximum speed
– acceleration and deceleration times
– maximum current
– maximum torque
– stall protection

7. Maintenance

WARNING!
Voltage may be connected at standstill inside the terminal box for heating elements or direct winding heating.

7.1 General inspection

1. Inspect the motor at regular intervals, at least once a year. The frequency of checks depends on, for example, the humidity level of the ambient air and on the local weather conditions. This can initially be determined experimentally and must then be strictly adhered to.
2. Keep the motor clean and ensure free ventilation airflow. If the motor is used in a dusty environment, the ventilation system must be regularly checked and cleaned.
3. Check the condition of shaft seals (e.g. V-ring or radial seal) and replace if necessary.
4. Check the condition of connections and mounting and assembly bolts.
5. Check the bearing condition by listening for any unusual noise, vibration measurement, bearing temperature, inspection of spent grease or SPM bearing monitoring. Pay special attention to bearings when their calculated rated life time is coming to an end.

When signs of wear are noticed, dismantle the motor, check the parts and replace if necessary. When bearings are changed, replacement bearings must be of the same type as those originally fitted. The shaft seals have to be replaced with seals of the same quality and characteristics as the originals when changing bearings.

In the case of the IP 55 motor and when the motor has been delivered with a plug closed, it is advisable to periodically open the drain plugs in order to ensure that the way out for condensation is not blocked and allows condensation to escape from the motor. This operation must be done when the motor is at a standstill and has been made safe to work on.

7.1.1 Standby motors

If the motor is in standby for a longer period of time on a ship or in other vibrating environment the following measures have to be taken:

1. The shaft must be rotated regularly every 2 weeks (to be reported) by means of starting up of the system. In case a start-up is not possible, for any reason, at least the shaft has to be turned by hand in order to achieve a different position once a week. Vibrations caused by other vessel's equipment will cause bearing pitting which should be minimized by regular operation/hand turning.
2. The bearing must be greased while rotating the shaft every year (to be reported). If the motor has been provided with roller bearing at the driven end, the transport lock must be removed before rotating the shaft. The transport locking must be remounted in case of transportation.
3. All vibrations must be avoided to prevent a bearing from failing. All instructions in the motor instruction manual for commissioning and maintenance have to be followed. The warranty will not cover the winding and bearing damages if these instructions have not been followed.

7.2 Lubrication

WARNING!
Beware of all rotating parts!

WARNING!
Grease can cause skin irritation and eye inflammation. Follow all safety precautions specified by the manufacturer of the grease.

Bearing types are specified in the respective product catalogs and on the rating plate of all motors, except smaller frame sizes.

Reliability is a vital issue for bearing lubrication intervals. ABB uses mainly the L_1 -principle (i.e. that 99 % of the motors are certain to make the life time) for lubrication.

7.2.1 Motors with permanently greased bearings

Bearings are usually permanently greased bearings of 1Z, 2Z, 2RS or equivalent.

As a guide, adequate lubrication for sizes up to 250 can be achieved for the following duration, according to L_1. For duties with higher ambient temperatures, please contact ABB. The informative formula to change the L_1 values roughly to L_{10} values: $L_{10} = 2.0 \times L_1$.

Duty hours for permanently greased bearings at ambient temperatures of 25 °C and 40 °C are:

Frame size	Poles	Duty hours at 25 °C	Duty hours at 40 °C
56	2	52 000	33 000
56	4–8	65 000	41 000
63	2	49 000	31 000
63	4–8	63 000	40 000
71	2	67 000	42 000
71	4–8	100 000	56 000
80–90	2	100 000	65 000
80–90	4–8	100 000	96 000
100–112	2	89 000	56 000
100–112	4–8	100 000	89 000
132	2	67 000	42 000
132	4–8	100 000	77 000
160	2	60 000	38 000
160	4–8	100 000	74 000
180	2	55 000	34 000
180	4–8	100 000	70 000
200	2	41 000	25 000
200	4–8	95 000	60 000
225	2	36 000	23 000
225	4–8	88 000	56 000
250	2	31 000	20 000
250	4–8	80 000	50 000

Data is valid up to 60 Hz.

7.2.2 Motors with regreasable bearings

Lubrication information plate and general lubrication advice

If the motor is equipped with a lubrication information plate, follow the given values.

Greasing intervals regarding mounting, ambient temperature and rotational speed are defined on the lubrication information plate.

During the first start or after a bearing lubrication a temporary temperature rise may appear, approximately 10 to 20 hours.

Some motors may be equipped with a collector for old grease. Follow the special instructions given for the equipment.

A. Manual lubrication

Regreasing while the motor is running
- Remove grease outlet plug or open closing valve if fitted.
- Be sure that the lubrication channel is open.
- Inject the specified amount of grease into the bearing.
- Let the motor run for 1-2 hours to ensure that all excess grease is forced out of the bearing. Close the grease outlet plug or closing valve, if fitted.

Regreasing while the motor is at a standstill
If it is not possible to re-grease the bearings while the motors are running, lubrication can be carried out while the motor is at a standstill.
- In this case, use only half the amount of grease and then run the motor for a few minutes at full speed.
- When the motor has stopped, apply the rest of the specified amount of grease to the bearing.
- After 1–2 running hours, close the grease outlet plug or closing valve, if fitted.

B. Automatic lubrication

The grease outlet plug must be removed permanently with automatic lubrication or open closing valve, if fitted.

ABB recommends only the use of electromechanical systems.

The amount of grease per lubrication interval stated in the table should be multiplied by three if a central lubrication system is used. When using a smaller automatic re-grease unit (one or two cartridges per motor) the normal amount of grease can be used.

When 2-pole motors are automatically re-greased, the note concerning lubricant recommendations for 2-pole motors in the Lubricants chapter should be followed.

The used grease should be suitable for automatic lubrication. The automatic lubrication system deliverer and the grease manufacturer's recommendations should check.

Calculation example of amount of grease for automatic lubrication system

Central lubrication system: Motor IEC M3_P 315_ 4-pole in 50 Hz network, re-lubrication interval according to Table is 7600 h/55 g (DE) and 7600 h/40 g (NDE):

(DE) RLI = 55 g/7600 h*3*24 = 0,52 g/day

(NDE) RLI = 40 g/7600 h*3*24 = 0,38 g/day

Calculation example of amount of grease for single automation lubrication unit (cartridge)

(DE) RLI = 55 g/7600 h*24 = 0,17 g/day

(NDE) RLI = 40 g/7600 h*24 = 0,13 g/day

RLI = Re-lubrication interval, DE = Drive end,
NDE = Non drive end

7.2.3 Lubrication intervals and amounts

Lubrication intervals for vertical motors are half of the values shown in the table below.

As a guide, adequate lubrication can be achieved for the following duration, according to L_1. For duties with higher ambient temperatures please contact ABB. The informative formula to change the L_1 values roughly to L_{10} values is $L_{10} = 2.0 \times L_1$, with manual lubrication.

The lubrication intervals are based on a bearing operating temperature of 80 °C (ambient temperature +25 °C).

NOTE!
An increase in the ambient temperature raises the temperature of the bearings correspondingly. The interval values should be halved for a 15 °C increase in bearing temperature and may be doubled for a 15 °C decrease in bearing temperature.

Higher speed operation, e.g. in frequency converter applications, or lower speed with heavy load will require shorter lubrication intervals.

WARNING!
The maximum operating temperature of the grease and bearings, +110 °C, must not be exceeded. The designed maximum speed of the motor must not be exceeded.

Frame size	Amount of grease g/bearing	kW	3600 r/min	3000 r/min	kW	1800 r/min	1500 r/min	kW	1000 r/min	kW	500-900 r/min
	Ball bearings, lubrication intervals in duty hours										
112	10	all	10 000	13 000	all	18 000	21 000	all	2 5 000	all	28 000
132	15	all	9 000	11 000	all	17 000	19 000	all	23 000	all	26 500
160	25	≤ 18,5	9 000	12000	≤ 15	18 000	21 500	≤ 11	24 000	all	24 000
160	25	> 18,5	7 500	1 0000	> 15	15 000	18 000	> 11	22 500	all	24 000
180	30	≤ 22	7 000	9 000	≤ 22	15 500	18 500	≤ 15	24 000	all	24 000
180	30	> 22	6 000	8 500	> 22	14 000	17 000	> 15	21 000	all	24 000
200	40	≤ 37	5 500	8 000	≤ 30	14 500	17 500	≤ 22	23 000	all	24 000
200	40	> 37	3 000	5 500	> 30	10 000	12 000	> 22	16 000	all	20 000
225	50	≤ 45	4 000	6 500	≤ 45	13 000	16 500	≤ 30	22 000	all	24 000
225	50	> 45	1 500	2 500	> 45	5 000	6 000	> 30	8 000	all	10 000
250	60	≤ 55	2 500	4 000	≤ 55	9 000	11 500	≤ 37	15 000	all	18 000
250	60	> 55	1 000	1 500	> 55	3 500	4 500	> 37	6 000	all	7 000
280[1)]	60	all	2 000	3 500	–	–	–	–	–	–	–
280[1)]	60	–	–	–	all	8 000	10 500	all	14 000	all	17 000
280	35	all	1 900	3 200		–	–		–		–
280	40		–	–	all	7 800	9 600	all	13 900	all	15 000
315	35	all	1 900	3 200		–	–		–		–
315	55		–	-	all	5 900	7 600	all	11 800	all	12 900
355	35	all	1 900	3 200		–	–		–		–
355	70		–	-	all	4 000	5 600	all	9 600	all	10 700
400	40	all	1 500	2 700		–	–		–		–
400	85		–	–	all	3 200	4 700	all	8 600	all	9 700
450	40	all	1 500	2 700		–	–		–		–
450	95		–	–	all	2 500	3 900	all	7 700	all	8 700

	Roller bearings, lubrication intervals in duty hours										
160	25	≤ 18,5	4 500	6 000	≤ 15	9 000	10 500	≤ 11	12 000	all	12 000
160	25	> 18,5	3 500	5 000	> 15	7 500	9 000	> 11	11 000	all	12 000
180	30	≤ 22	3 500	4 500	≤ 22	7 500	9 000	≤ 15	12 000	all	12 000
180	30	> 22	3 000	4 000	> 22	7 000	8 500	> 15	10 500	all	12 000
200	40	≤ 37	2 750	4 000	≤ 30	7 000	8 500	≤ 22	11 500	all	12 000
200	40	> 37	1 500	2 500	> 30	5 000	6 000	> 22	8 000	all	10 000
225	50	≤ 45	2 000	3 000	≤ 45	6 500	8 000	≤ 30	11 000	all	12 000
225	50	> 45	750	1 250	> 45	2 500	3 000	> 30	4 000	all	5 000
250	60	≤ 55	1 000	2 000	≤ 55	4 500	5 500	≤ 37	7 500	all	9 000
250	60	> 55	500	750	> 55	1 500	2 000	> 37	3 000	all	3 500
280[1)]	60	all	1 000	1 750	–	–	–	–	–	–	–
280[1)]	70	–	–	–	all	4 000	5 250	all	7 000	all	8 500
280	35	all	900	1 600		–	–		–		–
280	40		–	–	all	4 000	5 300	all	7 000	all	8 500
315	35	all	900	1 600		–	–		–		–
315	55		-	-	all	2 900	3 800	all	5 900	all	6 500
355	35	all	900	1 600		–	–		–		–
355	70		-	-	all	2 000	2 800	all	4 800	all	5 400
400	40	all	–	1 300		–	–		–		–
400	85		–	–	all	1 600	2 400	all	4 300	all	4 800
450	40	all	–	1 300		–	–		–		–
450	95		–	–	all	1 300	2 000	all	3 800	all	4 400

[1)] M3AA

7.2.4 Lubricants

WARNING!
Do not mix different types of grease.
Incompatible lubricants may cause bearing damage.

When re-greasing, use only special ball bearing grease with the following properties:

– good quality grease with lithium complex soap and with mineral- or PAO-oil
– base oil viscosity 100-160 cST at 40 °C
– consistency NLGI grade 1.5 - 3 *)
– temperature range –30 °C - +120 °C, continuously

*) A stiffer end of scale is recommended for vertical mounted motors or in hot conditions.

The above mentioned grease specification is valid if the ambient temperature is above –30 °C or below +55 °C, and the bearing temperature is below 110 °C; otherwise, consult ABB regarding suitable grease.

Grease with the correct properties is available from all major lubricant manufacturers.

Admixtures are recommended, but a written guarantee must be obtained from the lubricant manufacturer, especially concerning EP admixtures, that admixtures do not damage bearings or the properties of lubricants at the operating temperature range.

WARNING!
In general, lubricants containing EP admixtures are not recommended. In some cases it can cause harm in the bearing, therefore its use has to be evaluated case by case together with lubricant suppliers.

The following high performance greases can be used:
– Mobil Unirex N2 or N3 (lithium complex base)
– Mobil Mobilith SHC 100 (lithium complex base)
– Shell Gadus S5 V 100 2 (lithium complex base)
– Klüber Klüberplex BEM 41-132 (special lithium base)
– FAG Arcanol TEMP110 (lithium complex base)
– Lubcon Turmogrease L 802 EP PLUS (special lithium base)
– Total Multis Complex S2 A (lithium complex base)

NOTE!
Always use high speed grease for high speed 2-pole motors where the speed factor is higher than 480,000 (calculated as Dm x n where Dm = average bearing diameter, mm; n = rotational speed, r/min).

The following greases can be used for high speed cast iron motors but not mixed with lithium complex greases:

– Klüber Klüber Quiet BQH 72-102 (polyurea base)
– Lubcon Turmogrease PU703 (polyurea base)

If other lubricants are used, check with the manufacturer that the qualities correspond to those of the above mentioned lubricants. The lubrication intervals are based on the listed high performance greases above. Using other greases can reduce the interval.

8. After Sales Support

8.1 Spare parts

Unless otherwise stated, spare parts must be original parts or approved by ABB.

When ordering spare parts, the motor serial number, full type designation and product code, as stated on the rating plate, must be specified.

8.2 Dismantling, re-assembly and rewinding

Rewinding should always be carried out by qualified repair shops.

Smoke venting and other special motors should not be rewound without first contacting ABB.

8.3 Bearings

Special care should be taken with the bearings.

These must be removed using pullers and fitted by heating or using special tools.

Bearing replacement is described in detail in a separate instruction leaflet available from the ABB Sales Office.

Any directions placed on the motor, such as labels, must be followed. The bearing types indicated on the rating plate must not be changed.

NOTE!
Any repair by the end user, unless expressly approved by the manufacturer, releases the manufacturer from responsibility to conformity.

9. Environmental requirements

Most of ABB's motors have a sound pressure level not exceeding 82 dB (A) (± 3 dB) at 50 Hz.

Values for specific motors can be found in the relevant product catalogs. At 60 Hz sinusoidal supply, the values are approximately 4 dB(A) higher compared to 50 Hz values stated in the product catalogs.

For sound pressure levels at frequency converter supplies, please contact ABB.

When motor(s) need to be scrapped or recycled, appropriate means, local regulations and laws must be followed.

10. Troubleshooting

These instructions do not cover all details or variations in equipment nor provide information for every possible condition to be met in connection with installation, operation or maintenance. Should additional information be required, please contact the nearest ABB Sales Office.

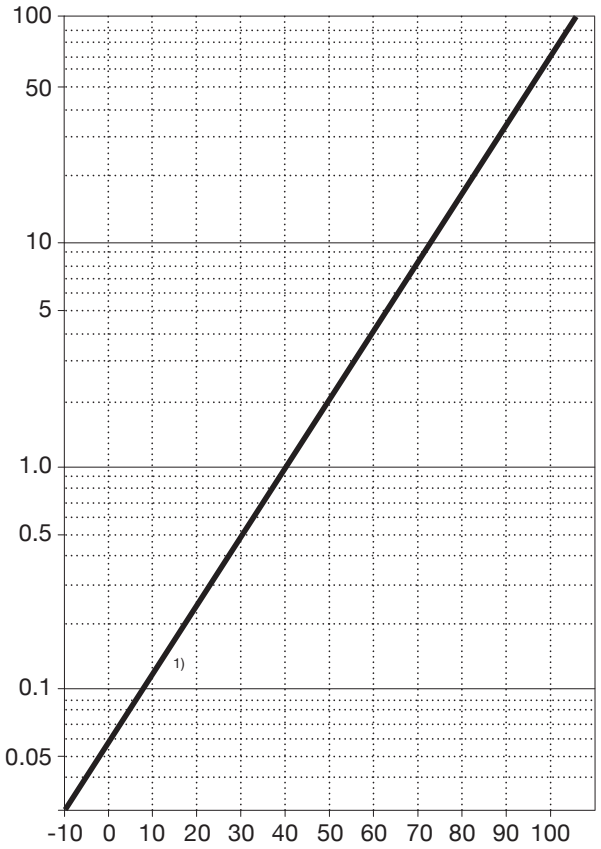
Motor troubleshooting chart

Your motor service and any troubleshooting must be handled by qualified persons who have the proper tools and equipment.

TROUBLE	CAUSE	WHAT TO DO
Motor fails to start	Blown fuses	Replace fuses with proper type and rating.
	Overload trips	Check and reset overload in starter.
	Improper power supply	Check to see that power supplied agrees with motor rating plate and load factor.
	Improper line connections	Check connections against diagram supplied with motor.
	Open circuit in winding or control switch	Indicated by humming sound when switch is closed. Check for loose wiring connections and ensure that all control contacts are closing.
	Mechanical failure	Check to see if motor and drive turn freely. Check bearings and lubrication.
	Short circuited stator	Contact ABB or Ensure that the supply is disconnected and grounding for work done, disconnect the cables and measure the insulation resistance.
	Poor stator coil connection	Indicated by blown fuses. Motor must be rewound. Remove end shields and locate fault.
	Motor may be overloaded	Reduce load.
Motor stalls	One phase may be open	Check lines for open phase.
	Wrong application	Change type or size. Consult equipment supplier.
	Overload	Reduce load.
	Low voltage	Ensure the rating plate voltage is maintained. Check connection.
	Open circuit	Fuses blown. Check overload relay, stator and push buttons.
Motor runs and then dies down	Power failure	Check for loose connections to line, fuses and control.
Motor does not accelerate up to nominal speed	Not applied properly	Consult equipment supplier for proper type.
	Voltage too low at motor terminals because of line drop	Use higher voltage or transformer terminals or reduce load. Check connections. Check conductors for proper size.
	Starting load too high	Check the motor's starts against "no load".
	Broken rotor bars or loose rotor	Look for cracks near the rings. A new rotor may be required, as repairs are usually temporary.
	Open primary circuit	Locate fault with testing device and repair.

TROUBLE	CAUSE	WHAT TO DO
Motor takes too long to accelerate and/or draws high current	Excessive load	Reduce load.
	Low voltage during start	Check for high resistance. Make sure that an adequate cable size is used.
	Defective squirrel cage rotor	Replace with new rotor.
	Applied voltage too low	Correct power supply.
Wrong rotation direction	Wrong sequence of phases	Reverse connections at motor or at switchboard.
Motor overheats while running	Overload	Reduce load.
	Frame or ventilation openings may be full of dirt and prevent proper ventilation of motor	Open vent holes and check for a continuous stream of air from the motor.
	Motor may have one phase open	Check to make sure that all leads and cables are well connected.
	Grounded coil	Motor must be rewound.
	Unbalanced terminal voltage	Check for faulty leads, connections and transformers.
Motor vibrates	Motor misaligned	Realign.
	Weak support	Strengthen base.
	Coupling out of balance	Balance coupling.
	Driven equipment unbalanced	Rebalance driven equipment.
	Defective bearings	Replace bearings.
	Bearings not in line	Repair motor
	Balancing weights shifted	Rebalance rotor.
	Contradiction between balancing of rotor and coupling (half key - full key)	Rebalance coupling or rotor.
	Poly phase motor running single phase	Check for open circuit.
	Excessive end play	Adjust bearing or add shim.
Scraping noise	Fan rubbing end shield or fan cover	Correct fan mounting.
	Loose on bedplate	Tighten holding bolts.
Noisy operation	Air gap not uniform	Check and correct end shield fits or bearing fits.
	Rotor unbalance	Rebalance rotor.
Hot bearings	Bent or sprung shaft	Straighten or replace shaft.
	Excessive belt pull	Decrease belt tension.
	Pulleys too far away from shaft shoulder	Move pulley closer to motor bearing.
	Pulley diameter too small	Use larger pulleys.
	Misalignment	Correct by realignment of the drive.
	Insufficient grease	Maintain proper quality and amount of grease in bearing.
	Deterioration of grease or lubricant contaminated	Remove old grease, wash bearings thoroughly in kerosene and replace with new grease.
	Excess lubricant	Reduce quantity of grease, bearing should not be more than half full.
	Overloaded bearing	Check alignment, side and end thrust.
	Broken ball or rough races	Replace bearing, clean housing thoroughly first.

11. Figures



Key

X-axis: Winding temperature, Celsius Degrees

Y-axis: Insulation Resistance Temperature Coefficient, ktc

1) To correct observed insulation resistance, R_i, to 40 °C multiply it by the temperature coefficient k_{tc}. $R_{i\ 40\ °C} = R_i$ x

Figure 1. Diagram illustrating the insulation resistance dependence from the temperature and how to correct the measured insulation resistance to the temperature of 40 °C.

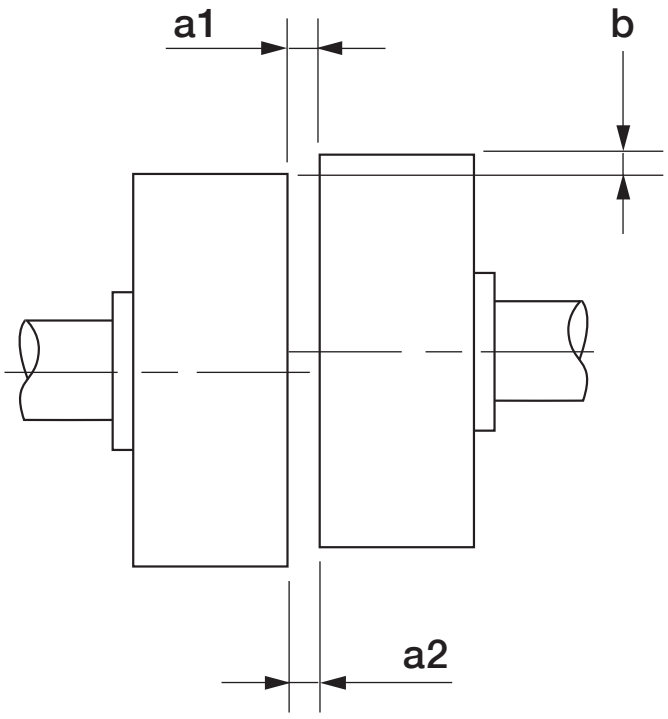


Figure 2. Mounting of half-coupling or pulley

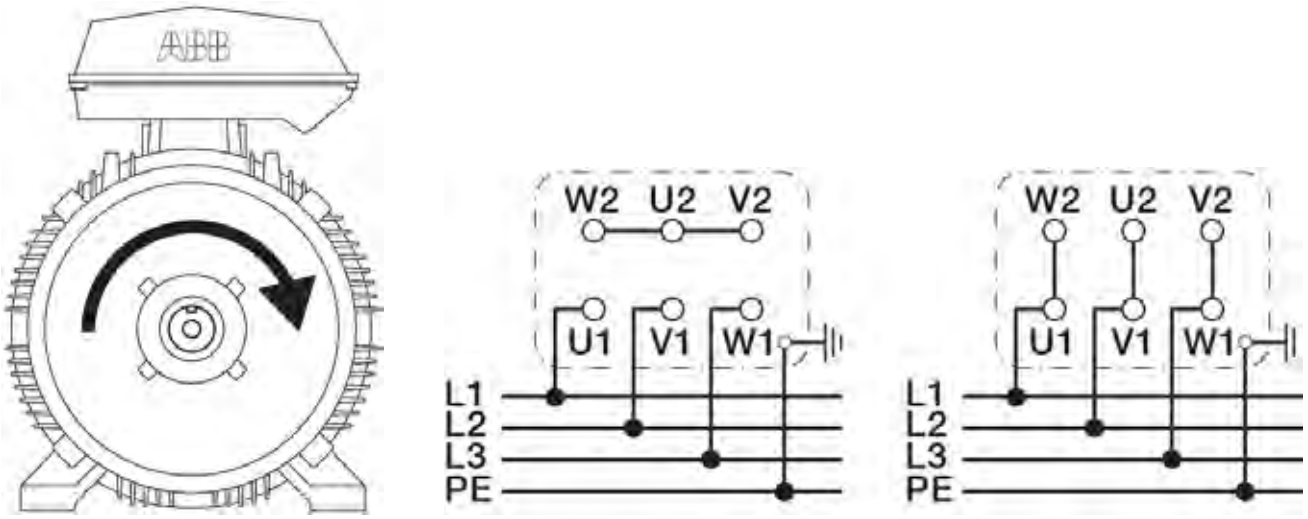
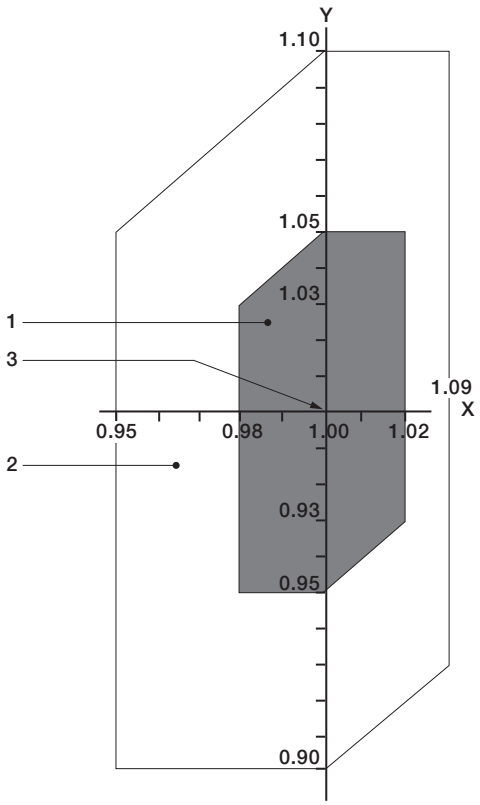


Figure 3. Connection of terminals for main supply



Key

X axis	frequency p.u.
Y axis	voltage p.u.
1	zone A
2	zone B (outside zone A)
3	rating point

Figure 4. Voltage and frequency deviation in zones A and B

Guideline loadability curves with converters with DTC control

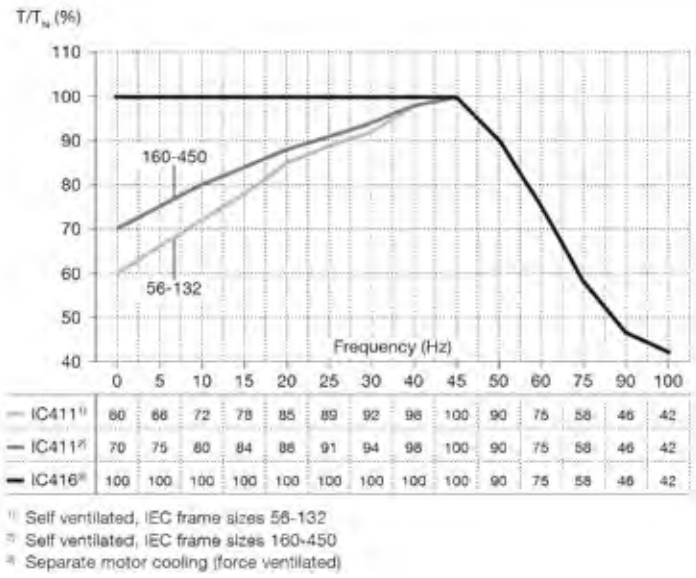


Figure 5a. Conventer with DTC control, 50 Hz, temperature rise B

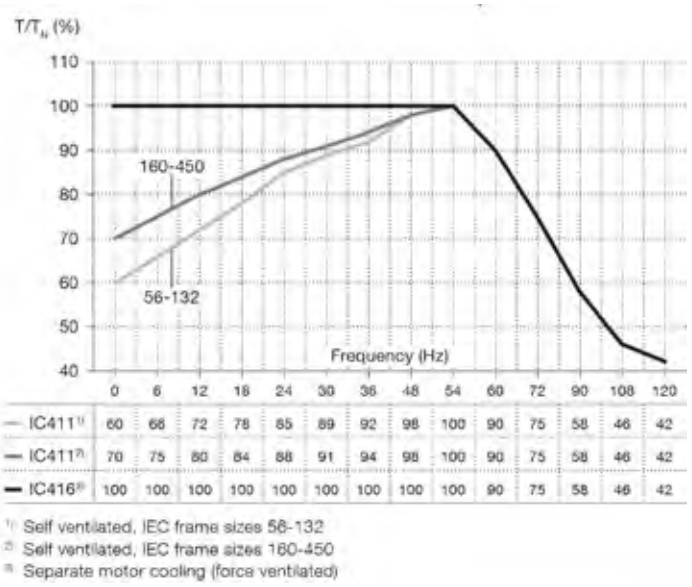


Figure 5b. Conventer with DTC control, 60 Hz, temperature rise B

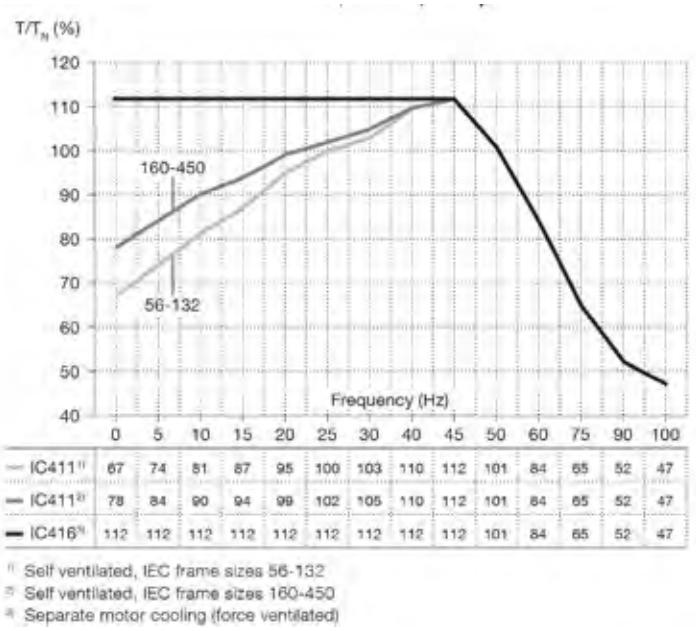


Figure 5c. Conventer with DTC control, 50 Hz, temperature rise F

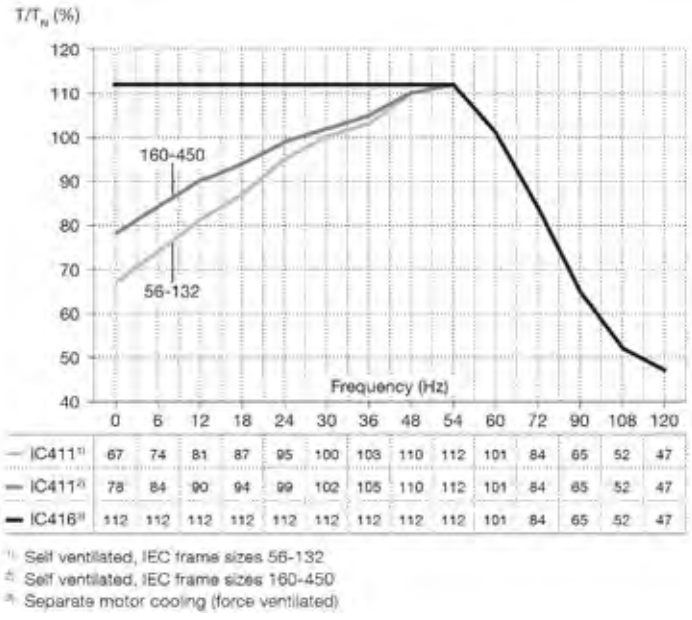


Figure 5d. Conventer with DTC control, 60 Hz, temperature rise F

Guideline loadability curves with other voltage source PWM type

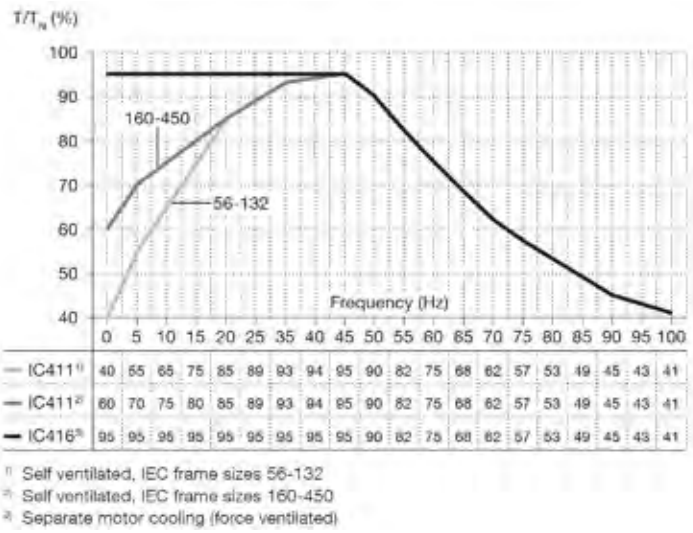


Figure 6a. Other voltage source PWM type converter, 50 Hz, temperature rise B

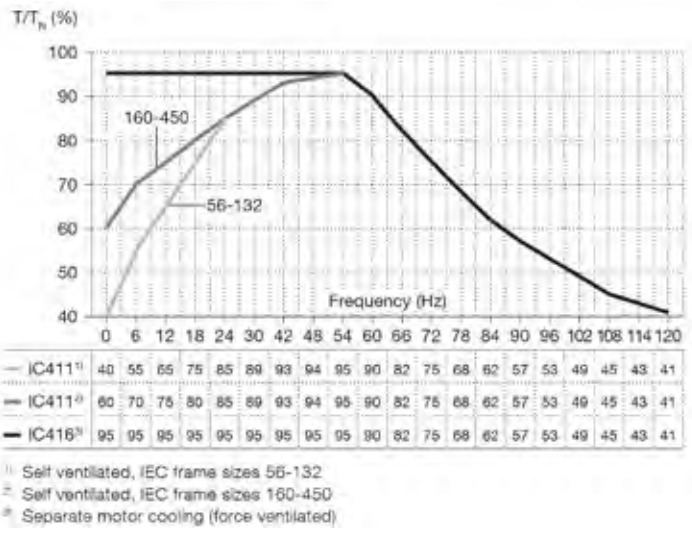


Figure 6b. Other voltage source PWM type converter, 60 Hz, temperature rise B

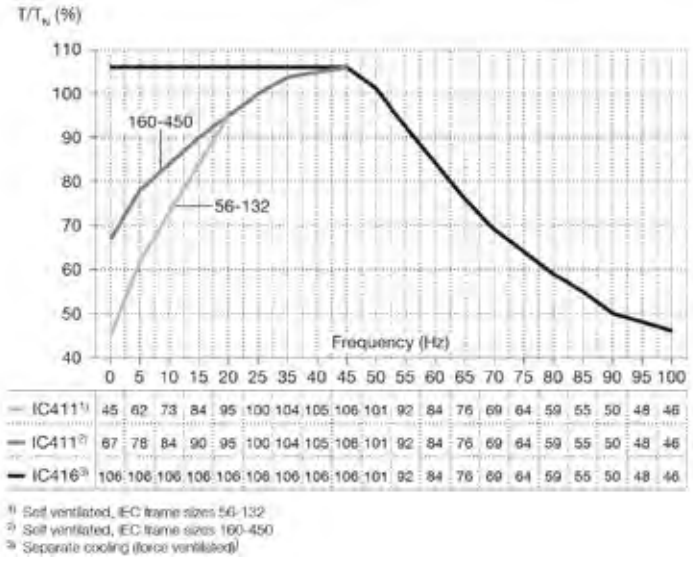


Figure 6c. Other voltage source PWM type converter, 50 Hz, temperature rise F

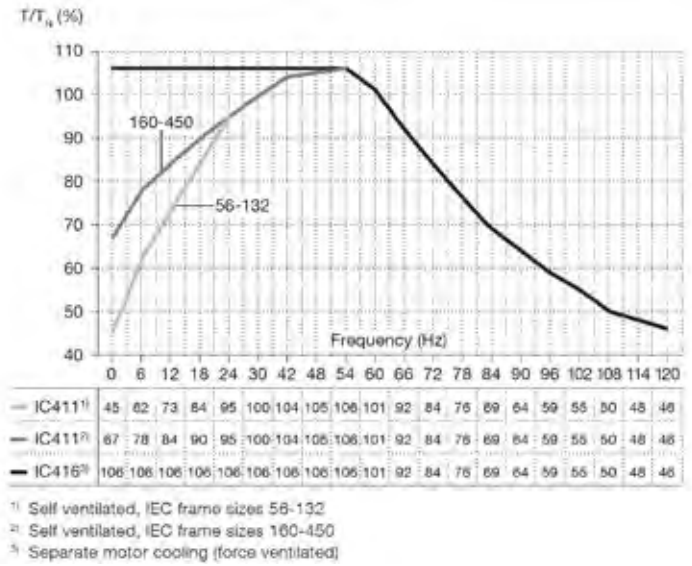


Figure 6d. Other voltage source PWM type converter, 60 Hz, temperature rise F

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3GZF500730-85 Rev G EN 07-2016

Power and productivity for a better world™

Material / Material **902028599**
Description / Beschreibung **DISCHARGE DOOR OPERATION PNEU. 10-36 V D**
ENTLEERSCHIEBERBETAETIG. PNEU. 10-36 VDC

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	902025472	SOLENOID VALVE MAGNETVENTIL 5/3 WAY	1,000	ST
2	902021510	PROXIMITY SWITCH IE0001 10-36VDC NAEHERUNGSSCHALTER IE0001 10-36VDC	1,000	ST

Deckblatt
Cover page

BHS Nummer BHS Number	902028599
Beschreibung Description	ENTLEERSCHIEBERBETAETIG. PNEU. 10-36 VDC DISCHARGE DOOR OPERATION PNEU. 10-36 V D

ISO standard solenoid valve

ESV200~400 Series

Product feature

1. Succinct appearance and compact conformation.
2. The installation size is conforms to the ISO 5599/1 standard.
3. Because of the special seals, the feature are large flow rate and long lifetime.
4. You can adjust the installation direction of the pilot O-ring to change the acting type: internal pilot, external pilot,or air control.
5. You need install the valve together with the manifold. There are single type and parallel type for manifold.
6. Various connection and installation method for manifold. It is easy to use.
7. The manifold have the function of exhaust throttling, so no need to connect another throttle valve.

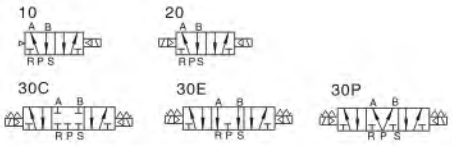
Ordering code of valve

ESV | 2 | 10 | A | □ | □

- **Model**: ESV: ISO standard solenoid valve
- **Code**: 2: 200 Series; 3: 300 Series; 4: 400 Series
- **Valve type**: 10: Single solenoid 5/2 way; 20: Double solenoid 5/2 way; 30C: Double solenoid 5/3 way closed center; 30E: Double solenoid 5/3 way exhaust center; 30P: Double solenoid 5/3 way pressure center
- **Voltage**: A: AC220V; B: DC24V; C: AC110V; E: AC24V; F: DC12V
- **Electrial entry**: Blank: Terminal; I: Grommet
- ① **Pilot type**: Blank: Internal pilot; W: External pilot

①Note:Internal guided mode can be interchanged with external guided mode,please adjust the installation method of the O-ring refering to article 1 o 2 in the installation manual.

Symbol



Specification

Item		Specification
Fluid		Air (to be filtered by 40μm filter element)
Acting		Internal pilot or external pilot
Lubrication		Not required
Pressure	Internal pilot	0.2~1.0MPa(2~10.0bar)(29~145psi)
	External pilot	0~1.0MPa(0~10.0bar)(0~145psi)
Control pressure (external pilot)		0.2~1.0MPa(2~10.0bar)(29~145psi)
Proof pressure		1.5MPa(15.0bar)(215psi)
Temperature		-20~70℃
Port size (manifold)		200 Series:1/4″ ;300 Series:3/8″ ;400 Series:1/2″
Port size (subassembly of plate)		200 Series:3/8″ ;300 Series:1/2″ ;400 Series:3/4″
Voltage range		AC: ±15% DC: ±10%
Power consumption		AC: 3.5VA DC: 3.0W
Activating time (0.5Mpa) Open/close	ESV200 Series	210、220 Series:33\41ms; 230 Series:38\50ms
	ESV300 Series	310、320 Series:42\55ms; 330 Series:50\62ms
	ESV400 Series	50\68ms
Insulation		Class B
Protection		IP65
Service life		30 million times above (normal use)
Installation size		ISO5599-1 standard

Ordering code of manifold

ESV | 2 | 01M | G | □ | □

- **Model**: ESV: ISO standard solenoid valve
- **Code**: 2: 200 Series; 3: 300 Series; 4: 400 Series
- **Thread type**: G: G
- **Valve type**: 01M: Single manifold; 02M: Parallel manifold; 03M: The subassembly of plate
- **External pilot port type**: Blank: Individual pilot port; W: Centralized pilot port
- **Port position type**: Blank: Side port; B: Bottom port; Blank: Left side port; R: Right side port; B: Bottom port

Note:1.For the same model, the port size of plate is bigger than the manifold's (For example ESV202M, the port size of manifold is 1/4″ ,and the subassembly of plate is 3/8″).
2.The external pilot port for Single manifold is individual pilot port.
3.The subassembly of plate is applied with Parallel manifold, both for individual pilot type and centralized pilot type.

Ordering code of blanking plate

ESV | 200M | - | B

- **Model**: ESV: ISO standard solenoid valve
- **Code**: 200M: 200 Series manifold; 300M: 300 Series manifold; 400M: 400 Series manifold
- **Blanking plate**: B: Blanking plate

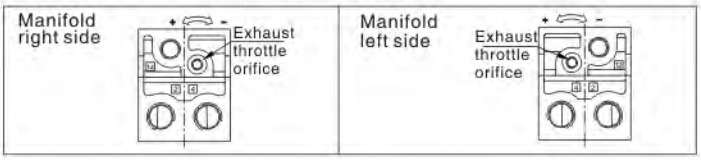
Installation and operation

1、Exhaust throttle function

1.1 The manifold have exhaust throttle function, as the below picture shows the position of the exhaust throttle orifices on each side.

1.2 Use inner hexagon spanner to adjust the screw.

1.3 Rotate the screw clockwise to reduce the exhaust orifice, rotate the screw counter-clockwise to enlarge the exhaust orifice.



2、The classification and selection for the parallel manifolds

2.1、According to the direction of air supply, we can divide the parallel manifold into two types: the individual pilot and centralized pilot.

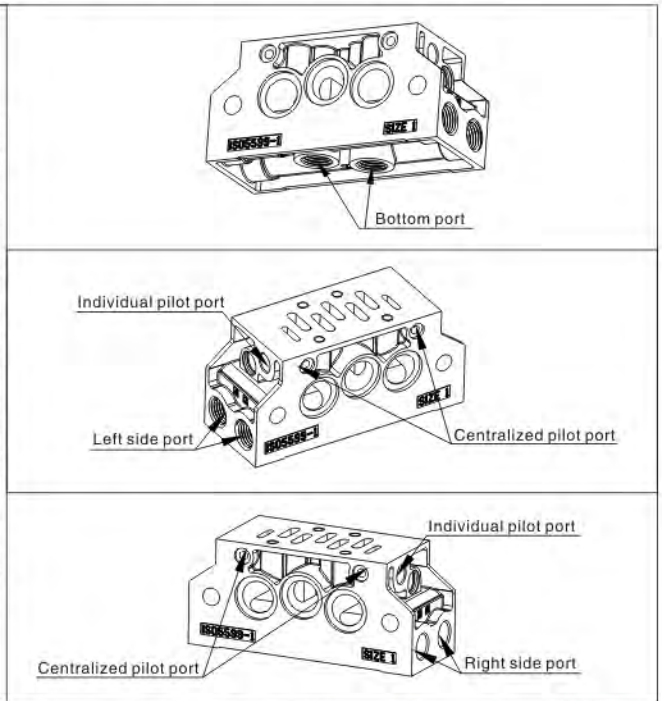
2.2、If you select the individual pilot, the fitting must be connected to the individual pilot ports.If you select the centralized pilot type, the fitting must be connected to the centralized pilot ports.

2.3、If you use parallel manifold, all of the manifold must be used the same pilot type: such as, all of them are the individual pilot type, or all of them are the centralized pilot type.

*Note: Only when you use the external pilot type, you can select the individual pilot or centralized pilot. When you use the internal pilot type, the pilot ports on the manifold are ineffective.

3、The position and specification of the parallel manifolds ports

The position and specification of the schematic diagram



Corresponding tables the ordering code of the parallel manifolds

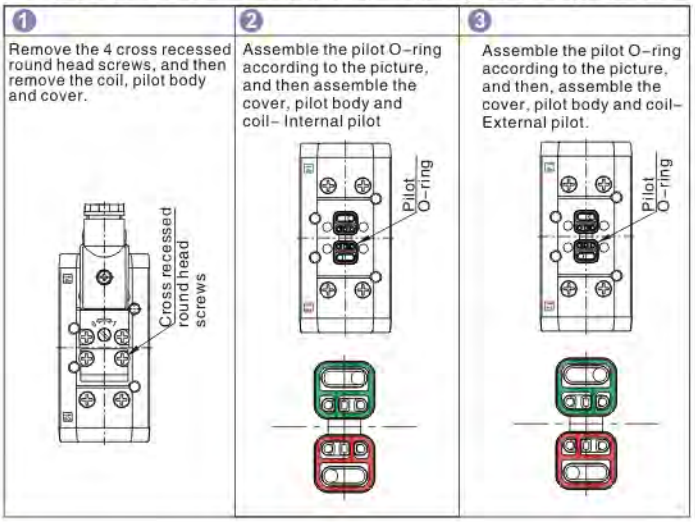
Port working condition / Ordering code	Port name				
	Left side port	Right side port	Bottom port	Centralized pilot port	Individual pilot port
ESV202M	Use	Unused	Unused	Unused	Use
ESV202MR	Unused	Use	Unused	Unused	Use
ESV202MB	Unused	Unused	Use	Unused	Use
ESV202MW	Use	Unused	Unused	Use	Unused
ESV202MWR	Unused	Use	Unused	Use	Unused
ESV202MWB	Unused	Unused	Use	Use	Unused

Note: Please seal the bottom port by plug, when it is unused.
The above list is an example of 200M series' ordering code, the other series is follow the same regulation, only need to change the series code.

4、The classification and selection for the pilot type of valve

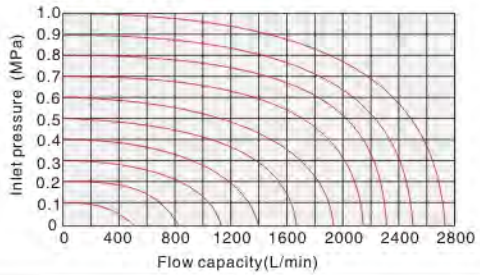
4.1 According to the source of pilot air, we can divide the valve into two types: the internal pilot and external pilot. The standard type is internal pilot.

4.2 You can convert from internal pilot to external pilot by the following methods.

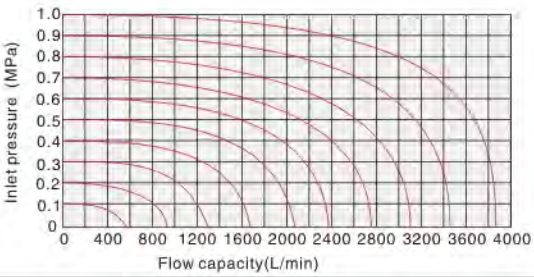


Flow chart

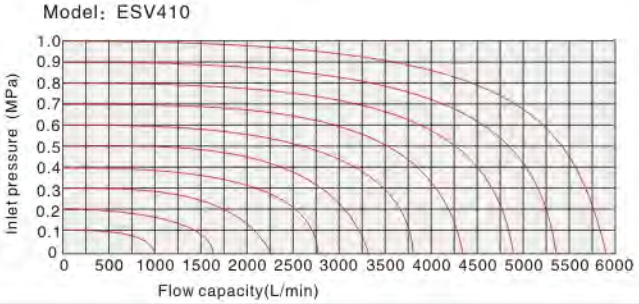
Model: ESV210



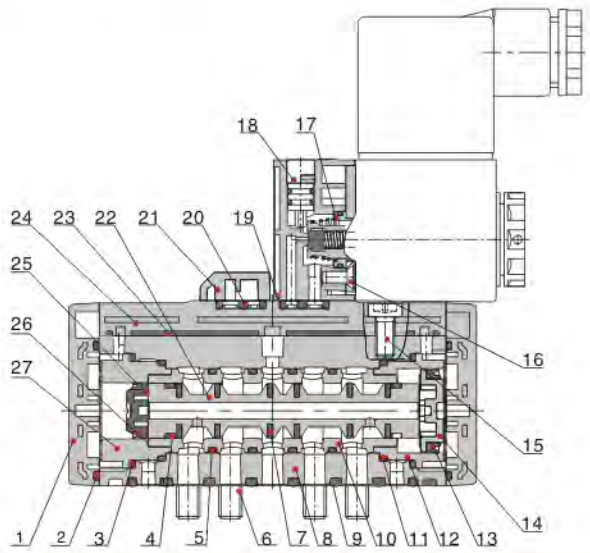
Model: ESV310



Model: ESV410



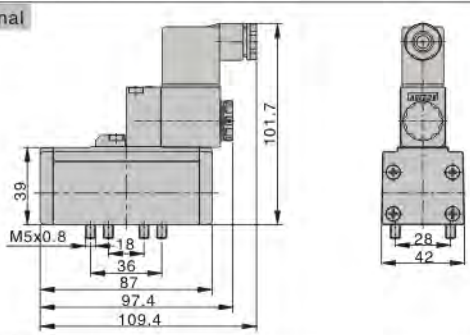
Inner structure



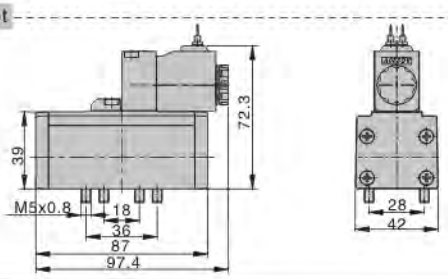
NO.	Item	NO.	Item	NO.	Item
1	Bottom cover	10	Spacer	19	Pilot kit
2	O-ring	11	O-ring	20	Pilot O-ring
3	O-ring	12	Big piston sheath	21	Cover plate
4	Wear ring	13	Big piston O-ring	22	Spool
5	O-ring	14	Big piston	23	Upper cover gasket
6	Screw	15	Screw	24	Upper cover
7	O-ring	16	Screw	25	Small piston
8	Body	17	Gasket	26	Small piston O-ring
9	Spacer O-ring	18	Manual override	27	Small piston sheath

Dimensions(ESV200 Series)

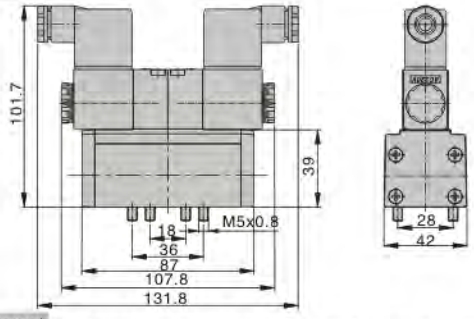
ESV210 Terminal



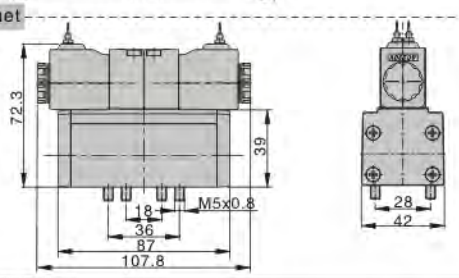
ESV210 Grommet



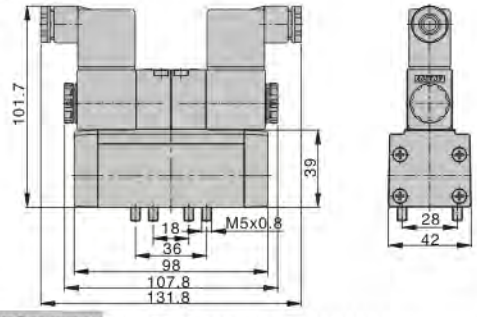
ESV220 Terminal



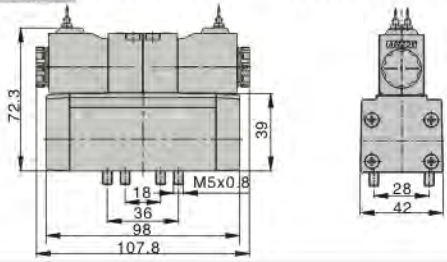
ESV220 Grommet



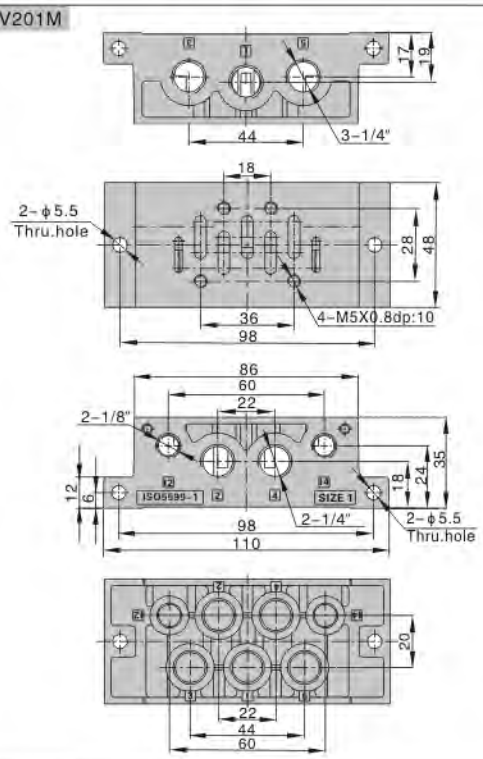
ESV230C(E\P) Terminal



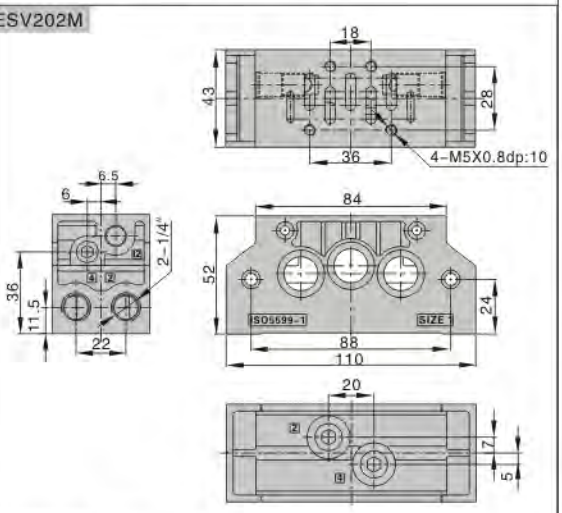
ESV230C(E\P) Grommet



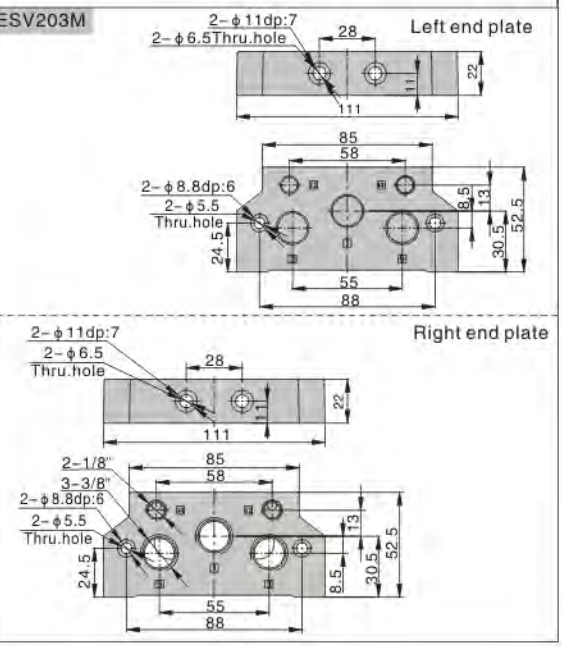
ESV201M



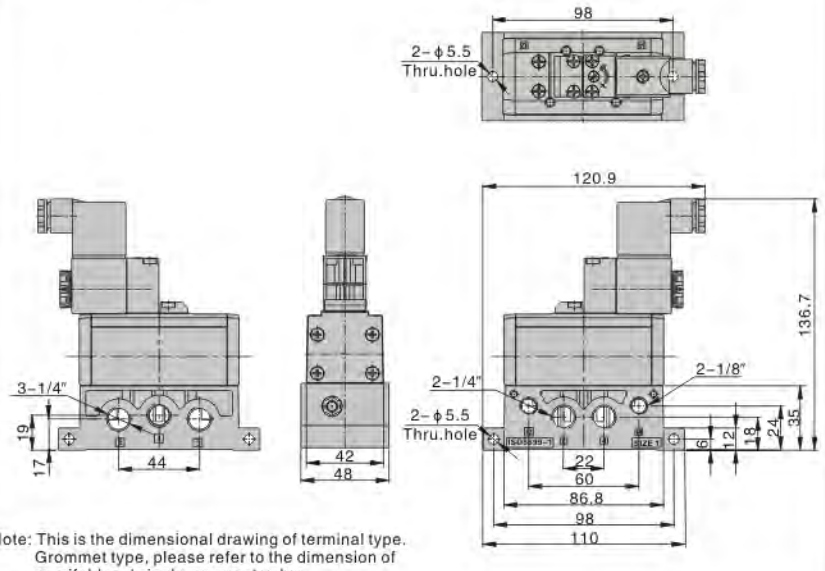
ESV202M



ESV203M

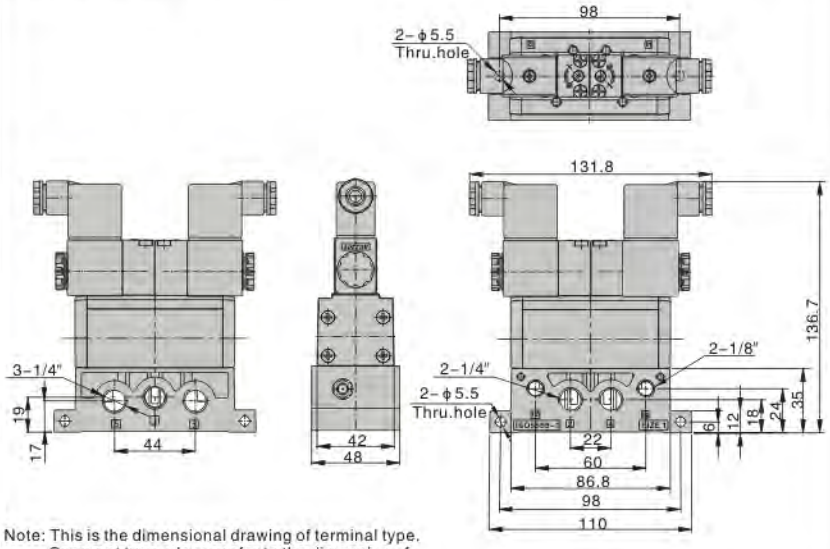


ESV210+ESV201M



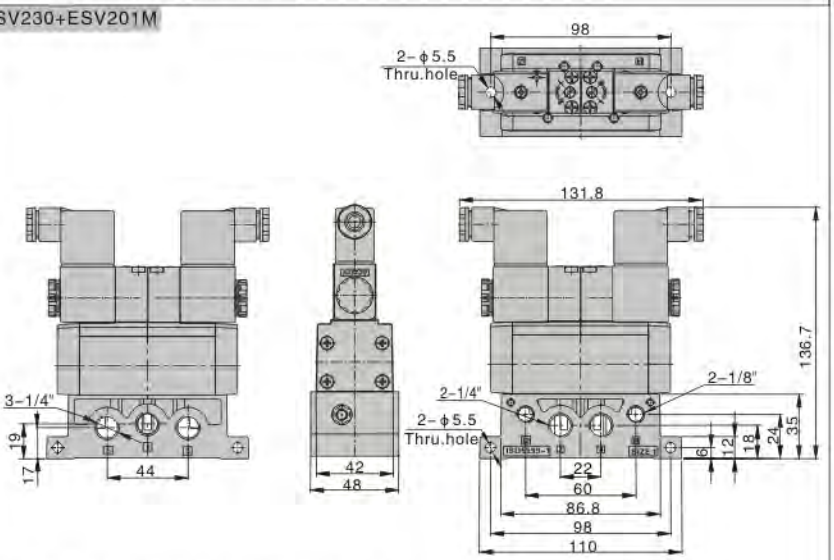
Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

ESV220+ESV201M



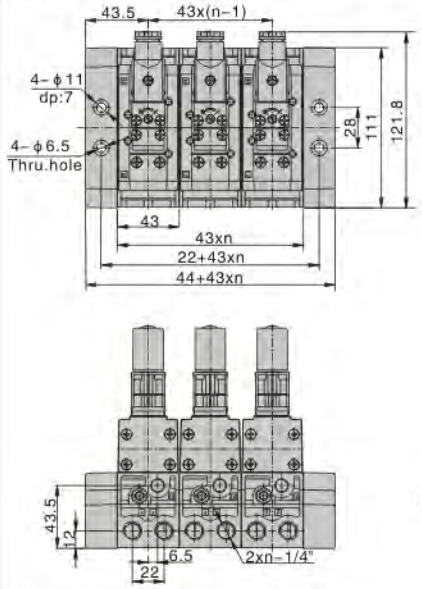
Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

ESV230+ESV201M



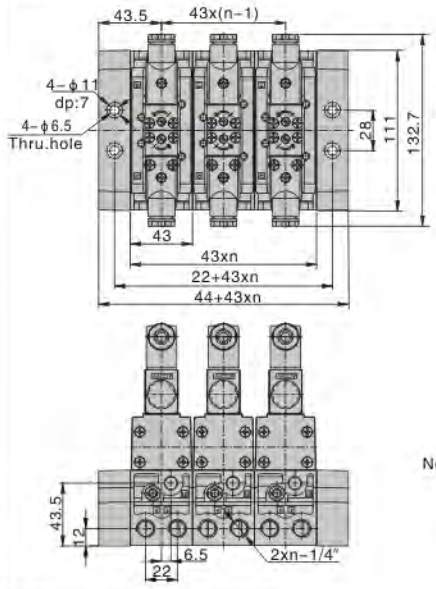
Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

ESV210+ESV202M+ESV203M



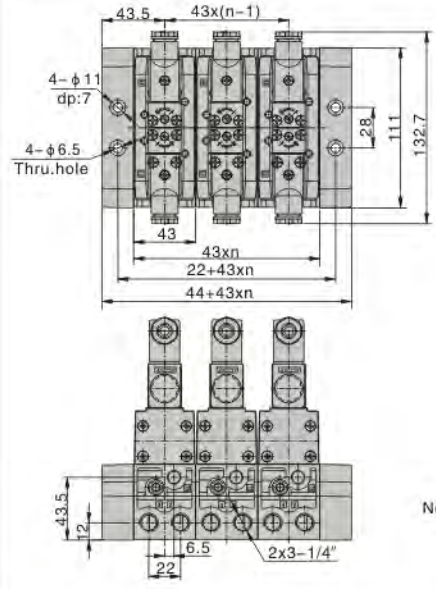
Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

ESV220+ESV202M+ESV203M



Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

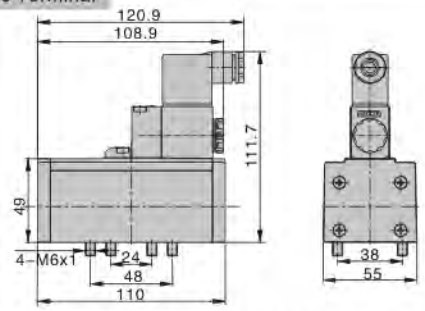
ESV230+ESV202M+ESV203M



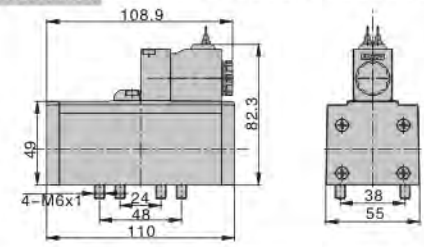
Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

Dimensions(ESV300 Series)

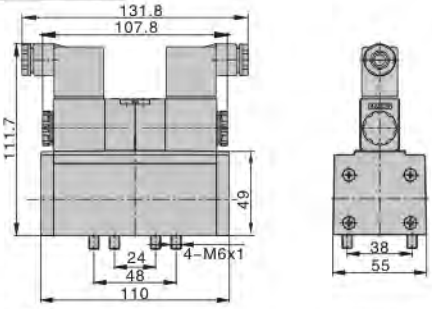
ESV310 Terminal



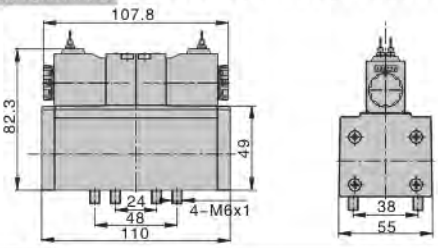
ESV310 Grommet



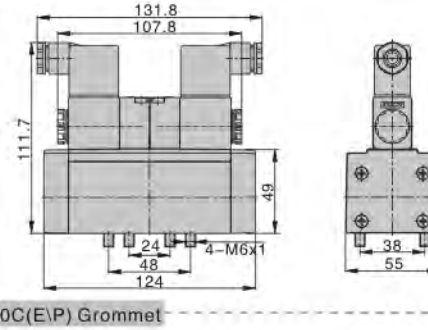
ESV320 Terminal



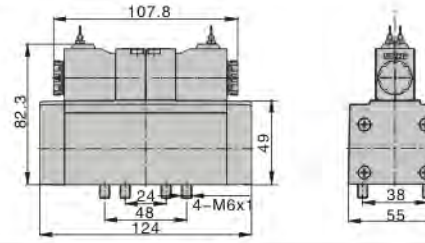
ESV320 Grommet



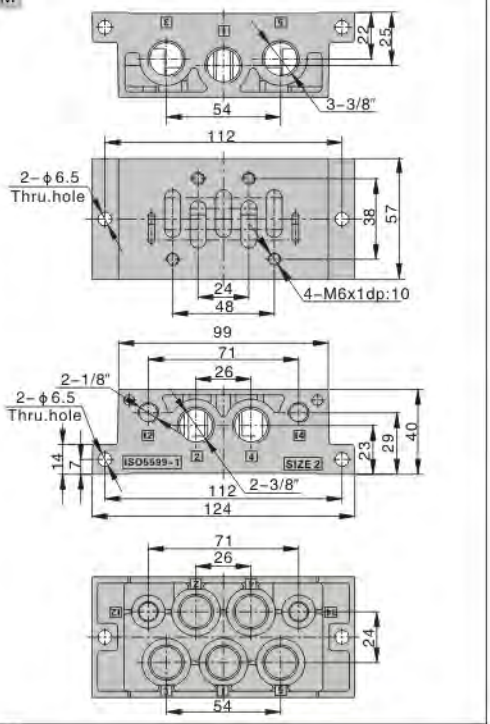
ESV330C(E\P) Terminal



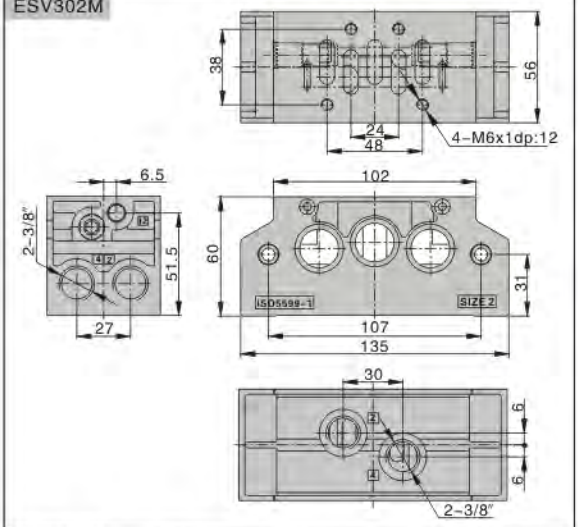
ESV330C(E\P) Grommet



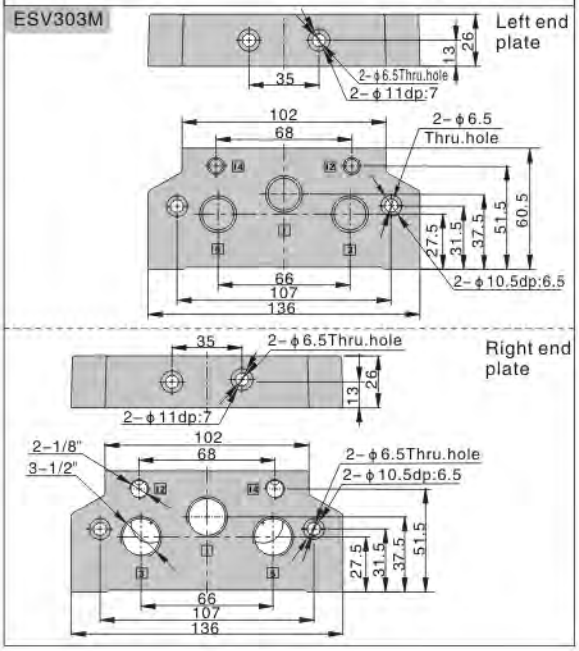
ESV301M



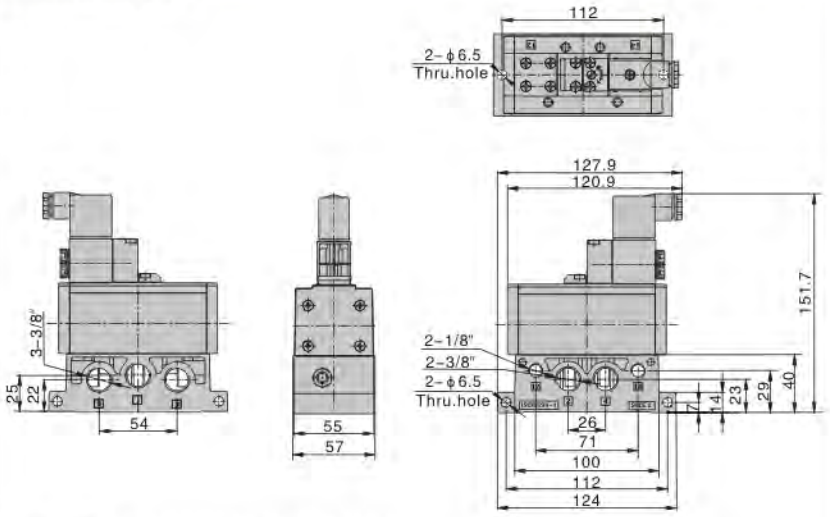
ESV302M



ESV303M

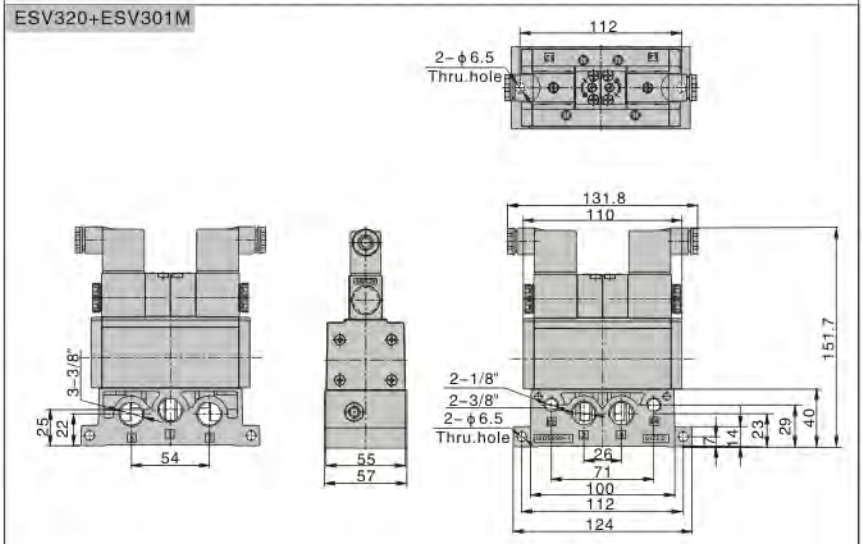


ESV310+ESV301M



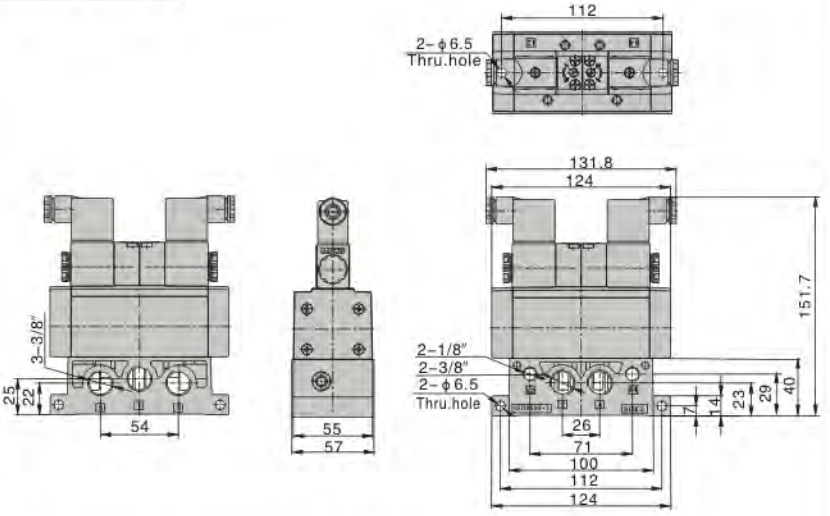
Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

ESV320+ESV301M



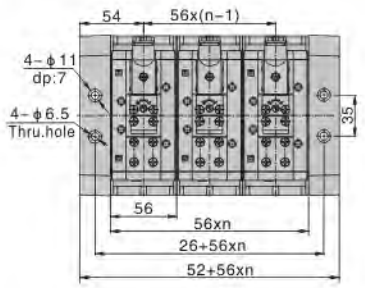
Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

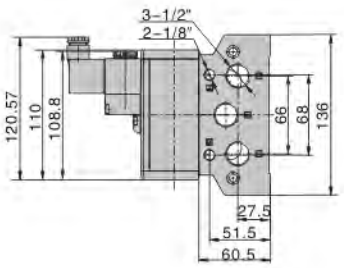
ESV330+ESV301M

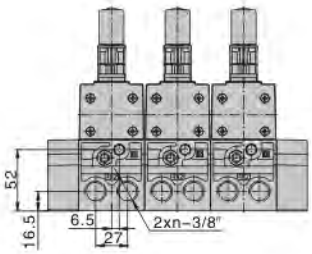


Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

ESV310+ESV302M+ESV303M

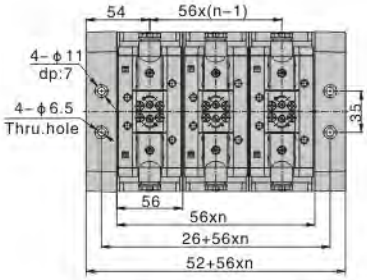


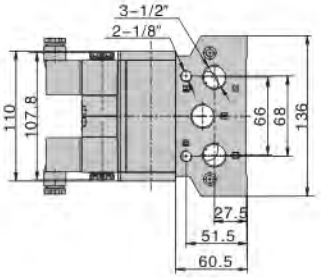


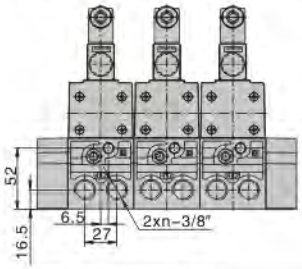


Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

ESV320+ESV302M+ESV303M

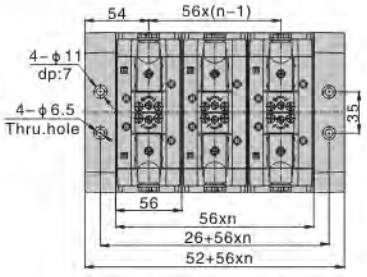


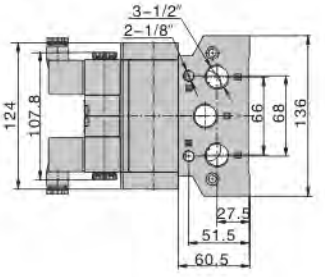


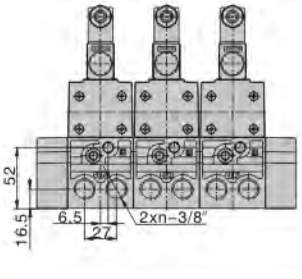


Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

ESV330+ESV302M+ESV303M



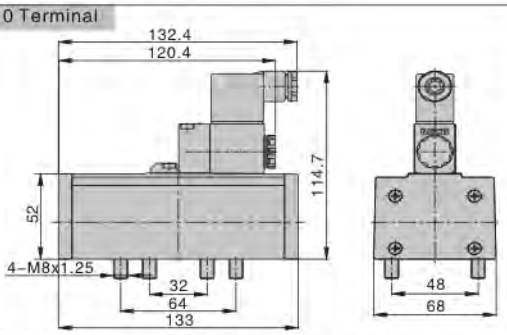




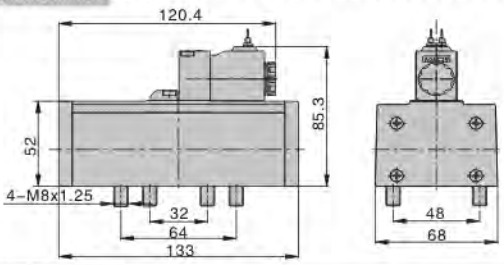
Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

Dimensions(ESV400 Series)

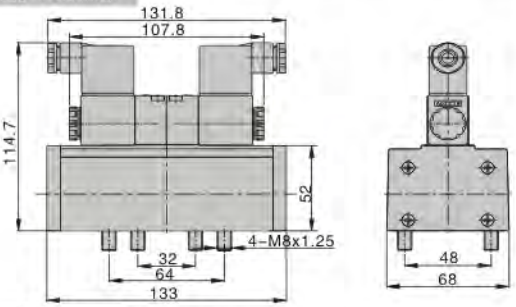
ESV410 Terminal



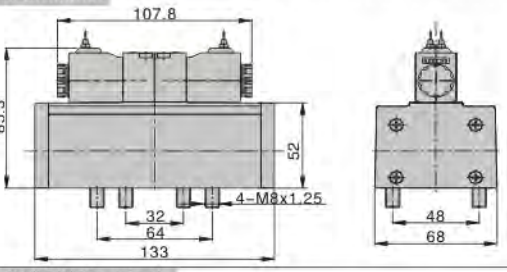
ESV410 Grommet



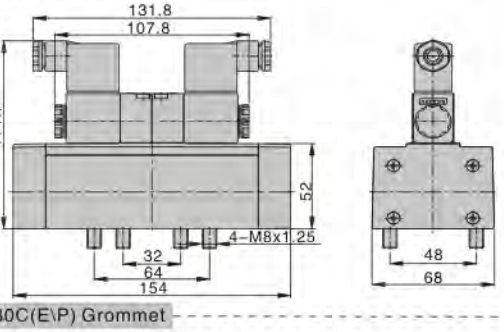
ESV420 Terminal



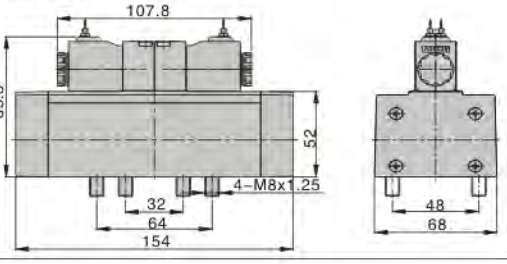
ESV420 Grommet



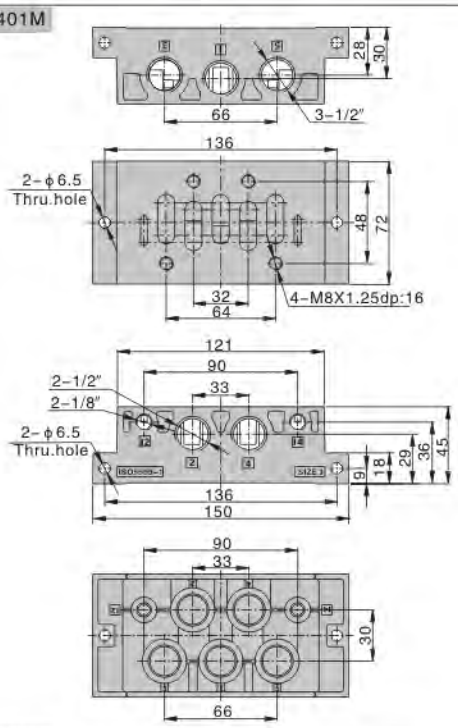
ESV430C(E\P) Terminal



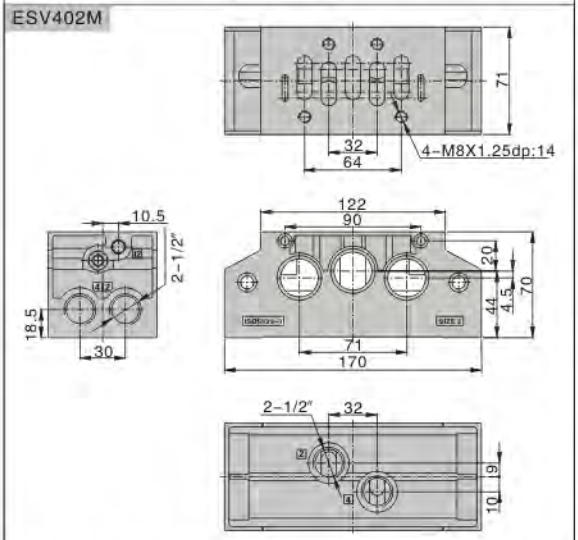
ESV430C(E\P) Grommet



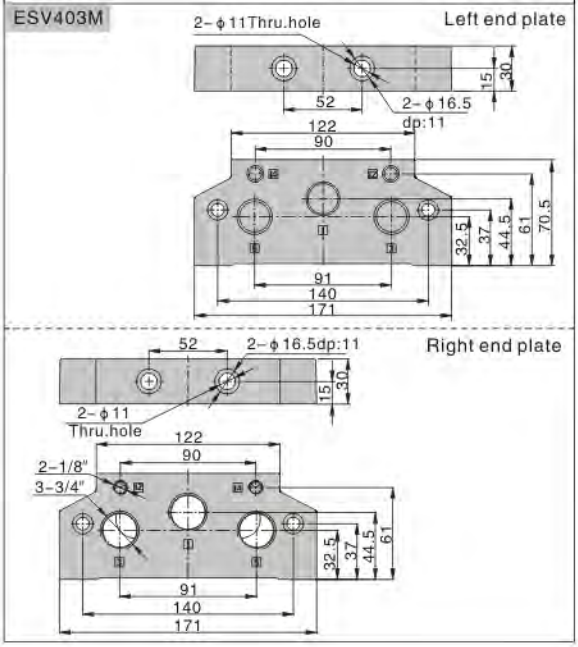
ESV401M



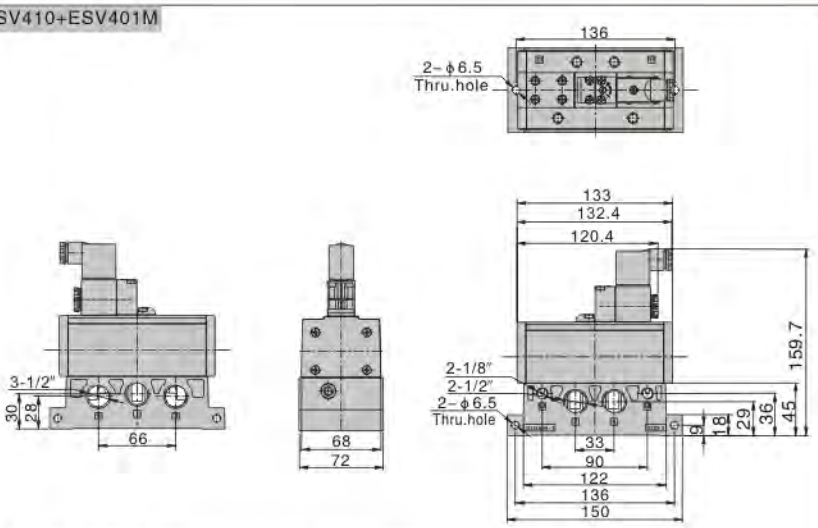
ESV402M



ESV403M

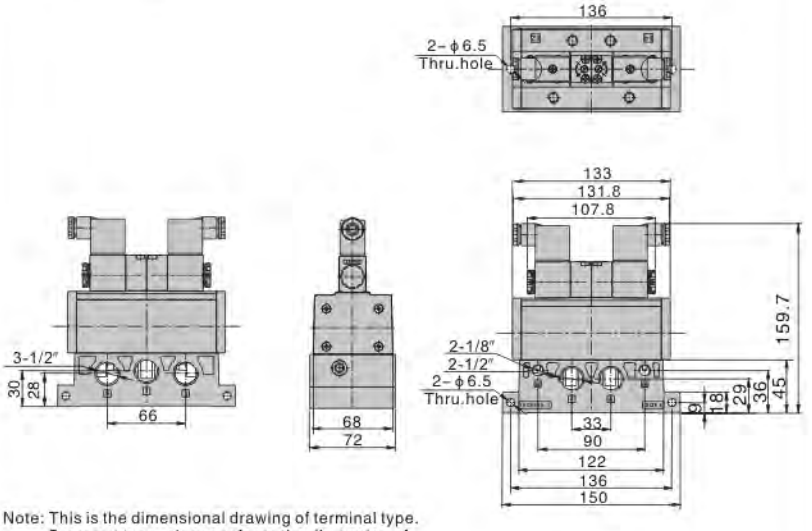


ESV410+ESV401M



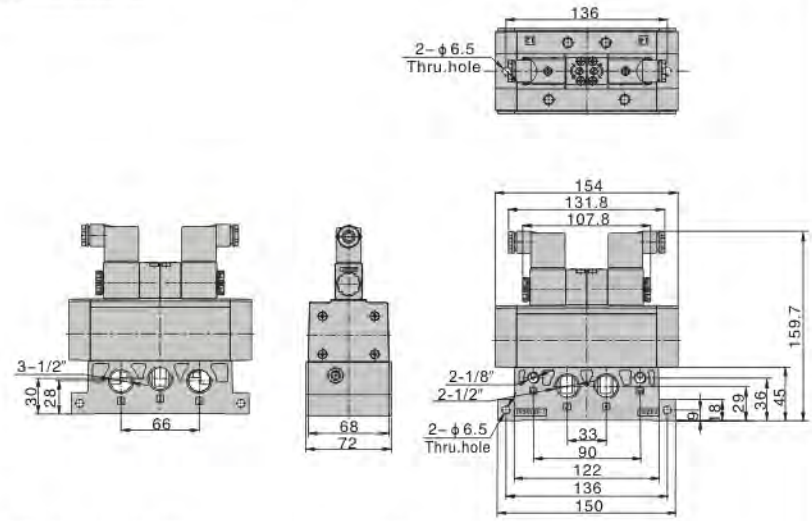
Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

ESV420+ESV401M



Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

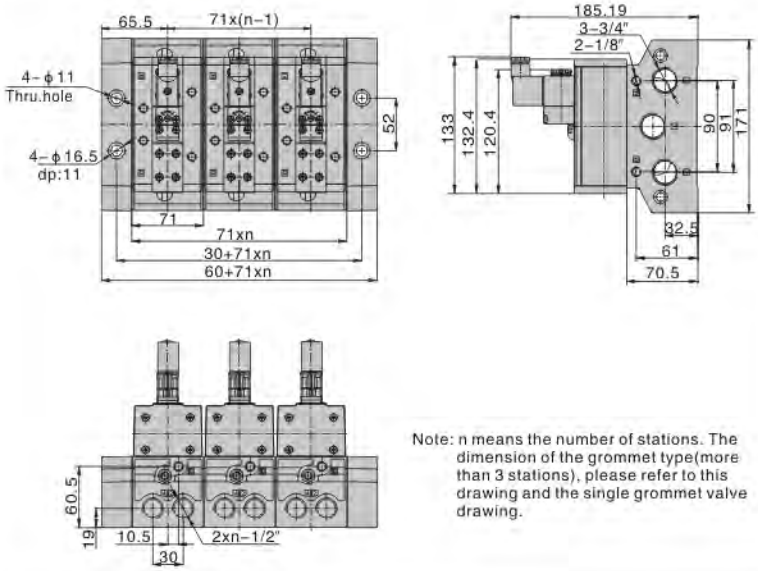
ESV430+ESV401M



Note: This is the dimensional drawing of terminal type. Grommet type, please refer to the dimension of manifold and single grommet valve.

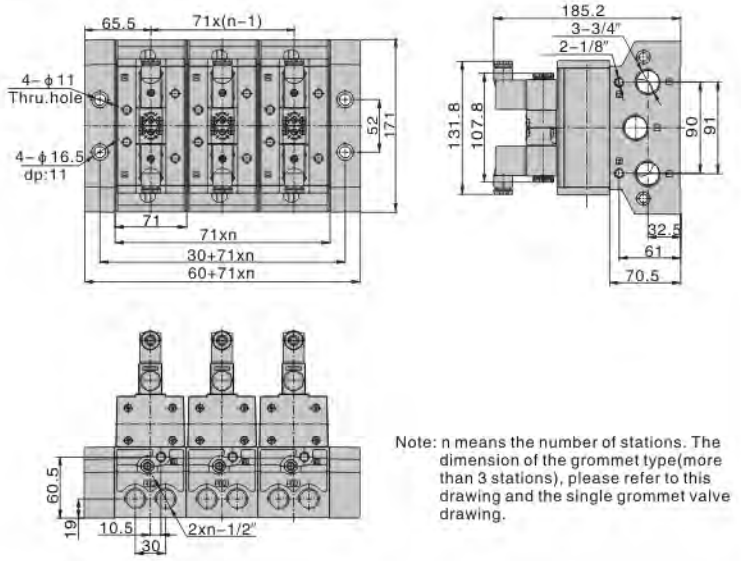
ESV200~400 Series

ESV410+ESV402M+ESV403M



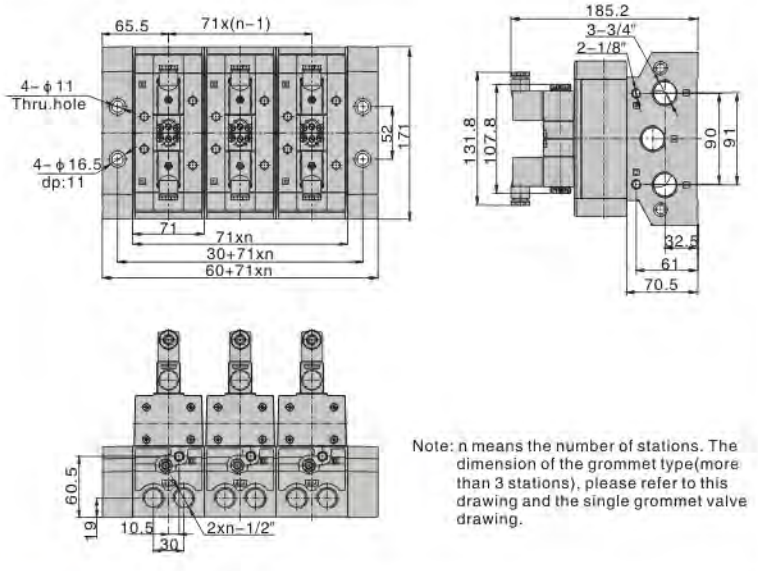
Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

ESV420+ESV402M+ESV403M

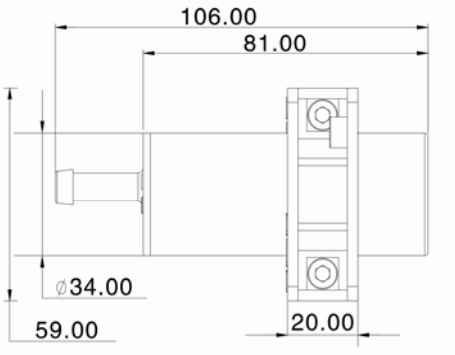
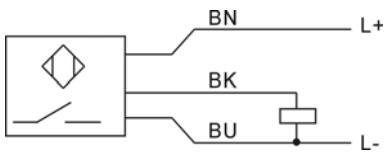


Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

ESV430+ESV402M+ESV403M



Note: n means the number of stations. The dimension of the grommet type(more than 3 stations), please refer to this drawing and the single grommet valve drawing.

IE0001 Inductive proximity sensor Plastic housing ∅ 34 cable Size 80mm Sensing range 22mm[nf] Non-flush	
Electric design	DC PNP
Output	N.O.
Operating voltage [V]	10…36 DC
Current loading [mA]	350
Short-circuit protection	Yes
Reverse polarity protection	Yes
Overload protection	Yes
Voltage drop [V]	<2.5
Consumed Current [mA]	<15(24V)
Real sensing range [㎜]	22±10%
Operating range [㎜]	0…18
Switch-point drift [%/Sr]	-10…10
Hysteresis [%/Sr]	1…15
Switching frequency [Hz]	100
Adjustment factors	Low carbon steel=1 / Stainless steel approx. 0.7 / Brass approx. 0.5 / Alumium approx. 0.4/ Copper approx. 0.3
Operating temperature [℃]	-25℃…80℃
Protection classification	IP67
Dimension	
Housing material	PBT+GF
Switching state display LED	Red (90°)
Connection	PVC-cable /2m;3x0.34m㎡
Wiring Core color BN + BU - BK Signal Line	
Accessory(Included)	Mounting clamp

ema Electronic Corp. Mail: info@ema-electronic.com

Material / Material **902025138**
Description / Beschreibung **CENTRAL LUBRICATION GREASE**
ZENTRALSCHMIERUNG FETT

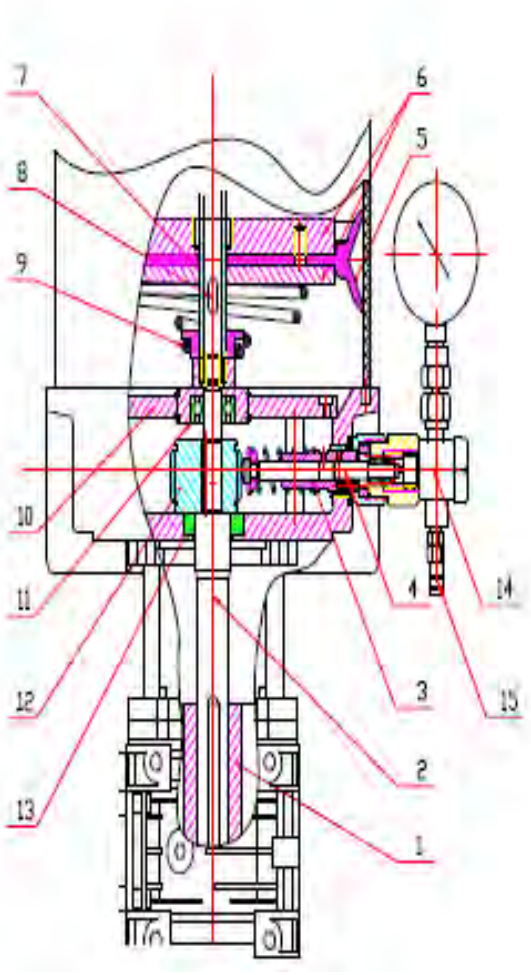
Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	902025139	OPERATING INSTRUCTIONS / SPARE-PARTS LIS BEDIENUNGSANLEITUNG / ERSATZTEILLISTE	1,000	ST
2	902025140	FUNCTIONAL DESCRIPTION FUNKTIONSBESCHREIBUNG	1,000	ST

Deckblatt
Cover page

BHS Nummer BHS Number	902025138
Beschreibung Description	ZENTRALSCHMIERUNG FETT CENTRAL LUBRICATION GREASE

Operating Instructions and Spare Parts List of Lubrication Pump

1. Structure and functional characteristics

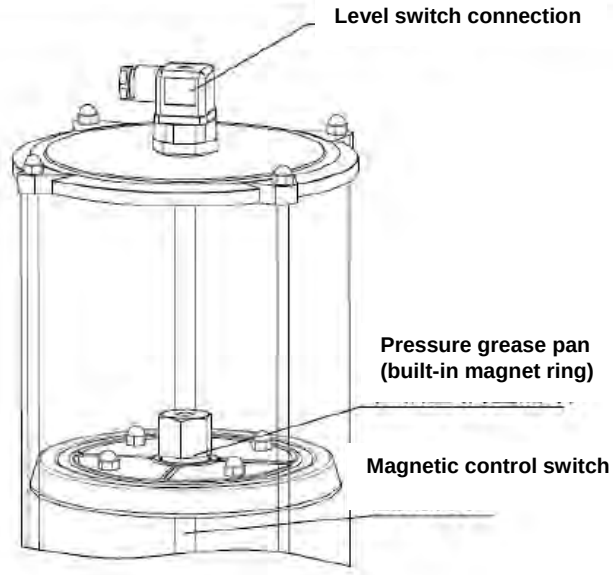


1. Gearunit
2. Transmission shaft
3. Plunger
4. Check valve
5. Y-type sealing ring
6. Press grease pan
7. Guide rail
8. Magnetic switch
9. Taper spring
10. Support
11. Bearing
12. Eccetric wheel
13. Grease seal
14. Pressure gauge
15. Safety valve

Figure 1

2. Assembly and electrical connection

The grease pump must be located at the position where is accessible and is easy to maintain. Electrical control of grease pump motor (P=0.25KW) and drive motor of the mixer are parallel. That is, the mixer and the grease pump start and stop synchronously. The rotation direction of the motor should be anti-clockwise viewed from fan side. The grease inside the tank must be controlled by the electrically-connected grease level switch. The indicator must be illuminated or the alarm must be sent when the float switch reaches the low level (minimum grease level).

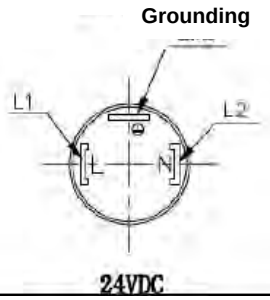


Type: NO
Voltage: 24V
Current: 0.1A

Plug connection: DIN43650
Protection type: IP65
Connection type: seaming
Terminal quantity: 2+ground
Conductor area: 0.5mm

Scope of application: the grease has a low level alarm point. Trigger the alarm to remind filling the grease.

Connection mode



3. Commission and operation

Before starting the grease pump, to check and refill lubricating grease into the tank is necessary.

Tip: only clean lubricating grease can be used.

Tip: piston and piston cylinder are not interchangeable; otherwise they will rub against each other.

If the grease overflows from all outlets, all hoses shall be connected. After retightening the hose, re-grease four pieces of the conical lubrication heads manually until grease overflow again inside of the mixing trough between dust cover and wearing ring.

3.1 Injection interval

NOTE!

Each time after cleaning the interior of the mixing trough the inner chambers of the axial face seals must be regreased through the conical lubrication heads while the mixer is in operation until fresh grease comes out inside of the mixing trough.

3.2 Refilling of vessel

It is important to refill the vessel with grease immediately when an empty signal is indicated,

i.e. minimum grease level. If this is neglected, however, the grease supply will fail within a very short period of time causing the destruction of the shaft seals at the mixer.

Refill the grease from the refilling inlet at the bottom of the tank.

4. Spare parts list

1. Gear unit
2. Transmission shaft
3. Plunger
4. Check valve
5. Y-type sealing ring
6. Pressure grease pan
7. Guide rail
8. Magnetic switch
9. Taper spring
10. Support
11. Bearing
12. Eccentric wheel
13. Grease seal
14. Pressure gauge
15. Safety valve

1 Purpose and features

EG-B is a plunger type high-pressure multipoint grease lubrication pump that is externally equipped with fully detachable sub-pump unit and low-level detective device, and supplies the grease to each lubricating point. It is a grease central lubrication system that is extremely convenient to operate, repair, assemble and disassemble, and is suitable for various large- and medium-sized machineries.

2 Model specification and technical parameters

Items / model	Nominal displacement	Nominal pressure	Stroke frequency	Quantity of grease nipples	Grease	Capacity of grease reservoir	Specification of grease nipple pipe	Motor power
	mL /min	MPa	Times/min	pcs	(NLGI)	L	mm	kw
EG-B	0.8-2ml/min	25	14	1～4	000～2#	4	Φ6	0.25

Note: 1. 1～3 grease nipples are available and the user shall indicate it while ordering.

2. NO contacts of high and low grease level signal sender, capacity: AC 220V/1A DC24V/2A.

3 Outline and installation dimension (Figure 1)

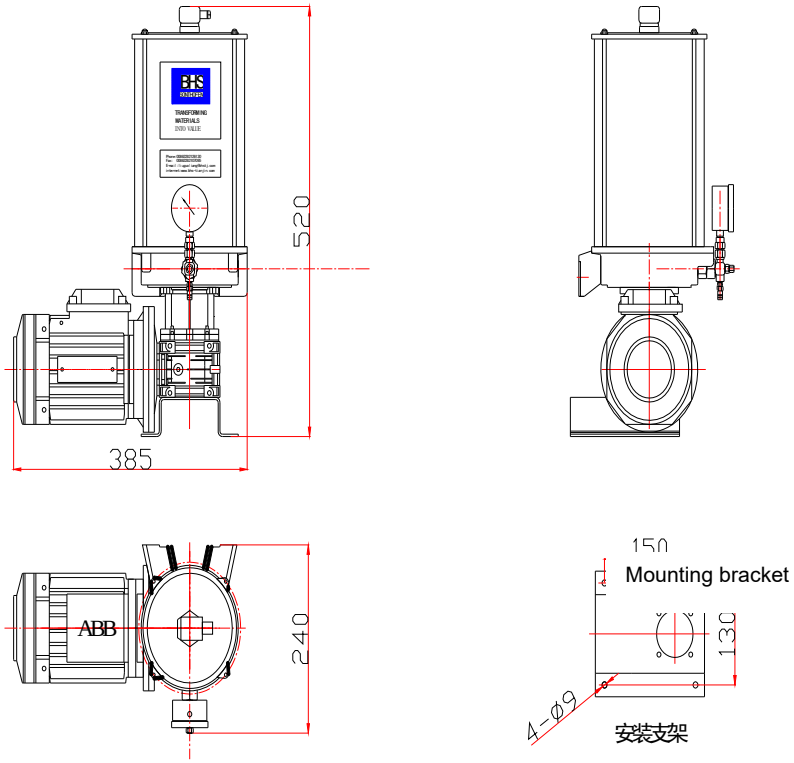
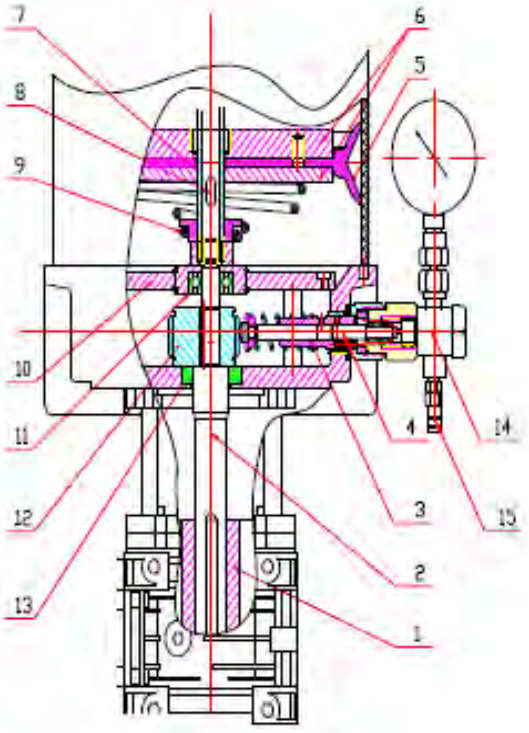


Figure 1

4 Structure and operating principle

Grease pump: The multipoint high-pressure grease pump uses the plunger type structure (Figure 2). The motor is directly connected to the gear unit (1) and drives the eccentric wheel (12) into reciprocating motion along the radically arranged pump plunger (3), thus completing grease suction and discharge processes. When the plunger moves from the external dead point to internal dead point, the vacuum forms inside the grease chamber and enables the grease enter into the chamber via suction hole. When the plunger moves to external dead point, the grease inside the chamber is compressed and the pressure increases to lift off the check valve (4), and cause the grease to discharge from the orifice of the sliding valve.

The pump plunger is equipped with a separate safety valve (15) and check valve (4), to prevent overloading and pressure interference during operation. The low level inside the grease reservoir passes through magnetic switch (8) on the pressure grease pan (6) and causes the magnetic switch in the guide rail (7) to send the signal at the corresponding grease level position. At filling, the magnet ring on the pressure grease pan rises with the grease level. During operation, the magnet ring on the pressure grease pan goes down with the grease level. When the grease level lowers the magnet ring to the signal sending position, the low level magnetic switch sends the signal to close the contact and output the low level signal.



1. Gearunit
2. Transmission shaft
3. Plunger
4. Check valve
5. Y-type sealing ring
6. Press grease pan
7. Guide rail
8. Magnetic switch
9. Taper spring
10. Support
11. Bearing
12. Eccetric wheel
13. Grease seal
14. Pressure gauge
15. Safety valve

Figure 2

5. Installation notes

5.1 The lubrication pump shall be installed at the position that is less pollutant, easy to connect, with proper tubing and filling and suitable for observation.

5.2 Consistency range of grease used for the lubrication pump: (NLGI) 000～2#.

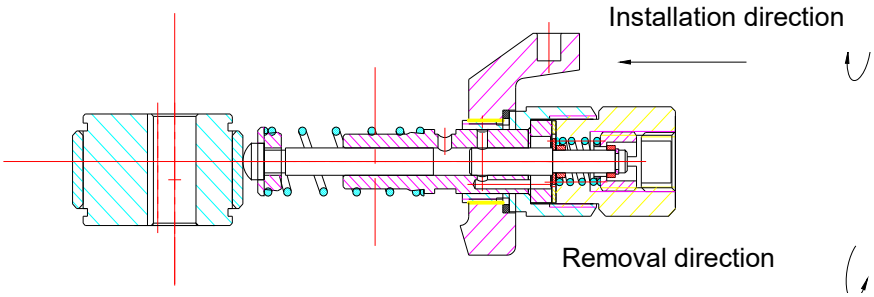
5.3 The applicable voltage is 3 phase 220V, 380V, 400~480V±10% (50/60Hz). The level signal sender at the top cap of the grease reservoir shall be connected to the protective circuit of the grease pump motor. For motor connection, **ensure the motor rotation direction is correct: rotate anti-clockwise when facing rear end cover of the motor.**

5.4 For first use or re-use after long-term shutdown, it is preferable to open the reservoir cover, remove the remaining old grease inside the reservoir and fill in sufficient grease.

5.5 Inject the grease from the filler located at the base and the grease must be clean and free of foreign matters and bubble. The filler is equipped with grease filter and grease fitting and is suitable for YG-6 pneumatic grease pump; if it is used for other grease pump, the user shall provide the adapter.

5.6 Clean all piping inner holes of the lubrication system, minimize pipe joints and elbows while configuring the pipeline and fasten them with pipe clamp.

5.7 Plunger installation and removal



Plunger installation and removal notes:
1. When installing the plunger, turn the motor to drive the eccentric wheel into the dead center position inside the plunger. Screw in the plunger slowly. The plunger shall be kept at the horizontal position and cannot tilt, to prevent the grease pump bracket from thread damage. Removal method of the plunger is opposite to its installation method.
2. Plunger and sliding valve are processed through sophisticated configuration and research. They shall be used in pairs and cannot be exchanged arbitrarily.

6 .Service and maintenance

6.1 Before connecting with hose pipes, to make test run for 5min, to confirm the grease pump operates normally.

6.2 The pump plunger is equipped with safety valve. The protective pressure of EG-B can be set under 25Mpa (regulating to 25Mpa at delivery). If the user re-adjusts the pressure of the safety valve, mount the pressure gage onto the grease discharge pipeline. When the system pressure exceeds the desired pressure, the valve element (steel ball) opens, and the grease discharges via the safety valve. Normally, the user shall not set the pressure of the safety valve.

6.3 The pump plunger is provided with grease discharge check valve, to prevent pressure interference during operation and grease backflow.

6.4 The grease filler of the grease pump is equipped with grease filter. The user shall clean the screen inside the filter, to prevent the screen from being blocked by foreign matters and thus cause it unable to fill the grease into the pump tank.

6.5 Before connecting with hose pipes, to make test run according to 6.1, to confirm the grease pump operates normally. **Pre-fill the grease into each lubricating point and grease separator to confirm they are unblocked. If necessary, top up each pipeline with grease and then to be connected with pipes properly.**

6.7 When the grease outlet of the lubrication pump is used with the progressive grease distributor, the grease distributor shall be installed on the flat position that is located inside each lubricating point and easy to inspect. Do not block certain grease outlet of the distributor, otherwise the distributor won`t l provide grease and the pressured grease will not flow out of the safety valve.

7. Troubleshooting and maintenance

7.1 Failures and troubleshooting

Failures	Causes	Troubleshooting
No grease flows out of the pump	Empty grease reservoir Dirt inside the safety valve element Blockage or damage of check valve Blockage of suction inlet or grease outlet of pump components Wear of pump plunger pair	Fill in the grease and vent the pump Clean the safety valve and re-regulate the pressure Clean or replace the check valve element Assemble, disassemble and clean pump components Replace components of the pump unit
The pump has no pressure	Pipeline leakage Dirt inside the safety valve element Wear of pump plunger pair	Check whether each pipeline connection leaks Clean the safety valve and re-regulate the pressure Replace components of the pump unit
Blockage of host machine or system	Lubricating point and pipeline: The grease overflows from the safety valve	Check whether the lubricating point is blocked and set it right Check whether pipeline and connections are blocked and set it right Check whether certain outlet of grease separator is blocked and set it right

Deckblatt
Cover page

BHS Nummer BHS Number	902037012
Beschreibung Description	ERSATZTEILLISTE SPARE PARTS LIST

Material / Material
Description / Beschreibung

902037012
SPARE PARTS LIST
ERSATZTEILLISTE

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
10	900382800	NOTICE SPARE PARTS LIST MACHINES HINWEIS ERSATZTEILLISTE MASCHINEN	1,000	ST
20	902024660	TROUGH WEARING PARTS TROGVERSCHLEISSTEILE	1,000	ST
30	902024663	DISCHARGE ROTARY GATE ENTLEERSCHIEBER	1,000	ST
31	902024864	DISCHARGE DOOR OPERATION PNEU. ENTLEERSCHIEBERBETAETIG. PNEU.	1,000	ST
39	902024646	MAINTENANCE UNIT WARTUNGSEINHEIT MIT LUFTLEITUNG	1,000	ST
40	902030253	SPLASH GUARD SPRITZSCHUTZ	1,000	ST
50	902024696	MIXING SHAFT WITH BEARING MISCHWELLE M.LAGERUNG	1,000	ST
51	200045384	MIXING TOOLS MISCHWERK	1,000	ST
60	200029780	LUBRICATION PIPE SCHMIERLEITUNG	1,000	ST
61	200029781	LUBRICATION PIPE SCHMIERLEITUNG	1,000	ST
63	902031700	CENTRAL LUBRICATION GREASE ZENTRALSCHMIERUNG FETT	1,000	ST
70	902024642	DRIVE WITHOUT TURBO ANTRIEB O.TURBO	1,000	ST
72	200050964	EQUIPMENT DRIVE 1X30KW AUSRUESTUNG ANTRIEB 1X30KW	1,000	ST

Condition for continuous function and readiness for use of the machine/plant is that the most important spare and wearing parts are kept on stock.
Our guarantee covers only original spare parts, which have been supplied by us.

With your spare parts order please indicate the following:

		see:
Werk no.		spare parts list, nameplate, client's documentation cover sheet
Year of construction		nameplate, client's documentation cover sheet

No. of spare parts (f. e. 9X XXXXX)	**item**	**part no.**	**required quantity**	**denomination**

By ordering hoses, seals and similar materials please specify the required length.
Deviations from the above indication make the treatment of your order difficult and can lead to wrong deliveries.

Dept.: After Sales Service

BHS-Sonthofen GmbH
Postfach 1164
An der Eisenschmelze 47
87527 Sonthofen

Mixing, Crushing and Recycling Division
Tel.: +49 8321 6099 - 149

Filtration Division
Tel. : +49 8321 6099 - 340

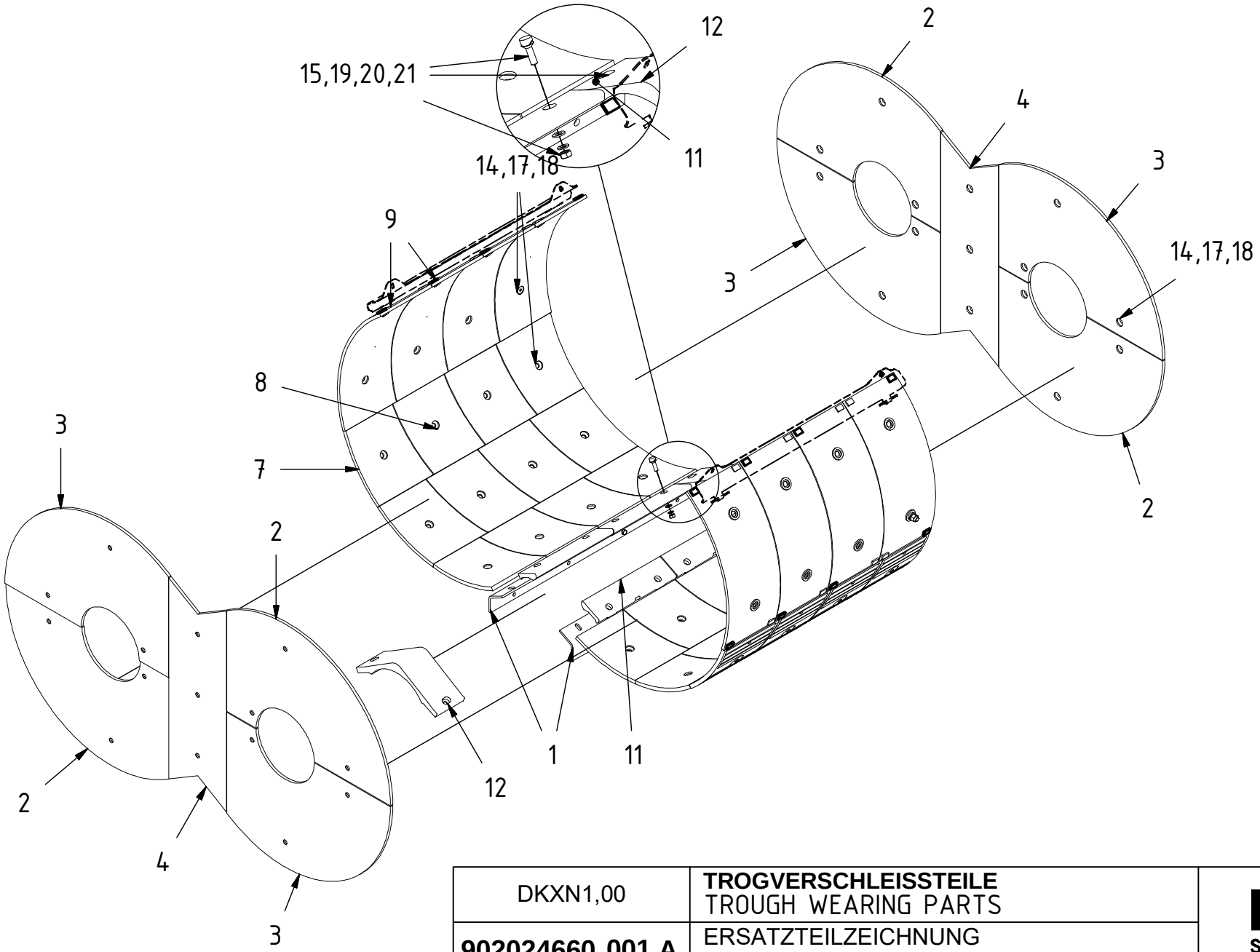
Fax.: +49 8321 6099 - 220
Email: service@bhs-sonthofen.de

Material / Material **902024660**
Description / Beschreibung **TROUGH WEARING PARTS**
TROGVERSCHLEISSTEILE

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200033665	FIXING ANGLE BEFESTIGUNGSWINKEL	2,000	ST
2	100089300	FRONT WALL STEEL LINER LEFT STIRNWANDBLECH LI	4,000	ST
3	100089200	FRONT WALL STEEL LINER RIGHT STIRNWANDBLECH RE	4,000	ST
4	100089100	FRONT WALL STEEL LINER CENTRE STIRNWANDBLECH MITTELST	2,000	ST
7	200032961	TROUGH TILE EXTERNAL WANNENKACHEL AUSSEN	12,000	ST
8	200032962	TROUGH TILE INTERNAL WANNENKACHEL INNEN	12,000	ST
9	200033758	TROUGH SHEET UPPER PART WANNENBLECH OBEN	8,000	ST
11	200033158	DISCHARGE DOOR LEDGE SCHIEBERLEISTE	4,000	ST
12	200033160	DISCHARGE DOOR COVER SCHIEBERABDECKUNG	2,000	ST
14	200045342	COUNTERSUNK SCREW SENKSCHRAUBE	70,000	ST
15	200007452	COUNTERSUNK SCREW COMPL. SENKSCHRAUBE KOMPL.	12,000	ST
17	503041600	HEXAGON NUT 6KT-MUTTER	70,000	ST
18	503351600	DISK SCHEIBE	70,000	ST
19	503041200	HEXAGON NUT 6KT-MUTTER	12,000	ST

Material / Material **902024660**
Description / Beschreibung **TROUGH WEARING PARTS**
TROGVERSCHLEISSTEILE

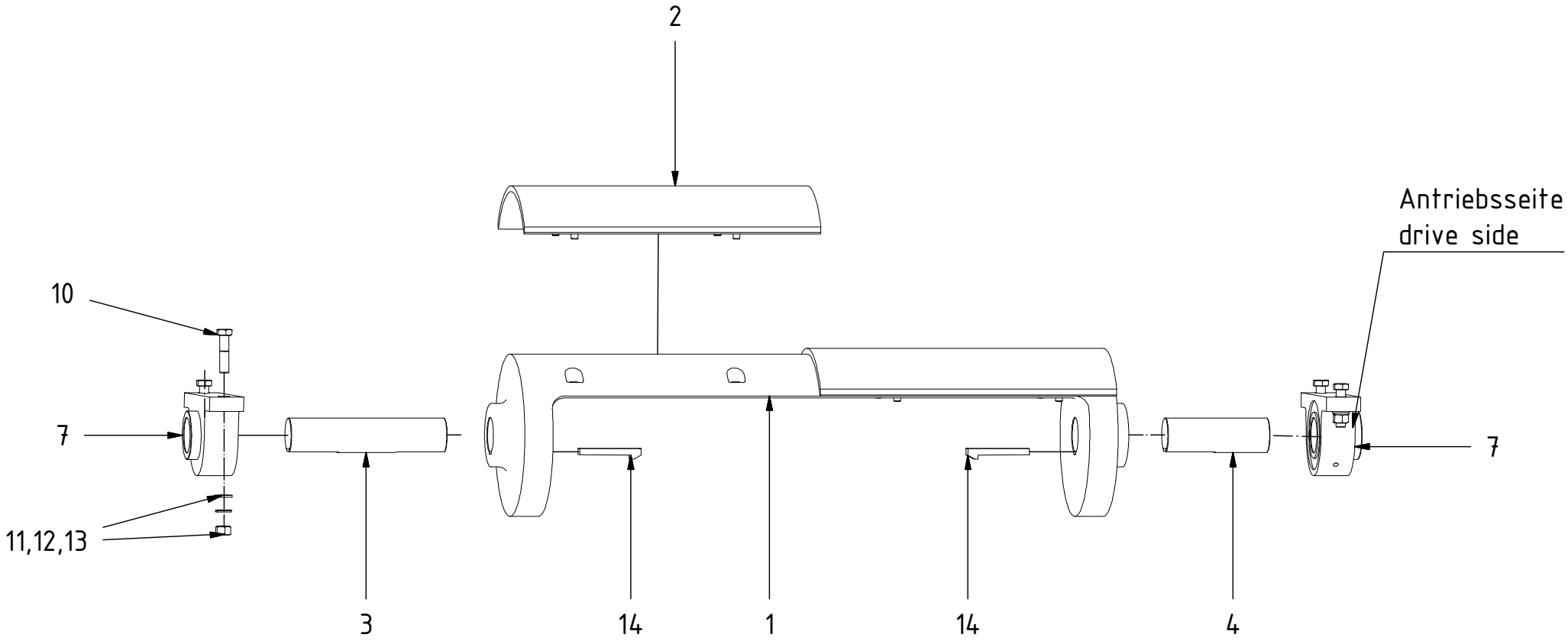
Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
20	503361200	SPRING RING FEDERRING	12,000	ST
21	503351200	DISK SCHEIBE	12,000	ST



DKXN1,00	**TROGVERSCHLEISSTEILE** TROUGH WEARING PARTS	**BHS** SONTHOFEN
902024660 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	

Material / Material **902024663**
Description / Beschreibung **DISCHARGE ROTARY GATE**
ENTLEERSCHIEBER

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	100090500	DISCHARGE DOOR CYLINDER SCHIEBERWALZE	1,000	ST
2	200007455	ROLLER PROTECTION WALZENSCHUTZ	2,000	ST
3	100030400	DISCHARGE DOOR BOLT SCHIEBERBOLZEN	1,000	ST
4	100017500	DISCHARGE DOOR BOLT SCHIEBERBOLZEN	1,000	ST
7	910008800	PEDESTAL BEARING STEHLAGER	2,000	ST
10	500029200	HEXAGON BOLT 6KT-SCHRAUBE	4,000	ST
11	503041600	HEXAGON NUT 6KT-MUTTER	4,000	ST
12	503351600	DISK SCHEIBE	4,000	ST
13	503361600	SPRING RING FEDERRING	4,000	ST
14	506115000	GIB KEY NASENKEIL	2,000	ST

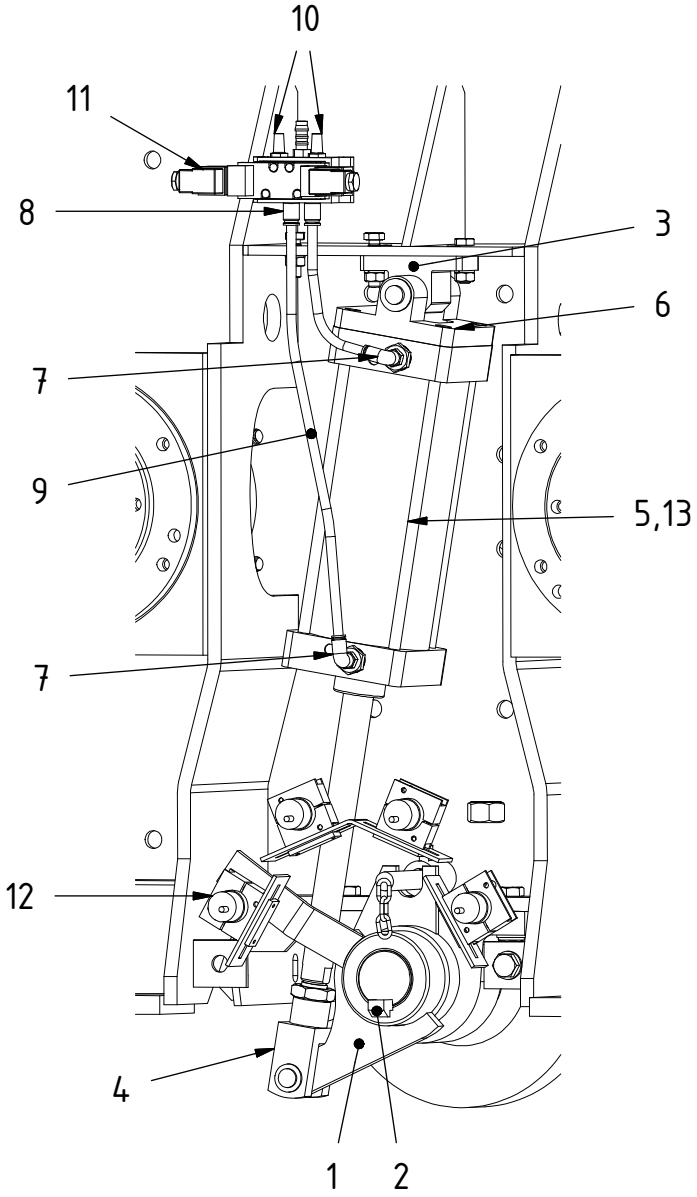


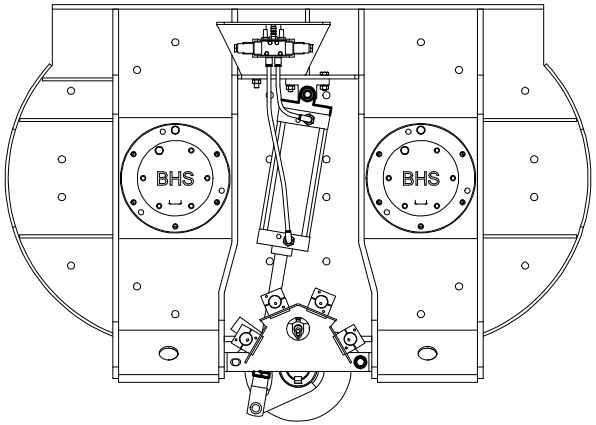
DKXN1,00	**ENTLEERSCHIEBER** DISCHARGE ROTARY GATE
902024663 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN

Material / Material **902024864**
Description / Beschreibung **DISCHARGE DOOR OPERATION PNEU.**
ENTLEERSCHIEBERBETAETIG. PNEU.

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200007492	LEVER HEBEL	1,000	ST
2	506114900	GIB KEY NASENKEIL	1,000	ST
3	504312701	COUNTERBEARING WITHOUT BOLT GEGENLAGER O.BOLZEN	1,000	ST
4	504311801	FORK JOINT GABELGELENK	1,000	ST
5	504310201	PNEUMATIC CYLINDER PNEUMATIKZYLINDER	1,000	ST
6	504313801	SUSPENSION FIXTURE W. BOLT AUFHAENGEBEFESTIGUNG M. BOLZE	1,000	ST
7	504326600	SCREW FITTING VERSCHRAUBUNG >STECK<	2,000	ST
8	504325300	SCREW FITTING VERSCHRAUBUNG >STECK<	2,000	ST
9	541501400	HOSE SCHLAUCH 10/6.5 (AD/ID)	1,000	M
10	504315600	SILENCER GERAEUSCHDAEMPFER	2,000	ST
11	504315010	SOLENOID VALVE 5/3 WAY ISO1 MAGNETVENTIL 5/3 WEG ISO1	1,000	ST
12	920005293	PROXIMITY SWITCH NAEHERUNGSSCHALTER IND.	3,000	ST
13	504338300	SPARE PARTS PACKAGE ERSATZTEILPAKET	1,000	ST

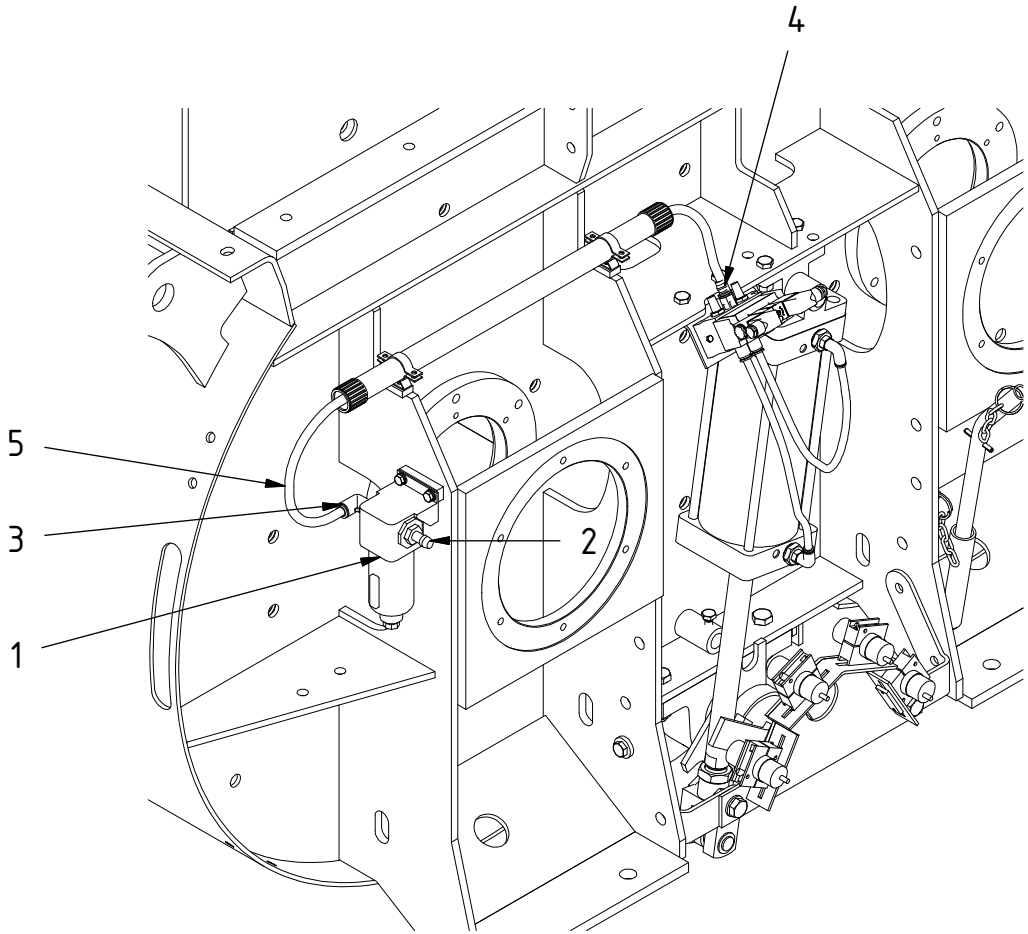




	ENTLEERSCHIEBERBETAETIG. PNEU. DISCHARGE DOOR OPERATION PNEU.	**BHS** SONTHOFEN
902024864 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	

Material / Material **902024646**
Description / Beschreibung **MAINTENANCE UNIT**
WARTUNGSEINHEIT MIT LUFTLEITUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	920008714	FILTER FILTER GF400-15	1,000	ST
2	504350400	HOSE NOZZLE SCHLAUCHTUELLE	1,000	ST
3	504326700	screw fitting VERSCHRAUBUNG >STECK<	1,000	ST
4	504325101	SCREW FITTING VERSCHRAUBUNG >STECK<	1,000	ST
5	541501500	HOSE 12/8,0 (AD/ID) SCHLAUCH 12/8,0 (AD/ID)	1,000	M

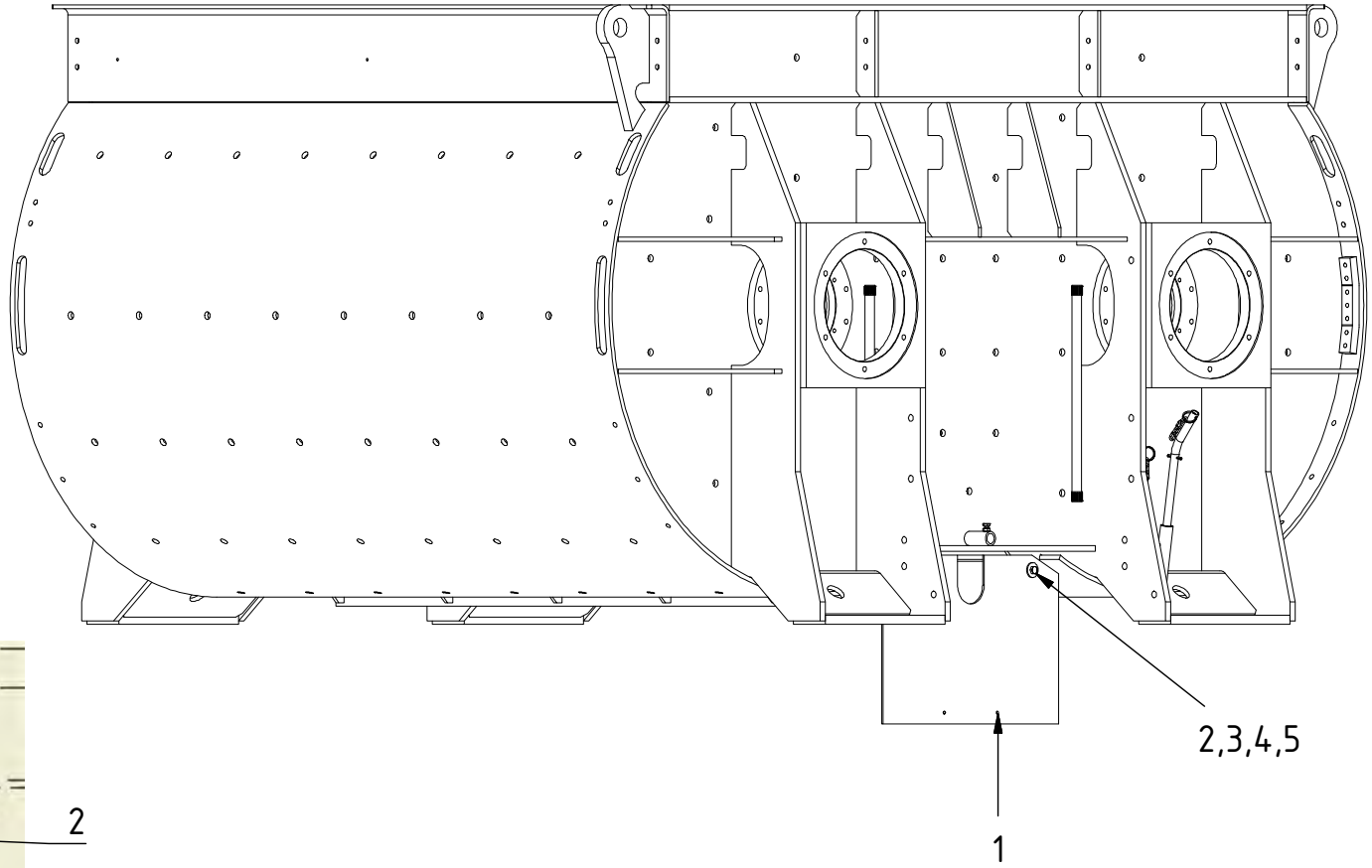


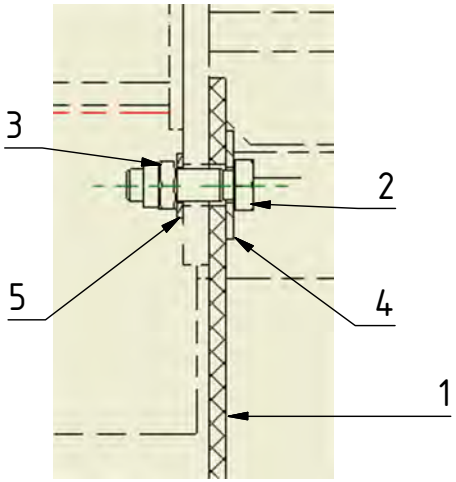
DKX	**WARTUNGSEINHEIT MIT LUFTLEITUNG** MAINTENANCE UNIT
902024646 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN

Material / Material **902030253**
Description / Beschreibung **SPLASH GUARD**
SPRITZSCHUTZ

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200035500	RUBBER CLOTH GUMMITUCH	1,000	ST
2	500133400	HEXAGON BOLT 6KT-SCHRAUBE	2,000	ST
3	503101200	HEXAGON NUT W.CLAMP.PART 6KT-MUTTER M.KLEMMTEIL	2,000	ST
4	503423200	DISK SCHEIBE	2,000	ST
5	503351200	DISK SCHEIBE	2,000	ST

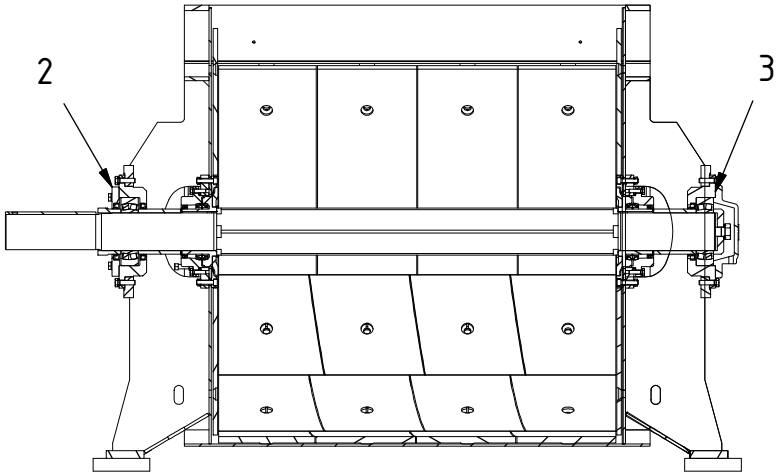


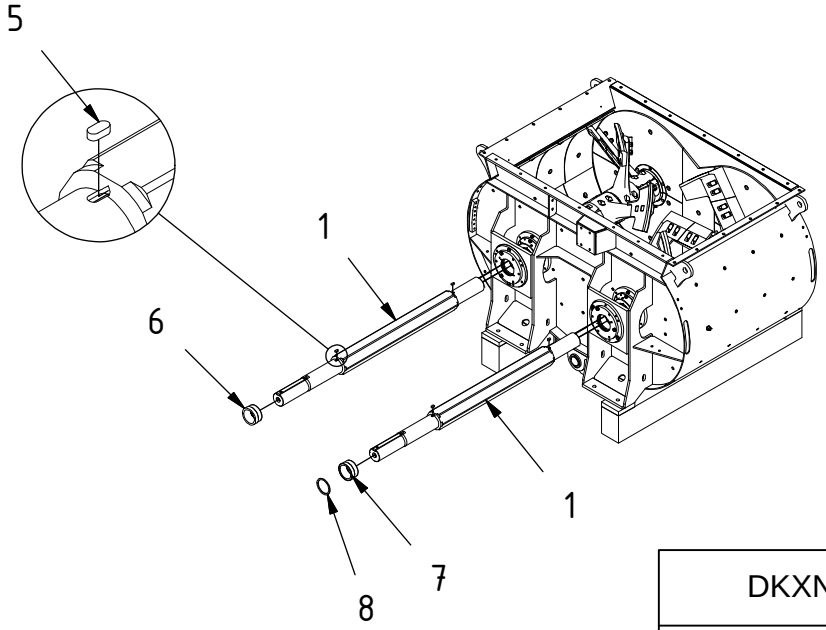


DKX	**SPRITZSCHUTZ** SPLASH GUARD	**BHS** SONTHOFEN
902030253 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	

Material / Material **902024696**
Description / Beschreibung **MIXING SHAFT WITH BEARING**
MISCHWELLE M.LAGERUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200033794	MIXING SHAFT MISCHWELLE	2,000	ST
2	902024697	BEARING LAGERUNG AS	2,000	ST
3	902024698	BEARING LAGERUNG AGS	2,000	ST
5	506104500	WEDGE KEIL	4,000	ST
6	200006090	DISTANCE SLEEVE DISTANZBUCHSE	1,000	ST
7	200006091	DISTANCE SLEEVE DISTANZBUCHSE	1,000	ST
8	504305700	LAMINUM ADJUSTING RING LAMINUM-PASSRING	1,000	ST





DKXN1,00	**MISCHWELLE M.LAGERUNG** MIXING SHAFT WITH BEARING
902024696 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

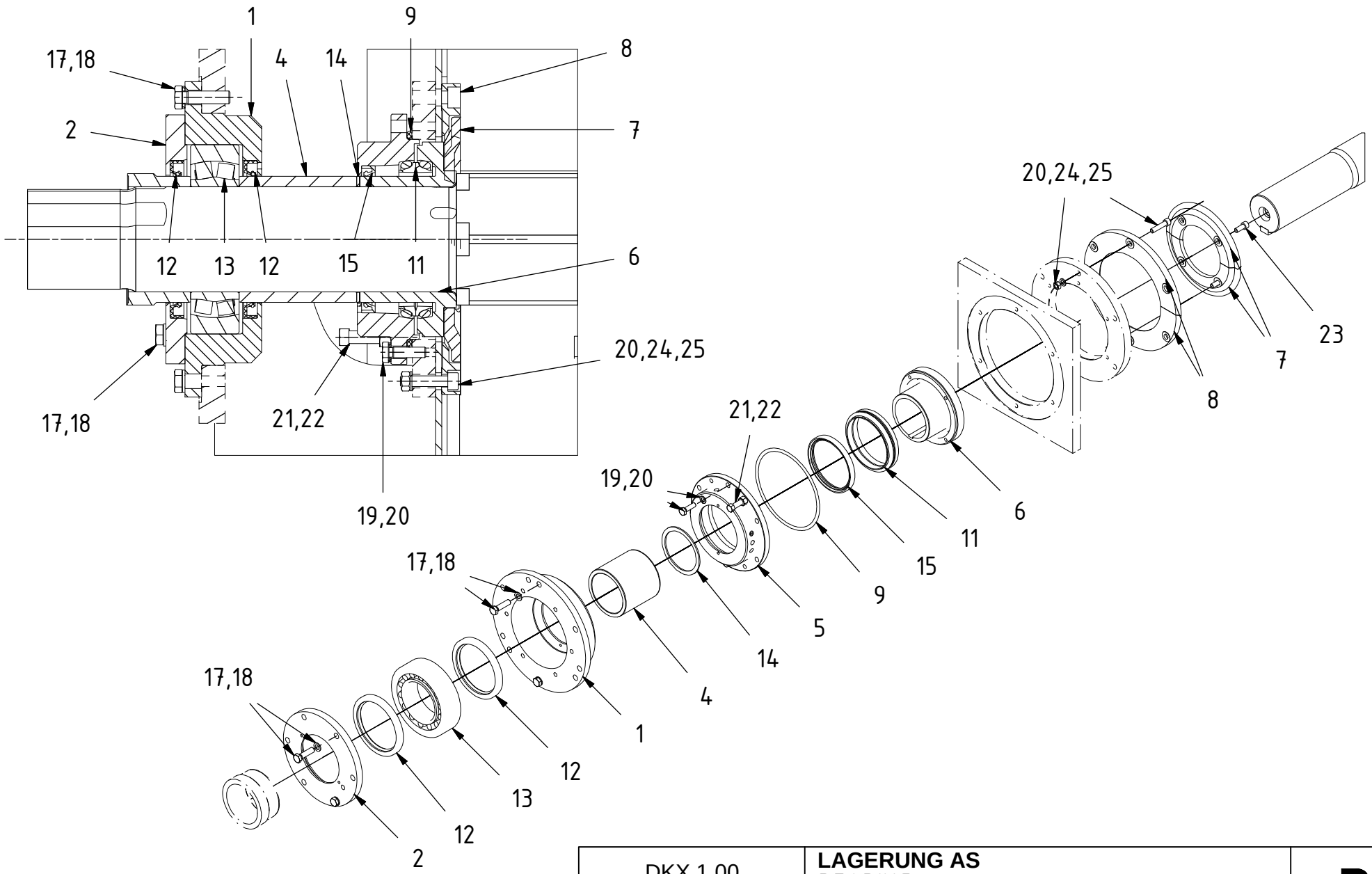
BHS SONTHOFEN

Material / Material **902024697**
Description / Beschreibung **BEARING**
LAGERUNG AS

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	100016200	bearing box LAGERKOERPER	1,000	ST
2	100016100	BEARING COVER LAGERDECKEL	1,000	ST
4	101132300	DISTANCE SLEEVE DISTANZBUCHSE	1,000	ST
5	101115100	RETAINING RING AUFNAHMERING	1,000	ST
6	100016300	SHAFT BUSH WELLENBUCHSE	1,000	ST
7	100262200	DUST COVER STAUBDECKEL	2,000	ST
8	100262100	WEARING RING SCHLEISSRING	2,000	ST
9	101050900	SEALING RING DICHTUNGSRING	1,000	ST
11	504301000	AXIAL FACE SEAL GLEITRINGDICHTUNG	1,000	ST
12	507078100	SHAFT SEALING RING WELLENDICHTRING	2,000	ST
13	506771400	SELF-ALIGNING ROLLER BRG. PENDELROLLENLAGER	1,000	ST
14	504305700	LAMINUM ADJUSTING RING LAMINUM-PASSRING	1,000	ST
15	910682400	SHAFT SEALING RING WELLENDICHTRING TRC001200	1,000	ST
17	500133600	HEXAGON BOLT 6KT-SCHRAUBE	12,000	ST

Material / Material **902024697**
Description / Beschreibung **BEARING**
LAGERUNG AS

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
18	503361200	SPRING RING FEDERRING	12,000	ST
19	500130600	HEXAGON BOLT 6KT-SCHRAUBE	6,000	ST
20	503361000	SPRING RING FEDERRING	12,000	ST
21	500223000	HEX.BOLT FULL DOG POINT 6KT-SCHRAUBE MIT ZAPFEN	4,000	ST
22	503041200	HEXAGON NUT 6KT-MUTTER	4,000	ST
23	500505700	CYLINDER HEAD SCREW ZYLINDERSCHRAUBE	4,000	ST
24	500506100	CYLINDER HEAD SCREW ZYLINDERSCHRAUBE	6,000	ST
25	503041000	HEXAGON NUT 6KT-MUTTER	6,000	ST



DKX 1,00	**LAGERUNG AS** BEARING
902024697 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

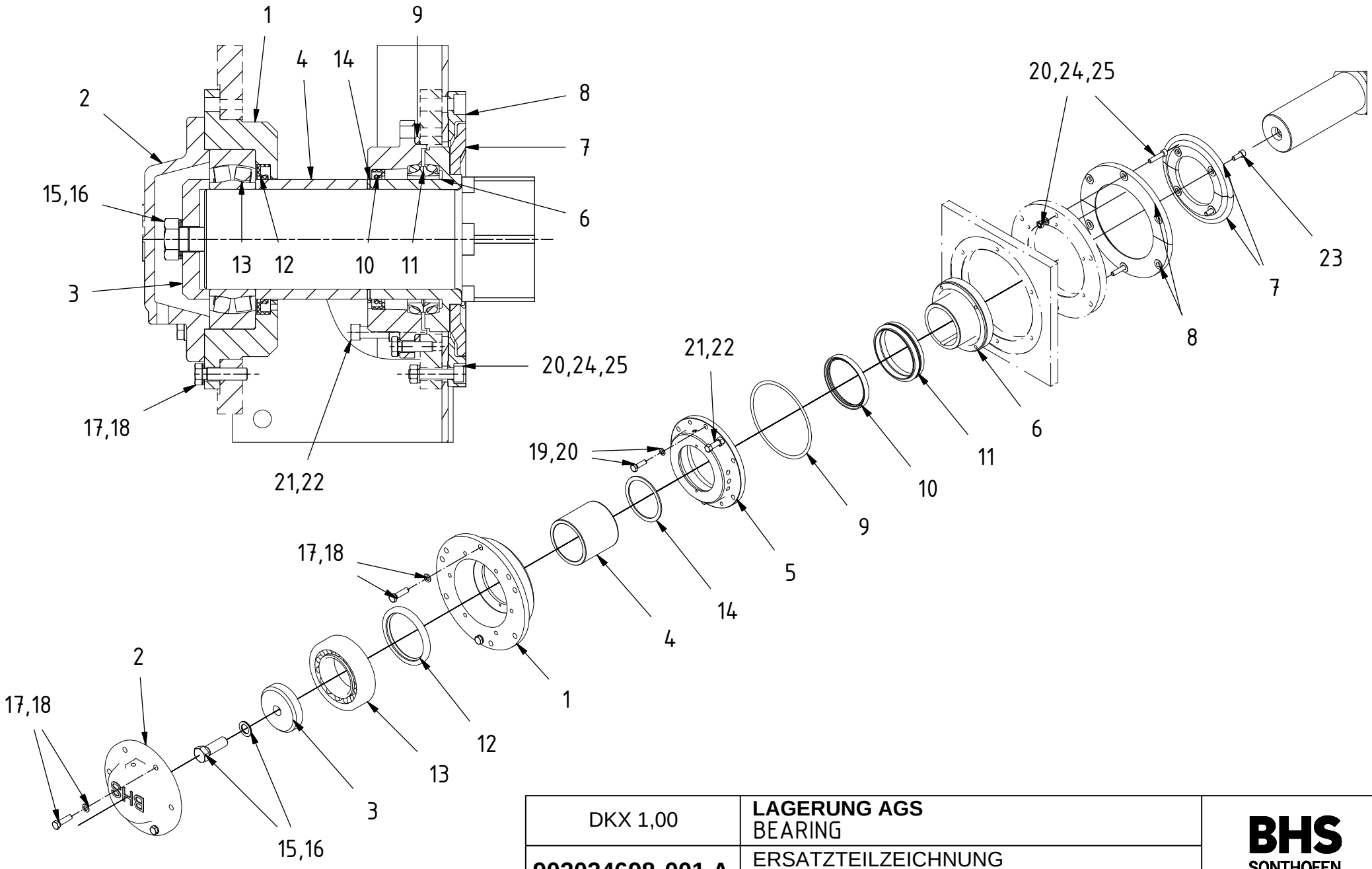
BHS
SONTHOFEN

Material / Material **902024698**
Description / Beschreibung **BEARING**
LAGERUNG AGS

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	100016500	bearing box LAGERKOERPER	1,000	ST
2	100016800	BEARING COVER LAGERDECKEL AUSSEN	1,000	ST
3	100016700	END DISK SCHLUSSCHEIBE	1,000	ST
4	101132300	DISTANCE SLEEVE DISTANZBUCHSE	1,000	ST
5	101115100	RETAINING RING AUFNAHMERING	1,000	ST
6	100016300	SHAFT BUSH WELLENBUCHSE	1,000	ST
7	100262200	DUST COVER STAUBDECKEL	2,000	ST
8	100262100	WEARING RING SCHLEISSRING	2,000	ST
9	101050900	SEALING RING DICHTUNGSRING	1,000	ST
10	910682400	SHAFT SEALING RING WELLENDICHTRING TRC001200	1,000	ST
11	504301000	AXIAL FACE SEAL GLEITRINGDICHTUNG	1,000	ST
12	507078100	SHAFT SEALING RING WELLENDICHTRING	1,000	ST
13	506771400	SELF-ALIGNING ROLLER BRG. PENDELROLLENLAGER	1,000	ST
14	504305700	LAMINUM ADJUSTING RING LAMINUM-PASSRING	1,000	ST

Material / Material **902024698**
Description / Beschreibung **BEARING**
LAGERUNG AGS

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
15	500142700	HEXAGON BOLT 6KT-SCHRAUBE	1,000	ST
16	503346400	LOCK WASHER SICHERUNGSSCHEIBE NORDLOCK	1,000	ST
17	500133600	HEXAGON BOLT 6KT-SCHRAUBE	12,000	ST
18	503361200	SPRING RING FEDERRING	12,000	ST
19	500130600	HEXAGON BOLT 6KT-SCHRAUBE	6,000	ST
20	503361000	SPRING RING FEDERRING	12,000	ST
21	500223000	HEX.BOLT FULL DOG POINT 6KT-SCHRAUBE MIT ZAPFEN	4,000	ST
22	503041200	HEXAGON NUT 6KT-MUTTER	4,000	ST
23	500505700	CYLINDER HEAD SCREW ZYLINDERSCHRAUBE	4,000	ST
24	500506100	CYLINDER HEAD SCREW ZYLINDERSCHRAUBE	6,000	ST
25	503041000	HEXAGON NUT 6KT-MUTTER	6,000	ST

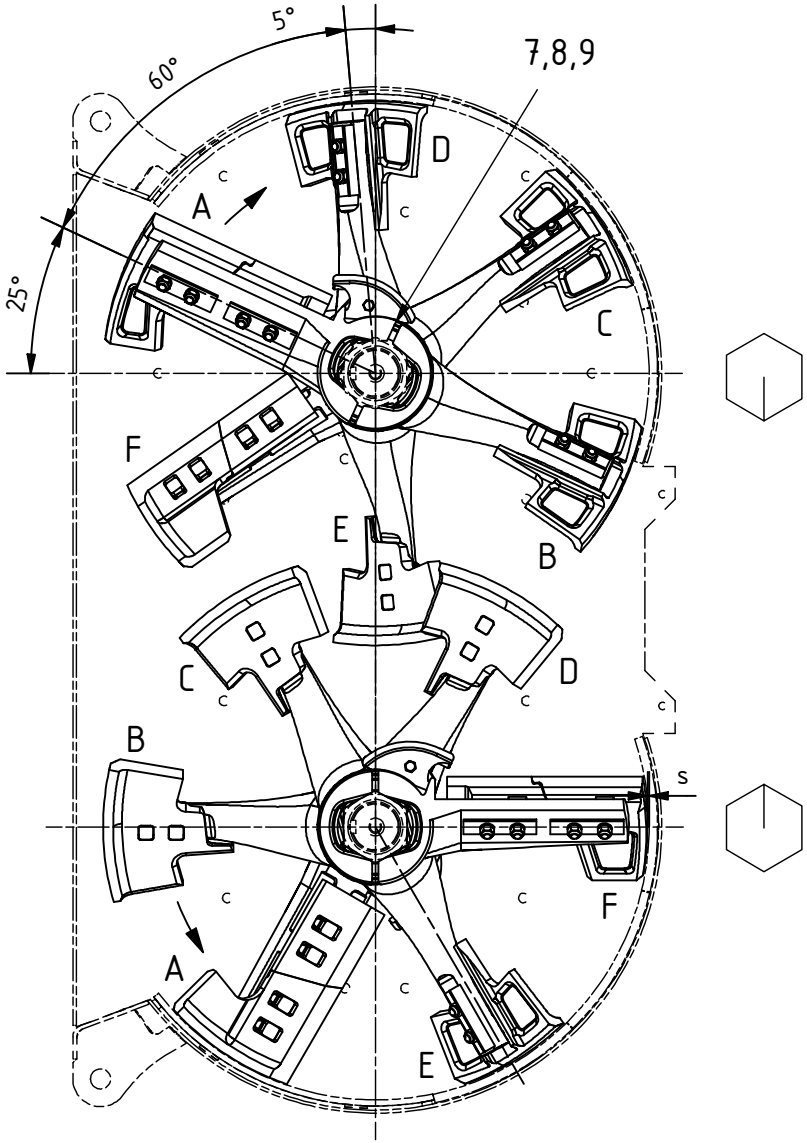


DKX 1,00	**LAGERUNG AGS** BEARING
902024698 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

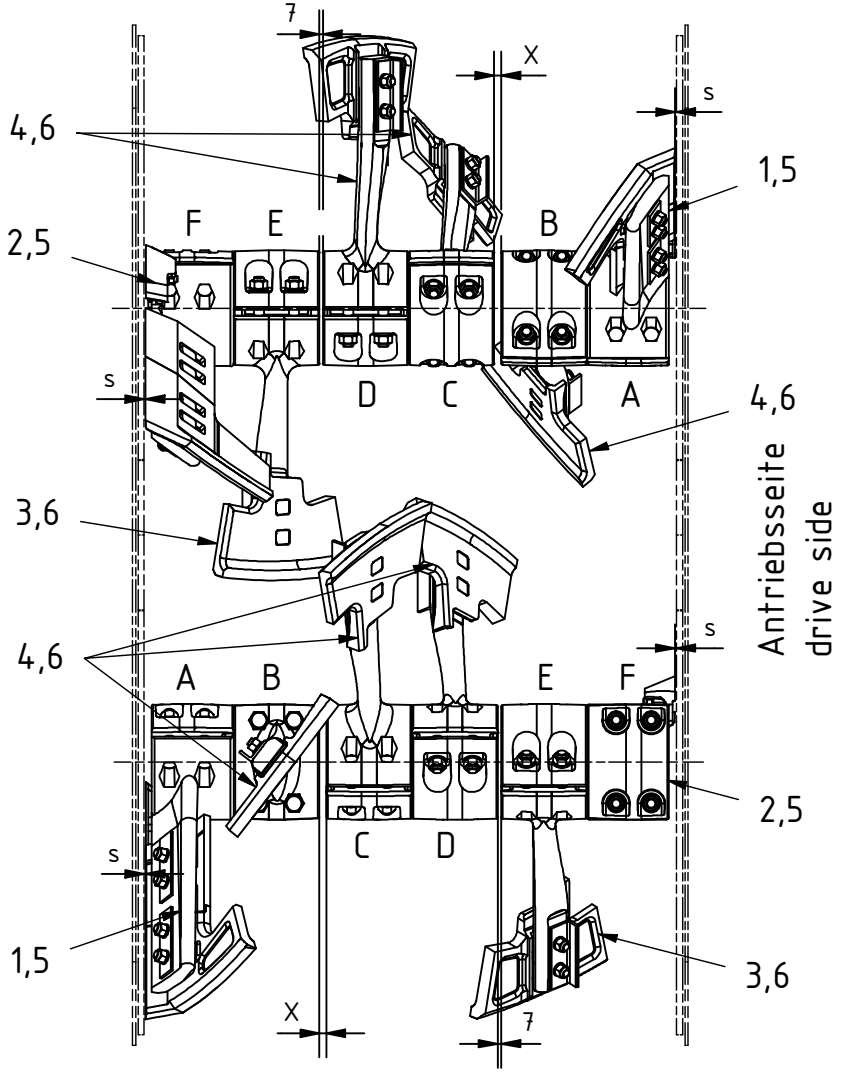
BHS
SONTHOFEN

Material / Material **200045384**
Description / Beschreibung **MIXING TOOLS**
MISCHWERK

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200005614	LATERAL ARM SEITENARM RE KPL	2,000	ST
2	200005615	LATERAL ARM SEITENARM LI KPL	2,000	ST
3	200014427	CENTRAL ARM MITTELARM LI KPL	2,000	ST
4	200005663	CENTRAL ARM MITTELARM KPL	6,000	ST
5	100355300	COUNTERPART FOR LATERAL ARM GEGENSTUECK FÜR SEITENARM	4,000	ST
6	200005777	COUNTERPART FOR CENTRAL ARM GEGENSTUECK FÜR MITTELARM	8,000	ST
7	500032200	HEXAGON BOLT 6KT-SCHRAUBE	48,000	ST
8	503042000	HEXAGON NUT 6KT-MUTTER	48,000	ST
9	503435600	SPHERICAL DISK KUGELSCHEIBE	48,000	ST



Markierungen auf der antriebsseitigen Mischwellen-Stirnseite
zur Einstellung des Mischwerks (Kerbe zeigt zur Mitte)
Marks on drive end mixing shaft face to adjust the mixing
tools (notch points to the centre)



Maß s = min 1 mm an der engsten Stelle
dimensions s = min 1 mm at narrowest point

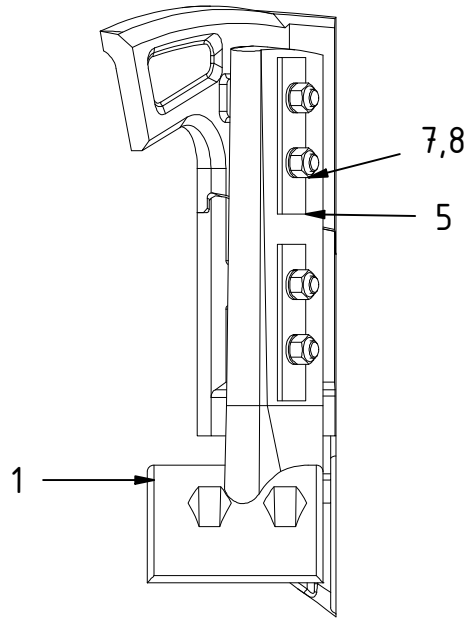
Stirnwandauskleidung: lining of front walls:	Blech metal plate	Gußkacheln cast tiles
Maß X dimension X	14mm	11mm

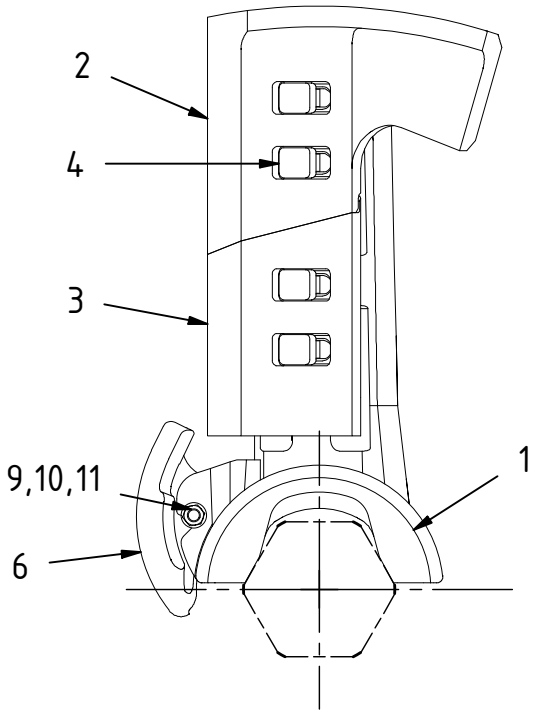
200045384

	MIXING TOOLS	
200045384	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	BHS SONTHOFEN

Material / Material **200005614**
Description / Beschreibung **LATERAL ARM**
SEITENARM RE KPL

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200005683	LATERAL ARM RIGHT SEITENARM RECHTS	1,000	ST
2	200005684	LATERAL BLADE SEITENSCHAUFEL RECHTS	1,000	ST
3	200005685	LATERAL PLATE SEITENPLATTE RECHTS	1,000	ST
4	200005682	MIXING BLADE SCREW MISCHSCHAUFELSCHRAUBE	4,000	ST
5	200005718	SHIM UNTERLAGE	2,000	ST
6	100352900	ARM PROTECTION RIGHT ARMSCHUTZ RECHTS	1,000	ST
7	503041600	HEXAGON NUT 6KT-MUTTER	4,000	ST
8	503361600	SPRING RING FEDERRING	4,000	ST
9	500133700	HEXAGON BOLT 6KT-SCHRAUBE	1,000	ST
10	503351200	DISK SCHEIBE	1,000	ST
11	503041200	HEXAGON NUT 6KT-MUTTER	1,000	ST



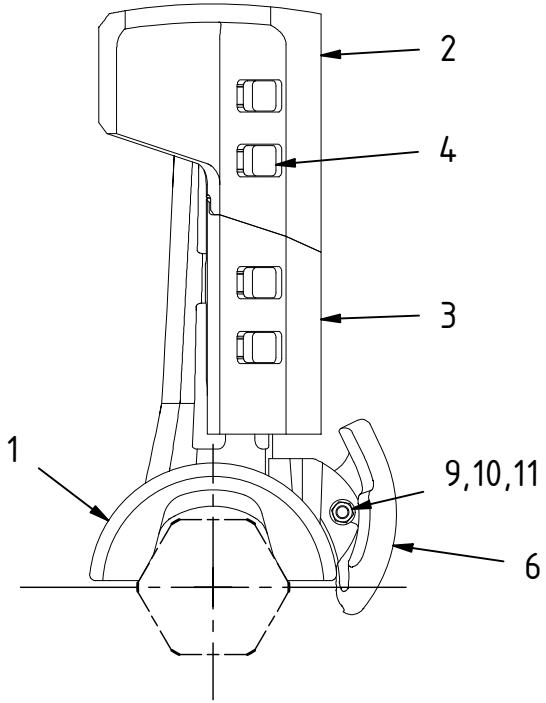


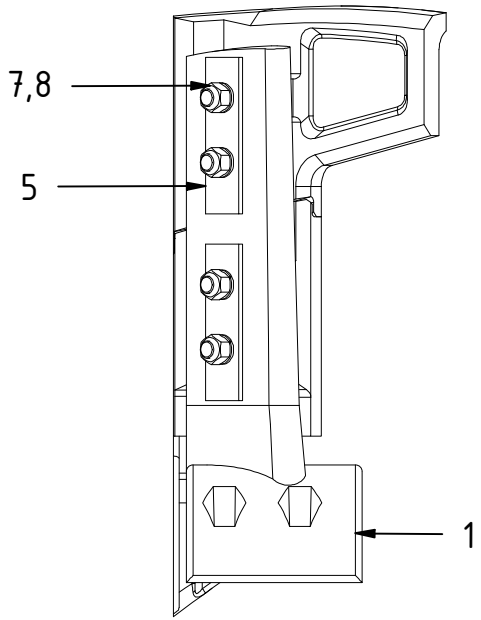
	LATERAL ARM
200005614	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN

Material / Material **200005615**
Description / Beschreibung **LATERAL ARM**
SEITENARM LI KPL

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200005731	LATERAL ARM LEFT SEITENARM LINKS	1,000	ST
2	200005732	LATERAL BLADE LEFT SEITENSCHAUFEL LINKS	1,000	ST
3	200005733	LATERAL PLATE SEITENPLATTE LINKS	1,000	ST
4	200005682	MIXING BLADE SCREW MISCHSCHAUFELSCHRAUBE	4,000	ST
5	200005718	SHIM UNTERLAGE	2,000	ST
6	100260800	ARM PROTECTION LEFT ARMSCHUTZ LINKS	1,000	ST
7	503041600	HEXAGON NUT 6KT-MUTTER	4,000	ST
8	503361600	SPRING RING FEDERRING	4,000	ST
9	500133700	HEXAGON BOLT 6KT-SCHRAUBE	1,000	ST
10	503351200	DISK SCHEIBE	1,000	ST
11	503041200	HEXAGON NUT 6KT-MUTTER	1,000	ST



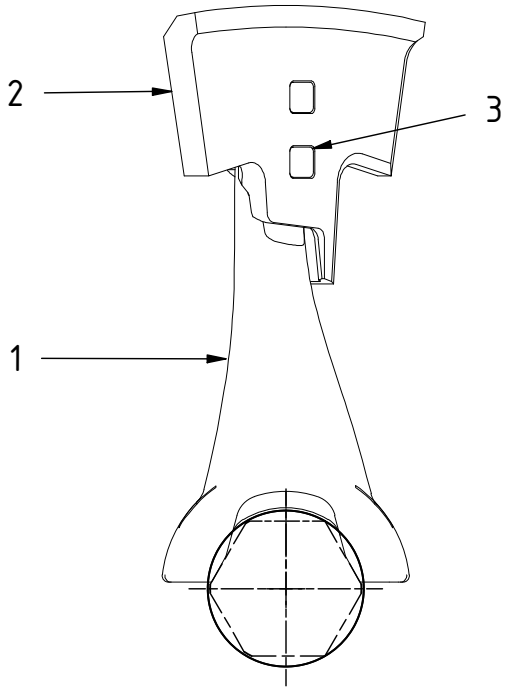


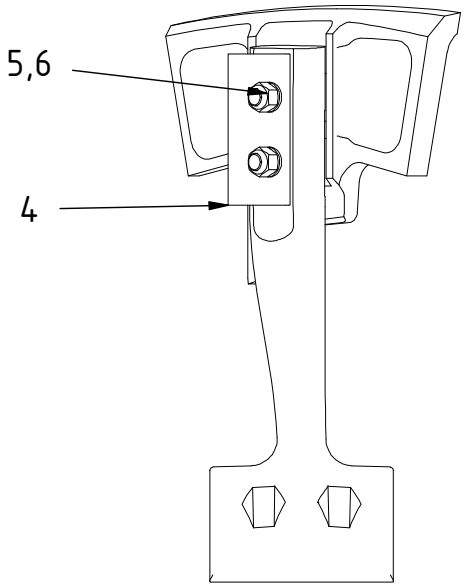
	LATERAL ARM
200005615	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN

Material / Material	**200014427**
Description / Beschreibung	**CENTRAL ARM** **MITTELARM LI KPL**

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200014426	CENTRAL ARM MITTELARM LINKS	1,000	ST
2	200014324	CENTRAL BLADE MITTELSCHAUFEL LINKS	1,000	ST
3	200005682	MIXING BLADE SCREW MISCHSCHAUFELSCHRAUBE	2,000	ST
4	100179000	WEAR PROTECTION VERSCHLEISSCHUTZ	1,000	ST
5	503041600	HEXAGON NUT 6KT-MUTTER	2,000	ST
6	503361600	SPRING RING FEDERRING	2,000	ST



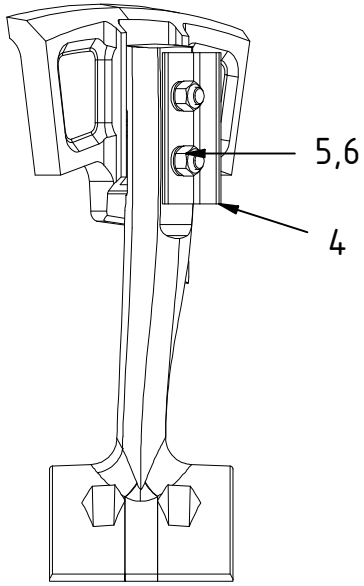


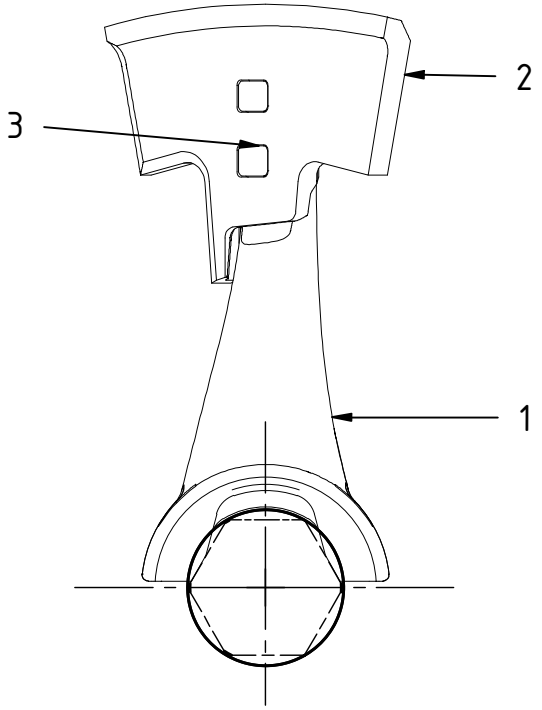
	CENTRAL ARM
200014427	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN

Material / Material	**200005663**
Description / Beschreibung	**CENTRAL ARM** **MITTELARM KPL**

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	200005664	CENTRAL ARM MITTELARM	1,000	ST
2	200005666	CENTRAL BLADE MITTELSCHAUFEL	1,000	ST
3	200005682	MIXING BLADE SCREW MISCHSCHAUFELSCHRAUBE	2,000	ST
4	100179000	WEAR PROTECTION VERSCHLEISSCHUTZ	1,000	ST
5	503041600	HEXAGON NUT 6KT-MUTTER	2,000	ST
6	503361600	SPRING RING FEDERRING	2,000	ST



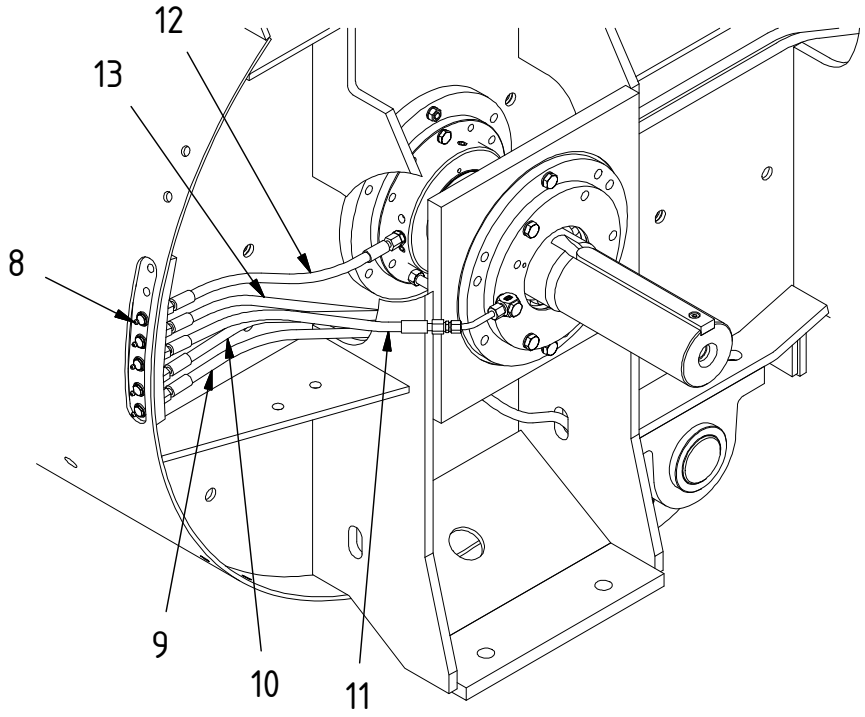


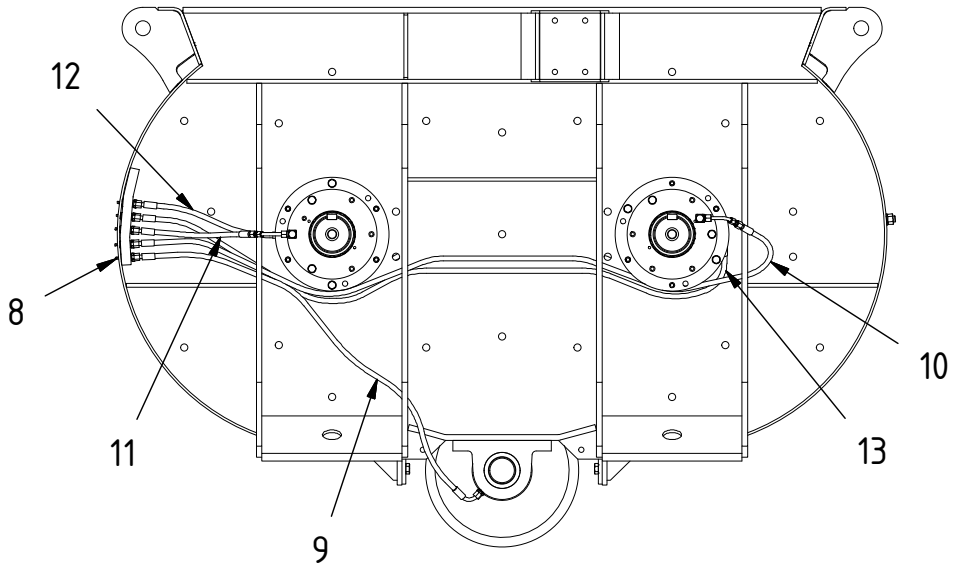
	CENTRAL ARM
200005663	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN

Material / Material **200029780**
Description / Beschreibung **LUBRICATION PIPE**
SCHMIERLEITUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
8	507636500	CONICAL LUBR. HEAD KEGELSCHMIERNIPPEL	5,000	ST
9	910450300	HOSE PIPE SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
10	910692100	HOSE PIPE 1SN-DN 6 A0A0-2070 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
11	910761900	HOSE PIPE 6 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
12	920000906	HOSE PIPE A0A0-450 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
13	920000907	HOSE PIPE A0A3-1850 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST

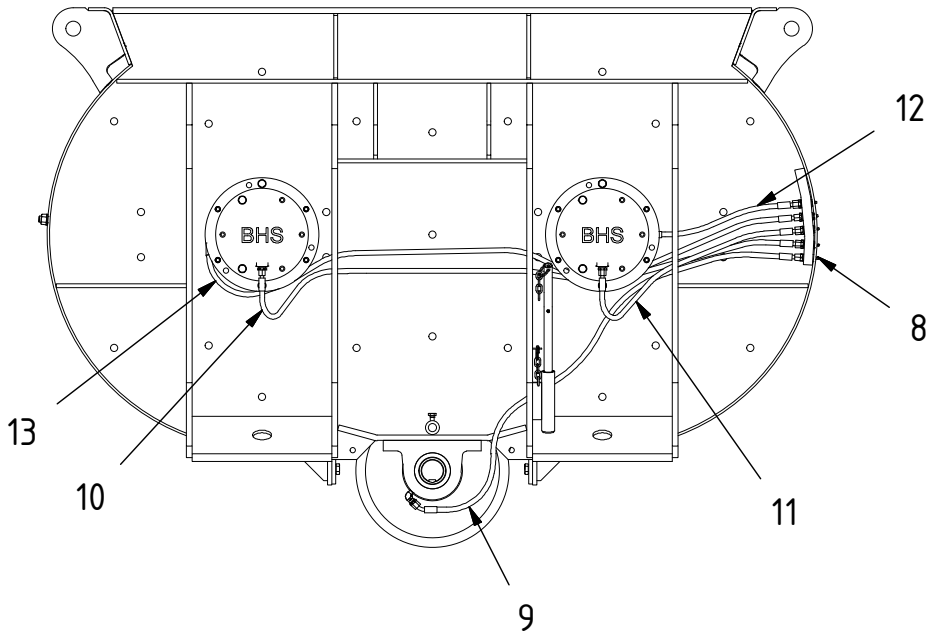


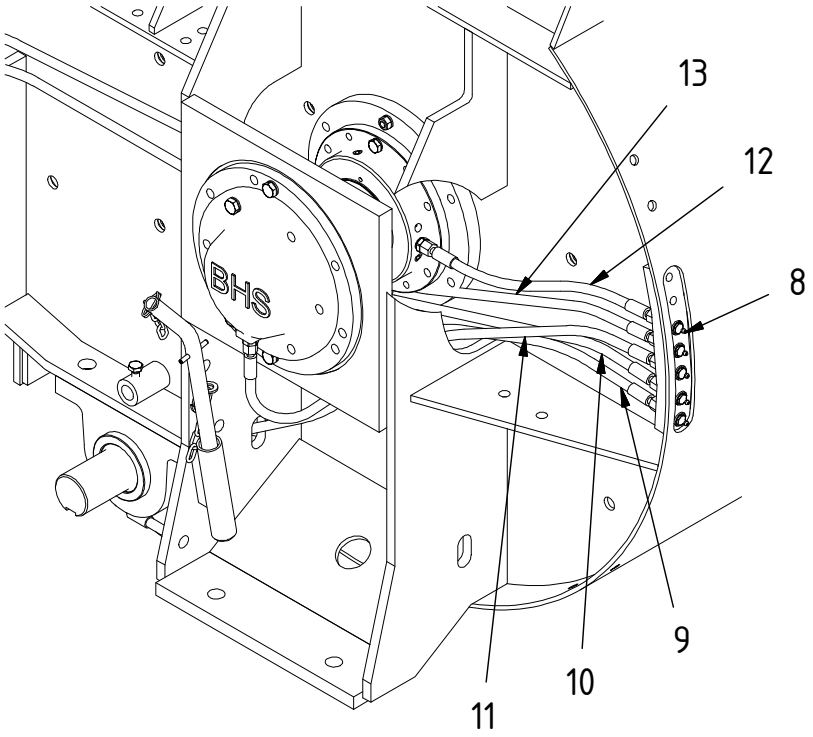


D 1,00-1,67	**SCHMIERLEITUNG AS** LUBRICATION PIPE AS	BHS SONTHOFEN
200029780 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	

Material / Material **200029781**
Description / Beschreibung **LUBRICATION PIPE**
SCHMIERLEITUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
8	507636500	CONICAL LUBR. HEAD KEGELSCHMIERNIPPEL	5,000	ST
9	920001983	HOSE PIPE A0A2-1450 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
10	920001116	HOSE PIPE 1SN-DN 6 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
11	910815200	HOSE PIPE SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
12	920000906	HOSE PIPE A0A0-450 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
13	920000907	HOSE PIPE A0A3-1850 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST



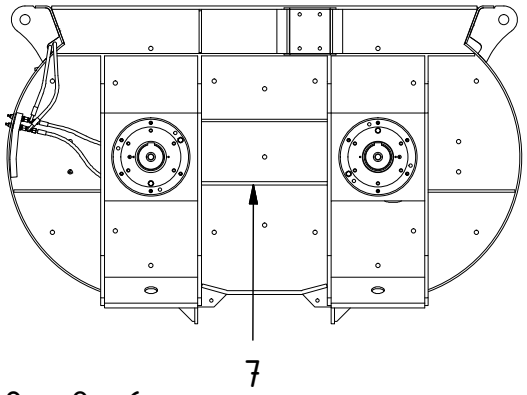


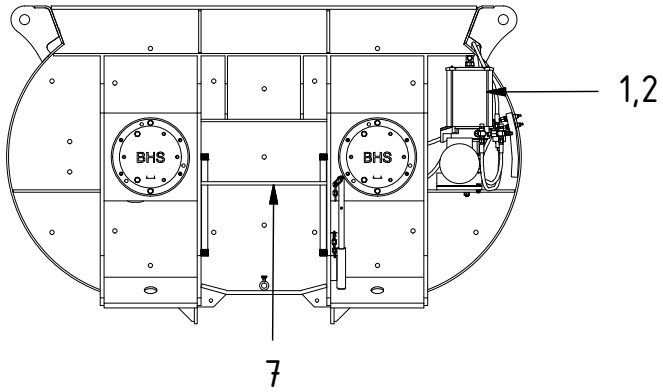
D 1,00-1,67	**SCHMIERLEITUNG AGS** LUBRICATION PIPE AGS	BHS SONTHOFEN
200029781A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	

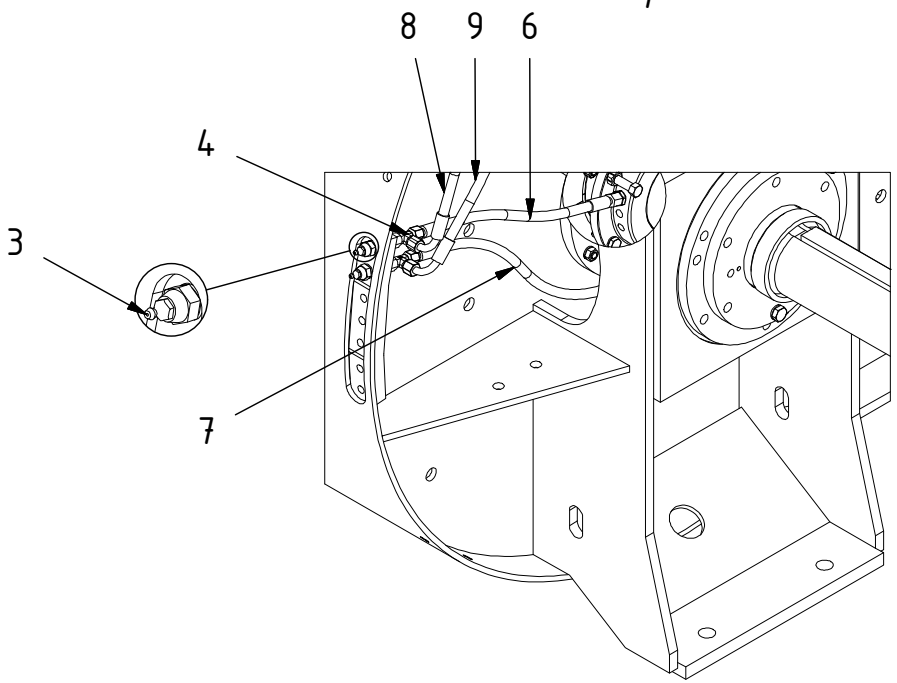
Material / Material **902031700**
Description / Beschreibung **CENTRAL LUBRICATION GREASE**
ZENTRALSCHMIERUNG FETT

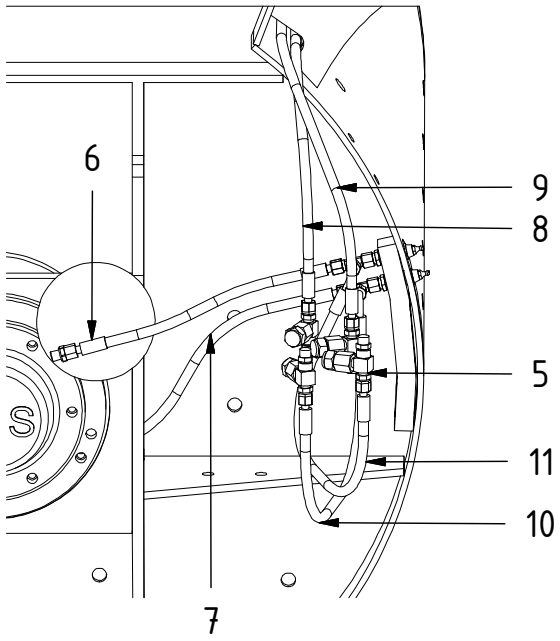
Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	920009599	GREASE PUMP FETTSCHMIERPUMPE	1,000	ST
2	509531000	ANTIFRICT. BEARING GREASE WAELZLAGERFETT K2K	4,000	KG
3	910795000	CONICAL LUBR. HEAD KEGELSCHMIERNIPPEL	4,000	ST
4	920005576	L-SCREW FITTING L-VERSCHRAUBUNG EINSTELLBAR	4,000	ST
5	920010182	PUMP ELEMENT PUMPENELEMENT	4,000	ST
6	920005043	HOSE PIPE 6 SCHLAUCHLEITUNG 1SN-DN 6	2,000	ST
7	920000907	HOSE PIPE A0A3-1850 SCHLAUCHLEITUNG 1SN-DN 6	2,000	ST
8	920003352	HOSE PIPE SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
9	910691900	HOSE PIPE 1SN-DN 6 A0A3-2150 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
10	920005121	HOSE PIPE SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST
11	910507800	HOSE PIPE 6 SCHLAUCHLEITUNG 1SN-DN 6	1,000	ST

Antriebsseite
drive side









D 1,00	**ZENTRALSCHMIERUNG FETT** CENTRAL LUBRICATION GREASE	**BHS** SONTHOFEN
902031700 001 A	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	

Material / Material **902024642**
Description / Beschreibung **DRIVE WITHOUT TURBO**
ANTRIEB O.TURBO

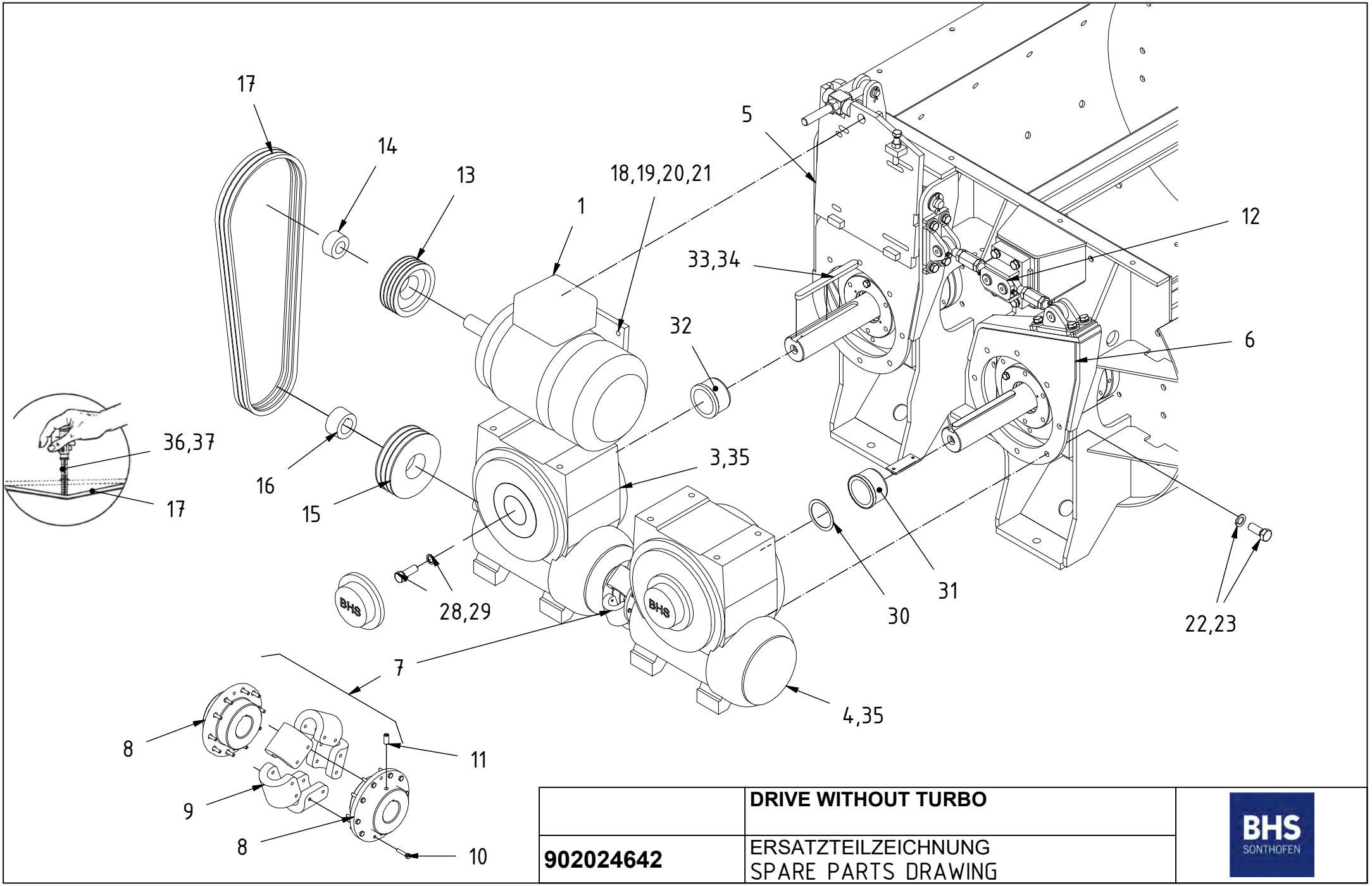
Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	919900000	three-phase motor DREHSTROMMOTOR NR. 1	1,000	ST
3	920009454	WORM GEAR SOG 180 LI SCHNECKENGETRIEBE	1,000	ST
4	920009455	WORM GEAR SOG 180 RE SCHNECKENGETRIEBE	1,000	ST
5	200033795	TORQUE SUPPORT LEFT COMPL DREHMOMENTSTUETZE LI KPL	1,000	ST
6	200033802	TORQUE SUPPORT RIGHT DREHMOMENTSTUETZE RE	1,000	ST
7	200033823	COUPLING MCF KUPPLUNG MCF	1,000	ST
8	200033834	COUPLING HUB KUPPLUNGSNABE	2,000	ST
9	910304800	RUBBER ELEMENT KREUZSTOLLEN	5,000	ST
10	500175200	HEXAGON BOLT 6KT-SCHRAUBE	20,000	ST
11	501645900	THREADED PIN GEWINDESTIFT	2,000	ST
12	902024643	COMPONENTS EINZELTEILE ABSTÜTZUNG	1,000	ST
13	910506700	V-BELT PULLEY TL SPB 236X4 KEILRIEMENSCHEIBE TL	1,000	ST
14	505791100	SPRING COLLET SPANNBUCHSE TAPER-LOCK	1,000	ST
15	505763100	V-BELT PULLEY TL SPB 400X4 KEILRIEMENSCHEIBE TL	1,000	ST

Material / Material **902024642**
Description / Beschreibung **DRIVE WITHOUT TURBO**
ANTRIEB O.TURBO

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
16	505794000	SPRING COLLET SPANNBUCHSE TAPER-LOCK	1,000	ST
17	505734000	V-BELT SPB2650 KEILRIEMEN	3,000	ST
18	500029500	HEXAGON BOLT 6KT-SCHRAUBE	4,000	ST
19	503041600	HEXAGON NUT 6KT-MUTTER	4,000	ST
20	503351600	DISK SCHEIBE	8,000	ST
21	503361600	SPRING RING FEDERRING	4,000	ST
22	500136200	HEXAGON BOLT M16X 40 6KT-SCHRAUBE	16,000	ST
23	503346000	LOCK WASHER SICHERUNGSSCHEIBE NORDLOCK	16,000	ST
28	500032000	HEXAGON BOLT 6KT-SCHRAUBE	2,000	ST
29	503346200	LOCK WASHER SICHERUNGSSCHEIBE NORDLOCK	2,000	ST
30	504305700	LAMINUM ADJUSTING RING LAMINUM-PASSRING	1,000	ST
31	200006091	DISTANCE SLEEVE DISTANZBUCHSE	1,000	ST
32	200006090	DISTANCE SLEEVE DISTANZBUCHSE	1,000	ST
33	200033886	FEATHER KEY PASSFEDER	2,000	ST

Material / Material **902024642**
Description / Beschreibung **DRIVE WITHOUT TURBO**
ANTRIEB O.TURBO

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
34	500571700	CHEESE HEAD SCREW ZYLINDERSCHRAUBE	2,000	ST
35	509507300	LUBRICATING OIL SYNTHETIC VG460 SCHMIEROEL SYNTHETISCH VG460	18,000	L
36	920001545	MEASURING INSTRUMENT MESSGERAET KEILRIEMENSPANNUNG	1,000	ST
37	910669400	MEASURING INSTRUMENT MESSGERAET KEILRIEMEN-SPANN.PRUEFER	1,000	ST



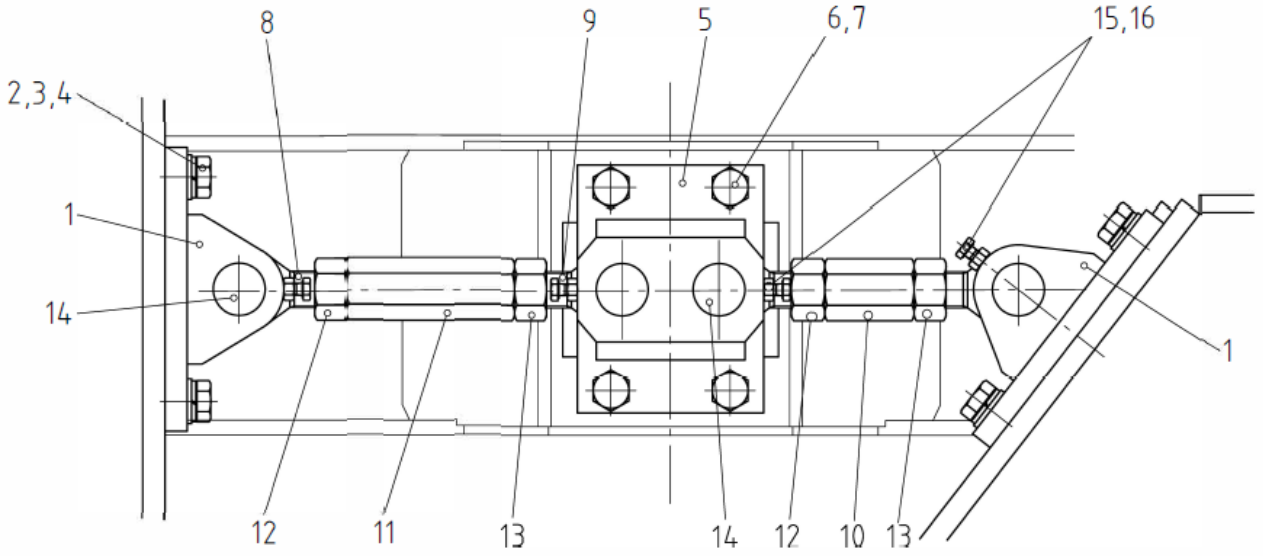
	DRIVE WITHOUT TURBO	
902024642	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	BHS SONTHOFEN

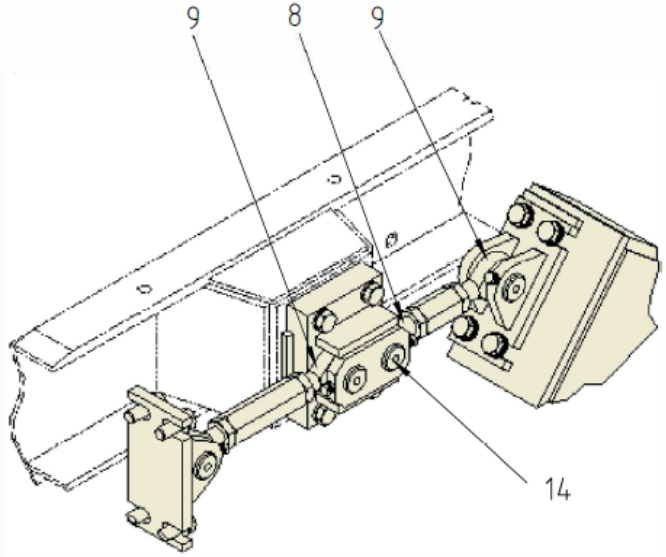
Material / Material **902024643**
Description / Beschreibung **COMPONENTS**
EINZELTEILE ABSTÜTZUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	100615000	BEARING BLOCK ABSTUETZBOCK	2,000	ST
2	500136200	HEXAGON BOLT M16X 40 6KT-SCHRAUBE	8,000	ST
3	503351600	DISK SCHEIBE	8,000	ST
4	503361600	SPRING RING FEDERRING	8,000	ST
5	100614900	TRESTLE BOCK	1,000	ST
6	500136600	HEXAGON BOLT 6KT-SCHRAUBE	4,000	ST
7	503361600	SPRING RING FEDERRING	4,000	ST
8	910211000	JOINT HEAD GELENKKOPF ASKUBAL	2,000	ST
9	910210900	JOINT HEAD GELENKKOPF ASKUBAL	2,000	ST
10	100360300	TURNBUCKLE SPANNSCHLOSS	1,000	ST
11	200033868	TURNBUCKLE SPANNSCHLOSS	1,000	ST
12	910210800	HEXAGON NUT FLAT 6KT-MUTTER FLACH	2,000	ST
13	910210700	HEXAGON NUT FLAT 6KT-MUTTER FLACH	2,000	ST
14	100616000	BOLT BOLZEN	4,000	ST

Material / Material **902024643**
Description / Beschreibung **COMPONENTS**
EINZELTEILE ABSTÜTZUNG

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
15	500177500	HEXAGON BOLT 6KT-SCHRAUBE	4,000	ST
16	503020800	HEXAGON NUT 6KT-MUTTER	4,000	ST

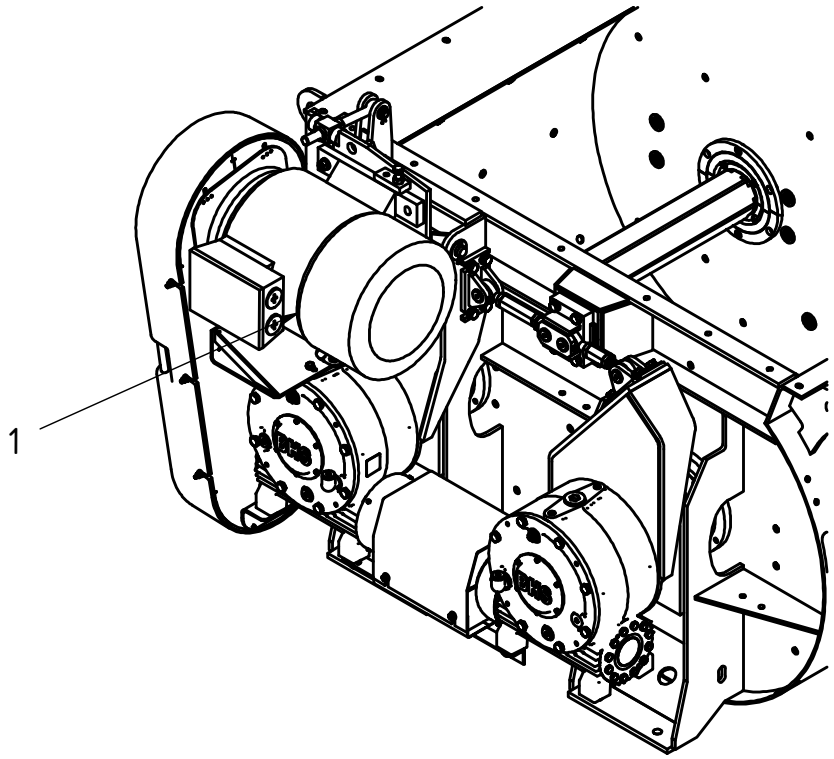




	COMPONENTS	
902024643	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING	BHS SONTHOFEN

Material / Material **200050964**
Description / Beschreibung **EQUIPMENT DRIVE 1X30KW**
AUSRUESTUNG ANTRIEB 1X30KW

Mark Pos.	Item Code Artikelnummer	Description Beschreibung	Quantity Menge	QU ME
1	920011508	THREE-PHASE MOTOR 30KW ABB~M3BP DREHSTROMMOTOR 30KW	1,000	ST



	EQUIPMENT DRIVE 1X30KW
200050964	ERSATZTEILZEICHNUNG SPARE PARTS DRAWING

BHS SONTHOFEN