Off-line cooler
BNK ATEX-2GD

Installation and Operation Instructions

Original instructions
Read this instruction carefully prior to installation and/or use. Pay attention particularly to all advises and safety instructions to prevent injuries. Bühler Technologies can not be held responsible for misusing the product or unreliable function due to unauthorised modifications.

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1 Introduction

1.1 Intended Use
The Oil/air bypass flow coolers are used as cooling fans to cool and convey oils in hydraulic- and lubricant circuits. Their scope is indicated by their specifications. Various combinations of the equipment can be marketed.

The coolers are solely intended for proper and designated use in systems for industrial purposes and typical industrial atmospheres (without aggressive substances). They may only be used in accordance with the technical documentation and the specifications on the type plate. Any other applications require the prior approval of Bühler Technologies GmbH.

Non-compliance will void any and all warranty and manufacturer liability.

1.2 Model key

BNK 4.4-30-0.75kW-ATEX-T4-IBx

Temperature class T4
ATEX mark
Motor power
Pump output per litre
Number of motor contacts
Frame size

If a bypass is desired, the information is added to the to the type designation:

Bypass version
AB (BNK 2-7) external bypass
IBx (BNK 3-7) internal bypass
ITB (BNK 3-7) internal temperature-dependent bypass 2 bar / 45 °C
ATB (BNK 2-7) external temperature-dependent bypass 2 bar / 45 °C
x bypass value 2 bar, 5 bar, 8 bar

1.3 Type plate

Example:

Manufacturer including address
II 2G Ex h IIC T4 Gb
230/400V 50Hz / 276/480V 60Hz
-15°C ≤ Ta ≤ 40°C
Ref: 13 ATEX 0010 X
Year: 2016

1.4 Scope of delivery

Off-Line Oil/Air Cooler
Oil-air coolers consist of the following key sub-assemblies:
- Electric drive motor (with separate ATEX approval).
- An anti-static fan connected to the motor through a positive-fit connection, with the air intake side closed by a fan guard (IP20).
- An aluminium cooling matrix for the fluid circuit mounted directly to the air outlet side of the fan.
- An additional gerotor fluid pump mounted to the other shaft end on the motor.

Documentation
- BLK ATEX Operating Instructions
2 Safety instructions

2.1 Important notices

Before installing the equipment, verify the application parameters for your cooler meet the specifications and the approved ambient parameters. Further check if all contents are complete. Please also note the motor instructions in the appendix.

This unit may only be used if:

- The product is being used under the conditions described in the operating- and system instructions, used according to the nameplate and for applications for which it is intended. Any unauthorized modifications of the device will void the warranty provided by Bühler Technologies GmbH,
- The specifications and markings in the type plate are observed,
- The threshold values in the data sheet and the instructions are observed,
- Monitoring equipment / protection devices are connected correctly,
- Service and repair work not described in these instructions are performed by Bühler Technologies GmbH,
- Genuine spare parts are used,
- All special requirements in the enclosed type examination certificate are observed.

Erecting electrical systems in explosive areas requires compliance with regulations EN 60079-14 and EN 60079-17.

Additional national regulations pertaining to initial operation, operation, maintenance, repairs and disposal must be observed.

These operating instructions including the instructions for add-on parts (e.g. motor) are a part of the entire equipment. The manufacturer reserves the right to change performance-, specification- or technical data without prior notice. Please keep these instructions for future reference.

Signal words for warnings

**DANGER**
Signal word for an imminent danger with high risk, resulting in severe injuries or death if not avoided.

**WARNING**
Signal word for a hazardous situation with medium risk, possibly resulting in severe injuries or death if not avoided.

**CAUTION**
Signal word for a hazardous situation with low risk, resulting in damaged to the device or the property or minor or medium injuries if not avoided.

**NOTICE**
Signal word for important information to the product.

Warning signs

In this manual, the following warning signs are used:

- **Warning against hazardous situations**
- **Warning against high pressure**
- **Warning against electrical voltage**
- **Warning against potentially explosive atmospheres**
- **Warning against hot surface**
- **General notice**
- **Warning against environmental hazard**
- **Disconnect from mains**
- **Warning against rotating parts**
- **Wear protection gloves**
General explosion prevention information:

The equipment complies with the applicable standards and regulations and meet the requirements of directive 2014/34/EU.

Depending on the designation, the equipment may be used as follows:

a) In zone 1 (Gas-Ex, Category 2G) in explosion groups IIA, IIB and IIC (hydrogen only)
b) In zone 21 (Dust-Ex, Category 2D) in explosion groups IIIA (lint) and IIIB (non-conducting dusts)
c) In zone 2 (Gas-Ex, Category 3G) in explosion groups IIA, IIB and IIC (hydrogen only)
d) In zone 22 (Dust-Ex, Category 3D) in explosion groups IIIA (lint) and IIIB (non-conductive dusts)

The surface temperature qualification is T4. The equipment has no ignition sources for any gasses, vapours and mists with an ignition temperature > 135 °C. When using this equipment in T3 the limit temperature is > 200 °C. The equipment may therefore only be operated in atmospheres where the ignition temperatures are not lower than these values. Installing add-on parts beyond the as-delivered condition may cause a rise in temperature. Be sure these do not exceed the temperature class marking.

Dust environment requirements

The cooler may only be used in areas with an explosive dust atmosphere if the glow temperatures of the dust layers and the ignition temperatures of the dust atmosphere are higher than the following temperatures:

<table>
<thead>
<tr>
<th>Glow temperature (5 mm dust layer)</th>
<th>Version T 125 °C</th>
<th>Version T 150 °C</th>
</tr>
</thead>
<tbody>
<tr>
<td>≥ 200 °C</td>
<td>≥ 225 °C</td>
<td></td>
</tr>
<tr>
<td>Dust atmosphere ignition temperature</td>
<td>≥ 188 °C</td>
<td>≥ 225 °C</td>
</tr>
</tbody>
</table>

Always note the explosion prevention mark in the type plate of your equipment (and all add-on parts).

Operating fluid requirements

In temperature class T4 or T125 °C only convey fluids with a flash point ≥ 175 °C through the cooler.
In temperature class T3 or T150 °C only convey fluids with a flash point ≥ 200 °C through the cooler.

ATEX marking on standard equipment

The ATEX mark depends on the version of the equipment and provides information on equipment category, equipment group, ex-atmosphere, ignition protection type. Please refer to the chart below for possible and complete markings.

<table>
<thead>
<tr>
<th>Version for</th>
<th>Marking</th>
<th>Explanation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gas</td>
<td>II 2G Ex h IIC T4 Gb</td>
<td>Zone 1, 2 (IIC hydrogen only) Temperature class T4</td>
</tr>
<tr>
<td>Gas</td>
<td>II 2G Ex h IIC T3 Gb</td>
<td>Zone 1, 2 (IIC hydrogen only) Temperature class T3</td>
</tr>
<tr>
<td>Dust</td>
<td>II 2D Ex h IIIB T125 °C Db</td>
<td>Zone 21, 22 max. surface temperature 125 °C</td>
</tr>
<tr>
<td>Dust</td>
<td>II 2D Ex h IIIB T150 °C Db</td>
<td>Zone 21, 22 max. surface temperature 150 °C</td>
</tr>
</tbody>
</table>

Gas and dust atmosphere must not be present at the same time.

Vibrations: The fan units of Bühler oil/air coolers are precisely balanced and subjected to vibration testing per EN 14986. During use, however, external vibration or (in the event of a malfunction) vibration produced by the cooler itself could result in premature damage to the motor bearings. This can result in high, incendive temperatures or sparks on the motor bearings.
The equipment must be installed on a solid and vibration-free surface. Select an installation site so vibrations and resonances will not have a negative impact.

Please pay attention to any turbulent operation and unusual noise in all equipment. These can indicate damage to the motor bearings. The equipment must then immediately be put out of operation and replaced by Bühler. Please refer to the Service schedule for inspection intervals.
Devices in category 2D (use in zone 21) require regular vibration testing per EN 14986. The following limits (effective or peak values) must be observed for bearing housing vibration:

<table>
<thead>
<tr>
<th>State</th>
<th>Peak value mm/s</th>
<th>Effective value mm/s</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start-Up</td>
<td>8.8</td>
<td>6.3</td>
</tr>
<tr>
<td>Alarm</td>
<td>16.5</td>
<td>11.8</td>
</tr>
<tr>
<td>Shutdown</td>
<td>17.8</td>
<td>12.5</td>
</tr>
</tbody>
</table>

When exceeding these limits the cooler must immediately be removed from service. Replacement of the motor bearings and/or fan unit must be performed by Bühler.

The precise test interval should be adapted according to the vibration history to be documented by the user. In the even the vibration values deteriorate (nearing the limits) the test interval must generally be reduced.

2.2 General hazard warnings

The equipment must be installed by a professional familiar with the safety requirements and risks.

Be sure to observe the safety regulations and generally applicable rules of technology relevant for the installation site. Prevent malfunctions and avoid personal injuries and property damage.

The operator of the system must ensure:
- Safety notices and operating instructions are available and observed,
- The respective national accident prevention regulations are observed,
- The permissible data and operational conditions are maintained,
- Safety guards are used and mandatory maintenance is performed,
- Legal regulations are observed during disposal,
- compliance with national installation regulations.

Maintenance, Repair

Please note during maintenance and repairs:
- Repairs to the unit must be performed by Bühler authorised personnel.
- Only perform conversion-, maintenance or installation work described in these operating and installation instructions.
- Always use genuine spare parts.

Always observe the applicable safety and operating regulations in the respective country of use when performing any type of maintenance.

DANGER

Electrical voltage

Electrocution hazard.

a) Disconnect the device from power supply.
b) Make sure that the equipment cannot be reconnected to mains unintentionally.
c) The device must be opened by trained staff only.
d) Regard correct mains voltage.

DANGER

Electrostatic propagating brush discharge

Propagating brush discharges are strong sources of ignition with a high energy content. The unit must not be used in processes generating high loads.

DANGER

Explosion hazard when exceeding the flash point of the fluid

The fluid may ignite when exceeding the flash point. In temperature class T4 or T125 °C only convey fluids with a flash point ≥ 175 °C through the cooler. In temperature class T3 or T150 °C only convey fluids with a flash point ≥ 200 °C through the cooler.
Explosion hazard due to high bearing temperatures from vibration

Strong vibration can result in premature damage to the motor bearings, thus incendive bearing temperatures and sparks.

Category 2D (use in zone 21) units must regularly be vibration tested per EN 14986. If limits are exceeded, the units must immediately be removed from service. In addition, motor bearings and/or fan units must be replaced by Bühler.

Explosion hazard due to igniting dust layers

Dust accumulations can raise the equipment temperatures to prohibited levels. Dust layers > 2 mm are prohibited and must therefore be cleaned regularly. When doing so, be sure not to cause dust clouds, which could ignite. Only clean insulating surfaces with a damp cloth.

Hot surface

Depending on the operating parameters and type, the housing temperature may reach up to 100 °C during operation. Allow the unit to cool down before performing maintenance. Wear suitable protective gloves.

High pressure

Hazard of injury due to flung off parts or oil, environmental hazard due to oil.

a) Before starting any maintenance or repair to the oil circuit, make sure that the device is depressurized. This applies to the locking screws as well.

b) Avoid environmental pollution (oil spills) during cleaning or maintenance of the oil circuit.

c) Use drip pans.
3 Transport and storage

The product should only be transported inside the original packaging or a suitable alternative. Ensure secure fastening and mooring.

Units with air coolers have M10 eye bolts at the top of cooler housing for transport. Please note, due to the variety of versions the mounting bracket is not located at the exact centre of gravity and the cooler may swing when hoisted. Never hoist by the M8 threads in the cooling elements!

Only use the engine transport eyes to hoist the engine without add-ons.

Do not use the eye bolts according to DIN 580 in ambient temperatures below -20 °C. The eye bolts could fracture in these temperatures, injuring personnel and/or damage the system.

Do not strain the eye bolts more than 45° in the thread direction.

When not in use, the equipment must be protected from moisture and heat. They must be stored in a covered, dry, dust-free room at room temperature.

---

**WARNING**

**Crushing hazard**

Crushing hazard during equipment transport and set-up.

Use the correct hoisting gear to prevent injuries during hoisting.

Be sure the hoisting gear is free from defects and approved for the weight of the oil/air cooler.

Ensure secure fastening and mooring when transporting.
4 Installation and connection

4.1 Installation site requirements

Be absolutely sure only to install equipment and accessories with EX classifications meeting the prevailing EX zones / categories.

Be absolutely sure to comply with the applicable national erection regulations (e.g. EN 1127-1, EN 60079-14) during installation/assembly.

On principle, a Potential equalisation must be established in the system. Also observe the erection regulations in the country of use (e.g. VDE 0100 Part 540, IEC 364-5 54). Be sure no vagrant currents are conveyed through the coolers (e.g. produced through welding systems or motors in inverter operation). The coolers must not be used in systems with cathodic corrosion protection.

Air cooler

The aggregate must be set up to allow for unobstructed air flow and adequate room for maintenance/repairs. When installed outdoors, be sure to consider the motor protection rating and ensure adequate protection from the weather.

The cooler must be located in such a way that the air flowing through the matrix has free flow on entry and exit. The distance between air intake or air outlet to the nearest surrounding obstacle should be at minimum half the height of the matrix. Free air flow must be provided. If the cooler is to be sited near to working personnel, the effect of hot draught and noise emissions must be taken into account.

If the cooler is installed in closed space, ensure sufficient air circulation. Avoid back flow of warmed air. If necessary, the room must be vented.

Due to lower temperatures with respect to closed rooms, the cooling capacity outside raises, but on the other hand higher start up pressure may result due to higher oil viscosity. In this case, consider a bypass valve and/or a heating.

The rotating fan might lead to static charging. Therefore sensitive equipment like electronics should be kept away from the device.
4.2 Cooler installation

DANGER Explosion hazard due to foreign objects entering (impact sparks)
Foreign objects (e.g. screws, tools) sucked in and/or accelerated by the cooler air flow can generate incendive impact sparks or damage the fan wheel.
Protect the unit from nearby foreign objects entering.

DANGER Explosion hazard if vibration dampers not installed
High equipment vibration can result in bearing failure on the motor and cause incendive temperatures or sparks.
Install the included vibration absorbers prior to initial use.

DANGER Explosion hazard due to:
Failure to observe equipment specifications
Explosion hazard if operated outside the equipment specification.
All coolers may only be operated within the specifications indicated. Please note the type plate and the specifications in these instructions.

Electrostatic discharge
Equipment may only be used where normal operating conditions do not produce frequent flammable, electrostatic discharge.

Cooler airflow
The airflow of the coolers can result in the electrostatic charge of insulating surfaces.
Do not install the fan near insulating surfaces and sensitive devices (e.g. electronics), etc.

Impact
Strong blows to the housing can produce sparks, which can ignite an EX atmosphere.
There further is the risk of excessively temperatures due to grinding contact between the fan wheel and deformed housing parts.
Protect the equipment from external impact. Damaged / deformed housing parts must be replaced immediately.
Ensure a minimum clearance of approx. 1 % of the fan diameter between the housing parts and fan blades.

The coolers are secured to the mounting rails with four screws. Be sure the support structure is sized adequately. Please note the specified torque (see chapter Torque).

Only mount the cooler onto a solid, vibration-free surface. Only mount the cooler in a way that vibrations and resonances will not have a negative impact. Vibrations can result in premature wear or even failure.

Vibration dampers
If the unit includes vibration dampers, these must be installed before putting the unit into service.

Fig. 1: Installing vibration dampers for the mounting rail
Protect against falling objects:

The fan produces strong airflow, thus suction effect in the direction to the fan. Foreign objects (small parts, e.g. screws and nuts or tools) could therefore be sucked into the cooler and/or accelerated in the airflow. Such accelerated foreign objects are able to generate incendive impact sparks or damage the fan wheels. Protect the cooler from foreign objects from the surrounding area entering/being accelerated as described above. Do not place small parts or tools on or near the cooler. If applicable, protect the cooler from falling parts (e.g. with a protective hood).

To protect the cooler and system from damage, the connections to the cooler must be stress free. We recommend using flexible hoses. Be sure the hose is stable against negative pressure, e.g. steel wire reinforced. Avoid leaks in the circuit to prevent environmental damages. If necessary, use an oil pan.

Also note the cooler must not be installed above hot parts, which could ignite leaking fluid / operating liquid. Select an installation site for your cooler so that even in the event of a malfunction (e.g. cooler or line leak) fluid /Operating liquid will not be ignited by nearby hot parts.

4.2.1 Additional advices for units with pump

**DANGER**

Explosion hazard due to particles / solid objects in the fluid

Particles / solid objects inside the fluid to be conveyed can damage and overheat the oil pump. Ensure fluid flowing through the pump is filtered adequately (grade of filtration ≤ 25µm).

**DANGER**

Explosion hazard due to excessive temperatures

Contamination, ageing or corrosion of fluids can cause excessive oil pump temperatures. The values may then exceed those in the type plate and potentially ignite an explosive atmosphere.

a) Please note the maximum life of the fluids being conveyed.
b) Maintain the prescribed intervals for replacing fluids.

The distance from the unit to the reservoir should be as short as possible. Especially the suction pipe should be short and of sufficient inner diameter.

We suggest mounting the unit in the same height as the liquid level. Mounting below the liquid level is possible as well. If the aggregate can only be installed above this level, the pump will have a constant suction pressure of 0.4 bar (atmosphere). Depending on the oil viscosity and temperature, this will result in a different suction lift. A difference in value of 2 m can be used as a guide.

Until the oil is heated to operating temperature, a suction pressure of 0.6 bar is permissible temporarily.

The diameter of the intake pipe should not be smaller than specified in the data sheet. We recommend a max. flow rate of 1.5 m/s.

When first starting up a hydraulic system with a long intake pipe can cause problems due to excess air in the intake pipe. In this case we suggest filling the suction pipe with oil and using a suction valve without spring.

Oil is sprayed into the pump housing during the assembly process at our factory. This is necessary to seal the gerator from the housing with an oil film. During extended periods of storage the pump housing may not have enough oil anymore to create this oil film when switching on the pump. The pump may then completely lose suction. Before connecting the suction pipe we recommend spraying some oil into the pump housing to prevent this.

The pump may be exposed to max. 0.5 bar of pressure on the suction side.
4.3 Hydraulic connection

Carry out the hydraulic connection as described under Technical Data. Connect the lines stress and vibration free, so typically using hoses. Be sure to use suitable lines (with regard to fluid resistance, environmental influences, fire) when connecting to the hydraulic-, lubricant circuit. Tighten the hose lines with a suitable torque (see chapter Torques).

**With free discharge to the tank, coolers can be used at a viscosity of up to 300 mm$^2$/s.**

Contaminated fluids impact the life of the cooling system, we therefore recommend a purity class of 23/19/13 per ISO 4406.

If your hydraulic system is equipped with control or shut-off valves, we urgently recommend protecting the cooling system with a pressure relief valve. No pressure relief valves are factory installed in the cooler (bypass valve optionally available).

4.4 Electrical connections

**CAUTION**

**Electric voltage**

*An incorrect mains voltage can destroy the unit*

The connection must be made by a trained professional. Observe the mains voltage indicated on the type plate. Make sure the cables have sufficient strain relief.

**Fusing**

Fusing must comply with applicable standards!

**Polarity**

Please note the direction of rotation of the motor when connecting: Fan wheel rotates left (counter-clockwise) viewed from the motor end!

See directional arrow on the decal and pump.

The electrical circuits must be installed in accordance with the applicable erection specifications (by professionals). Electricity is connected via the terminals in the motor housing. Ensure proper installation and maintaining IP protection!

On principle the motor must always be connected under zero potential.

In EX areas, the electric circuits of the motor connection may only be put into operation by professionals with qualifications similar to a qualified person according to TRBS 1203. The specifications on the type plate must absolutely be observed.

Please also note the motor manufacturer’s operating instructions.

**DANGER**

**Potential equalization/static charge**

*Static charges can result in incendive sparking.*

Avoid static charges. Any conductive parts of the cooler must be grounded!

The housing has a connection for an earth/equipotential bonding conductor (see figure "External earthing connector"). Ensure the housing is adequately earthed (minimum conductor cross-section 4 mm$^2$).

Particularly observe the requirements of EN 60079-14!

Use the applicable local regulations to determine the safety values and the cross-sections of connection leads. The motor and, if equipped, starting devices must be connected to protective earth.

Connect the protective earth of the motor to the protective earth on site. Protective earth per DIN VDE 0100 must be connected to the marked earth lead terminal.

**DANGER**

**Motor connection, operation and maintenance**

Improper handling of the motor poses an explosion hazard.

Be sure to observe the separate instructions of the motor manufacturer.
Motor monitoring

Lead fuses protect the cables in case of a short circuit, but are not sufficient to protect the motor coils from overheating/burning due to overload. Therefore, install an adequate motor circuit breaker with high precision range of adjustment for thermal protection to protect the motor against overload and operation with two phases.

Adjust the **motor circuit breaker** according to the nominal current specified on the type plate of the motor. Operation outside the specified mains voltage and frequency range limits is prohibited.

The operator of the equipment is responsible for ensuring lightning protection.

---

**DANGER**

Explosion hazard due to frequency converter operation

The motor could produce incendive leakage currents or potential differences due to frequency converter operation. Frequency converter operation of the motors prohibited!

For thermal overload protection, temperature class T4 motors are equipped with three serial **positive temperature coefficient thermistors (PTCs)**. Each motor coil has a PTC (see figure “Simplified motor diagram”). To ensure thermal overload protection of these motors, the motors must be monitored by a thermistor tripping unit certified for explosive areas (safety, monitoring and control equipment per Directive 2014/34/EU (ATEX)) (thermistor motor protection relay). The PTCs should ideally be operated virtually currentless (**max. current supply 2.5 V DC**). In the event of thermal overload of these motors, the thermistor sensors change to high impedance. The tripping unit must then immediately shut down the motor via relay. The response temperature of the PTCs is approx. 120°C. In this case the PTC impedance rapidly jumps from <100 Ohm (< 300 Ohm for 3 PTC) to > 1000 Ohm (> 3000 Ohm for 3 PTC). Please also observe the related operating manual for the ATEX compliant tripping unit!

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![Centre earth bolt](image)

*Fig. External earthing connector*

*Fig. Simplified motor diagram with 3x PTC*

**Connection**

- Open the motor connection box and install the bridge circuits according to the voltage for the connection in star or delta connection.
- Connect the power supply to U1/V1/W1.
- Close the terminal box.
△ Delta connection - low voltage

![Delta connection diagram]

- Earth connection U1 V1 W1
- Connection
- PTC tripping device (3x PTC series-connected)

△ Star connection - high voltage

![Star connection diagram]

- Earth connection U1 V1 W1
- Connection
- PTC tripping device (3x PTC series-connected)

Change the direction of rotation by switching any two leads.
5 Operation and control

5.1 Before startup

**Before startup, check:**

- The operating instructions for the motor (see appendix) were observed.
- All parts for damage, particularly the cooling elements and protective grating. Do not put a damaged device into operation.
- The warning labels (rotating parts, fan) have been attached to the cooler.
- The connection is correct as described in chapter “Installation and Connection”.
- All valves or other parts which must be open during startup were opened.
- The fan blades do not come into contact with the air guide ring of the fan case.
- The oil viscosity of all coolers with pump is ≤ 300 m²/s
- The cooler is not being operated outside the specifications (observe specification on type plate, in the data sheet, in the operating instructions).
- The EX classification of the equipment (per type plates) is suitable for use in the prevailing explosive area.
- The voltage and frequency on the nameplate match the mains values.
- All connection cables are installed without strain.
- All required protective measures have been taken (e.g. earthing + potential equalisation, motor circuit breaker, thermistor tripping unit, fluid filter.
- All cable glands are sealed properly.
- The hose- and electrical connections are installed correctly and undamaged.
- No parts of the cooler have been removed.
- Compliance with EX regulations (e.g. EN 60079-14).
- The direction of the cooler air stream is correct.
  - On the 2GD version air is pushed through the cooling matrix.
- Natural vibration or external vibration is prevented.
- The cooler is adequately protected from nearby foreign objects entering the unit.
- when used in Zone 21 the proper vibration monitor was mounted and is ready for use.

5.2 During startup

**Explosion hazard due to oil pump dry running**

Dry running the pump causes excessive temperatures or sparks. These can ignite an explosive atmosphere.

Dry running is prohibited during normal operation. Dry running is only permitted briefly (<30s) when starting the pump up and under supervision. Regularly check the pump for oil leaks (see maintenance schedule).

Monitor the fluid level in your hydraulic system.

Monitoring circuits used to ensure excess fluid of the pump must at a minimum meet PL a per EN 13849-1.

First check the polarity of the motor is correct, or that the fan rotates in the correct direction (counter-clockwise viewed from the motor end, directional arrow M on the pump housing).

Particularly note, operating the cooler with a damaged housing is **strictly prohibited**.

**If equipment malfunctions occur, immediately put it out of operation and correct the malfunction (see chapter Troubleshooting).**

**Noise level**

Coolers equipped with a low pressure pump feature very low noise emissions. The noise level exceeding the specified value may be the result of improper cooler installation, particularly the intake pipe. A Bühler Technologies GmbH technical advisor will gladly assist you.
6 Maintenance

**DANGER**

**Explosion hazard due to dust-laden air flow**

Strong, dust-laden air flows can result in abrasion or adhesion to the fan wheel. This can produce an incendive imbalance of the fan wheel.

Category 2D (use in zone 21) units therefore require monthly visible inspection of the fan wheels with respect to geometric changes or adhesion. If necessary, carefully remove adhesion. Damaged fan wheels must immediately be replaced by Bühler. Operation with a damaged or adhesion-laden fan wheel is prohibited.

**DANGER**

**Electrostatic charge (sparking)**

Cleaning housing parts can result in an electrostatic charge of the surfaces. Always clean housing parts with insulating surfaces with a damp cloth.

**DANGER**

**Explosion hazard due to excessive temperatures**

Contamination, ageing or corrosion of fluids can cause excessive oil pump temperatures. The values may then exceed those in the type plate and potentially ignite an explosive atmosphere.

a) Please note the maximum life of the fluids being conveyed.
b) Maintain the prescribed intervals for replacing fluids.

During maintenance, remember:

- The equipment must be maintained by a professional familiar with the safety requirements and risks.
- Only perform maintenance work described in these operating and installation instructions.
- When performing maintenance of any type, observe the respective safety and operation regulations.

The outside of the motors, particularly the cooling ribs and cooling ducts as clean as possible to prevent compromising heat release.

Please note the specified protection against dust and moisture. Pressure cleaning is only permitted if the motor has the respective protection rating.

The motors feature ball bearings sealed on both sides. The grease filling is designed to last for the life of the unit. Greasing is not necessary.

The motor mounts may only be replaced by Bühler or a qualified specialist company.

The coolers must regularly be maintained and cleaned. The intervals (see maintenance schedule) must be determined and adjusted by the operator according to environmental exposure.

Always observe the applicable safety and operating regulations when performing any type of maintenance. Maintenance work must always be performed by personnel with qualifications comparable to a qualified person per the Technical Rules for Operating Safety (TRBS 1203).

Only perform conversion-, maintenance or installation work described in these operating and installation instructions. Any other work on the unit must be performed by personnel authorised by Bühler.

Only perform maintenance and cleaning when there is no explosive atmosphere or outside the explosive area. If this is not possible, equivalent contingency measures (e.g. non-arcing tools) must be taken.

Only use original spare parts suitable for use in EX areas. Particularly ensure following maintenance all components are firmly screwed together again same as at delivery. It’s further important all conductive parts of the cooler are earthed with the earthing bolt on the housing.
6.1 Cooling matrix cleaning and disassembly

**DANGER**

**Electrostatic charge (sparking)**

The cooler matrix must be cleaned outside the explosive area.
All conductive parts of the cooler must be earthed again after cleaning and being reinstalled.

Due to the design of the cooling fins, the cooler has low susceptibility to dust and dirt. Normally, it is sufficient to clean the front surface with a brush. Heavy accumulation of dirt may require the cooler matrix to be cleaned.

Proceed as follows:

- First allow the cooler matrix to cool down. Disconnect the motor from the mains and secure it against accidental restarting.
- Depressurize the system and disconnect the piping to the cooler matrix. Place an oil drip pan below the cooler matrix to collect leaking oil.
- Close all connections with plugs to avoid more oil leaking from the matrix.
- Protect the cooler matrix from falling down.
- After removing the four connecting bolts to the box, the cooling element can be loosened and removed. Model size 6 to 8 have M8 threads for eye bolts for lifting the cooling element.
- Take it to the cleaning site outside the explosive area. Be sure not to crush the fins during transport and manipulation.
- The fins can easily be cleaned with pressurized air. Carefully direct the stream parallel to the fins.
- After cleaning, remount the cooler matrix in reverse order. Be sure the matrix is electrically connected with the earth connection.
- Ensure that the thread connectors are located in the right installation position.

6.2 Cleaning the cooler matrix inside

In the event of deposits in the cooling matrix due to inadequate filtration, you may try to remove these as follows after cleaning the outside:

- Remove the cooler matrix as described in "Cooler matrix cleaning and disassembly".
- Add degreaser and close the cooler matrix.
- After allowing the degreaser to sit for a while, drain and flush the cooler matrix with clean fluid. Dispose of the degreaser and flushing oil as required by law.
- After cleaning, remount the cooler matrix in reverse order.

6.3 Cleaning the fan case and fan

The cooling matrix must be removed from the fan case to clean inside the fan case and the fan wheel.

- First allow the cooler matrix to cool down. Disconnect the motor from the mains and secure it against accidental restarting.
- Depressurize the system and disconnect the piping to the cooler matrix. Place an oil drip pan below the cooler matrix to collect leaking oil.
- Close all connections with plugs to avoid more oil leaking from the matrix.
- Protect the cooler matrix from falling down.
- Disconnect the cooler matrix from the fan case by loosening the four retaining screws. Protect it from damage whilst cleaning. Be sure not to crush the air fins.
- Carefully clean the fan case or the fan wheel respectively using only a damp cloth.
- After cleaning, remount the cooler matrix in reverse order. **Be sure the matrix is electrically connected with the earth connection.**
6.4 Paint touch-up

**DANGER**

Explosion hazard due to repainting

Repainting the housing and motor parts can result in incendiary, electrostatic charges during operation and maintenance.

Repainting the motor is prohibited.

**Repainting**

Repainting the motor is prohibited. Small, unpainted blemishes (< 40 cm²) may only be touched up using commercially available, solvent-based and non-conductive paint. The paint layer must not be thicker than 0.2 mm. When performing repair work, repainting areas with existing paint is prohibited. Larger areas (> 40 cm²) may only be repainted by Bühler using speciality paint.

6.5 Replacing the vibration dampers

The vibration dampers are exposed to strain and must be replaced when damaged, e.g. cracks in the elastomer or mechanical damage. Always replace the vibration dampers in sets.

Replace the vibration dampers as follows:

- First allow the cooler matrix to cool down. Disconnect the motor from the mains and secure it against accidental restarting.
- Depressurize the system and disconnect the piping to the unit. Place an oil drip pan below the cooler matrix to collect leaking oil.
- Close all connections with plugs to avoid more oil leaking from the unit.
- Remove the screws and washers from the vibration damper. Lift the unit with suitable hoisting equipment and place on a solid surface.
- Replace the vibration dampers with genuine spare parts.
- After replacing the vibration dampers, reassemble the unit in reverse order. Make sure the vibration dampers are installed stress-free.
## 6.6 Maintenance schedule

<table>
<thead>
<tr>
<th>Component</th>
<th>Interval</th>
<th>Work to be performed</th>
<th>To be performed by</th>
</tr>
</thead>
<tbody>
<tr>
<td>Motor</td>
<td>See motor operating instructions</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Motor</td>
<td>Every 750 h or monthly*</td>
<td>– Check for turbulent operation</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Acoustic inspection for unusual noise</td>
<td>Customer</td>
</tr>
<tr>
<td>4 screws for the motor flange</td>
<td>After 200 h</td>
<td>Retighten the screws to 6 Nm</td>
<td>Customer</td>
</tr>
<tr>
<td>Fan</td>
<td>Every 4000 h or 6 months*</td>
<td>Visually inspect the clearance $d$ between the fan case and fan blades ($d_{min} = 1%$ of the fan diameter)</td>
<td>Customer</td>
</tr>
<tr>
<td>Oil pump</td>
<td>Every 750 h or monthly*</td>
<td>Check for prohibited heating using suitable measuring devices, and for unusual noise</td>
<td>Customer</td>
</tr>
<tr>
<td>Oil pump</td>
<td>Every 750 h or monthly*</td>
<td>Visually inspect pump for leaks</td>
<td>Customer</td>
</tr>
<tr>
<td>Entire cooler</td>
<td>Every 750 h or monthly*</td>
<td>– Visual inspection for intactness</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Remove dust deposits</td>
<td>Customer</td>
</tr>
<tr>
<td>Entire cooler</td>
<td>Depending on dust load</td>
<td>– Check level of dirt</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Clean cooler and fan case</td>
<td>Customer</td>
</tr>
<tr>
<td>Electrical components</td>
<td>8000 h or annually*</td>
<td>Detailed inspection for intactness and functionality</td>
<td>Customer</td>
</tr>
<tr>
<td>Entire cooler</td>
<td>After 25000 h or 3 years</td>
<td>– Inspection at Bühler</td>
<td>Bühler Technologies service technician</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Replace motor bearings</td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Replace pump bearings (BFP 60 and BFP 90 only)</td>
<td></td>
</tr>
<tr>
<td>Fan blades</td>
<td>Every 750 h or monthly*</td>
<td>– Visual inspection for abrasion or adhesion due to dust particles</td>
<td>Customer</td>
</tr>
<tr>
<td></td>
<td></td>
<td>– Remove adherions, have worn fan blades replaced</td>
<td></td>
</tr>
<tr>
<td>Hose lines</td>
<td>Every 750 h or monthly*</td>
<td>Tighten according to chart in chapter &quot;Torques&quot;</td>
<td>Customer</td>
</tr>
<tr>
<td>Vibration dampers</td>
<td>Every 750 h or monthly*</td>
<td>Visually inspect for intactness</td>
<td>Customer</td>
</tr>
<tr>
<td>Operating fluids</td>
<td>Per manufacturer specifications</td>
<td>Replace or treat per manufacturer specifications</td>
<td>Customer</td>
</tr>
</tbody>
</table>

Maintenance schedule for normal ambient conditions / * whichever occurs first.

### Special measures:

1. Also observe the maintenance notes in the motor instructions.
2. If unusual events occur, e.g. short-circuit, emergency shutdown, period duty or overload cut-off, a visual inspection is required before restarting the unit!
3. When used in zone 2 or zone 22 the monthly monitoring intervals may be doubled.
4. Replacing the motor bearings: The motor bearings must be replaced by Bühler Technologies authorized persons or a motor manufacturer certified shop.
5. The lifetime calculation is based on a typical mixed application at 25 % of the life at full-load operation and 75 % of the life at left-load operation of the motor.
### 7 Service and repair

This chapter contains information on troubleshooting and correction should an error occur during operation. Repairs to the unit must be performed by Bühler authorised personnel. Please contact our Service Department with any questions:

**Tel.: +49-(0)2102-498955** or your agent

If the equipment is not functioning properly after correcting any malfunctions and switching on the power, it must be inspected by the manufacturer. Please send the equipment inside suitable packaging to:

**Bühler Technologies GmbH**

**Werk 2 – Service-**

**Halskestr. 23**

**40880 Ratingen**

**Germany**

Please also attach the completed and signed RMA decontamination statement to the packaging. We will otherwise be unable to process your repair order.

You will find the form in the appendix of these instructions, or simply request it by e-mail: service@buehler-technologies.com.

#### 7.1 Troubleshooting

**DANGER**

**Risk due to defective unit**

Personal injury or property damage may occur. Correct defects to the unit immediately. Switch the unit off and disconnect from the mains. Discontinue use of the device until the defect has been corrected.

<table>
<thead>
<tr>
<th>Problem / malfunction</th>
<th>Possible cause</th>
<th>Action</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insufficient cooling capacity</td>
<td>Air temperature higher than specified</td>
<td>Select a larger model</td>
</tr>
<tr>
<td></td>
<td>Motor direction of rotation incorrect</td>
<td>Correct connection, see chapter “Electrical Connections”</td>
</tr>
<tr>
<td></td>
<td>Motor doesn’t start</td>
<td>Correct connection, see chapter “Electrical Connections”</td>
</tr>
<tr>
<td></td>
<td>Air flow too low</td>
<td>Correct connection, see chapter “Electrical Connections”</td>
</tr>
<tr>
<td></td>
<td>Fins clogged</td>
<td>Clean per chapter “Maintenance”</td>
</tr>
<tr>
<td></td>
<td>Obstructions nearby</td>
<td>Maintain the minimum clearance</td>
</tr>
<tr>
<td></td>
<td>Oil flow too low</td>
<td>Increase oil flow</td>
</tr>
<tr>
<td></td>
<td>Oil channel clogged</td>
<td>Clean per chapter “Cleaning the cooling matrix from inside”</td>
</tr>
<tr>
<td></td>
<td>Excessive suction pressure, reducing the oil flow rate</td>
<td>Select a large enough suction hose</td>
</tr>
<tr>
<td></td>
<td>Excess back-pressure in the pressure pipe. Motor is being overloaded and throttled</td>
<td>Reduce suction lift</td>
</tr>
<tr>
<td>No oil flow</td>
<td>insufficient oil in the pump housing after prolonged standstill, thus no suction</td>
<td>spray some oil into the housing before connecting the oil ling</td>
</tr>
<tr>
<td>Loud pump</td>
<td>Negative intake pressure too high</td>
<td>Select a large enough suction hose</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Reduce suction lift</td>
</tr>
</tbody>
</table>

*Tab. 1: Troubleshooting*
8 Disposal

Dispose of the parts in such a way that does not present a danger to other people’s health or to the environment. Observe the legal requirements in the country of use for the disposal of electrical components and oils and coolants.
9 Calculations

9.1 Calculating viscosity
Valid for VG-oil between 10 - 100 °C at an exactness from ± 5 %.

Definitions

\[ V_{40} \] oil viscosity at 40 °C in cst

\[ T \] temperature in °C

\[ \nu \] viscosity in cst

\[ b = 159 \cdot \ln \frac{V_{40}}{0.23} \]

\[ a = 0.23 \cdot e^{\frac{V_{40}}{259.6}} \]

\[ \nu = a \cdot e^{\frac{V_{40}}{259.6}} \]

Example: oil VG 46

\[ V_{40} = 46 \text{ cst} \]

\[ T = 25 ^\circ\text{C} \]

\[ b = 159 \cdot \ln \frac{46}{0.23} = 842.4325 \]

\[ a = 0.23 \cdot e^{\frac{46}{259.6}} = 0.08801 \]

\[ \nu = 0.08801 \cdot e^{\frac{46}{259.6}} = 97.35 \text{ cst} \]

9.2 Table of operational viscosity for VG oil

<table>
<thead>
<tr>
<th>Temperature (°C)</th>
<th>VG 46</th>
<th>VG 68</th>
<th>VG 220</th>
<th>VG 320</th>
</tr>
</thead>
<tbody>
<tr>
<td>10</td>
<td>264.45</td>
<td>444.77</td>
<td>2.120.17</td>
<td>3.489.92</td>
</tr>
<tr>
<td>20</td>
<td>131.96</td>
<td>210.85</td>
<td>861.60</td>
<td>1.350.22</td>
</tr>
<tr>
<td>30</td>
<td>73.58</td>
<td>112.61</td>
<td>404.31</td>
<td>607.96</td>
</tr>
<tr>
<td>40</td>
<td>46.00</td>
<td>68.00</td>
<td>220.00</td>
<td>320.00</td>
</tr>
<tr>
<td>50</td>
<td>29.13</td>
<td>41.63</td>
<td>121.71</td>
<td>171.40</td>
</tr>
<tr>
<td>60</td>
<td>20.04</td>
<td>27.86</td>
<td>74.99</td>
<td>102.85</td>
</tr>
<tr>
<td>70</td>
<td>14.43</td>
<td>19.58</td>
<td>49.00</td>
<td>65.66</td>
</tr>
<tr>
<td>80</td>
<td>10.78</td>
<td>14.32</td>
<td>33.61</td>
<td>44.12</td>
</tr>
<tr>
<td>90</td>
<td>8.32</td>
<td>10.84</td>
<td>24.01</td>
<td>30.94</td>
</tr>
</tbody>
</table>

Viscosity given in cst (mm²/s)

9.3 Calculating the pressure loss
Valid for smooth straight piping per meter at laminar current.

Definitions

\[ \nu \] Viscosity in cst

\[ \rho \] spec. gravity in kg/dm³

\[ \text{DN} \] tube diameter in mm

\[ V \] flow in m/s

\[ PV \] pressure loss in bar

\[ PV = \frac{0.32 \cdot \nu \cdot \rho \cdot V}{\text{DN}^2} \]

Example: oil VG 46

\[ \nu = 97.35 \text{ cst} \]

\[ \rho = 0.8817 \text{ kg/dm}^3 \]

\[ \text{DN} = 20 \text{ mm} \]

\[ V = 3.18 \text{ m/s (60 l/min for tube DN 20)} \]

\[ PV = \frac{0.32 \cdot 97.35 \cdot 0.8817 \cdot 3.18}{20^2} = 0.22 \text{ bar} \]

NOTICE
Pressure loss increases significantly for bends and fittings.
It might be necessary in some cases to determine the final shape of the suction line on site under specific conditions.

Please do not hesitate to contact us for help to calculate the pressure loss of the suction line for your specific application.

NOTICE
To avoid damage of the cooling system, make sure that the maximum pump pressure is not exceeded. High pressure may occur if the system is shut off or throttled at the pressure side.
## 10 Pressure loss in straight pipes

Pressure loss (bar) per metre in straight tubing with laminar flow of mineral oil:

### BFP 8 8 l/min – DN 25

<table>
<thead>
<tr>
<th></th>
<th>VG 46</th>
<th>VG 68</th>
<th>VG 120</th>
<th>VG 160</th>
<th>VG 220</th>
<th>VG 320</th>
<th>VG 460</th>
<th>VG 680</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 °C</td>
<td>0.03</td>
<td>0.05</td>
<td>0.11</td>
<td>0.17</td>
<td>0.25</td>
<td>0.42</td>
<td>0.68</td>
<td>1.14</td>
</tr>
<tr>
<td>20 °C</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
<td>0.07</td>
<td>0.10</td>
<td>0.16</td>
<td>0.25</td>
<td>0.40</td>
</tr>
<tr>
<td>30 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
<td>0.07</td>
<td>0.11</td>
<td>0.17</td>
</tr>
<tr>
<td>40 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.03</td>
<td>0.03</td>
<td>0.04</td>
<td>0.05</td>
<td>0.08</td>
</tr>
<tr>
<td>50 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
</tr>
<tr>
<td>60 °C – 100 °C</td>
<td>&lt; 0.03 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BFP 15 16 l/min – DN 32

<table>
<thead>
<tr>
<th></th>
<th>VG 46</th>
<th>VG 68</th>
<th>VG 120</th>
<th>VG 160</th>
<th>VG 220</th>
<th>VG 320</th>
<th>VG 460</th>
<th>VG 680</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 °C</td>
<td>0.02</td>
<td>0.04</td>
<td>0.08</td>
<td>0.12</td>
<td>0.19</td>
<td>0.31</td>
<td>0.50</td>
<td>0.85</td>
</tr>
<tr>
<td>20 °C</td>
<td>0.01</td>
<td>0.02</td>
<td>0.04</td>
<td>0.10</td>
<td>0.08</td>
<td>0.12</td>
<td>0.19</td>
<td>0.30</td>
</tr>
<tr>
<td>30 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.05</td>
<td>0.04</td>
<td>0.05</td>
<td>0.08</td>
<td>0.12</td>
</tr>
<tr>
<td>40 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
<td>0.06</td>
</tr>
<tr>
<td>50 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.01</td>
<td>0.03</td>
<td>0.03</td>
</tr>
<tr>
<td>60 °C – 100 °C</td>
<td>&lt; 0.02 bar</td>
<td></td>
<td></td>
<td></td>
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### BFP 30 28 l/min – DN 32

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<th>VG 120</th>
<th>VG 160</th>
<th>VG 220</th>
<th>VG 320</th>
<th>VG 460</th>
<th>VG 680</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 °C</td>
<td>0.04</td>
<td>0.07</td>
<td>0.15</td>
<td>0.22</td>
<td>0.33</td>
<td>0.54</td>
<td>0.88</td>
<td>1.48</td>
</tr>
<tr>
<td>20 °C</td>
<td>0.02</td>
<td>0.03</td>
<td>0.06</td>
<td>0.09</td>
<td>0.13</td>
<td>0.21</td>
<td>0.33</td>
<td>0.52</td>
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<td>30 °C</td>
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<td>0.02</td>
<td>0.03</td>
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<td>0.07</td>
<td>0.09</td>
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<tr>
<td>40 °C</td>
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<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
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<td>0.07</td>
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<td>50 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
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<td>0.06</td>
</tr>
<tr>
<td>60 °C – 100 °C</td>
<td>&lt; 0.03 bar</td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BFP 60 57 l/min – DN 40

<table>
<thead>
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<th></th>
<th>VG 46</th>
<th>VG 68</th>
<th>VG 120</th>
<th>VG 160</th>
<th>VG 220</th>
<th>VG 320</th>
<th>VG 460</th>
<th>VG 680</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 °C</td>
<td>0.03</td>
<td>0.06</td>
<td>0.12</td>
<td>0.18</td>
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</tr>
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<td>20 °C</td>
<td>0.02</td>
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<td>0.04</td>
<td>0.06</td>
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<tr>
<td>50 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
</tr>
<tr>
<td>60 °C – 100 °C</td>
<td>&lt; 0.03 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### BFP 90 86 l/min – DN 40

<table>
<thead>
<tr>
<th></th>
<th>LVG 46</th>
<th>VG 68</th>
<th>VG 120</th>
<th>VG 160</th>
<th>VG 220</th>
<th>VG 320</th>
<th>VG 460</th>
<th>VG 680</th>
</tr>
</thead>
<tbody>
<tr>
<td>10 °C</td>
<td>0.05</td>
<td>0.09</td>
<td>0.19</td>
<td>0.27</td>
<td>0.42</td>
<td>0.68</td>
<td>1.11</td>
<td>1.87</td>
</tr>
<tr>
<td>20 °C</td>
<td>0.03</td>
<td>0.04</td>
<td>0.08</td>
<td>0.12</td>
<td>0.17</td>
<td>0.26</td>
<td>0.41</td>
<td>0.65</td>
</tr>
<tr>
<td>30 °C</td>
<td>0.02</td>
<td>0.02</td>
<td>0.04</td>
<td>0.06</td>
<td>0.08</td>
<td>0.12</td>
<td>0.18</td>
<td>0.27</td>
</tr>
<tr>
<td>40 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.03</td>
<td>0.04</td>
<td>0.06</td>
<td>0.09</td>
<td>0.13</td>
</tr>
<tr>
<td>50 °C</td>
<td>0.01</td>
<td>0.01</td>
<td>0.01</td>
<td>0.02</td>
<td>0.02</td>
<td>0.03</td>
<td>0.05</td>
<td>0.07</td>
</tr>
<tr>
<td>60 °C – 100 °C</td>
<td>&lt; 0.04 bar</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**Note:** Values in blue exceed the suction operation limit of -0.4 bar.
11 Appendices

11.1 Technical data

Technical Data

Cooling battery: Aluminium, RAL 7001, painted
Ventilation box, safety guard and motor brackets: Stainless steel 1.4401, unpainted
Fan hub: Aluminium die casting
Motor housing: Aluminium die casting
Motor flanges: Grey cast iron
Pump: Anodised and impregnated aluminium, sintered steel
Operating fluids: Mineral oils per DIN 51524, Gear oil per DIN 51517-3
Operating pressure, static: 15/28/42 L/min – max. 6 bar, 58/86 L/min – max. 8 bar
Suction pressure: max. -0.4 bar
Operating oil temperature: max. 80 °C
max. viscosity: 100 cSt medium viscosity (see viscosity charts), higher upon request
Ambient temperature: -15 to 40 °C

Electric motors (others available upon request)

Voltage / frequency: 230 / 400 V - 50 Hz ± 5 %, 277 / 480 V - 60 Hz ± 5 %
Thermal stability: Class of insulation F, utilisation per class B
Colour: RAL 2004
Protection class: IP 65
The motors comply with standards IEC 60034, IEC 60072, IEC 60085

Please also observe the operating manual for the motor!

11.1.1 Basic data BNK ATEX-T4 (at a frequency of 50 Hz)

<table>
<thead>
<tr>
<th>Part no.*</th>
<th>Cooler type</th>
<th>spec. cooling power kW/K</th>
<th>Cooling power at ETD = 40 K (kW)</th>
<th>max. circulation rate (l/min)</th>
<th>Power output Poles Rated current at 400 V</th>
<th>Weight (kg)</th>
<th>Capacity (l)</th>
<th>Noise emission dB(A)**</th>
</tr>
</thead>
<tbody>
<tr>
<td>3602401ATEXT4</td>
<td>BNK 2.4-15-0.75kW</td>
<td>0.07</td>
<td>2.8</td>
<td>15</td>
<td>0.75 kW / 4 / 1.7 A</td>
<td>45</td>
<td>1.3</td>
<td>66</td>
</tr>
<tr>
<td>3602402ATEXT4</td>
<td>BNK 2.4-30-0.75kW</td>
<td>0.10</td>
<td>4.0</td>
<td>28</td>
<td>0.75 kW / 4 / 1.7 A</td>
<td>48</td>
<td>1.3</td>
<td>66</td>
</tr>
<tr>
<td>3603401ATEXT4</td>
<td>BNK 3.4-15-0.75kW</td>
<td>0.12</td>
<td>4.8</td>
<td>15</td>
<td>0.75 kW / 4 / 1.7 A</td>
<td>50</td>
<td>1.8</td>
<td>71</td>
</tr>
<tr>
<td>3603402ATEXT4</td>
<td>BNK 3.4-30-0.75kW</td>
<td>0.19</td>
<td>7.6</td>
<td>28</td>
<td>0.75 kW / 4 / 1.7 A</td>
<td>53</td>
<td>1.8</td>
<td>71</td>
</tr>
<tr>
<td>3604401ATEXT4</td>
<td>BNK 4.4-10-2.2kW</td>
<td>0.27</td>
<td>10.8</td>
<td>42</td>
<td>1.5 kW / 4 / 3.3 A</td>
<td>50</td>
<td>2.3</td>
<td>73</td>
</tr>
<tr>
<td>3604402ATEXT4</td>
<td>BNK 4.4-40-2.2kW</td>
<td>0.30</td>
<td>12.0</td>
<td>86</td>
<td>2.2 kW / 4 / 4.4 A</td>
<td>75</td>
<td>2.3</td>
<td>73</td>
</tr>
<tr>
<td>3605414ATEXT4</td>
<td>BNK 5.4-90-2.2kW</td>
<td>0.44</td>
<td>17.8</td>
<td>86</td>
<td>2.2 kW / 4 / 4.4 A</td>
<td>87</td>
<td>3.1</td>
<td>79</td>
</tr>
<tr>
<td>3606613ATEXT4</td>
<td>BNK 6.6-60-2.2kW</td>
<td>0.52</td>
<td>20.8</td>
<td>58</td>
<td>2.2 kW / 6 / 5.1 A</td>
<td>116</td>
<td>4.1</td>
<td>74</td>
</tr>
<tr>
<td>3607414ATEXT4</td>
<td>BNK 7.4-90-3.0kW</td>
<td>0.84</td>
<td>33.6</td>
<td>86</td>
<td>3.0 kW / 4 / 5.9 A</td>
<td>114</td>
<td>5.4</td>
<td>89</td>
</tr>
</tbody>
</table>

*Cooler models BNK2.4-15 to BNK 4.4-90 operate at 50/60 Hz, BNK 5.4-90 to BNK 7.4-90 at 50 Hz (60 Hz models available upon request).

**DIN EN ISO 3744, Class 3
### 11.2 Dimensions

![Diagram of BNK ATEX-2GD motor with dimensions and connections](diagram.png)

**Connection** G ½ for temperature switch

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
<th>G</th>
<th>H</th>
<th>J</th>
<th>K</th>
<th>L</th>
<th>M</th>
<th>N</th>
<th>O</th>
<th>P</th>
<th>Q</th>
</tr>
</thead>
<tbody>
<tr>
<td>BNK 2.4-15-0.75kW</td>
<td>370</td>
<td>370</td>
<td>203</td>
<td>83.5</td>
<td>455</td>
<td>-</td>
<td>25</td>
<td>2x G1</td>
<td>125</td>
<td>106</td>
<td>119</td>
<td>G1</td>
<td>G1 1/4</td>
<td>30</td>
<td>130</td>
<td>212</td>
</tr>
<tr>
<td>BNK 2.4-30-0.75kW</td>
<td>370</td>
<td>370</td>
<td>203</td>
<td>83.5</td>
<td>453</td>
<td>-</td>
<td>25</td>
<td>2x G1</td>
<td>125</td>
<td>106</td>
<td>119</td>
<td>G1</td>
<td>G1 1/4</td>
<td>30</td>
<td>130</td>
<td>212</td>
</tr>
<tr>
<td>BNK 3.4-15-0.75kW</td>
<td>440</td>
<td>440</td>
<td>203</td>
<td>118.5</td>
<td>480</td>
<td>230</td>
<td>25</td>
<td>3x G1</td>
<td>150</td>
<td>105</td>
<td>119</td>
<td>G1</td>
<td>G1 1/4</td>
<td>30</td>
<td>130</td>
<td>247</td>
</tr>
<tr>
<td>BNK 3.4-30-0.75kW</td>
<td>440</td>
<td>440</td>
<td>203</td>
<td>118.5</td>
<td>478</td>
<td>230</td>
<td>25</td>
<td>3x G1</td>
<td>150</td>
<td>105</td>
<td>119</td>
<td>G1</td>
<td>G1 1/4</td>
<td>30</td>
<td>130</td>
<td>247</td>
</tr>
<tr>
<td>BNK 4.4-40-1.5kW</td>
<td>500</td>
<td>500</td>
<td>203</td>
<td>148.5</td>
<td>590</td>
<td>230</td>
<td>25</td>
<td>3x G1</td>
<td>175</td>
<td>104</td>
<td>119</td>
<td>G1</td>
<td>G1 1/4</td>
<td>30</td>
<td>130</td>
<td>277</td>
</tr>
<tr>
<td>BNK 4.4-90-2.2kW</td>
<td>500</td>
<td>500</td>
<td>203</td>
<td>148.5</td>
<td>692</td>
<td>230</td>
<td>25</td>
<td>3x G1</td>
<td>175</td>
<td>104</td>
<td>135</td>
<td>G1 1/4</td>
<td>G1 1/2</td>
<td>53</td>
<td>135</td>
<td>277</td>
</tr>
<tr>
<td>BNK 5.4-90-2.2kW</td>
<td>580</td>
<td>580</td>
<td>356</td>
<td>112</td>
<td>718</td>
<td>305</td>
<td>23.5</td>
<td>3x G1</td>
<td>200</td>
<td>100</td>
<td>134</td>
<td>G1 1/4</td>
<td>G1 1/2</td>
<td>53</td>
<td>135</td>
<td>317</td>
</tr>
<tr>
<td>BNK 6.6-60-2.2kW</td>
<td>700</td>
<td>700</td>
<td>356</td>
<td>172</td>
<td>845</td>
<td>410</td>
<td>9.5</td>
<td>3x G1 1/4</td>
<td>225</td>
<td>110</td>
<td>132</td>
<td>G1 1/4</td>
<td>G1 1/2</td>
<td>53</td>
<td>135</td>
<td>377</td>
</tr>
<tr>
<td>BNK 7.4-90-3.0kW</td>
<td>700</td>
<td>840</td>
<td>356</td>
<td>172</td>
<td>792</td>
<td>590</td>
<td>9.5</td>
<td>3x G1 1/4</td>
<td>250</td>
<td>91</td>
<td>132</td>
<td>G1 1/4</td>
<td>G1 1/2</td>
<td>53</td>
<td>135</td>
<td>447</td>
</tr>
</tbody>
</table>
11.3 Functional diagram

**Standard version BNK 2**

The oil inlet is on the left of the cooling battery. The oil outlet is always on the opposite side.

**Standard version BNK 3 to BNK 7**

The oil inlet is on the bottom left of the cooling battery. The second connection at the top must be closed. The oil outlet is always on the opposite side.

**Internal bypass IB/ITB (BNK 3-7)**

The oil inlet and outlet is always on the same side of the cooling battery. The connection on the opposite side must be closed.

**External bypass AB/ATB (BNK 2-7)**

The oil inlet is always at the bottom left of the cooling battery. The second connection must be closed. The oil outlet is always on the opposite side.

**With bypass valve**

**With temperature-dependent bypass valve**

11.4 Installation torques and clamping range for cable fitting

<table>
<thead>
<tr>
<th>Size</th>
<th>Strain relief clamping range (mm)</th>
<th>Installation torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>M12x1,5</td>
<td>3-6</td>
<td>1,5</td>
</tr>
<tr>
<td>M16x1,5</td>
<td>5-9,5</td>
<td>2,5</td>
</tr>
<tr>
<td>M20x1,5</td>
<td>8-13</td>
<td>3,5</td>
</tr>
<tr>
<td>M25x1,5</td>
<td>11-17</td>
<td>5</td>
</tr>
<tr>
<td>M32x1,5</td>
<td>15-21</td>
<td>5</td>
</tr>
<tr>
<td>M40x1,5</td>
<td>19-28</td>
<td>7,5</td>
</tr>
<tr>
<td>M50x1,5</td>
<td>27-35</td>
<td>7,5</td>
</tr>
<tr>
<td>M63x1,5</td>
<td>32-42</td>
<td>13</td>
</tr>
</tbody>
</table>
### 11.5 Tightening torques

<table>
<thead>
<tr>
<th>Connections/mounts</th>
<th>Torque (Nm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cooler mount, cooling matrix M8</td>
<td>12</td>
</tr>
<tr>
<td>Hose connections DN20</td>
<td>180</td>
</tr>
<tr>
<td>Hose connections DN25</td>
<td>250</td>
</tr>
<tr>
<td>Hose connections DN32</td>
<td>350</td>
</tr>
</tbody>
</table>
### 11.6 User book (Please make copies)

<table>
<thead>
<tr>
<th>Maintained on</th>
<th>Unit no.</th>
<th>Operating hours</th>
<th>Remarks</th>
<th>Signature</th>
</tr>
</thead>
<tbody>
<tr>
<td>27</td>
<td></td>
<td>Bühler Technologies GmbH</td>
<td>BE360002 • 03/2018</td>
<td></td>
</tr>
</tbody>
</table>
12 Attached documents

12.1 Declaration of conformity
EG-/EU Konformitätsklärung
EC/EU Declaration of Conformity

Hiermit erklärt Bühler Technologies GmbH, dass die nachfolgenden Produkte „Geräte“ im Sinne des Artikels 1, (3) a) der Richtlinie in ihrer aktuellen Fassung sind und die Schutzziele erfüllen.

Die Produkte sind Maschinen im Sinne der Richtlinie 2006/42/EG (MRL) Artikel 2 a) und erfüllen alle einschlägigen Anforderungen.

Folgende Richtlinien wurden berücksichtigt:

- **Produkt / products:** Öl-Luftkühler / Oil/Air Blast Coolers
  Förderpumpen / Oil pumps
- **Typ / type:** BLK***, BNK***, BFP***
  "Siehe Typenschlüssel im entsprechenden Datenblatt/see model key in the corresponding data sheet"

Die Produkte werden entsprechend der derzeit gültigen ATEX-Richtlinie innerhalb der internen Fertigungskontrolle folgendermaßen gekennzeichnet:

The products are marked according to the currently valid ATEX directive during internal control of production:

- Il 3G Ex h IIB T4 Gb
- Il 3D Ex h IIB T125 °C Db

Zur Beurteilung der Konformität gemäß ATEX-Richtlinie wurden folgende harmonisierte Normen herangezogen:

For the assessment of conformity according to the ATEX directive the following standards have been used:

- **EN ISO 80079-36:2016**
- **EN ISO 80079-37:2016**
  Zusätzlich wurden berücksichtigt:
  In addition, the following standards have been used:
  - **EN 50204-1:2007**
  - **EN 61000-6-2:2005**
  Zusätzlich wurden folgende nationale Normen, Richtlinien oder Spezifikationen berücksichtigt:
  In addition, the following national standards, guidelines or specifications have been used:
  - **TRGS 727:2016**
  Die alleinige Verantwortung für die Ausstellung dieser Konformitätsklärung trägt der Hersteller.
  This declaration of conformity is issued under the sole responsibility of the manufacturer.

Dokumentationsverantwortlicher für diese Konformitätserklärung ist Herr Stefan Eschweiler mit Anschrift am Firmensitz.

The person authorised to compile the technical file is Mr. Stefan Eschweiler located at the company’s address.

Ratingen, den 05.02.2019

Stefan Eschweiler
Geschäftsführer – Managing Director

Frank Pospiech
Geschäftsführer – Managing Director

Bühler Technologies GmbH, Harkortstr. 29, D-40880 Ratingen,
Tel. +49 (0) 21 02 / 49 89-0, Fax. +49 (0) 21 02 / 49 89-20
Internet: www.buehler-technologies.com

K X 35 0100
12.2 Statement of Conformity
(1) Konformitätsaussage

(2) Richtlinie 2014/34/EU - Geräte zur bestimmungsgemäßen Verwendung in explosionsgefährdeten Bereichen

- Directive 2014/34/EU - Equipment Intended for Use in Potentially Explosive Atmospheres

(3) Nummer: ExGuide 13 ATEX 0010 X (Edition 2)

(4) Geräte: Öl-Luftkühler / Oil/Air Blast Coolers BLK*** und/and BNK*** und/and Förderpumpen / Oil pumps BFP***

(5) Hersteller: Bühler Technologies GmbH

(6) Anschrift: Harkortstraße 29, DE 40880 Ratingen

(7) Die Bauart dieser Geräte, sowie die verschiedenen zulässigen Ausführungen sind in der Anlage zu dieser Konformitätsaussage festgelegt.


This equipment and any acceptable variation thereto is specified in the enclosure of this Statement of Conformity.

ExGuide Technology – Günter Kamper VDI certifies that this equipment has been found to comply with the Essential Safety and Health Requirements relating to the design and construction of equipment of Categories 2 and 3 intended for use in potentially explosive atmospheres given in Annex II of the Directive.

The ISO 9001 system of ExGuide Technology – Gunter Kamper VDI is supervised by BVOi under the registration number DE003950-1. The examination and test results are recorded in the confidential report number D045090323.

Diese Konformitätsaussage mit ihren Anhängen darf nur unverändert weiterverbreitet werden.

This statement of conformity and its enclosures may only be reproduced in its entirety and without changes.
Die Erfüllung der grundlegenden Sicherheits- und Gesundheitsanforderungen wird durch Übereinstimmung mit den folgenden Normen bestätigt:

- TRGS 727:2016

Falls das Zeichen "X" hinter der Nummer (3) steht, wird in der Anlage zu dieser Konformitätsaussage auf besondere Bedingungen für die sichere Anwendung des Gerätes hingewiesen.

Diese Konformitätsaussage bezieht sich nur auf die Konzeption und den Bau des festgelegten Gerätes. Weitere Anforderungen dieser Richtlinie gelten für die Herstellung und das Inverkehrbringen.

Die Kennzeichnung der Geräte soll die folgenden Angaben enthalten:

II 3G¹ Ex h IIb² T4³ Gb⁴ und/oder / and/or
II 3D⁵ Ex h IIb T125 °C⁶ Db⁷
-15 °C ≤ Ta ≤ 40 °C⁸

ExGuide Technology - Günter Kämper VDI
Ing.-Büro für Explosionsschutz
Birkenstraße 10
DE 44579 Castrop-Rauxel


Günter Kämper, Inhaber
Verbindlich ist die deutsche Fassung / Only the German version is binding

Anlagen / Enclosures

1. Je nach Ausführung 26 oder 36 / In accordance to the construction 26 oder 36
2. Je nach Ausführung IIb oder IIC / In accordance to the construction IIb oder IIC
3. Je nach Ausführung T4 oder T3 / In accordance to the construction T4 oder T3
4. Je nach Ausführung Gb oder Gc / In accordance to the construction Gb oder Gc
5. Je nach Ausführung 2D oder 3D / In accordance to the construction 2D oder 3D
6. Je nach Ausführung T125 °C oder T150 °C / In accordance to the construction T125 °C oder T150 °C
7. Je nach Ausführung Db oder Dc / In accordance to the construction Db oder Dc
8. Für die Versionen RKN und BFP / For versions RKN and BFP
9. Für die Version BLK ist hier 60 °C zulässig / for version BLK 60 °C is valid at this place

Compliance with the Essential Safety and Health Requirements has been assured by compliance with the following standards:

If the sign "X" is placed after the Document-ID (3), it indicates that the equipment is subject to special conditions for safe use specified in the enclosure of this Statement of Conformity.

This Statement of Conformity relates only to the design and construction of the specified equipment. Further requirements of this Directive apply to the manufacturing and supply of this equipment.

The marking of the equipment shall include the following:

II 3G¹ Ex h IIb² T4³ Gb⁴ und/oder / and/or
II 3D⁵ Ex h IIb T125 °C⁶ Db⁷
-15 °C ≤ Ta ≤ 40 °C⁸

ExGuide Technology - Günter Kämper VDI
Ing.-Büro für Explosionsschutz
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Günter Kämper, Inhaber
Verbindlich ist die deutsche Fassung / Only the German version is binding

Anlagen / Enclosures

1. Je nach Ausführung 26 oder 36 / In accordance to the construction 26 oder 36
2. Je nach Ausführung IIb oder IIC / In accordance to the construction IIb oder IIC
3. Je nach Ausführung T4 oder T3 / In accordance to the construction T4 oder T3
4. Je nach Ausführung Gb oder Gc / In accordance to the construction Gb oder Gc
5. Je nach Ausführung 2D oder 3D / In accordance to the construction 2D oder 3D
6. Je nach Ausführung T125 °C oder T150 °C / In accordance to the construction T125 °C oder T150 °C
7. Je nach Ausführung Db oder Dc / In accordance to the construction Db oder Dc
8. Für die Versionen RKN und BFP / For versions RKN and BFP
9. Für die Version BLK ist hier 60 °C zulässig / for version BLK 60 °C is valid at this place
Anlage zur

Konformitätsaussage

ExGuide 13 ATEX 0010 X

(15) Beschreibung der Geräte

(15a) Die Kühlgäbe und die Hydraulikpumpen sind für den Einsatz in Fluid-Kreisläufen vorgesehen. Sie können in unterschiedlichen Kombinationen (siehe 15d) in Verkehr gebracht werden. Sie bestehen aus den wesentlichen Teilgeräten:

a) Elektrischer Antriebsmotor (mit eigener Zulassung),
b) wahlweise einem Lüfter, der mit dem Motor form-
   schlüssig verbunden ist und dessen Luftleitungsseite
   von einem Lüfterschutzgitter (IP20) abgeschlossen
   wird,
c) wahlweise einem Aluminium-Kühlregister für den
   Fluid-Kreislauf, das direkt an der Luftaustrittsseite
   des Lüfters montiert ist,
d) wahlweise einer Gerotor-Fluidpumpe, die zusätzlich
   auf einem (zweiten) Wellenausgang des Motors mon-
   tiert ist.
e) Öl-Luft-Kühler können darüber hinaus mit beige-
   stellten Förderpumpen kombiniert und in Verkehr
   gebracht werden.

(15b) Alle Geräte und Gerätekombinationen können, je nach
Kennzeichnung auf dem Typenschild, folgendermaßen
eingesetzt werden:

a) In der Zone 2 (Gas-Ex, Kategorie 3G, EPL Gc) in den
   Explosionsgruppen IIA, IIB und IIC (nur H₂)
b) In der Zone 22 (Staub-Ex, Kategorie 3D, EPL Dc) in den
   Explosionsgruppen IIIA und IIIB
c) In der Zone 1 (Gas-Ex, Kategorie 2G, EPL Gb) in den
   Explosionsgruppen IIA, IIB und IIC (nur H₂)
d) In der Zone 21 (Staub-Ex, Kategorie 2D, EPL Db) in den
   Explosionsgruppen IIIA und IIIB
e) Die Pumpen sind bei bestimmungsgemäßem Betrieb
   immer vollständig gefüllt; hier tritt keine Zone auf.

Die Qualifizierung hinsichtlich der Oberflächen-tempera-
atur ist T4 oder T3; für alle Gase, Dämpfe und Nebel mit
einer Zündtemperatur > 135 °C / 200 °C sind die Gerät-
e keine Zündquelle.

Im Staub-Ex-Bereich ist 125 °C / 150 °C die Bezugstemperatur für die weiteren Überlegungen in Hinsicht
Sicherheitsabstand von der Glümpentemperatur.

(15c) Mechanische Daten und Leistungen gem. Angaben des Herstellers, u.a. / Mechanical data in accordance
with the manufacturer’s specifications

Details siehe / Details see 17 ff

Setzt / page 3 von / of 6 zu / to ExGuide 13 ATEX 0010 X E2

Diese Konformitätsaussage mit ihren Anhängen darf nur unverändert weiterverbreitet werden.

This statement of conformity and its enclosures may only be reproduced in its entirety and without changes.

ExGuide Technology – Günter Kämper VDI, Birkenstraße 10, DE 44579 Castrop-Rauxel
Typenschlüssel / Type coding  Typ / Type BLK
BLK 4. 4 - ATEX - T4 - I8
1 2 3 4 5
1  =  BLK Öl-Luftkühler / oil/air blast cooler
2  =  Baugröße / module 2, 3, 4, 5, 6, 7, 8
3  =  Polzahl des Motors / motor poles 4, 6
4  =  Temperaturklasse / temperature class
5  =  Bypassversion (oder leer) / bypass version (or empty)
   •  AB  außen liegender Bypass / external bypass
   •  IB  innen liegender Bypass / internal bypass
   •  x  Bypasswert / bypass value 2, 5 oder / or 8 bar
   •  ITB innen liegender temperaturabhängiger Bypass 2 bar / 45 °C / internal, temperature-related bypass
   •  ATB außen liegender temperaturabhängiger Bypass 2 bar / 45 °C / external, temperature-related bypass
   •  x  Bypasswert / bypass values 2, 5 oder / or 8 bar

Typ / Type BFP
BFP 8 - 4 - 0.75 kW - ATEX - T4 - B8
1 2 3 4 5 6
1  =  BFP Pumpe / pump
2  =  Lüterleistung der Pumpe / power output per litre [l min⁻¹] 8, 15, 30, 40, 60, 90
3  =  Polzahl des Motors / motor poles 4
4  =  Leistung des Motors / motor power in kW 0.75, 0.9, 1.5, 1.8, 2.2, 2.6, 3, 3.6
5  =  Temperaturklasse / temperature class
6  =  Bypassversion (oder leer) / bypass version (or empty)
   •  x  Bypasswert / bypass value in bar, 6, 8

Typ / Type BNK:
BNK 4. 4 - 40 - 1.5 kW - ATEX - T4 - I8
1 2 3 4 5 6 7
1  =  BNK Öl-Luftkühler mit Pumpe (Nebenstromkühler) / oil/air blast cooler with pump (bypass cooler)
2  =  Baugröße / module 2, 3, 4, 5, 6, 7
3  =  Polzahl des Motors / motor poles 4, 6
4  =  Durchfluss / flow rate l/min: 30, 40, 60, 70, 90, 105
5  =  Leistung des Motors / motor power in kW 0.75, 1.5, 1.8, 2.2, 2.6, 3, 3.6
6  =  Temperaturklasse / temperature class
7  =  Bypassversion (oder leer) / bypass version (or empty)
   •  AB  außen liegender Bypass / external bypass
   •  IB  innen liegender Bypass / internal bypass
   •  x  Bypasswert / bypass value 2, 5 oder / or 8 bar
   •  ITB innen liegender temperaturabhängiger Bypass 2 bar / 45 °C / internal, temperature-related bypass
   •  ATB außen liegender temperaturabhängiger Bypass 2 bar / 45 °C / external, temperature-related bypass
   •  x  Bypasswert / bypass values 2, 5 oder / or 8 bar

Typ / type BLK, kombiniert mit liefergetellter Förderpumpe BFP / combined with feed pump provided
Kühlaggregat / cooling unit 2 - 4 - IB2 - 15 - 0.75 kW - B6 - ATEX - T3
1 2 3 4 5 6 7
1  =  Kühl er Baugröße / cooler module 2, 3, 4, 5, 6, 7, 8
2  =  Polzahl des Motors / motor poles 4, 6
3  =  Bypassversion (oder leer) / bypass version (or empty)
   •  AB  außen liegender Bypass / external bypass
   •  IB  innen liegender Bypass / internal bypass
   •  x  Bypasswert / bypass value 2, 5 oder / or 8 bar
   •  ITB innen liegender temperaturabhängiger Bypass 2 bar / 45 °C / internal, temperature-related bypass
   •  ATB außen liegender temperaturabhängiger Bypass 2 bar / 45 °C / external, temperature-related bypass
   •  x  Bypasswert / bypass values 2, 5 oder / or 8 bar

Setzt / page 4 von / at 6 zu / to ExGuide 13 ATEX 0010 X E2
Diese Konformitätsaussage mit ihren Anhängen darf nur unverändert weiterverbreitet werden
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ExGuide Technology - Günter Kämper VIII, Birkenstraße 10, DE 44579 Castrop-Rauxel
• 0 ohne Bypass / without bypass
4 = Leistung der Pumpe / power output per litre (l/min⁻¹) 8, 15, 30, 40, 60, 90
5 = Leistung des Motors / motor power in kW 0, 075, 150, 220, 300
6 = Pumpen-Bypassventil / bypass version (or empty)
   • 0 ohne Bypass / without bypass, 6 = Bypassdruck / bypass pressure 6 bar
8 = Bypassdruck / bypass pressure 8 bar
7 = ATEX Temperaturklasse / ATEX temperature class
   • T3, T4

(15a) Mindestkennzeichnung
Hersteller mit Anschrift
Type: B *** [Serienummer] CE [Baujahr]
Ex II 2G Ex h IIC T4 oder siehe Zeile 12!
TFR: 13 ATEX 0010 X
-15 °C ≤ Ta ≤ 40 °C
(Ergänzungen sind zulässig.)

Minimum Identification
Name and address of manufacturer
Type: (serial number) CE [Year of construction] see also line 12!

(Additional hints are allowed)

Die vertrauliche Nachweisdokumentation mit der TFR 13 ATEX 0010 X lag zur Bewertung vor und ist bei der benannten Stelle 0158 BV5 (DEKRA EXAM, Bochum) hinterlegt.

Test reports are stored in the internal document DD45090323 In cooperation with the manufacturer a risk assessment report PL45090319 was compiled.
The confidential proof documentation with TFR 13 ATEX 0010 X has been submitted to inspection at notified body 0158 BV5 (DEKRA EXAM, Bochum)

Safety relevant notes:
a) The notes in the operator’s manual, enclosed to each order of the manufacturer, have to be followed strictly.
b) Parts being stuck (e.g. by corrosion or icing) may not be removed by force in the presence of explosive atmosphere.
c) In order to ensure the explosion protection required, additional electrical and mechanical equipment has to meet the requirements of the locally applicable zones and has to be checked separately by the company installing the unit.
d) Variants of the equipment intended for use in Dust-Ex atmospheres may only be equipped with conductive cooler guards which have sufficient contact surface to the enclosure.
e) When used in Zone 21, regular vibration monitoring shall be carried out, and it is advised to do this with an automatic measuring device.
f) Mechanical elements have to be cleaned according to local conditions.
g) It is not permitted to operate the equipment against closed gate valves and chokes if this can lead to a temperature increase inside the machine exceeding the limit values stated in 15c).
h) At normal operation no explosive mixture shall
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<td>&lt; 145 °C</td>
<td>T3</td>
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</table>

Special conditions for safe use

a) The equipment is only permitted for use in explosion group IIC if hydrogen is the only explosive IIC gas to be present.

b) When putting the equipment into service (and when operating it later) it has to be ensured that the hot spots mentioned in line 17b are not exceeded.
12.3 Motor operating instructions (Leroy-Somer)
Bühler Technologies GmbH, Harkortstr. 29, D-40880 Ratingen
Tel. +49 (0) 21 02 / 49 89-0, Fax: +49 (0) 21 02 / 49 89-20
Internet: www.buehler-technologies.com
E-Mail: fluidcontrol@buehler-technologies.com

Read this instruction carefully prior to installation and/or use. Pay attention particularly to all advises and safety instructions to prevent injuries. Bühler Technologies can not be held responsible for misusing the product or unreliable function due to unauthorised modifications.

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Document information
Document No.................................................. 350031EN
Version.......................................................... 03/2017
This manual is to be given to the end user.

Bühler Technologies GmbH
DE-40880 Ratingen

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II 2 G(D)

Ex e II T1 bis T4

LSE-FLSE
Three-phase induction motors for atmospheres containing explosive gases and dust

Installation and maintenance

Rev. 15
IMPORTANT

These symbols ⚠️ ⚠️ appear in this document whenever it is important to take special precautions during installation, operation, maintenance or servicing of the motors.

It is essential that electric motors are installed by qualified, experienced and authorised personnel.

In accordance with the main requirements of the EC Directives, the safety of people, animals and property should be ensured when fitting the motors into machines.

Particular attention must be given to equipotential ground or earthing connections.

The noise level of the machines, measured under standard conditions, conforms to the requirements of the standard and does not exceed the maximum value of 85 dB(A) pressure at 1 metre.

⚠️ The following preliminary precautions must be taken before working on any stationary device:
- Mains voltage disconnected and no residual voltage present
- Careful examination of the causes of the stoppage (blocked transmission - loss of phase - cut-out due to thermal protection - lack of lubrication, etc)

1 - PREFACE
1.1 - Training

⚠️ Electric motors are industrial products. They must therefore be installed by qualified, experienced and authorised personnel. The safety of people, animals and property must be ensured when fitting the motors into machines (please refer to current standards).

Those persons required to work on electrical installations and equipment in zones where there is a risk of explosion must be specially trained and authorised for this type of equipment.
They must be familiar with not only the electrical risks, but also with those that are due to the chemical properties and physical characteristics of the products used in the installation (gas, vapour, dust), as well as the environment in which the equipment operates. These elements determine the risk of fire and explosion.

In particular, they must be informed and aware of the reasons for the specific safety instructions in order to comply with them. For example:
- Do not open when powered up
- Do not open when powered up in atmospheres containing explosive gas or dust
- Do not repair while powered up
- Do not move when on load
- Wait for a few minutes before opening
- Replace the seals tightly to ensure watertightness

⚠️ Before commissioning, ensure compatibility of the information on the motor nameplate with the actual explosive atmosphere and the operating zone.

NOTE:
LEROY-SOMER reserves the right to modify the characteristics of its products at any time in order to incorporate the latest technological developments. The information contained in this document may therefore be changed without notice.

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This document is the property of LEROY-SOMER.
It may not be reproduced in any form without prior authorisation.
All brands and models have been registered and patents applied for.
Dear Customer,

You have just acquired a LEROY-SOMER safety motor.

This motor benefits from the experience of one of the largest manufacturers in the world, using state-of-the-art technology in automation, specially selected materials and rigorous quality control. As a result, the regulatory authorities have awarded our motor factories the ISO 9000 - Edition 2000 international certificate.

We thank you for making this choice, and would ask you to read the contents of this manual.

By observing a few essential rules, you will ensure problem-free operation for many years.

1.2 - Conformity

Motors for potentially explosive atmospheres comply with:
- ATEX 94/9/EC, 2006/95/EC and 93/68/EC directives (low voltage)
- IEC-EN 60034, IEC-EN 60072, EN 60529 standards.
- IEC-EN 60079-0: Electrical apparatus for explosive gas atmospheres (general rules)
- IEC-EN 60079-7: Electrical apparatus for explosive atmospheres (increased safety “e”)
- IEC-EN 61241-0 and 1: Electrical apparatus for use in the presence of combustible dust; Part 0: General requirements and part 1 (protection by enclosures “ID”)

They are designed for use in potentially explosive atmospheres due to the presence of gas (G marking) or gas and dust (GD marking); for each danger zone there is a corresponding class of equipment.

These documents are supplied with the relevant products.
# LSE-FLSE

**THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST**

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On receipt of your motor, check that it has not suffered any damage in transit.
If there are obvious signs of knocks, contact the carrier (you may able to claim on their insurance) and after a visual check, turn the motor by hand to detect any malfunction.

2 - MARKING

As soon as you receive the motor, check that the nameplate on the machine conforms to your order.

![Nameplate](image)

**Definition of symbols used on nameplates:**

- **Legal mark of conformity to the requirements of European Directives.**
  - **ATEX specific marking**: INERIS (Notified Body) identification number
  - **Group and category of equipment**: Specific marking for protection against risks of explosion
  - **Symbol for equipment designed for potentially explosive atmospheres**: Group and category of equipment
  - **Protection type**: Symbol for equipment designed for potentially explosive atmospheres
  - **Temperature class**: Symbol for equipment designed for potentially explosive atmospheres
  - **Protection type and maximum surface temperature in “dust” atmospheres (optional)**
  - **Specific recommendations for the German market**: Protection type and maximum surface temperature in “dust” atmospheres (optional)

**Motor**

- **Type**: Three-phase A.C. motor
- **Series**: LSE
- **Frame size**
- **40°C**: Maximum ambient operating temperature

**Motor no.**

- **Serial number**: kg
- **Supply voltage**: V
- **Supply frequency**: Hz
- **Revolutions per minute (rpm)**
- **Rated output power**: kW
- **Power factor**: cos ϕ
- **Rated current**: A
- **Connection symbol**: Δ
- **Starting current**: I_{st}/I_{N}
- **Locked rotor time**: t_e

**Bearings**

- **Drive end**: DE
- **Drive end bearing**: DE
- **Non drive end**: NDE
- **bearing**: NDE

---

**LSE-FLSE**

**THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST**

**ZONE**

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---

**MOT 3 ~**

- **LSE 112 MU**
- **LSE 160L**
- **IP55 / IP65**
- **Mot. 3 ~**

---

**Installation and Maintenance**

---

**LEROY-SOMER**

---

**5**
3 - STORAGE

Prior to commissioning, machines should be stored:
- Away from humidity: at relative humidity levels above 90%, the machine insulation can drop very rapidly, to just above zero at around 100%. The state of the anti-rust protection on unpainted parts should be monitored.
- For very long storage periods the motor can be placed in a sealed enclosure (for example heat-shrunk plastic) containing sachets of desiccant:
  - Away from frequent significant variations in temperature, to avoid the risk of condensation. During storage the drain plugs must be removed to allow condensation water to escape.
  - If the area is subject to vibration, try to reduce the effect of this vibration by placing the motor on a damping support (rubber plate or similar) and turn the rotor a fraction of a turn once a fortnight to prevent the bearing rings from becoming marked. Remove and replace the rotor locking device if applicable.
  - Do not remove the rotor locking device (where there are roller bearings).

Even if the motor has been stored in the correct conditions, certain checks must be carried out before it is started up:

Greasing

The motors must be stored in their original packaging, in a location away from humidity (RH<90%) and vibrations.
- Motors fitted with permanently greased bearings: maximum storage period = 3 years; after this time, replace the bearings with an identical type.
- Motors fitted with grease nipples:

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<th>Grade 3 grease</th>
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</thead>
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<td>&lt; 6 months</td>
<td>&lt; 1 year</td>
<td>No regreasing before commissioning.</td>
</tr>
<tr>
<td>6 months to 1 year</td>
<td>1 to 2 years</td>
<td>Regrease before commissioning in accordance with the instructions appearing on the nameplate (quantity and quality of grease).</td>
</tr>
<tr>
<td>1 to 5 years</td>
<td>2 to 5 years</td>
<td>Dismantle and clean the bearings. Completely replace the grease in accordance with the instructions appearing on the nameplate (quantity and quality of grease). Replace the seals on the shaftways and for IP 66 motors on the spigots before commissioning.</td>
</tr>
<tr>
<td>&gt; 5 years</td>
<td>&gt; 5 years</td>
<td>Change the bearings. Completely replace the grease in accordance with the instructions appearing on the nameplate (quantity and quality of grease). Replace the seals on the shaftways (lubricate them using the same grease as that on the bearings) and for IP 66 motors on the spigots before commissioning.</td>
</tr>
</tbody>
</table>

4 - COMMISSIONING

**Before starting the motor, it is advisable to check the insulation between the phases and earth, and between phases.**

This check is essential if the motor has been stored for longer than 6 months or if it has been kept in a damp atmosphere. This measurement must be carried out using a megohmmeter at 500 V D.C. (do not use a magnetoelectric system).
- It is better to carry out an initial test at 30 or 50 volts and if the insulation is greater than 1 megohm, carry out a second test at 500 volts for 60 seconds. The insulation value must be at least 10 megohms in cold state.
- If this value cannot be achieved, or if the motor may have been splashed with water or salt spray, or kept for a long period in a very humid place or if it is covered with condensation, it is advisable to dry the stator for 24 hours (only by an authorised Leroy-Somer repair shop) in a drying oven at a temperature of between 110°C and 120°C.
- If it is not possible to place the motor in a drying oven:
  - Switch on the motor, with the rotor locked, at 3-phase A.C. voltage reduced to approximately 10% of the rated voltage, for 12 hours (use an induction regulator or a reduction transformer with adjustable outlets).
  - Or supply the 3 phases in series with a D.C. current, with the voltage at 1 to 2% of the rated voltage (use a D.C. generator with independent excitation or batteries for motors of less than 22 kW).
- NB: The A.C. current must be monitored using a clamp ammeter, and the D.C. current using a shunt ammeter. This current must not exceed 60% of the rated current.
- It is advisable to place a thermometer on the motor housing: if the temperature exceeds 70°C, reduce the indicated voltage or current by 5% of the original value for every 10°C difference. While it is drying, all the motor orifices must be open (terminal box, drain holes). Before commissioning, all these covers must be replaced so that the motor conforms to IP 55 or 65 degree of protection. Clean or replace the orifices and plugs or breathers before reassembly.

**Warning:** If the high voltage test, carried out at the factory before despatch, needs to be repeated, it should be performed at half the standard voltage, i.e: 1/2 (2 U + 1000 V). Check that the capacitive effect resulting from the high voltage test is eliminated before connecting the terminals to earth.

**Prior to commissioning for all motors:**
- Remove all dust from the machine.
- Rotate the motor with no load (no mechanical load) for 2 to 5 minutes, checking that there is no abnormal noise. If there is any abnormal noise, see section 11.
5 - INSTALLATION

5.1 - Position of lifting rings

⚠️ The lifting rings are intended for lifting the motor on its own. They must not be used to lift the whole machine once the motor has been fitted to it.

Labour regulations stipulate that all loads over 25 kg must be fitted with lifting devices to facilitate handling. The positions of the lifting rings and the minimum dimensions of the loading bars are given below in order to help with preparation for handling the motors. If these precautions are not followed, there is a risk of warping or crushing some equipment such as the terminal box, protective cover or drip cover.

- Horizontal position

⚠️ Motors intended for use in the vertical position may be delivered in the horizontal position on a pallet. When the motor is pivoted, the shaft must under no circumstances be allowed to touch the ground, as the bearings may be irreparably damaged.

- Vertical position

<table>
<thead>
<tr>
<th>Type</th>
<th>A</th>
<th>E</th>
<th>h</th>
<th>Øt</th>
<th>C</th>
<th>E</th>
<th>D</th>
<th>n</th>
<th>ØS</th>
<th>e min.</th>
<th>h min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>100</td>
<td>120</td>
<td>200</td>
<td>150</td>
<td>9</td>
<td>320</td>
<td>200</td>
<td>230</td>
<td>2</td>
<td>14</td>
<td>320</td>
<td>350</td>
</tr>
<tr>
<td>112</td>
<td>120</td>
<td>200</td>
<td>150</td>
<td>9</td>
<td>320</td>
<td>200</td>
<td>230</td>
<td>2</td>
<td>14</td>
<td>320</td>
<td>270</td>
</tr>
<tr>
<td>132</td>
<td>160</td>
<td>200</td>
<td>150</td>
<td>9</td>
<td>390</td>
<td>265</td>
<td>290</td>
<td>2</td>
<td>14</td>
<td>390</td>
<td>320</td>
</tr>
<tr>
<td>160</td>
<td>200</td>
<td>160</td>
<td>110</td>
<td>14</td>
<td>410</td>
<td>300</td>
<td>295</td>
<td>2</td>
<td>14</td>
<td>410</td>
<td>450</td>
</tr>
<tr>
<td>180 L</td>
<td>200</td>
<td>160</td>
<td>110</td>
<td>14</td>
<td>410</td>
<td>300</td>
<td>295</td>
<td>2</td>
<td>14</td>
<td>410</td>
<td>450</td>
</tr>
<tr>
<td>180 MR</td>
<td>200</td>
<td>260</td>
<td>150</td>
<td>14</td>
<td>500</td>
<td>400</td>
<td>502</td>
<td>2</td>
<td>30</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>250 MZ</td>
<td>270</td>
<td>260</td>
<td>165</td>
<td>14</td>
<td>500</td>
<td>400</td>
<td>502</td>
<td>2</td>
<td>30</td>
<td>500</td>
<td>500</td>
</tr>
<tr>
<td>250 ME</td>
<td>270</td>
<td>260</td>
<td>250</td>
<td>14</td>
<td>500</td>
<td>400</td>
<td>500</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>280 SC/MC</td>
<td>400</td>
<td>400</td>
<td>500</td>
<td>30</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

* if the motor is fitted with a drip cover, allow an additional 50 to 100 mm to avoid damaging it when the load is swung.

5.2 - Location - ventilation

Our motors are cooled in accordance with method IC 411 (standard IEC 60034-6), i.e. “machine cooled by the surface, using the ambient fluid (air) flowing along the machine”. The fan at the non drive end cools the motor. Air is sucked in through the grille of a fan cover (which provides protection against the risk of direct contact with the fan in accordance with standard IEC 60034-5) and blown along the housing fins to ensure thermal equilibrium of the motor whatever the direction of rotation.
The motor must be installed in an adequately ventilated area, with clearance for the air intake and outlet of at least one-quarter of the frame size. Blocking the fan cover grille and the housing fins, even accidentally (clogging), is likely to adversely affect the operation and safety of the motor.

In the case of vertical operation with the shaft extension facing down, it is advisable to fit the motor with a drip cover to prevent the entry of any foreign bodies. It is necessary to check that the hot air is not being recycled. If it is, pipes must be provided for the intake of cold air and discharge of hot air, in order to prevent abnormal temperature rise of the motor.

In this case, if the air is not circulated by an auxiliary fan, the dimensions of the pipes must be such that the load losses are negligible compared to those of the motor.

Positioning

The motor must be mounted in the position specified on the order, on a base which is rigid enough to prevent distortion and vibration.

Where the motor feet have six fixing holes, it is preferable to use those which correspond to the standard dimensions for the motor power rating (refer to the technical catalogue for induction motors) or, failing that, to those shown at B2.

Provide easy access to the terminal box, the condensation drain plugs and, if appropriate, to the grease nipples.

Use lifting equipment which is compatible with the weight of the motor (indicated on the nameplate).

5.3 - Coupling

Preparation

Turn the motor by hand before coupling to detect any possible fault due to handling.

Remove any protection from the shaft extension. Drain off any condensation water which may have formed inside the motor (see section 4 page 6).

Rotor locking device

For made-to-order motors with roller bearings, remove the rotor locking device.

In exceptional circumstances when the motor has to be moved after the coupling device has been fitted, the rotor must be re-immobilised.

Balancing

Rotating machines are balanced according to standard IEC 60034-14:
- Half-key when the shaft extension is marked H.

By special request, the balancing can be set:
- No key when the shaft extension is marked N
- Full key when the shaft extension is marked F

Any coupling element (pulley, coupling sleeve, slip-ring, etc) must therefore be balanced accordingly.

Motor with 2 shaft extensions:

If the second shaft extension is not used, in order to comply with the balancing class, the half-key or key must be fixed firmly in the keyway so that it is not thrown out during rotation (H or F balancing) and must be protected against direct contact.
6 - ELECTRICAL PARAMETERS LIMIT VALUES

6.1 - Minimizing motor starting problems

In order to protect the installation, any significant temperature rise in the cabling conduits must be prevented, while ensuring that the protection devices are not triggered during starting.

Problems affecting the operation of other devices connected to the same source are due to the voltage drop caused by the current inrush on starting.

Even though mains supplies increasingly allow D.O.L. starting, the current inrush must be reduced for certain installations.

Jolt-free operation and soft starting ensure greater ease of use and an increased lifespan for the machines being driven.

The two essential parameters for starting cage induction motors are:
- Starting torque
- Starting current

The starting torque and the resistive torque determine the starting time.
Depending on the load being driven, it may be necessary to adapt the torque and the current to the machine starting time and to the possibilities of the mains power supply.

The five essential modes are:
- D.O.L. starting
- Star/delta starting
- Soft starting with autotransformer
- Soft starting with resistors
- Electronic starting

The "electronic" starting modes control the voltage at the motor terminals during the entire starting phase and enable very soft, jolt-free starting.

Starting systems must be placed outside the potentially explosive zone or be of an approved type.

6.2 - Supply voltage

The rated voltage is indicated on the nameplate.

6.3 - Starting time

For application with very long starting time, please contact Leroy-Somer passing on the motor type as the serial number.

6.4 - Locked rotor time $t_E$

$t_E$ is the maximum locked rotor time permitted to conform to the rated temperature class. The $t_E$ value is indicated on the motor nameplate.

If the rotor locks, a protective device should switch off the power supply in a time less than $t_E$.

Protection devices must be placed outside the potentially explosive zone or be of an approved type.

6.5 - Supply by frequency inverter

(See section 8.1)
7 - USE

Thermal protection (see section 9) and space heaters.

<table>
<thead>
<tr>
<th>Type</th>
<th>Operating principle</th>
<th>Operating curve</th>
<th>Breaking capacity (A)</th>
<th>Protection provided</th>
<th>Mounting Number of devices*</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thermistor with positive temperature coefficient PTC</td>
<td>Non-linear variable resistor, indirectly heated</td>
<td><img src="image1" alt="Graph" /></td>
<td>0</td>
<td>General surveillance for transient overloads</td>
<td>Mounted with associated relay in control circuit 3 in series</td>
</tr>
<tr>
<td>Thermocouples T (150°C) Copper Constantan K (1000°C) Copper-nickel</td>
<td>Peltier effect</td>
<td><img src="image2" alt="Graph" /></td>
<td>0</td>
<td>Continuous surveillance at hot spots at regular intervals</td>
<td>Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot</td>
</tr>
<tr>
<td>Platinum resistance thermometer PT 100</td>
<td>Variable linear resistance to indirect heating</td>
<td><img src="image3" alt="Graph" /></td>
<td>0</td>
<td>High accuracy continuous surveillance at key hot spots</td>
<td>Mounted in control boards with associated reading equipment (or recorder) 1 per hot spot</td>
</tr>
</tbody>
</table>

- NRT: nominal running temperature.
- The NRTs are chosen according to the position of the sensor in the motor and the temperature rise class.
- The number of devices relates to the winding protection.

Alarm and early warning
All protective equipment can be backed up by another type of protection (with different NRTs): the first device will then act as an early warning (light or sound signals given without shutting down the power circuits), and the second device will be the alarm (shutting down the power circuits).

Thermal magnetic protection
The motors must be protected by a thermal magnetic device located between the isolating switch and the motor. These protection devices provide total protection of the motor against non-transient overloads.
This device can be accompanied by fused circuit-breakers.

Built-in indirect thermal protection
The motors can be equipped with optional heat sensors. These sensors can be used to monitor temperature changes at “hot spots”:
- Overload detection
- Cooling check
- Monitoring strategic points for maintenance of the installation
- Ensuring the temperature of the hot spots is monitored

⚠️ To ensure that the maximum surface temperature is never reached, the thermal sensors fitted on the motor must be connected to a device (in addition to and functionally independent of any system which could be required for operational reasons in normal conditions) which switches off the motor.

⚠️ Under no circumstances can these sensors be used for direct control of the motor operating cycles.

⚠️ Control and breaking devices must be installed in cabinets placed outside the danger zone or must be of an approved type.

Temperature sensor operating thresholds:
- Maximum surface temperature: 125°C (GD)
  - winding sensor: 120°C ± 5°C
  - DE shield sensor: 120°C ± 5°C
- Maximum surface temperature: 130°C (class T4)
  - winding sensor: 120°C ± 5°C
  - DE shield sensor: 120°C ± 5°C
- Maximum surface temperature: 195°C (class T3)
  - winding sensor: 150°C ± 6°C
  - DE shield sensor: 120°C ± 5°C
LSE-FLSE

THREE-PHASE INDUCTION MOTORS FOR ATMOSPHERES CONTAINING EXPLOSIVE GASES AND DUST

8 - SPECIAL OPERATING CONDITIONS

- Thermal protection (see sections 7 & 9)

- Space heaters (see section 7)

- Temperatures: storage and ambient
  Note: \( T_s = \) ambient temperature
  If the motor has been stored at a temperature lower than \(-10\)°C, heat it (see section 4) and turn the shaft manually before starting up the machine.
  If it is to be used at a temperature lower than \(-20\)°C, the motor may be equipped with space heaters.
  Our standard motors are designed to operate at an ambient temperature \( T_a \) of between \(-20\)°C and \(40\)°C.
  If \(-40\)°C \( \leq T_s < -25\)°C, the shaftway seals must be made of silicon and the fan must be metal. The flat seals of the terminal box must be silicon or polyurethane mastic.

- Surface temperature
  As standard, the maximum surface temperature of our motors is \(200\)°C for \( T_s \) or \(135\)°C for \( T_s \) with an ambient temperature \( \leq 40\)°C (G).
  If the motors are also to be used in atmospheres which may contain explosive dust, the maximum surface temperature will be \(125\)°C (GD).

- Installation zones
  Motors with IP 65 protection are designed for use in atmospheres containing explosive dust - group II - Category 2 (zone 21) or Category 3 (zone 22).
  In atmospheres containing explosive gas, the degree of protection is IP 55.

- Connection
  Particular attention must be paid to the information on the nameplate in order to choose the correct type of connection for the supply voltage.

- Earthing
  It is compulsory to earth the motor, and earthing must be performed in accordance with current regulations (protection of workers).

- Seals
  If the drain plugs or breathers are removed, they must be replaced in order to ensure that the motor conforms to IP 55 or IP 65 protection. Replace the seals which have been removed with new seals of the same type. Clean the holes and plugs before reassembly.

* Each time the motor is dismantled, and during planned maintenance, replace the seals on the shaftways, the shield spigots and the terminal box cover with new seals of the same type after cleaning all parts. The seals on the shaftways must be fitted using the same type of grease as on the bearings.

This operation must be carried out by an authorised repair shop.

- Workforce safety
  Protect all rotating devices before power-up.
  If a motor is started up without a coupling device having been fitted, carefully immobilise the key in its location.
  All measures must be taken to ensure protection against the risks which arise when there are rotating parts (coupling sleeve, pulley, belt, etc).
  Beware of backdriving when the motor is switched off. The appropriate precautions must be taken:
  - For example, for pumps a non-return valve must be installed.

- Contactors - Isolators
  In all cases, contactors, isolators, etc, must be installed and connected in an enclosure outside the danger zone or be of an approved type.

- Shock resistance
  The motor can withstand a weak mechanical shock (IK 08 according to EN 50102). The user must provide additional protection if there is a high risk of mechanical shock.
**8.1 - Use with a variable speed drive**

When a drive is used, any special instructions detailed in the specific drive manual must be observed. In particular, the following minimum steps must be taken:

- Check that the drive switching frequency is at least 3 kHz.

- Check that the motor has a second nameplate indicating the maximum motor characteristics when used with a variable speed drive.

- The reference voltage, usually 400 V at 50 Hz, is indicated on the motor nameplate. The drive must deliver a constant voltage/frequency signal to the motor.

- Program in the drive the maximum current value and also the min. and max. frequency values indicated on the second motor nameplate.

- Each type of "e" motor should have been tested first on load with a drive of exactly the same type as the one it will be controlled with.

> **Drives and sensor connection devices must be placed outside danger zones (outside zones 0, 1, 2, 20, 21 and 22).**

**8.1.1 - Special conditions for safe operation**

- As standard, the motor shock resistance corresponds to a “low” risk of mechanical danger, and they should therefore be installed in an environment with a low risk of shocks.

- The motor must be fitted with thermal sensors in the winding (all frame sizes) and on the DE bearing (frame size 160 and above) in the following cases:
  - Motor supplied by a frequency inverter
  - Motor in a good air-flow (IC418) and not self-cooled
  - Motor adapted so as to no longer be self-cooled (IC410)
  - Motor fitted with a backstop

- The thermal sensors fitted on the motor must be connected to a device placed outside the zone, which switches off the motor when the operating thresholds are reached, so that the maximum surface temperature is never reached. This device must operate in normal conditions and must be in addition to and functionally independent of any system which could be required for operational reasons in normal conditions.

- When the motor is fitted with auxiliary or forced ventilation (IC416), a device must be present to prevent the main motor from operating when there is no ventilation.

- The space heaters should only be supplied with power when the motor is switched off and cold; their use is recommended in ambient temperatures less than -20°C.

- The supply voltage and frequency must conform to those indicated on the motor nameplate.

- The frequency range specified on the motor nameplate must be strictly observed.

- When several motors are supplied by the same drive, individual protection must be provided on each motor starter (thermal relay for example), for safety reasons.

- When a frequency inverter is used, any special instructions detailed in its specific manual must be complied with.

- The cable glands should be compatible with the protection method used for the connection part. On variants with an integral cable(s), the motor must be connected outside the potentially explosive atmosphere, or inside a box protected by a suitable recognised protection method.

- When the motor is fitted with one or more auxiliary junction boxes protected with increased safety, it can only tolerate a low risk of mechanical danger, and the user will need to provide additional protection if there is a high level of risk. (In other words, when an auxiliary terminal box is attached to the main terminal box).

**Remark:**

PTCs thermistor characteristics as wiring diagram can be transmitted by Leroy-Somer.
Please always pass on motor type and serial number.
9 - MECHANICAL ADJUSTMENTS

Tolerances and adjustments
The standard tolerances are applicable to the mechanical characteristics given in our catalogues. They comply fully with the requirements of IEC standard 60072-1.
- Users must adhere strictly to the instructions provided by the transmission device supplier.
- Avoid impacts which could damage the bearings.
Use a spanner and the tapped hole of the shaft extension with a special lubricant (e.g. molykote grease) to make it easier to fit the coupling.

The hub of the transmission device must be:
- Fully in contact with the shoulder of the shaft or, if this is missing, against the metal stop ring which forms a labyrinth seal and thus locks the bearing in place (do not crush the seal).
- Longer than the shaft extension (2 to 3 mm) so that it can be tightened using a screw and washer. If it is not, a spacer ring must be inserted without cutting the key (if this ring is large, it must be balanced).

If there is a second shaft extension, it must only be used for direct coupling and the same recommendations must be followed.

⚠️ The 2nd shaft extension may also be smaller than the main shaft extension, and under no circumstances can it deliver torques greater than half the rated torque.

Inertia flywheels must not be mounted directly onto the shaft extension, but installed between end shields and connected by a coupling device.

Direct connection onto the machine
When mounted directly on the motor shaft extension of the moving device (pump or fan turbine), check that this device is perfectly balanced and that the radial force and the axial thrust are within the limits indicated in the catalogue for bearing performance.

Direct connection using a flexible coupling
Selection of the coupling sleeve should take account of the rated torque to be transmitted and the safety factor dependent on the starting conditions for the electric motor. The machines must be carefully aligned, so that any lack of concentricity and parallelism in the two parts of the coupling sleeve is compatible with the recommendations of the coupling sleeve manufacturer. The two parts of the coupling sleeve must be assembled provisionally to assist their movement in relation to one another.

Adjust the parallel plane of both shafts using a gauge. Measure the distance between the two coupling surfaces at one point on the circumference. Rotate them 90°, 180° and 270° in relation to this initial position, and measure each time. The difference between the two extreme values of dimension “x” must not exceed 0.05 mm for standard couplings.

To perfect this adjustment and at the same time check the concentricity of the two shafts, fit 2 gauges as shown in the diagram and slowly turn both shafts. The differences registered by either shaft will indicate the need for an axial or radial adjustment if the difference exceeds 0.05 mm.

Direct connection using a rigid coupling
The two shafts must be aligned so as to adhere to the tolerances of the coupling sleeve manufacturer. Maintain the minimum distance between the two shaft extensions to allow for expansion of the motor shaft and the load shaft.

<table>
<thead>
<tr>
<th>Ø (mm)</th>
<th>A (mm) min.</th>
</tr>
</thead>
<tbody>
<tr>
<td>9 to 55</td>
<td>1</td>
</tr>
<tr>
<td>60</td>
<td>1.5</td>
</tr>
</tbody>
</table>
10 - SUPPLY CONNECTION

10.1 - Terminal box

This is placed as standard on the top of the motor near the drive end. It has IP 55 (G) or IP 65 (GD) protection and is fitted with a cable gland according to the table below.

Warning: The position of the terminal box cannot be easily modified, even with flanged motors, as the condensation drain holes (if appropriate) must be at the bottom.

Cable size

Adapt the cable gland and its reducer or amplifier, if fitted, to the diameter of the cable being used, in accordance with the manual specific to the cable gland, which is included with the motor. To maintain the original stated IP protection of the motor, it is essential to make a watertight seal between the rubber ring and the cable, by tightening the cable gland correctly (it should not be possible to unscrew it without a tool). Unused cable glands must be replaced with threaded plugs. Unused orifices must also be closed off using threaded plugs. When fitting cable glands or blocking holes, a seal of perbunan, or silicon or polyurethane mastic, must be inserted between the cable glands, the plugs, the reducers or (and) the amplifiers and the support or the terminal box.

For connections using screwed conduit entries, a minimum of 5 cylindrical threads or 3 tapered threads must be engaged (check the minimum thickness of the cable gland). These threads must be rendered watertight by using polyurethane or silicon mastic, or anti-vibration adhesive.

Cable size of the cable glands and diameter of drill holes on the cable gland baseplates

<table>
<thead>
<tr>
<th>Cable gland type *</th>
<th>Min. cable Ø (mm)</th>
<th>Max. cable Ø (mm)</th>
</tr>
</thead>
<tbody>
<tr>
<td>ISO M16 x 1.5</td>
<td>6</td>
<td>11</td>
</tr>
<tr>
<td>ISO M20 x 1.5</td>
<td>7.5</td>
<td>13</td>
</tr>
<tr>
<td>ISO M25 x 1.5</td>
<td>12.5</td>
<td>18</td>
</tr>
<tr>
<td>ISO M32 x 1.5</td>
<td>17.5</td>
<td>25</td>
</tr>
<tr>
<td>ISO M40 x 1.5</td>
<td>24.5</td>
<td>33.5</td>
</tr>
<tr>
<td>ISO M50 x 1.5</td>
<td>33</td>
<td>43</td>
</tr>
<tr>
<td>CMA 3&quot; GC</td>
<td>40</td>
<td>62</td>
</tr>
</tbody>
</table>

* Cable anchor gland® certified Exe. Cable gland made of brass.
The motors are factory-fitted with guidance labels which must be kept clean and legible.

Under no circumstances should the power supply cable be used for handling the motor.

10.2 - Wiring diagram for terminal block or isolators

All motors are supplied with a wiring diagram in the terminal box. If required, this diagram should be obtained from the supplier, specifying the motor type and number (shown on the motor nameplate).

The connector links required for coupling can be found inside the terminal box.

Single speed motors have a block with 6 EExe approved safety terminals, whose marking complies with IEC 60034-8 (or NFC 51-118).

10.3 - Direction of rotation

When the motor is powered by U1, V1, W1 or 1U, 1V, 1W from a direct mains supply L1, L2, L3, it turns clockwise when seen from the drive shaft end.

If 2 phases of the power supply are changed over, the motor will rotate anti-clockwise (the motor should be checked to ensure that it has been designed to rotate in both directions).

If the motor is fitted with accessories (thermal protection or space heater), these must be connected on mini-terminals.

Motor fitted with a terminal block

10.4 - Earth terminal

It is compulsory to earth the motor, and earthing must be performed in accordance with current regulations (protection of workers).

One earth terminal is located inside the terminal box, and another is outside the enclosure. They are marked: 

They must be protected against self-release by a jumper, lock washer, screw or locknut, or anti-vibration adhesive.

The sizing of the cables must comply with the specifications of standard 60079-0.

10.5 - Connecting the power supply cables to the terminal block

The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter (diagrams 1 and 3). They must be crimped in accordance with the connector supplier’s instructions.
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10.5.1 - Terminal block with round connectors
These terminal blocks, mounted on the housing and held in place by 2 locked screws, make it possible to use standard round connectors.

![Diagram 1](image)

Each terminal consists of the following items, positioned in order:
- 1: motor cable connector, shank locked
- 2: power supply cable connector, shank locked
- 3: terminal washer
- 4: Y or △ connector link
- 5: "Serpess" brake nut

Tightening torque (N.m) for the nuts on LSE terminal blocks

<table>
<thead>
<tr>
<th>Terminal</th>
<th>M4</th>
<th>M5</th>
<th>M6</th>
</tr>
</thead>
<tbody>
<tr>
<td>Steel</td>
<td>2</td>
<td>3.2</td>
<td>5</td>
</tr>
<tr>
<td>Brass</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>

- Earth terminal:
This is situated inside the terminal box; in some cases, the earth terminal may be situated on one of the feet or on one of the cooling fins (round motors). It is indicated by the symbol: ⚗

⚠️ It is compulsory to earth the motor, and earthing must be performed in accordance with current regulations (protection of workers).

* If required, ask the supplier for this diagram, specifying the motor type and number (shown on the motor nameplate).

- Connecting the power supply cables to the terminal block:
The cables must be fitted with connectors suitable for the cable cross-section and the terminal diameter.
They must be crimped in accordance with the connector supplier's instructions.
Connection must be carried out with connector resting on connector (see the diagrams below):

![Diagram 2](image)

11 - MAINTENANCE
11.1 - General information
11.1.1 - Frequent monitoring
This monitoring, generally carried out by operators, is intended to:
- Monitor, as a preventive measure, the state of the equipment (cables, cable glands, etc) bearing in mind the environmental conditions (temperature, humidity, etc).
- Detect as early as possible any potentially dangerous problems, such as damage to the cable ducts by abrasion.
- Ensure that staff are fully trained on the risks and means of prevention.

⚠️ If there is an accumulation of dust between the fins and/or on the fan cover grille, leading to a rise in the surface temperature, the motor should be cleaned frequently.

11.1.2 - Repairs
Repairs to and/or rewinding of the electrical equipment for use in potentially explosive zones must be carried out by qualified staff, using identical equipment, in compliance with the specifications of standard 60079-19. It is essential that the motor is returned to its original state, adhering scrupulously to the original motor construction. Disregarding this may affect the safety of the equipment (for example, protection index not conforming to IP 55 or IP 65) or the surface temperature (for example, rewinding the motor). Prior written authorisation from the manufacturer is necessary.

⚠️ Unless written authorisation has been obtained, the manufacturer cannot be held responsible for any action which could affect the motor’s safe operation.

Service Centres (CDS) are trained and approved by “Saqo - ATEX” to guarantee the maintenance and repair of these motors in complete safety.
11.1.3 - Spare parts

When ordering spare parts, you must indicate the complete motor type, its serial number and the information given on the nameplate (see section 2).

Part numbers can be found on the exploded views and their descriptions in the parts list (section 12).

Routine maintenance kits can be obtained from our After Sales Service.

In the case of flange mounted motors, indicate the type of flange and its dimensions (see below).

To ensure that our motors operate correctly and safely, we recommend the use of original manufacturer spare parts.

In the event of failure to comply with this advice, the manufacturer cannot be held responsible for any damage.

11.2 - Corrective maintenance: general information

11.2.1 - Dismantling the motor

First switch off and lock the power supply and ensure there is no potentially explosive atmosphere.

Repair and maintenance of inner parts must be carried out by an authorized repair shop. Control and replacement of seals described in §11.2.2 can be done by a trained and competent body according to EN 60079-19

- Open the terminal box, mark the wires and their positions
- Disconnect the power supply wires
- Uncouple the motor from the equipment being driven

Always use an extractor to remove any devices mounted on the motor shaft extension.

11.2.2 - Check-up of the shaftways seals

To maintain the protection principle of an ATEX dust motor, it’s mandatory to prevent the ingress of dust into the machine to avoid its combining with air to form an explosive atmosphere.

For the motors use in explosive dust environment (zone 21 & 22), it’s imperative to maintain the protection index (IP 65) of the machines. Therefore, all seals have to be replaced every 3 years of operation.

In zone 21, the shaftways seals installed fan drive side must be checked every year (not applicable for the seals installed oil pump drive side).

After decoupling of the driven equipment, the following controls must be carried out:
- Manually rotate the motor and verify that the lip rub remains in all position in contact with the endshield
- Check that the inner lip of the each seals doesn’t have any crack

11.2.3 - Shaftways seals replacement

Minimum every 3 years of operation, all the seals of the motors used in explosive dust atmosphere must be replaced.

Replace the seals on the shaftways and on the shield spigots with new seals of the same type, after cleaning the parts.

- Remove the shaft key, the fan cover (if installed) and the cooling fan (if installed)
- Clean the shaft extension as the endshields and remove all traces of knocks
- Install new shaftways seals of the same type (same dimensions and same material) as follow:
  o Prior to being fitted, the sealing member shall be greased but not between the sealing member and the case. It is important that the seal is fitted with adequate precision.
  o The seal shall be pressed onto the shaft with a uniform and even pressure.
  o The case must not be tapped directly with a hammer: the seal should be pressed to the right position by means of a suitable assembly tool (see figures).

**Installation principle**

**Assembly tool**

### 11.4 - Routine maintenance

**Inspection after commissioning**

After approximately 50 hours’ operation, check the tightness of the screws fixing the motor and the coupling device. In the case of chain or belt transmission, check that the tension is correctly adjusted.

**Cleaning**

To ensure the motor operates correctly, remove any dust or foreign bodies which may clog the air intake and the housing fins.

Precaution: Check that the motor is completely sealed (terminal box, drain holes, etc) before carrying out any cleaning operation.

Dry cleaning (vacuuming or compressed air) is always preferable to wet cleaning.

⚠️ Cleaning must always be carried out at a pressure of less than 10 bars, from the centre of the motor outwards to avoid dust and particles getting under the seals.

### 11.3 - Safety regulations

⚠️ Before any work is carried out on the motor or in the cabinet, ensure that there is no potentially explosive atmosphere and that all the components of the equipment are powered down.

⚠️ Before any work is carried out on the motor or in the cabinet, check that the cosine compensation capacitors are isolated and/or discharged (read the voltage at the terminals).

⚠️ Depending on the type of thermal protection, the motor may remain powered up. Ensure that the mains supply is disconnected before any work is carried out in the terminal box or in the cabinet.
11.4.1 - Lubrication

11.4.1.1 - Grease life
The lifetime of a lubricating grease depends on:
- the characteristics of the grease (type of soap and base oil, etc)
- service stress (type and size of bearing, speed of rotation, operating temperature, etc)
- contamination

11.4.1.2 - Permanently greased bearings
For motors from 80 to 132 frame size, the type and size of the bearings make for long grease life and therefore lubrication for the lifetime of the machine.

11.6 - IP 55 or IP 65 protection for the motor

Each time the motor is dismantled and during planned site maintenance, replace the seals on the shaftways, the shield spigots and the terminal box cover (if mastic) with new seals of the same type after cleaning all parts. The seals on the shaftways must be fitted using the same type of grease as on the bearings.

If the drain plugs or breathers are removed, they must be replaced in order to ensure that the motor conforms to IP 55 or IP 65 protection. Replace the seals which have been removed with new seals of the same type. Clean the holes and plugs before reassembly.

If the terminal box cover is removed, clean all the parts and replace the seal with a new seal of the same type, if its condition no longer provides the required degree of protection.

Remark:
Expertise or repair can only be carried out by an authorised and approved service Company.

11.7 - Repainting
If the motors must be repainted, the coating thickness can not exceed 200 µm (remove the old painting if necessary).

### Reference Bühler Technologies

<table>
<thead>
<tr>
<th>Reference</th>
<th>Motor Type</th>
<th>Polarity</th>
<th>D.E.</th>
<th>N.D.E.</th>
</tr>
</thead>
<tbody>
<tr>
<td>3MT075044ATEX</td>
<td>LSE 80L</td>
<td>4</td>
<td>6204ZZC3</td>
<td>6203ZZC3</td>
</tr>
<tr>
<td>3MT075044ATEX</td>
<td>LSE 80L</td>
<td>4</td>
<td>6204ZZC3</td>
<td>6204ZZC3</td>
</tr>
<tr>
<td>3MT075044ATEX</td>
<td>LSE 90S</td>
<td>4</td>
<td>6205ZZC3</td>
<td>6204ZZC3</td>
</tr>
<tr>
<td>3MT151004ATEX</td>
<td>LSE 100L</td>
<td>4</td>
<td>6204ZZC3</td>
<td>6202ZZC3</td>
</tr>
<tr>
<td>3MT151004ATEX</td>
<td>LSE 100L</td>
<td>6</td>
<td>6207ZZC3</td>
<td>6206ZZC3</td>
</tr>
<tr>
<td>3MT151220ATEX</td>
<td>LSE 112ML</td>
<td>4</td>
<td>6206ZZC3</td>
<td>6206ZZC3</td>
</tr>
<tr>
<td>3MT151220ATEX</td>
<td>LSE 112ML</td>
<td>6</td>
<td>6206ZZC3</td>
<td>6206ZZC3</td>
</tr>
</tbody>
</table>

* D.E. = terminal box side; N.D.E. = terminal box opposite side

11.5 - Reconditioning the bearings

Replacement of bearings must be only carried out by Leroy-Somer or by an authorised repair shop.
11.8 - Troubleshooting guide (in addition to standard IEC 79-17)

<table>
<thead>
<tr>
<th>Incident</th>
<th>Possible cause</th>
<th>Remedy</th>
</tr>
</thead>
<tbody>
<tr>
<td>Abnormal noise</td>
<td>Originating in motor or machine being driven?</td>
<td>Uncouple the motor from the equipment being driven and test the motor on its own</td>
</tr>
</tbody>
</table>
| Noisy motor                      | **Mechanical cause:** if the noise persists after switching off the electrical power supply
- Vibration
- Damaged bearings
- Mechanical friction: ventilation, coupling |
|                                  | **Electrical cause:** if the noise stops after switching off the electrical power supply
- Normal voltage and 3 phases balanced
- Abnormal voltage
- Phase imbalance (current)      | - Check the power supply at the motor terminals
- Check the connection of the terminal block and the tightening of the connectors
- Check the power supply line
- Check the winding resistance and the balancing of the mains supply (voltage) |

| Motor heats up abnormally        | Faulty ventilation                                                            | - Check the environment
- Check that the key conforms to the type of balancing (see section 11.3) |
|                                  | Faulty supply voltage                                                         | - Check
- Terminal connection fault      | - Check
|                                  | Overload                                                                      | - Check the current consumption in relation to that indicated on the motor nameplate |
|                                  | Partial short-circuit                                                        | - Check the electrical continuity of the windings and/or the installation |
|                                  | Phase imbalance                                                              | - Check the winding resistance |

| Motor does not start             | **No load**
- Mechanical seizing
- Broken power supply line      | When switched off:
- Check by hand that the shaft rotates freely
- Check the fuses, electrical protection, starting device, electrical continuity |
|                                  | **On load**
- Phase imbalance               | When switched off:
- Check the direction of rotation (phase order)
- Check the resistance and continuity of the windings
- Check the electrical protection |

11.9 - Preventive maintenance

The diagram and table below give the recommended equipment to use and the ideal positions to take measurements of all parameters which can affect the operation of the machine, such as eccentricity, vibration, state of the bearings, structural problems, electrical problems, etc.

<table>
<thead>
<tr>
<th>Detector</th>
<th>Measurement</th>
<th>Measurement points</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Accelerometer</td>
<td>For measuring vibrations</td>
<td><strong>M 01V</strong></td>
</tr>
<tr>
<td>2 Photo-electric cell</td>
<td>For measuring speed and phase (balancing)</td>
<td></td>
</tr>
<tr>
<td>3 Clamp ammeter</td>
<td>For measuring current (D.C. and 3-phase A.C.)</td>
<td></td>
</tr>
<tr>
<td>4 Voltage probe</td>
<td>For measuring voltages</td>
<td></td>
</tr>
<tr>
<td>5 Infra-red probe</td>
<td>For measuring temperature</td>
<td></td>
</tr>
</tbody>
</table>
(2) Equipment and protection systems intended for use in potentially explosive atmospheres
Directive 94/9/EC

(1) EC-TYPE EXAMINATION CERTIFICATE

(3) Number of the EC type examination certificate: INERIS 01ATEX0010 X

(4) Protection system or equipment:

3-PHASE ASYNCHRONOUS MOTOR TYPE FLSE... or LSE...
(the type may be supplemented by an option symbol and the type by the shaft height an indication of the symbol for the distance between the centre lines of the motor mounting holes and/or for the number of poles)

(5) Manufacturer: LEROY SOMER

(6) Address: F- 16015 ANGOULEME

(7) This protection system or equipment and any other acceptable alternative of this one are described in the appendix of this certificate and the descriptive documents quoted in this appendix.

(8) The INERIS, notified body and identified under number 0080, in accordance with article 9 of Council Directive 94/9/CE 23 th March 1994, certifies that this protection system or equipment fulfills the Essential of Health and Safety Requirements relating to the design and construction of equipments and protection systems intended for use in potentially explosive atmospheres, described in appendix II of the Directive.

The examinations and the tests are consigned in official report n° 16021/01.

(9) The respect of the Essential Health and Safety Requirements is ensured by:

- conformity with:
  EN 50 014 of June 1997 + A1 and A2
  EN 50 019 of November 2000
  EN 50 281-1-1 of September 1998

- specific solutions adopted by the manufacturer to meet the Essential Health and Safety Requirements described in the descriptive documents.

(10) Sign X, when it is placed following the Number of the EC type examination certificate, indicates that this equipment and protection system is subjected to the special conditions for safe use, mentioned in the annex of this certificate.
(11) This EC type examination certificate relates only to the design, examination and tests of the specified equipment or protective system in accordance to the directive 94/9/EC. Further requirements of the Directive apply to the manufacturing process and supply of this equipment or protective system. These are not covered by this certificate.

(12) The marking of the equipment or the protection system will have to contain:

\[ \text{Ex II 2 G or Ex II 2 GD EEx e II T3 or EEx e II T4} \quad \text{IP65 T200°C to T125°C} \]

Verneuil-en-Halatte, 2001 12 29

X. LEFEBVRE

Director of the Certifying Body,
By delegation
B. PIQUETTE
Deputy Manager of Certification

Engineer at the Laboratory for Certification of ATEX equipment

ATMOSPHERES EXPLOSIVES
NOTIFIED BODY 
EXPLOSIVE ATMOSPHERES
ANNEX

EC TYPE EXAMINATION CERTIFICATE N° INERIS 01ATEX0010 X

DESCRIPTION OF THE EQUIPMENT OR THE PROTECTION SYSTEM

Three-phase asynchronous electric motor with frame out of cast aluminium for type LSE... and frame out of cast iron for type FLSE... and cast iron flanges.
The basic shaft heights are in mm: 80, 90, 100, 112, 132 and 160.

A primary junction box in cast iron or steel is mounted on the housing. An auxiliary box can be fitted on the primary box. As a variation, between one and four auxiliary junction boxes, can be welded on the primary junction box in steel, or the connection can be made of a unterminated cable.

The motor may be designed with one or two speeds.

Temperature sensors may be incorporated in the stator windings and in the bearings.

The motor may be supplied through a frequency converter and/or can operate at variable speed. In this case, it is fitted with temperature sensors located in the stator windings and in the front bearing. These sensors should be connected to a device that shuts off power to the motor so that the maximum indicated surface temperature is never reached.

Heating resistances may be located in the winding.

The motor and the junction boxes can be realised by the manufacturer for use in an ambient temperature range from -25°C to 40°C, or from -25°C to 60°C or from -40°C to 60°C.

The degrees of protection of enclosures (motor and junction box(es)) are IP55 in the standard version, IP66 according in the variant to EN 60 034 part 5 EN 60 529.

The degrees of mechanical protection of enclosures are IK08 in the standard version.

Electrical cables are inserted into the apparatus through screw-in cable penetrations of a type certified EEx d and/or EEx e, according to the CENELEC standards or through conduit entrée(s).

The motor can be fitted with the following Ex components:
- Terminal KS 7A certificate PTB 90C3163U,
- Terminal KS 8A certificate PTB 90C3164U,
- Terminal KS 10A certificate PTB 90 C3165U.
SAFETY PARAMETERS

Motor:
- Supply voltage max : 1100 V above the shaft height 132
- Supply voltage max : 726 V until the shaft height 132
- Frequency : 50 or 60 Hz or
  - other fixed values between,
    - up to 200 Hz until the shaft height ≤ 132
    - up to 100 Hz up to the shaft height 132
- Frequency variation : same range defined below
- Rating : - standard version, SI service
  - from 0.37 kW to 11 kW under 50 Hz
  - for special versions the different parameters can be adapted.

Heating resistances : Umax = 240V (50/60Hz)
- P max = 100W

Operating maximal thresholds of the temperature sensors:
- Maximum surface temperature = 125°C
  - winding sensor = 120°C ± 5°C
  - bearing sensor = 120°C ± 5°C

- Maximum surface temperature = 130°C (class T4 )
  - winding sensor = 120°C ± 5°C
  - bearing sensor = 120°C ± 5°C

- Maximum surface temperature = 195°C (class T3 )
  - winding sensor = 150°C ± 6°C
  - bearing sensor = 190°C ± 5°C

MARKING

Marking must be readable and indelible; it must comprise the following indications:

- LEROY SOMER
  - F-16015 ANGOULEME
- FLSE... or LSE... (1)
- INERIS 01ATEX0010 X
- (serial number)
- (Year of construction)
- Ex II 2 G or Ex II 2 GD
- EEx e II T3 or EEx e II T4 IA/IN tE (•)
- IP65 T200°C or T 135°C or T125°C (**)  
- T amb: -25°C to 40°C

or
- **LEROY SOMER**  
  F-16015 ANGOULEME

- FLSE... or LSE... (1)
- INERIS 01ATEX0010 X
- (serial number)
- (Year of construction)
- **EX II 2 G or EX II 2 GD**
- EEEx e II T3 IA/IN tE (**)
- IP65 T200°C or T 145°C or T135°C (**)  
- T amb: -25°C to 50°C or T amb: -25°C to 60°C
- T cable : 100°C

(1) FLSE or LSE may be supplemented by an option symbol and the type by the shaft height an indication of the symbol for the distance between the motor mounting holes and/or of the number for poles

(*) see classification temperature table

(**) for explosive dusty atmospheres

Rated current and voltage

on the junction box, the marking :

DO NOT OPEN WHEN ENERGIZED

and, in each of the above cases, on each junction box lid, the following:

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT

The covered type by this EC type examination certificate are mentioned in the temperature class table.

The whole of marking can be carried out in the language of the country of use.

The protection apparatus or system must also carry the marking normally envisaged by the standards of construction which relate to it.

**ROUTINE EXAMINATIONS AND TESTS**

Each example of the equipment protected defined above must have successfully passed before delivery a dielectric strength test carried out as specified in 7.1 in accordance with 6 of the EN 50 019 standard on the connection elements.

**16) DESCRIPTIVE DOCUMENTS**

The report is composed of the documents quoted hereafter, constituting the descriptive file of the apparatus, object of this certificate.

- Descriptive notice ref..LS :BE69< LSE>12-01 : (7 pages)  
  signed on 10.12.2001
- Addition to instruction notice and maintenance  
  signed on 10.12.2001
- Temperature class table 23.10.2001
- Association table motors with frequency inverter on 2001.12.10
- Plans BE6919 rev A (3 folios) signed on 20.06.2001
- Plans BE6921 rev A (3 folios) signed on 20.06.2001
- Plans E6923 rev A (3 folios) signed on 20.06.2001
- Plans E6986 rev A (3 folios) dated on 25.09.2001 signed on 02.10.2001
- Plans E6989 rev A (3 folios) dated on 25.09.2001 signed on 10.10.2001
- Plans E7004 rev A (3 folios) dated on 10.10.2001 signed on 12.10.2001

(17) **SPECIAL CONDITIONS FOR SAFE USE**

When the motor is supplied through a frequency converter and/or used in an air flow, it must be fitted with thermal sensors in the windings, on the front bearing and eventually on the rear bearing.

When the motor is fitted with a forced ventilation, a device has to oppose to running of the main motor in absence of ventilation.

In order to ensure that the maximum surface temperature is not exceeded, the thermal sensors fitted to the motor should be connected to a device that switches off power to the motor when the operating thresholds defined in (15) are reached. Also the heating resistances may be powered only when the motor is disconnected from the power supply and cold.

When the motor is equipped with one or many auxiliary connecting boxes, it can only support a low risk of mechanical danger and the user would have to ensure a complementary protection in case of high risk.

The cable entries must be compatible with the type of protection used for the connecting part. In the variant with unterminated cable(s), the connection to the motor must be made whether in a non-explosive atmosphere or protected by a standard type of protection.

These special conditions are defined in the instructions for the motor.

(18) **ESSENTIAL REQUIREMENTS OF SAFETY AND HEALTH**

The respect of the Essential Health and Safety Requirements is ensured by:

- conformity to the European standards EN 50 014, EN 50 019 and EN 50 281-1-1
- the whole of the provisions adopted by the manufacturer and described in the descriptive documents.
ADDITION

INERIS 01ATEX0010 X/01

3-PHASE ASYNCHRONOUS MOTOR TYPE LSE...or FLSE...

Made by LEROY SOMER

(15) - PURPOSE OF THE ADDITION

Up date of the descriptive documents allowing:

- Extension of motor range according the following shaft height: 63, 71, 80, 90, 100, 112, 132, 160, 180, 200, 225, 250, 280.
- Modification of the ambient temperature range :-20°C to 40°C as normal use.
- Mechanical modification.
- Table of temperature class according to the shaft heights.
- Add of the components Ex defined in the descriptive documents.
- Association motor frequency converter.
- Add of manufacturing areas.

PARAMETERS RELATING TO THE SAFETY

The parameters relating to safety indicated in the basic certificate are supplemented as follow:

Motor:
Rating: - standard version, S1 service from 0.25 kW to 75 kW under 50 Hz - for special versions the different parameters can be adapted.

MARKING

The code marking envisaged in the basic certificate is supplemented by the following code:

- LEROY SOMER
- F- 16015 ANGOULEME or F- 90500 BEAUCOURT or F- 69 SAINT SYMPHORIEN D'OZON or F- 16230 MANSLE
- LSE...or FLSE... (1) - INERIS 01ATEX0010 X - (Serial number) - (Year of construction)
- Ex II 2 G or Ex II 2 GD
- EEx e II T3 IA/IN tE (*)

Or

- EEx e II T4 IA/IN tE (*)

IP66 T 125°C or T 135°C or T145°C(**)
Tamb : mandatory mention if it differs from -20°C to 40°C
(1) FLSE or LSE may be supplemented by an option symbol and the type by the shaft height an indication of the symbol for the distance between the motor mounting holes and/or of the number for poles
(*) see classification temperature table
(**) for explosive dusty atmospheres
Rated current and voltage
on the junction box, the marking :
DO NOT OPEN WHEN ENERGIZED

and, in each of the above cases, on each junction box lid, the following:
DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT

The covered type by this EC type examination certificate are mentioned in the temperature class table.

ROUTINE EXAMINATIONS AND TESTS

The examinations and individual tests envisaged in the basic certificate are unchanged.

(16) - DESCRIPTIVE DOCUMENTS

The documents referred to below, constitute the file describing the modifications of the apparatus and forming the subject of the present addition.
- Descriptive Notice of extension n°1 dated and signed on 2005.05.17
- Technical annex 25 items dated and signed on 2005.12.01
- Table of temperature class ST1036A dated and signed on 2005.03.15
- Table of temperature class T50Q020B dated and signed on 2005.03.14
- Table of temperature class ST70 0002_1 dated and signed on 2005.12.22
- Table of association motor/frequency converter ST1008_B dated and signed on 26.01.2006
- Plan GT104700 2005.02.08
(17) - SPECIAL CONDITIONS FOR SAFE USE

The special conditions are completed as follow:

The motor supplied through a frequency converter removed and located in non hazardous area or used in a sufficient air flow or eventually adapted in view to not be self ventilated must be fitted with thermal sensors in the windings (all shaft heights), on the front bearing (from the shaft height 160) and eventually on the rear bearing.

(18) - ESSENTIAL REQUIREMENTS OF SAFETY AND HEALTH

The respect of the Essential Health and Safety Requirements indicated in the basic certificate is unchanged.

Verneuil-en-Halatte, 2006 02 21

X. LEFEBVRE

Engineer at the Laboratory of Certification of ATEX Equipment

Director of the Certifying Body, By delegation
B. PIQUETTE
Deputy manager of Certification

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ADDION

(3)

INERIS 01ATEX0010X/02

(4)

3-PHASE ASYNCHRONOUS MOTOR TYPE LSE or FLSE...

(5)

Made by LEROY SOMER

(15) PURPOSE OF THE ADDITION

- Modification of plastic materials of the ventilators, for the motors GD.
- Limitation of the maximum supply voltage to 1000V.
- Addition of a new maximum ambient temperature: +75°C.
- Electrical and mechanical execution variations.
- For the plant of BEAUCOURT, LEROY-SOMER becomes LEROY-SOMER MOTORS, Constructions Electriques de Beaucourt (CEB), company of LEROY-SOMER group.
- Addition of synchronous motors.

PARAMETERS RELATING TO THE SAFETY

The parameters relating to the safety are modified as follow:
- Maximal supply voltage: 800V, up to shaft height 132,
- Maximal supply voltage: 1000V, beyond of shaft height 132,
- Maximum output per pole: 200kW.
MARKING

The marking is modified as follow:

LEROY SOMER
F-16015 ANGOULEME or F-69360 SAINT SYMPHORIEN D’OZON or F-16230 MANSLE
or
LEROY SOMER MOTORS - CEB
F-90500 BEAUCOURT
LSE or FLSE...([1])
INERIS 01ATEX0010X
(Serial number)
(Year of construction)

\[ \text{Ex II 2 G or } \text{Ex e II T3 ou T4} \]

\[ \text{Ex II 2 GD or } \text{Ex e II T3 or T4} \]

\[ \text{Ex tD A21 IP65 or IP66 } \text{T(2)} \]

\[ I_a/I_n \]

\[ \varepsilon \]

Tamb: \((3)\)

Tcable: \((4)\)

Rated voltage and current

WARNINGS \((5)\):

DO NOT OPEN WHEN AN EXPLOSIVE ATMOSPHERE MAY BE PRESENT

DO NOT OPEN WHEN ENERGIZED

---

(1) may be supplemented by an option symbol and the type by the shaft height an indication of the symbol for the distance between the motor mounting holes and/or of the number for poles.

(2) T125°C, T135°C or T200°C in conformity with descriptive documents.

(3) ambient temperature range if different to -20°C, +40°C and in the limits of -25°C, +75°C ; as defined in the descriptive documents.

(4) in accordance with descriptive documents.

(5) on each junction box lid.

The whole of marking can be carried out in the language of the country of use.

The protection apparatus or system must also carry the marking normally envisaged by the standards of construction which relate to it.

ROUTINE EXAMINATIONS AND TESTS

The routine examinations and tests are modified as follow:

- In accordance with clause 7.1 of the EN 60079-7 standard, a test of dielectric strength on each of the different circuits of the connection units, performed according to the relevant standards. The test voltage has to be applied during one minute.
(16) DESCRIPTIVE DOCUMENTS

The descriptive documents quoted hereafter constitute the technical documentation describing the modification of the equipment, subject of this present addition.

- Document ST1353 revision A (4 pages) dated and signed on the 2010.03.03.
- Document Q1T135 revision E (1 page) dated and signed on the 2010.06.25.
- Document 3614Fr revision C dated on the June 2010
- Document ST1008 revision C (3 pages) dated and signed on the 2010.03.11
- Document SM A18 revision D dated and signed on the 2009.04.03
- Document ST1453 revision A dated and signed on the 2010.03.03
- Document ST1036 revision C dated and signed on the 2010.06.10
- Document ST70 0002 revision 3 dated and signed on the 2010.06.23
- Document T105105 revision D dated and signed on the 2010.08.20
- Document FB « ATEX »13/03 indice B dated and signed on the 2010/08/30
- Plan E9222_A signed on the 2010.02.05
- Plan E9224_A signed on the 2010.02.05
- Plan E9228_A signed on the 2010.02.05
- Plan E9227_A signed on the 2010.02.05
- Plan DM3051 revision A signed on the 2010.02.10
- Plan DM3052 revision A signed on the 2010.02.10
- Plan DM3053 revision A signed on the 2010.02.10
- Plan DM3054 revision A signed on the 2010.02.10
- Plan DM3055 revision A signed on the 2010.02.10
- Plan DM3056 revision A signed on the 2010.02.10
- Plan DM3057 revision A signed on the 2010.02.10
- Plan DM3058 revision A signed on the 2010.02.10
- Plan DM3059 revision A signed on the 2010.02.10
- Plan DM3061 revision A signed on the 2010.02.10
- Plan E7745 revision A signed on the 2004.09.01
- Plan E8140 revision B signed on the 2009.11.04
- Plan E8033 revision B signed on the 2009.11.04
- Plan PB81 revision F signed on the 2009.12.23
- Plan PB82 revision F signed on the 2009.12.23
- Plan ST1325 revision 0 dated on the 2009.12.20

(17) SPECIAL CONDITIONS FOR SAFE USE

The special conditions for safe use are unchanged.
(18) ESSENTIAL SAFETY AND HEALTH REQUIREMENTS

The respect of the Essential Health and Safety Requirements is ensured by:

- Conformity to the standards quoted in clause (15).
- All provisions adopted by the manufacturer and defined in the descriptive documents.

Verneuil-en-Halatte, 2010 09 24

Director of the Certifying Body,
By delegation
T. HOUEIX
Certification Officer
Certification Division
We, MOTEURS LEROY SOMER, Bd - Marcellin LEROY 16915 Angoulême cedex 9 France, declare, under our sole responsibility, that the following products:

LSE and FLSE series type "e" increased safety induction motors

bearing the following markings on their nameplates:

CE 0080 Ex II 2G (or T4) Gb (zone 1)
or CE 0080 Ex II 2GB Ex e IIC T3 (or T4) Gb Ex tb IIIC T125°C Db (zone 1 and 21)

IIC motors can be marked IIA or IIB for commercial reasons.

Comply with:

European Directives:
- Low Voltage Directive 2014/35/EU
- Electromagnetic Compatibility Directive 2014/30/EU
- ATEX Directives: 2014/34/EU

European and international standards:
- 60072-1-1:1991; IEC 60079-0; 2007; EN 60079-0:2009;
- EN 60079-31:2009 (Ex tb)

The type awarded an EC type-examination certificate by the notified body:

INERIS 01ATEX0010 X
INERIS (0080) - BP 2 – Parc technologique ALATA
60550 – VERNEUIL EN HALATTE

The design and manufacturing requirements are covered under the responsibility of the notified body by the PRODUCT QUALITY ASSURANCE notification: INERIS (0080)

These products are not concerned by major technical modifications brought in standard EN 60079-0:2012, they are considered as performing Essential Safety and Health Requirements from ATEX directive.

This conformity permits the use of these ranges of products in machines subject to the application of the Machinery Directive 2006/42/EC, provided that they are integrated or incorporated and/or assembled in accordance with, amongst others, the regulations of standard EN 60204 "Electrical Equipment for Machinery".

The products defined above may not be put into service until the machines in which they are incorporated have been declared as complying with the applicable Directive.

Installation of these motors must comply with the regulations, decrees, laws, orders, directives, application circulars, standards, rules or any other document relating to the installation site. LEROY-SOMER accepts no liability in the event of failure to comply with these rules and regulations.

Note: When the motors are supplied via appropriate separate electronic inverters and/or controlled by electronic control or monitoring devices, they must be installed by a professional who will be responsible for ensuring that the electromagnetic compatibility regulations of the country in which the product is installed are observed.

Signature of plant quality manager:
G. GARDAIS date: 28/04/2016

Signature of plant technical manager:
B. VINCENT date: 29/04/2016

V

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For the latest version of this document, please access the document management system
12.4 RMA - Decontamination statement
RMA-Formular und Erklärung über Dekontaminierung
RMA-Form and explanation for decontamination

RMA-Nr. / RMA-No. [ ]

Die RMA-Nummer bekommen Sie von Ihrem Ansprechpartner im Vertrieb oder Service. You may obtain the RMA number from your sales or service representative.

Zu diesem Rücksendeschein gehört eine Dekontaminierungserklärung. Die gesetzlichen Vorschriften schreiben vor, dass Sie uns diese Dekontaminierungserklärung ausgefüllt und unterschrieben zurücksenden müssen. Bitte füllen Sie auch diese im Sinne der Gesundheit unserer Mitarbeiter vollständig aus. This return form includes a decontamination statement. The law requires you to submit this completed and signed decontamination statement to us. Please complete the entire form, also in the interest of our employee health.

<table>
<thead>
<tr>
<th>Firmen/ Company</th>
<th>Ansprechpartner/ Person in charge</th>
</tr>
</thead>
<tbody>
<tr>
<td>Frauen/ Company</td>
<td>Name/ Name</td>
</tr>
<tr>
<td>Straße/ Street</td>
<td>Abt./ Dept.</td>
</tr>
<tr>
<td>PLZ, Ort/ Zip, City</td>
<td>Tel./ Phone</td>
</tr>
<tr>
<td>Land/ Country</td>
<td>E-Mail</td>
</tr>
<tr>
<td>Gerät/ Device</td>
<td>Serien-Nr./ Serial No.</td>
</tr>
<tr>
<td>Anzahl/ Quantity</td>
<td>Artikel-Nr./ Item No.</td>
</tr>
<tr>
<td>Auftragsnr./ Order No.</td>
<td>bitte spezifizieren/ please specify</td>
</tr>
</tbody>
</table>

**Grund der Rücksendung/ Reason for return**
- ☐ Kalibrierung/ Calibration
- ☐ Modifikation/ Modification
- ☐ Reklamation/ Claim
- ☐ Reparatur/ Repair
- ☐ andere/ other

**Ist das Gerät möglicherweise kontaminiert?/ Could the equipment be contaminated?**
- ☐ Nein, da das Gerät nicht mit gesundheitsgefährdenden Stoffen betrieben wurde./ No, because the device was not operated with hazardous substances.
- ☐ Nein, da das Gerät ordnungsgemäß gereinigt und dekontaminiert wurde./ No, because the device has been properly cleaned and decontaminated.
- ☐ Ja, kontaminiert mit:/ Yes, contaminated with:

![Safety Symbols](image)

**Bitte Sicherheitsdatenblatt beilegen!/ Please enclose safety data sheet!**

Das Gerät wurde gespült mit:/ The equipment was purged with:


Falls die Ware nicht gereinigt, also kontaminiert bei uns eintritt, muss die Firma Bühler sich vorhalten, diese durch einen externen Dienstleister reinigen zu lassen und Ihnen dies in Rechnung zu stellen.

**Datum/ Date** [ ]

rechtsverbindliche Unterschrift/ Legally binding signature
Die Analyse defekter Baugruppen ist ein wesentlicher Bestandteil der Qualitätssicherung der Firma Bühler Technologies.

Um eine aussagekräftige Analyse zu gewährleisten muss die Ware möglichst unverändert untersucht werden. Es dürfen keine Veränderungen oder weitere Beschädigungen auftreten, die Ursachen verdecken oder eine Analyse unmöglich machen.


Analysing defective assemblies is an essential part of quality assurance at Bühler Technologies.

To ensure conclusive analysis the goods must be inspected unaltered, if possible. Modifications or other damages which may hide the cause or render it impossible to analyse are prohibited.

Electronic assemblies may be sensitive to static electricity. Be sure to handle these assemblies in an ESD-safe manner. Where possible, the assemblies should be replaced in an ESD-safe location. If unable to do so, take ESD-safe precautions when replacing these. Must be transported in ESD-safe containers. The packaging of the assemblies must be ESD-safe. If possible, use the packaging of the spare part or use ESD-safe packaging.

Observe the above specifications when installing the spare part. Ensure the part and all components are properly installed. Return the cables to the original state before putting into service. When in doubt, contact the manufacturer for additional information.