HIMMEL® - Drum Motors

LAT® Maschinen und Antriebstechnik GmbH & Co. KG
Venneweg 28
D-48712 Gescher
Tel.: +49 (0) 2542 / 910-0
Fax: +49 (0) 2542 / 910-290
info@himmelinfo.de
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1 Important instructions

1.1 Instruction symbols in the operating instructions

The instructions, which concern safety or industrial safety respectively, are designation as follows:

- **DANGER !**
  Possible consequences: Death or very severe injuries.

- **CAUTION !**
  Possible consequences: Damage to the drive and the environment.

- **NOTE .**
  Pointers for application and useful information.

- **ATEX .**
  Instructions and measures applying in particular to drives in ATEX version.

1.2 General Instructions

The present manual is a component of supply.

This manual applies to all standard versions of the HIMMEL®-drum motors:
TM60, TM80, TM82, TM111, TM135, TM138, TM160, TM165, TM174, TM216, TM321,
TM415, TM518, TM620, TM630 and TM800.

Special types of drive and their accessory components are governed by the special contractual agreements and technical document.
Please consider the further provided manuals for accessory components, etc...

We accept no responsibility for damage or disruption resulting from disregard of these operating instructions.

Please keep the operating instructions near to the motor.

Read the operating instructions first before working with the motor.

Only the complete knowledge of this operating instruction guarantees a safe and error free use of the drum motor by avoiding user errors and improper use.

The HIMMEL®-Drum motors described here correspond to the state of the art technology at the time of printing of this operating instruction.

In the interest of further development we reserve the right to make changes to the single components and accessories which contribute to maintaining the fundamental criteria for increasing the performance and safety of the drives.

The copyright of this operating instruction lies with LAT® Maschinen und Antriebstechnik GmbH & Co. KG

This operating instruction may not be duplicated in full or in part, used unauthorised for competition or supplied to third parties without our agreement.

Changes or amendments to this operating instruction may only be performed through us; otherwise all guarantee claims on us expire.
2 Safety Notes

2.1 Intended Use

The Himmel®-drum motors covered in these operating instructions have been developed for the stationary use in general engineering. As long as not otherwise agreed, the motors are designed for use in industrial areas in machines and plants.

The motors are built state of the art and are supplied safe for operation. Unauthorized modifications which lead to impairment of the reliability are not permitted.

Modifications and rebuilding on Himmel®-drum motors together with additions (e.g. a rubber lining) must be approved by the manufacturer otherwise all warranties are void.

The motors are only designed for use as described in Chapter 3 (“General Information”). They may not be used outside the laid down power range. Differing operating conditions require new contractual agreements.

2.2 General safety instructions

The drives must be installed, started up, operated, maintained and, if necessary, repaired only by authorised, properly trained and qualified personnel. For definition of expert staff, refer to e.g. IEC 364.

The operator must ensure that all persons involved in installation, operation, maintenance and repair have read and understood these operating instructions and comply with them at all times in order to:

- avoid injury or damage
- ensure the safety and reliability of the drive
- avoid disruptions and environmental damage through incorrect use

Carry out work on the drives only when they are at a standstill.
Secure the drive units against unintentional starting (e.g. lock key switches or remove fuses in the power supply).
A notice should be attached to the start switch stating clearly that work on the drives is in progress.

Carry out all work with great care and with due regard to safety.

Always observe the instructions on the plates on the drives. The plates must be kept free from paint and dirt at all times. Replace any missing plates.

Ensure compliance with the relevant safety and environmental regulations during transport, assembly and dismantling, operation, and care and maintenance of the unit.

Secure rotating drive parts, against contact by means of suitable safety devices.

Ensure adequate ventilation when working with solvents. Do not inhale vapours. Do not smoke.

Collect and dispose of used oil in accordance with regulations. Remove any oil spillage immediately with an oil-binding agent in compliance with environmental requirements.

Do not wear loose garments or objects which could be seized from moving parts.
It is also recommended to wear solid and slide free boots during work in the open air.
During installation of drum-motors it is to be guaranteed, that by means of precautionary measure the injuring of operating- and service personal as well as non-participating persons is prevented.
In this case special care has to be taken to prevent, that persons do not come into contact with movable and rotating components, or do not reach for components between belt and drum.

The machine must be checked regulary for continuous ground. Interruptions must be removed immediately.
When mounting the drum motor to a band-conveyor the customer has to secure, that there is a equipotential bonding.

3 General Information

3.1 Electric motors

The electric motors of the HIMMEL®-drum motor series are wound according to DIN/VDE 0530 in IEC standard cores. The insulation class is as per IEC 60034-1 class "F". If the drum motor is operate without a belt, please inform LAT® Maschinen und Antriebstechnik.

3.2 Voltage

All HIMMEL®-drum-motors are supplied with wide range voltage windings, up to 2.2 kW with 230/400V ± 5% and from 3 kW onwards with 400/690 V ± 5%.

3.3 Frequency - Inverters

All HIMMEL®-drum-motors are supplied with squirrel-cage rotor motors and are therefore infinitely variable by means of static frequency converters within the frequency-range of 20 to 75 Hz.

HIMMEL®-drum-motors in ATEX-version can not be driven with frequency converter.

3.4 Output rating

The nominal output ratings refer to continuous duty as per VDE 0530 part 1, at a frequency of 50Hz, nominal voltage, a coolant temperature of up to 40°C and an altitude of 1000m above sea level.

3.5 Noise Levels

The noise level (sound pressure level) at drum-motors is measured according to DIN EN ISO 1680, using measuring instruments according to DIN IEC 651
4 Receipt of goods and storage

4.1 Receipt of goods

Immediately after receipt, the consignment has to be checked for transport damage. If necessary a claim for damage has to be raised at presence of a member of the carrier, otherwise no charge free damage regulation is possible.

4.2 Storage

4.2.1 General aspects

In case of storing the HIMMEL®-drum-motors, the storing area should exclude strong vibrations, as this may cause damage to the bearing systems. Additionally it has to be observed that dry rooms, free from excessive temperature variations have to be selected for storage.

After approximately two months, the motors have to be operated on no load for a short time, to prevent damage to the radial seals (seal lip). These rules have to be applied also after a longer stand still period.

4.2.2 Motors with rubber coatings

HIMMEL®-drum-motors with rubber lining have to be jacked up on the trunnions during storage.
5 Installation and assembly of HIMMEL®-drum motors

5.1 General information on installation

Before you begin

The drive unit maybe installed only if:

► the data on the type identification plate of the drum motor agree with the permissible Ex-application on site.

► the drive unit is intact, i.e. not damaged.

► there are no potentially explosive atmospheres, oils acids, gasses, vapours etc. in the area during installation.

► the lubricant viscosity agrees with the ambient temperature on site.

► steps have been taken to ensure that the drive unit is sufficiently ventilated and that there are no sources of external heat input.

Drives in ATEX version .

Affect on bearings of stray electric currents from electrical equipment.

When mounting or connecting the drum motor to the machine care must be taken that potential is equalised.

Drives in ATEX version .

Only drive and output elements with an ATEX approval must be used. Observe the operating instructions provided with the power transmission elements.

Due to the radial forces produced, power transmission elements, such as flat belts or V-belts, gearwheels and sprockets, cranks, eccentric cams etc., are to be arranged as close to the drum motor as possible. The bearings and drive shaft are then subject to the lowest possible load. Refer to out technical sales documentation for the maximum permissible load values.

The protective coating on the end of the shaft must be removed by suitable means prior to mounting the transmission elements. The same procedure applies for transmitting the drive power to the gear unit in connection with a free drive shaft.

DANGER !

When working with solvents, ensure adequate ventilation. Do not inhale vapours. Do not smoke!

CAUTION !

Overheating of the drives through exposure to direct sunlight.

Provide suitable safety equipment, such as covers and roofs.

CAUTION !

Irreparable damage to toothed components and bearings from fusing.

Do not carry out any welding work on the drive. The drives must not be used as an earthing point for welding operations.

NOTE .

Use headless bolts of strength class 8.8 or higher to fasten the drives.
5.2 Handling / Transport

Handle with care. DO NOT lift with cable.
Drum motors from size TM630 liftet only by the shaft!

5.3 Motor mounting position

The HIMMEL®-drum motors are designed for horizontal mounting. Furthermore there are mounting parallel to idler rollers and rectangular to the conveyor belt, as long as no other mounting position was agreed during ordering. Since the HIMMEL®-drum motors have two identical trunnions they can be mounted according to the structural conditions.
At amounts differ installation position, inform the producer!

Should the drum motors be installed other than shown here, damage to the plant or the drum motor can result meaning loss of the guarantee.
5.4 Mounting of the trunnions

The trunnions must be securely fastened by means of tab washers. It must be observed that as from Ø82 mm the marking “top” may only point upwards or maximal 30° to the left or right otherwise the cooling and lubrication of the motors is no longer guaranteed.

The inclination of the motor may also not be increased during operation. (Picture 1) The bolts for securing the Himmel® support bearings are to be chosen so that the weight of the drum motor and the expected belt tension can be adequately taken.

The Himmel® support bearings must lie on the framework over the full surface to avoid tensioning and twisting of the trunnions. Should no Himmel® support bearings be used it must be made sure that the trunnions are mounted with no play and no pre-tensioning. (Picture 3)

Where a low noise level is required, it should be observed during development of the conveyor that vibrations are reduced to a minimum and vibration dampeners are used where possible.

From motor size TM630 the tightness of the keys has to be checked regularly according to the prevailing operating conditions and if appropriate be repaved.

Where no Himmel® support bearings are used, the following must be observed:

1. The individual trunnion mountings must cover at least 80% of the trunnion.
2. The drum motors must be installed without axial play.
3. The play between the trunnions and the mounting may only be maximum 0.2mm.

For reversals or high switching frequency larger than that given in catalogue, the drum motor must be installed without play.

![Diagram showing mounting of trunnions](image-url)
5.5 Reversing duty

All Himmel-drum-motors without back-stop are allowed to be used for operation in reversed direction, but it has to be guaranteed that the motor comes to rest before reversal.

5.6 Drum motors with backstop

In case of Himmel-drum-motors with back stop it is important to observe the correct phase sequence. Connecting the lines L1,L2, L3 with terminals U1,V1,W1 the Himmel–drum motor runs in the free direction of rotation. If there is any doubt regarding the correct sequence of phases, you should test it with a three-phase meter. A test with only two phases is not permitted, as the motor may be damaged.

The permitted sense of direction is marked with a label showing an arrow.

**ATTENTION!** Incorrect connection can lead to damage of the backstop or the electric motor already during the first installation.

At ATEX-drum motors must be the output speed from motor greater than 1000 rpm.

5.7 Belt tension

The belt should only be tensioned so far that during usage under nominal load the belt does not slip. The maximum permissible belt tension at mean speed can be found in the following table. At higher speeds HIMMEL® Antriebstechnik must be make a separate calculation.

<table>
<thead>
<tr>
<th>Drum Ø</th>
<th>60</th>
<th>80</th>
<th>82</th>
<th>110</th>
<th>111</th>
<th>135</th>
<th>138</th>
<th>160</th>
<th>165</th>
</tr>
</thead>
<tbody>
<tr>
<td>Max. Tension [Fq] [N]</td>
<td>1.500</td>
<td>2.000</td>
<td>2.000</td>
<td>4.000</td>
<td>*4.500</td>
<td>5.250</td>
<td>8.300</td>
<td>5.250</td>
<td>8.000</td>
</tr>
<tr>
<td>Ø 174</td>
<td>216</td>
<td>321</td>
<td>415</td>
<td>518</td>
<td>620</td>
<td>630</td>
<td>800</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Max. Tension [Fq] [N]</td>
<td>4.500</td>
<td>10.000</td>
<td>16.000</td>
<td>18.000</td>
<td>35.000</td>
<td>35.000</td>
<td>88.300</td>
<td>1) 88.300</td>
<td>2) 180.000</td>
</tr>
</tbody>
</table>

* 3-stage / ** 2-stage 1) up to 55 kW 2) 55 - 132 kW

If there is no overhung load Fq, then an axial force Fa (tension or compression) amounting to 50% of the overhung load given in the selection table is permitted.
6 Electrical connection of a HIMMEL®-drum motor

Before working on the drum motor, disconnect fully from all mains supplies. Cables must be checked for possible damage. Connection may only be performed by qualified personnel. All relevant regulations in the area of electrical engineering must be observed during all work.

The user is liable for all accidents or costs resulting from none observation of these rules.

6.1 General

Squirrel cage rotor motors are started either direct or with star delta starting. Before HIMMEL®-drum motors are finally put into operation, they are to undergo a trail start under no-load conditions. In cable design, the wires have either an alphanumeric or colour coding. The grounding connection is always green-yellow striped.

Before connecting the motor it must be assured that the mains voltage available corresponds with the voltage given on the name plate.

The connection of the motor must be observed.

A correct phase sequence L1 L2 L3 (R-S-T) and connection according to the given connection diagram, causes the motor to rotate clockwise when looking at the side of the electrical connection (cable or terminal box). Counter clockwise rotation is achieved by interchanging two phases.

The voltage 230/400 V ±5% given on the name plate means that the motor can be driven with 230 V ±5% in delta and with 400 V ±5% in star connection.

6.2 Motor Protection

The winding of electrical motors has to be protected against over-current and non permissible temperature rise. The protection devices provided for the HIMMEL®-drum-motors guarantee the safe protection against overload with slowly occurring deviations. The suitable type of protection system for the motor should be selected according to the duty-types given as follows:

Guidelines for the position of different protection systems (supply of system is optional)

- **PTO or PTF** = (bimetallic thermostats ) to be incorporated into the auxiliary circuit
- **PTO (WT-opener)** = The thermostat opens the contacts at the predetermined temperature
- **PTF (WT-closer)** = The thermostat closes the contacts at the predetermined temperature
- **PTC (Thermistor)** = to be arranged within the auxiliary circuit along with the control unit.

**Thermistor:** A thermally sensitive semi-conductor resistor, whose primary function is to exhibit an considerable change in electrical resistance causing the controller to activate.
Warning and Switch-Off

If there is dual protection devices employed (with different nominal duty temperature ranges) the first device may take over the warning operation (in an acoustic or optical manner, without interrupting the line circuit) whereas the second protection device can be used to switch off the line circuit (all power supply for the concerned drive will be stopped). At a lack of protective equipment will void the warranty.

6.3 Motor Types

6.3.1 Drum -motors with single speed

Dependent on the supplied design, drum-motors with single speed have to be connected according to the wiring diagram supplied.

6.3.2 Drum motors with double speeds

For drives which require two different non-variable speeds, the motors will be supplied in a pole changing version. The standard design of pole changing motors is calculated for direct starting conditions.

Motors with a ratio of speed 1:2 are executed with tapped wound winding (Dahlander).

6.4 Connection Versions

6.4.1 Terminal block and direction of rotation

The HIMMEL®-drum motors with terminal box are equipped with a terminal board with either six or eight terminal-bolts, which correspond to the standard IEC-60034-8.

If the motor is connected according to the given wiring diagram, it rotates clockwise when facing the side of the electrical connection.

If the motor is equipped with additional accessories (e.g. winding thermostats or a brake), the connection results on the marked strip-terminals.

6.4.2 Grounding with Terminal Box

The grounding terminal is situated on an elevated portion within the terminal box. It is marked with the symbol 🌇. As special equipment a second grounding terminal can be provided on the housing itself. This is also marked in the same way.

The grounding has to be executed with at least the same cable cross-section as the cables for the power-supply.

6.4.3 Material

The standard material for the terminal boxes is either aluminium-alloy, cast-iron GG25 or plastic in enclosure IP 65.

The cable gland or strain relief is positioned downwards when looking at the terminal box.
6.5 Brake

During operation of drum-motors with brake it has to be observed that the brake has to be disengaged by connecting the coil voltage given on the name plate before starting of the motor. Otherwise damage to the brake may result.

HIMMEL®-drum motors in ATEX-version will be delivered generally without brake.

7 Operation of HIMMEL®-Drum Motors

7.1 Temperature rise / Insulation Class

The insulation system of the standard motors corresponds to insulation class F according to VDE 0530 (IEC34 Part 1, IEC86). For a cooling temperature of 40°C, the permissible temperature rise of the winding is 155°C (105 K).

7.2 Operation with conveyor belt

Should the drum-motor be operated in connection with a conveyor-belt, it must be observed, that no transport particles or obstacles are present between the belt and the drum. If this occurs either the drum, the belt or the rubber-lining may be damaged. Should then the drum motor block, the electric motor or gearbox can be destroyed. To avoid this deflecting equipment and preventive mechanisms can be used.
Warning: This total chapter 8 is for Himmel®-drum motors in ATEX-version. Only an exact knowledge and abidance by this chapter warranted a safety mode by Himmel®-drum motors in hazardous areas.

8.1 Conditions for safe operation

Dust explosion-proof Himmel® drum motors of the TM82, TM111, TM135, TM138, TM160, TM165, TM174, TM216, TM321, TM415, TM518, TM620, TM630, TM800.0 and TM800.1 are suitable for use in Zone 22 according to II 3 D Ex tc IIIC T120 ° C Dc (Old name: II 3 D Ex tD A22 IP 65 120 ° C) performed in accordance with EG-Directive 94/9/EC.

Use for cable entry only ATEX compliant (against dust), approved cable glands, for the protection of at least IP65 is guaranteed.

8.1.1 Before the installation:

This checklist lists activities, that will have to be performed before starting a drum motor according to EC Directive 94/9/EC (ATEX 100a) in a hazardous area.

<table>
<thead>
<tr>
<th>What needs to be examined?</th>
<th>see chapter</th>
<th>Tested:</th>
</tr>
</thead>
<tbody>
<tr>
<td>Inspect the shipment immediately upon receipt for shipping damage. Immediately inform the transport company. The installation or commissioning is, where appropriate, to exclude.</td>
<td>4.1</td>
<td></td>
</tr>
<tr>
<td>It is necessary to check whether the information given on the rating plate of the drum motor and the order confirmation with the permissible ex-conditions:</td>
<td>8.3</td>
<td></td>
</tr>
<tr>
<td>► Explosion Group</td>
<td></td>
<td></td>
</tr>
<tr>
<td>► Category</td>
<td></td>
<td></td>
</tr>
<tr>
<td>► type of dust (conductivity) in Zone 22</td>
<td></td>
<td></td>
</tr>
<tr>
<td>► maximum surface temperature</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Is it ensured, that during installation explosive atmospheres, oils, gases, vapors, etc. are there?</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>If the lubricant viscosity match the ambient temperature?</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>Is the oil level correct?</td>
<td>9.2</td>
<td></td>
</tr>
<tr>
<td>Do all to be mounted input and output elements have an ATEX approval for use in potentially explosive dust-air mixtures?</td>
<td>5.1</td>
<td></td>
</tr>
<tr>
<td>Are these fitted guidelines compliant?</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
### What needs to be examined?

<table>
<thead>
<tr>
<th></th>
<th>Tested</th>
</tr>
</thead>
<tbody>
<tr>
<td>When using a backstop in the drum motor the drive speed must be greater than 1000 rpm.</td>
<td>5.6</td>
</tr>
<tr>
<td>Additional measures must be observed, when drum are not installed horizontally e.g. a special oil level, spec. seals, motor and gear unit always lying in the lower part of the upright drum motor etc.</td>
<td>5.3</td>
</tr>
<tr>
<td>A version of the drum motor with brake is not allowed. Therefore, also no subsequent customer cultivation is allowed!</td>
<td>6.4</td>
</tr>
<tr>
<td>At an input speed (engine speed)&gt; 3000 1/min may occur to increase the temperatures. Therefore, the engine must not be operated with a frequency-inverter!</td>
<td>3.3</td>
</tr>
<tr>
<td>Drum motors in ATEX design are always executed with winding protection (PTC), which is to clamp accordingly.</td>
<td>8.2 and 11</td>
</tr>
</tbody>
</table>

### Drives in ATEX version:

When everything is checked and answered with "yes", only then the drive can be put into operation.

#### 8.1.2 During commissioning:

When connecting the terminal board must be observed
- Clipboard M5 allowed up to 25A. Tighten the nuts with 2 Nm.
- Clipboard M6 permitted up to 63A. Tighten the nuts to 3 Nm.

During commissioning of the transmission, it is imperative to measure the surface temperature at maximum load carry. The maximum surface temperature is reached after 4 hours.

The housing temperature may not exceed a difference of 80K to the ambient temperature (max.40°C) therefore, T max of 120°C. Otherwise the drive is immediately shut down. The operator must contact Neudecker & Jolitz.

The explosion-proof drum motor provides a maximum surface temperature of 120 °C with dust safely. In the operation instructions a note was taken that the ambient dust-site must have an ignition temperature / ignition temperature greater than 180 °C.

Measure the temperature on the cover plates or the drum shell with a suitable temperature sensor. Changes indicate possible incipient damage.

By damaged insulation of the connecting cable or missing cover of the terminal box (not closed) it can create sparks from electric shock.
8.1.3 During operation:

During operation, the seals and shaft seals should be checked for leakage location. All surfaces must be checked for paint and corrosion damage at regular intervals, every 200 hours of operation, at least twice a year. Any damage must be repaired or renew protective coat. The bearings should be checked regularly and replaced before failure. Indication of defective bearings are changes in the vibration and noise characteristics. Dust deposits prevent the heat radiation and cause high housing temperatures. The drive system has to be kept free of dirt and dust. All measures, checks and the results must be documented by the operator.

8.2 Temperature monitoring

Dust explosion-proof HIMMEL® drum motors in category 3D ensure a safe operation under normal operating conditions. When overloaded, the HIMMEL® drum motor must be safely switched off to avoid unacceptably high surface temperatures. The mode of switch off is standard with motor protection switch or thermistors (TF). The motor protective dependent permissible operating modes can be found in the table below.

Note when installing the motor protection switch to EN 60947 the following:

- The motor protection switch must turn off immediately in case of failure of a phase
- The motor protection switch must be adjusted to the nominal motor current given on the nameplate
- The PTC thermistor must be evaluated using a suitable device
- The valid installation regulations must be adhered to
- The effectiveness of the protective device is required prior to commissioning

<table>
<thead>
<tr>
<th>Protection against excessive temperatures</th>
<th>Permissible operating mode</th>
</tr>
</thead>
<tbody>
<tr>
<td>Temperature coefficient thermistors (TF)</td>
<td>• S1</td>
</tr>
<tr>
<td></td>
<td>• S6</td>
</tr>
<tr>
<td></td>
<td>• Switching frequency shall be calculated at idle and under load</td>
</tr>
<tr>
<td></td>
<td>• Heavy starting</td>
</tr>
</tbody>
</table>

According to EN 50019 Annex A there is a heavy starting, if for the normal operating conditions selected and set motor protection switch off already shuts off during the starting period. This is generally the case, when the starting time is more than 1.7 times of the time $t_E$. 

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8.3 Execution ATEX nameplate

General Specifications (nameplates):

The rating plate of the HIMMEL ® drum motors in ATEX design contains the most important technical data. These data and the contractual agreements on the drive determine the limits of its intended use.

Drive in ATEX version.
Construction nameplate
ATEX drum motors:

<p>| | | | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Phase number and current of the motor</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Order number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>Date</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Type</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Motor speed [1/min] / Output speed [1/min] / Operating mode</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Heat class Th Cl. / Protection / Ratio [i]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Belt speed [m / s]</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>CE marking or other marking</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>Oil type / Amount of oil</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Ex symbol and Ex marking: II 3 D Ex tc IIIC T120 ° C Dc &lt;</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9 Maintenance and Care

Careful maintenance and care according to our advice is the basis for a long life of the drum-motor. Extensive maintenance work has to be executed within the given intervals, smaller check-ups whenever possible but at the latest to the above mentioned interval periods.

9.1 Cleaning

When cleaning the drum-motor it has to be observed that only motors with labyrinth seals und V-ring seals are allowed to be cleaned with high pressure cleaning equipment. All other motors have to be cleaned without pressure application.

9.2 Lubrication / Oil Change

9.2.1 Lubrication

Greasing of the ball-bearings or roller-bearings used within the Himmel®-drum-motors is not required.

9.2.2 Oil Change

It is not necessary to change the oil, but it may be done for special reasons. We advise a change after 10,000 operating hours. The oil filled by the manufacturer, and the quantity can be read on the nameplate.

All Himmel®-drum-motors are supplied with the quantity of oil necessary for correct operation. The primary oil-filling at the factory complies with the following technical specifications:

100 cST / 40°C or 8° angle / 50°C, the pourpoint is -20°C.

The oil is suitable for ambient temperatures from -20°C up to +50°C.

Should other types of oil be used, please verify that the oil has no additives that could affect the insulation of the winding wires in a harmful way. Furthermore NO oil types which include substances like graphite, molybdenum-sulphide or other conductive agents may be used, as the insulation system of the motor will be damaged.

<table>
<thead>
<tr>
<th>ISO-VG</th>
<th>Viscosity mm²/s (cST)</th>
<th>Flash Point</th>
<th>Pour Point</th>
<th>Gear oil acc. to</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>40°C</td>
<td>100°C</td>
<td>°C</td>
<td>°C</td>
</tr>
<tr>
<td>100</td>
<td>102</td>
<td>11,3</td>
<td>240</td>
<td>-21</td>
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</tbody>
</table>

Recommended oil types of differing suppliers:

<table>
<thead>
<tr>
<th>Supplier</th>
<th>FINA</th>
<th>Castrol</th>
<th>BP</th>
<th>ESSO</th>
<th>Mobiloil</th>
<th>Shell</th>
<th>Texaco</th>
<th>DEA</th>
</tr>
</thead>
<tbody>
<tr>
<td>Type</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Giran</td>
<td>N 100</td>
<td>ZN 100</td>
<td>GR-XP100</td>
<td>H 100</td>
<td>627</td>
<td>Omala</td>
<td>Meropa</td>
<td>Falcon</td>
</tr>
</tbody>
</table>

On the flange of the drum-motor are two oil drain plugs, facing the side of the electrical connection. The two plugs have to be removed during oil changing and the drum has to be turned so long that the outer thread reaches the bottom position, to archive a free run out of the old used oil.
CAUTION:
It is to be observed that the marking „top“ on the connection side never shows downwards otherwise the cooling / lubrication is no longer guaranteed.

### Operating Instructions

Drum Motors BA EN 12-2013

<table>
<thead>
<tr>
<th>Typ</th>
<th>Erforderliche Ölmenge in Liter – waagerechter Einbau</th>
</tr>
</thead>
<tbody>
<tr>
<td>L (mm)</td>
<td></td>
</tr>
<tr>
<td>200</td>
<td></td>
</tr>
<tr>
<td>250</td>
<td></td>
</tr>
<tr>
<td>300</td>
<td></td>
</tr>
<tr>
<td>350</td>
<td></td>
</tr>
<tr>
<td>400</td>
<td></td>
</tr>
<tr>
<td>450</td>
<td></td>
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<tr>
<td>500</td>
<td></td>
</tr>
<tr>
<td>550</td>
<td></td>
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<tr>
<td>600</td>
<td></td>
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<tr>
<td>650</td>
<td></td>
</tr>
<tr>
<td>700</td>
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<tr>
<td>750</td>
<td></td>
</tr>
<tr>
<td>800</td>
<td></td>
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<tr>
<td>850</td>
<td></td>
</tr>
<tr>
<td>900</td>
<td></td>
</tr>
<tr>
<td>950</td>
<td></td>
</tr>
<tr>
<td>1000</td>
<td></td>
</tr>
<tr>
<td>1050</td>
<td></td>
</tr>
<tr>
<td>1100</td>
<td></td>
</tr>
<tr>
<td>1150</td>
<td></td>
</tr>
<tr>
<td>1200</td>
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<td>1250</td>
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</tr>
<tr>
<td>1300</td>
<td></td>
</tr>
<tr>
<td>1350</td>
<td></td>
</tr>
</tbody>
</table>

Additional quantities of oil are available on request.

If the drum motor is not mounted horizontally the required quantity of oil changes. It will be adjusted on request to the respective conditions.
The drum motors TM60.1 and TM111.1 with stainless steel cap are lubricated for life.

**An environmentally compatible method of disposal of used oil is to be observed.**

When changing the oil it has to be ensured that no oil contaminates the floor or penetrates the earth by use of special collecting trays. Should oil escape it must be removed immediately with an oil binding agent in an environmentally compatible way. The oil, oil-binding agents and polluted soil must be disposed of professionally.
9.3 Oil level check

Course of action:

1. Before the oil level can be checked, the **HIMMEL®-drum-motor** shall be fixed in a horizontal position by using the spanner flats.  
   Caution: Consider the check mark “top”, graven on the shaft.
2. Rotate the **HIMMEL®-drum-motor** until one of the locking screws are positioned on angle $\alpha$ (see table below).
3. Screw these "lower" locking screw out. 
   The oil level is correct, when oil stands exactly below the hole.

Angle for oil level control:

<table>
<thead>
<tr>
<th>Type (TM)</th>
<th>80.1</th>
<th>82.1</th>
<th>111.0</th>
<th>111.1</th>
<th>135.1</th>
<th>138.1</th>
<th>160.0</th>
<th>165.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle $\alpha$</td>
<td>15°</td>
<td>15°</td>
<td>22°</td>
<td>22°</td>
<td>20°</td>
<td>22°</td>
<td>16°</td>
<td>28°</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Type (TM)</th>
<th>216.0</th>
<th>216.1</th>
<th>321.0</th>
<th>321.1*</th>
<th>321.1**</th>
<th>415.1</th>
<th>518.1</th>
</tr>
</thead>
<tbody>
<tr>
<td>angle $\alpha$</td>
<td>18°</td>
<td>16°</td>
<td>13°</td>
<td>13°</td>
<td>18°</td>
<td>12°</td>
<td>***</td>
</tr>
</tbody>
</table>

* until 4,0 kW / ** from 5,5kW / *** to enquiry

9.4 Replacing bearings

The bearing life depends very much on the operating conditions. It is therefore very difficult to calculate it reliably. If the operating conditions are specified by the operator, the bearing life can be calculated and indicated on the rating plate. If no information is given, changes in the vibration and noise pattern can serve as an indication that an immediate bearing replacement is necessary.

9.5 Sealing system

Labyrinth seals have to be checked visually for possible defects at short intervals or at least once a month.

Every 2000 operating hours, or at least once a year, the labyrinth-seals have to be completely cleaned. To do this you have to unscrew the protective cap and remove the V-ring or the labyrinth-seal from the shaft. During this cleaning procedure the satisfactory conditions of the seals have to be checked, otherwise the correct functionality of the seal is no longer guaranteed.

If there is a labyrinth seal with grease nipple it must be, according to the operating conditions as soon as after any cleaning relubricated or new lubricated, to secure the ingress of dirt into the drum motor and to guarantee a trouble-free run. It has to be secured that the grease which comes out of the labyrinth, is not dirty. Failure to follow of these instructions can cause oil leaks and it will void the product warranty.

If the frequency of relubrication intervals are too large, an automatic relubrication can be upgraded from the drum motor size TM630.
9.6 Brake

The brake dust of the internal brake of HIMMEL®-drum motors is removed automatically during every oil change.

9.7 Rubber lining

Drum-motors with rubber linings have to be visually checked at short intervals to ensure there is no damage to the rubber lining. Damage of the lining causes unbalance during operation of the drum and may lead to a bearing failure.

With drum motors in ATEX design is to ensure that an antistatic rubber is used.

10 Radio frequency interference suppression

The frame of the three-phase squirrel-cage motors are designed in such a way that electromagnetic disturbance sources are kept at such a distance that no real penetration into the magnetic circuit takes place to disturb the normal operation of the motor.

The normal three-phase squirrel-cage motor does not produce radio frequencies. But the conductors which are used to connect the motor to the mains (circuit breakers) may need additional components to clear interferences.
11 Warranties

All drum-motors which are returned during the guarantee period agreed to by us will be repaired on a no charge basis, if there is a damage or failure the factory itself is liable for.

We accept no liability for any damage or malfunction resulting from:

- Non observance of the information and rules given in this maintenance instruction, e.g. wrong belt tension, wrong electrical connections, not correct or missing maintenance or careful handling.
- Incorrect selected and calibrated motor-conductor or faulty connections of the winding protection contacts.
- Overloading of the motor.
- Operation on reversed speed without observing stopping position of the motor.
- Running the motor in the wrong direction against locked back-stop.
- Changing of operation condition against the given operating instructions
- Changes on motor and auxiliary units without written confirmation by the manufacturer.
- Repair and modification on motors without written confirmation by the manufacturer.
- Willful mishandling and damaging.
- Normal wear and tear of components

Our guarantee promise is only bound to failures on our supplied product.
We accept by no means charges due to disassembling and assembling of units, transport, package or shutdown of machinery.

In case of further inquiries or ordering of spare parts, please indicate the motor number. If there is no motor number shown on the name plate, the number can be read on the face of the shaft extension.

All given technical data in this operating instruction are liable to changes and therefore without obligation.
### 12 Spare parts list

<table>
<thead>
<tr>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>drum shell</td>
<td>66</td>
<td>bearing</td>
<td>122</td>
<td>copper shim</td>
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<tr>
<td>2</td>
<td>drum end shield</td>
<td>68</td>
<td>bearing</td>
<td>123</td>
<td>/copper shim</td>
</tr>
<tr>
<td>3</td>
<td>drum end shield</td>
<td>71</td>
<td>bearing</td>
<td>125</td>
<td>screw</td>
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<tr>
<td>4</td>
<td>gear box</td>
<td>75</td>
<td>supporting ring</td>
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<td>screw</td>
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<tr>
<td>5</td>
<td>bearing cover</td>
<td>76</td>
<td>key</td>
<td>127</td>
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<tr>
<td>6</td>
<td>bearing cover</td>
<td>77</td>
<td>key</td>
<td>128</td>
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<tr>
<td>7</td>
<td>labyrinth seal</td>
<td>78</td>
<td>key</td>
<td>129</td>
<td>screw</td>
</tr>
<tr>
<td>8</td>
<td>V – ring seal</td>
<td>79</td>
<td>key</td>
<td>132</td>
<td>screw</td>
</tr>
<tr>
<td>9</td>
<td>labyrinth seal</td>
<td>80</td>
<td>key</td>
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<td>grub screw</td>
</tr>
<tr>
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<td>pedestal bearing</td>
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<td>135</td>
<td>screw</td>
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<tr>
<td>11</td>
<td>pedestal bearing</td>
<td>82</td>
<td>key for brake</td>
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<td>screw</td>
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<td>12</td>
<td>intermediate ring</td>
<td>85</td>
<td>key for Backstop</td>
<td>138</td>
<td>grub screw</td>
</tr>
<tr>
<td>13</td>
<td>stator housing</td>
<td>87</td>
<td>key</td>
<td>139</td>
<td>screw</td>
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<tr>
<td>14</td>
<td>cover for brake</td>
<td>90</td>
<td>circlip</td>
<td>140</td>
<td>screw</td>
</tr>
<tr>
<td>15</td>
<td>terminal box</td>
<td>91</td>
<td>circlip</td>
<td>141</td>
<td>screw</td>
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<tr>
<td>16</td>
<td>terminal box-cover</td>
<td>92</td>
<td>circlip</td>
<td>142</td>
<td>screw</td>
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<tr>
<td>17</td>
<td>pinion 1. stage</td>
<td>93</td>
<td>circlip</td>
<td>143</td>
<td>locking screw</td>
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<tr>
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<td>helical 1. stage</td>
<td>94</td>
<td>circlip</td>
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<td>screw</td>
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<tr>
<td>19</td>
<td>pinion shaft 2.stage</td>
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<td>circlip</td>
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<td>circlip</td>
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<td>shim ring</td>
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<td>pinion shaft 3. stage</td>
<td>97</td>
<td>circlip for brake</td>
<td>150</td>
<td>grub screw</td>
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<tr>
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<td>hollow shaft 3. stage</td>
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<td>circlip</td>
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<td>shim ring</td>
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<td>circlip</td>
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<td>grounding plate</td>
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<td>circlip</td>
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<td>adapter sleeve</td>
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<td>connection head</td>
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<td>circlip</td>
<td>155</td>
<td>adapter sleeve</td>
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<td>distance ring</td>
<td>104</td>
<td>circlip for backstop</td>
<td>156</td>
<td>distance ring</td>
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<tr>
<td>31</td>
<td>distance ring</td>
<td>105</td>
<td>circlip</td>
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<td>gasket</td>
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<td>34</td>
<td>washer for reverse lock</td>
<td>106</td>
<td>friction disk for brake</td>
<td>160</td>
<td>sun gear 1. stage</td>
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<tr>
<td>35</td>
<td>stator complete</td>
<td>107</td>
<td>driver for brake</td>
<td>161</td>
<td>sun gear 2. stage</td>
</tr>
<tr>
<td>36</td>
<td>Motor end shield</td>
<td>108</td>
<td>brake complete</td>
<td>162</td>
<td>planet gear 1. stage</td>
</tr>
<tr>
<td>37</td>
<td>end shield for brake</td>
<td>110</td>
<td>backstop</td>
<td>163</td>
<td>planet gear 2. stage</td>
</tr>
<tr>
<td>38</td>
<td>end shield</td>
<td>111</td>
<td>terminal board</td>
<td>164</td>
<td>pinion cage 1. stage</td>
</tr>
<tr>
<td>42</td>
<td>Rotor complete for brake</td>
<td>112</td>
<td>gasket</td>
<td>165</td>
<td>pinion cage 2. stage</td>
</tr>
<tr>
<td>43</td>
<td>Rotor complete for reverse lock</td>
<td>113</td>
<td>gasket</td>
<td>166</td>
<td>driving cam</td>
</tr>
<tr>
<td>47</td>
<td>O-ring</td>
<td>114</td>
<td>Nilos-Ring</td>
<td>167</td>
<td>washer</td>
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<tr>
<td>50</td>
<td>shaft seal</td>
<td>115</td>
<td>bolting for terminal box</td>
<td>168</td>
<td>cover disk for cable</td>
</tr>
<tr>
<td>51</td>
<td>shaft seal</td>
<td>116</td>
<td>cable gland</td>
<td>169</td>
<td>snap ring</td>
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<tr>
<td>60</td>
<td>bearing</td>
<td>117</td>
<td>cable gland</td>
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<td>washer</td>
</tr>
<tr>
<td>61</td>
<td>bearing</td>
<td>117.1</td>
<td>reducing nipple</td>
<td>171</td>
<td>locking screw</td>
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<td>bearing</td>
<td>118</td>
<td>seal for cable</td>
<td>172</td>
<td>bearing spacer</td>
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<tr>
<td>64</td>
<td>bearing</td>
<td>119</td>
<td>pressure bushing</td>
<td>174</td>
<td>cover disk (stainless steal)</td>
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<tr>
<td>65</td>
<td>bearing</td>
<td>120</td>
<td>shim ring for cable</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

In case that you need spare parts it is necessary to inform us about the motor number. You will find this number on the type plate or and on the end of one shaft.
13 Assembly drawings

13.1 Size TM60.1 / TM80.1

13.2 Size TM82.1 / TM138
13.3 Size TM111.1

2-Stufiges Getriebe
2-stage gear

innenliegende Bremse
internal brake

Ausführung mit Doppellagerung
design with twin-bearing

Klemmenkasten
terminal box
13.4 Size TM135.1

2-Stufiges Getriebe
2-stage gear
innenliegende Bremse
internal brake
Klemmenkasten
terminal box
Ausführung mit Doppellagerung
design with twin-bearing
13.5 Size TM160.0

2-Stufiges Getriebe
2-stage gear
Klemmenkasten
terminal box
Ausführung mit Doppellagerung
design with twin-bearing
13.6 Size TM165.1 / TM216.0

- 2-Stufiges Getriebe
- innerliegende Bremse
- Klemmenkasten

- 2-stage gear
- internal brake
- terminal box

- Ausführung mit Doppellagerung

- design with twin-bearing
13.7 Size TM216.1

2-Stufiges Getriebe  
2-stage gear

innenliegende Bremse  
internal brake

(Version 1)

Rücklaufsperre  
Backstop

innenliegende Bremse  
internal brake

(Version 2)

Stehlager  
Pedestal bearing

Version/Design B-D  
Kabelausführung

Cable entry

Stehlager  
Pedestal bearing
13.8 Size TM321.0 / TM321.1 / TM415.0

2-Stufiges Getriebe
2-stage gear
innenliegende Bremse
internal brake
(Version 1)
innenliegende Bremse
internal brake
(Version 2)

Stehlager
Pedestal bearing

Version/Design B-D
Kabelausführung
Cable entry

Ausführung TM321.0 (TM216 Motor)
design TM321.0 (TM216 motor)
13.9 Size TM415.1 / TM518.0
13.10 Size TM518.1
13.11 Size TM620.0
Declaration of incorporation

In terms of the EC-Machine Directive 2006/42/EC, Annex II B.

We declare that it is our sole responsibility, that

HIMMEL®-Drum Motors with type designation:

TM60 - TM800

to which this declaration relates, fully comply with the safety and health requirements of the

EC-Machinery Directive 2006/42/EC, Appendix I

The relevant technical documents according to appendix VII B are available and will be presented to the competent national authorities electronically, if required.

The partly completed machinery complies with the following EC directive:

Low Voltage Directive 2006/95/EC

Applied harmonised standards:

DIN EN ISO 12100-1: Part 1: Basic terminology, Methodology
DIN EN ISO 12100-2: Part 2: Technical principles
DIN EN 60204-1: Part 1: Electric equipment of industrial machines
DIN EN 60034-1: Part 1: Rating and performance
DIN EN 60034-5: Part 5: Degrees of protection provided by integral design

The designated product is intended for installation into/to another machine. Operation is prohibited until the final product is in compliance with regulation 2006/42/EC. This statement does not provide a confirmation of product characteristics in terms of product liability.

Safety instructions stated in the product documentation must be adhered to.

Gescher 04.12.2013

Place Date

Paul Lütkenhaus
Managing Director / Managing Director Technology a)
Dietmar Dammfeld
Technology / Documentation b)

a) Authorized representative for issuing this declaration on behalf of the manufacturer
b) Authorized representative for compiling the technical documentation
(address of the Authorized representative for documentation see above)
Declaration of conformity

In terms of the EC-Machine Directive 2006/42/EC, Annex II B.

We declare that it is our sole responsibility, that

**HIMMEL®-Drum Motors with type designation: TM82 - TM620**

to which this declaration relates, fully comply with the safety and health requirements of the

**EC-Machinery Directive 2006/42/EC, Appendix I**

The relevant technical documents according to appendix VII B are available and will be presented to the competent national authorities electronically, if required.

The partly completed machinery complies with the following EC directive:

- Low Voltage Directive 2006/95/EC
- ATEX- Ex- Directive 94/9/EC

Applied harmonised standards:

<table>
<thead>
<tr>
<th>Standard</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>DIN EN 12100</td>
<td>Safety of machines, general principles for design, risk assessment and risk</td>
</tr>
<tr>
<td>DIN EN 1127-1</td>
<td>Part 1: Fundamentals and methodology</td>
</tr>
<tr>
<td>DIN EN 60034-1</td>
<td>Part 1: Rating and performance</td>
</tr>
<tr>
<td>DIN EN 60034-5</td>
<td>Part 5: Degrees of protection provided by integral design</td>
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<tr>
<td>DIN EN IEC 60079-31</td>
<td>Explosive atmospheres, Part 31: Equipment dust ignition protection by enclosure &quot;t&quot;</td>
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<tr>
<td>DIN EN 60204-1</td>
<td>Part 1: Electrical equipment of machines</td>
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<tr>
<td>DIN EN 13463-1,5,8</td>
<td>Non-electrical equipment for use in potentially explosive atmospheres</td>
</tr>
<tr>
<td></td>
<td>Part 1: Basic method and requirements</td>
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<td>Part 5: Protection by constructional safety &quot;c&quot;</td>
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<tr>
<td></td>
<td>Part 8: Protection by liquid immersion &quot;k&quot;</td>
</tr>
<tr>
<td>DIN EN 60529</td>
<td>Protection class by housing (IP)</td>
</tr>
</tbody>
</table>

The designated product is intended for installation into/to another machine. Operation is prohibited until the final product is in compliance with regulation 2006/42/EC. This statement does not provide a confirmation of product characteristics in terms of product liability.

Safety instructions stated in the product documentation must be adhered to.

Gescher 18.09.2010

Paul Lütkenhaus  
Managing Director / Managing Director Technology  
Dietmar Dammfeld  
Technology / Documentation

c) Authorized representative for issuing this declaration on behalf of the manufacturer

d) Authorized representative for compiling the technical documentation  
(address of the Authorized representative for documentation see above)