



Manufacturer:

Karl Klein Ventilatorenbau GmbH

Waldstr.24 D-73773 Aichwald

Tel.: +49-711-369060 Fax: +49-711-36906950

Email: info@karl-klein.de <http://www.karl-klein.de>

Fan types:

xxxx UMA yyyyy – zzzzz to xxxx UMP yyyyy – zzzzz
Motor-driven

xxxx URA yyyyy – zzzzz to xxxx URP yyyyy – zzzzz
Belt-driven

xxxx UKA yyyyy – zzzzz to xxxx UKP yyyyy – zzzzz
Clutch-driven

Hot Gas Circulation Fans – APOTHERM for industrial furnaces




	<p>User Manual for Hot Gas Circulation Fans APOTHERM</p>	<div data-bbox="1123 118 1259 188"> GB </div> <div data-bbox="991 181 1098 219"> Page 2 </div> <div data-bbox="1187 215 1394 250"> Edition: 06/2023 </div>
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1 General Information

1.1 General Description

The incomplete machine described in this user manual is a hot gas circulation fan for industrial furnaces in welded construction.



A fan in the application in question is a flow machine subject to high dynamic loads that must only be operated by qualified staff.

1.2 Intended Use

The fan is exclusively intended to convey the media specified in the data sheet for the machinery, with the operating parameters stated therein. Any other use above and beyond this, including a deviation from the operating parameters exceeding those in the general safety instructions is prohibited. The manufacturer is not liable for any resulting damage. All associated risks are borne by the owner/operator.

Intended use also includes compliance with the operating, maintenance, and service conditions stipulated by the manufacturer.

The fan must only be used, maintained, and serviced by staff familiar with the related procedures and the associated hazards.

Locally valid accident prevention regulations and other generally-accepted safety, occupational-medical, and public road traffic rules and regulations must be observed.

Unauthorized modifications on the machinery void the manufacturer's liability for any resulting damage.

The required raw materials were specified by assuming a reduced sulfuric gas furnace atmosphere.

The fan must only be exposed up to the specified furnace temperature. Exceeding the latter must be diligently avoided since this will damage the parts projecting into the furnace and the next-closest rolling bearings.

In order to avoid bearing damage, only switch off the fan after the furnace temperature has dropped below 150°C. The bearings may otherwise heat up beyond their rated temperature. If higher furnace temperatures occur during idle, the bearings must be lubricated prior to operating the fan.

1.3 Declaration for the installation of partly completed machinery

The fan described in these installation instructions complies with the health and safety requirements of Annex I of the Machinery Directive 2006/42/EC as stated in the Declaration of Incorporation only (see page 34). Only after completion to a complete machine (and thus fulfilment of all safety and health requirements of Annex I of the Machinery Directive 2006/42/EC) does it not pose a risk to the safety and health of persons and the safety of goods when properly installed and maintained and operated as intended.



You must read the chapter on Safety Instructions in this user manual before operating fan.



Prior to initial startup, and of course prior to any further startup following inspections and maintenance, verify that foreign objects, tools, scaffolding, and support equipment have been removed from the fan.



All safety devices, such as emergency shutoff switches, shaft shroud, clutch shroud, etc. must be installed.



Cordon off a wide hazard zone around the fan to unauthorized personnel, and switch on the fan from a safe distance.



Never allow personnel, animals, or loose objects to be in the airflow. The airflow generated by the fan can be sufficiently strong to ingest or propel a human body and even heavy objects.



All supplied and agreed and/or provided safety devices, such as temperature, vibration, and rotational speed monitors, etc. must be connected, and their operational readiness must be ensured at all times.

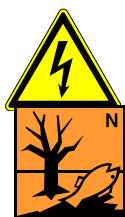
2 Safety Information

2.1 Symbols

The following symbols used in this user manual and on the fan must be given special attention:



Calls attention to hazardous situations with risk of bodily injury and property damage.



Hazard due to electrical current. Only trained electricians are authorized to do the work.

Environmental protection notices



Warning: hand injuries



Warning: suspended loads



Warning: hot surfaces



Warning: rotating parts



Warning: chemical burns



Warning: falling hazard



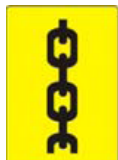
Warning: health-hazardous materials



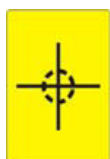
Warning: explosive atmosphere



Warning: toxins



Rigging points for fan transport



Fan center of gravity



Manual arc welding on fan prohibited



No operator passageway



Read this user manual prior to startup



Wear hearing protection



NOTICE observe instructions!

The cited safety instructions must be observed.



NOTICE wear hearing protection.

Wear hearing protection when working on the machinery.



NOTICE wear safety shoes.

Wear safety shoes when working on the machinery.



NOTICE wear gloves.

Wear appropriate safety gloves when working on the machinery.



NOTICE wear safety goggles.

Wear safety goggles when working on the machinery.

3 Limit Values

Limit values at which fan operation must be discontinued:

MACHINE VIBRATIONS

measured at the bearing locations

Alarm:	$\geq 7.1 \text{ mm/s}$	(fan must be inspected promptly)
Shutdown:	$\geq 9.0 \text{ mm/s}$	(fan must be shut down immediately)

4 Safety Instructions

4.1 Basic Safety Instructions

The fan was constructed according to the state-of-the-art and generally-accepted safety engineering practices. However, even when these are observed, users or third parties can nevertheless be exposed to risk of bodily injury or death, and the machinery and other property can nevertheless be damaged.

Only use the fan in technologically compliant condition, as intended, and in awareness of safety standards and potential hazards, while also observing the user manual. In particular, any malfunctions that compromise safety must be corrected immediately.

4.2 General Safety Instructions

- 4.2.1 In addition to the instructions in this user manual, you must also observe the general safety and accident prevention regulations.
- 4.2.2 The owner/operator must ensure that the machinery is only operated in flawless condition.
- 4.2.3 Modifying factory settings without our consent is prohibited.
- 4.2.4 Only start up the fans while the machine is at a full stop.
- 4.2.5 Exceeding the temperature and speed limits specified in the data sheet – even momentarily – is prohibited.
- 4.2.6 Prior to making the electrical connections to the motor, the safety and startup instructions of the motor manufacturer, and DIN VDE 0105 or IEC 364, must be observed.
- 4.2.7 Modifications on impellers in connection with operational balancing procedures performed by the customer must be reviewed and approved by us.
- 4.2.8 Keep liquids or foreign substances away from the fan so that these cannot be conveyed by the impeller. Conveying liquids will result in the destruction of the impeller. Condensate must be fully evacuated from the fan housing.
- 4.2.9 Dirt buildup, corrosion, and visible wear on impellers are prohibited. Countermeasures must be reviewed by and approved by us immediately.
- 4.2.10 Any equipment-induced spin of the gas flow in impeller direction must be avoided – opposing spin is prohibited.
- 4.2.11 In continuous operation, the lower minimum conveyance limit of $V_{\min} = 0.3 \cdot V_{\text{opt}}$ must be observed at all times; for pressure increases above 20 kPa, the lower minimum conveyance limit must be raised to $0.5 \cdot V_{\text{opt}}$, and the setpoint must be blocked for operating setpoints with pressure increases of less than 40% of the pressure increase. Extended operation below the specified conveyance volumes will result in the destruction of the impeller. Momentary operating states (startup and shutdown state) with a duration of less than 5 minutes/day are permitted.
- 4.2.12 Only operate fans in properly-balanced and vibration-free condition. If vibration monitors are present, the permitted bearing vibrations are defined by alarm and shutoff values specified by Karl Klein.
- 4.2.13 Alarm and shutoff functions must be implemented with the limit values specified in the installation manual. Any operation above the alarm value is only permitted briefly to analyze the cause of the vibration. Sudden degradations of vibration values can be leading indicators for failure of the machinery or a machinery component and can compromise operational safety. The causes must be identified immediately, and corrective actions must be implemented.
- 4.2.14 Operating fans without installed vibration monitors is permitted only if the vibrations in the bearing planes do not exceed a maximum limit of 9.0 mm/s (ISO 14694 BV-3)! For an optimized service life of the machinery, maximum vibrations must be limited 7.1 mm/s. On process-relevant fans, vibrations must be checked and documented regularly (at least biweekly).
- 4.2.15 Fan components that can be accidentally touched during normal fan operation; drive systems or supply systems with an exterior surface temperatures of above +65°C or below -12.5°C must be protected, insulated, or have warning labels (see DIN EN 563).
- 4.2.16 The specifications in DIN EN 60204-1, DIN EN 294 or DIN EN 349 must be observed for electrical and mechanical safety devices manufactured on-site.
- 4.2.17 Components must be connected to ground to prevent electrical discharges. The requirements in DIN EN 50081 Part 1 and 2 must be observed.

- 4.2.18 Prior to start up, the fan must be inspected for transportation damage, and must not be placed into service if damage is present.
- 4.2.19 Manual arc welding on the fan is prohibited and will void any and all warranty claims.
- 4.2.20 Use guide mandrels for installation and maintenance work.
- 4.2.21 Implement appropriate fall protection procedures for maintenance and repairs.
- 4.2.22 Do not operate 50Hz machinery on 60Hz power supplies.
- 4.2.23 Connect metal cable conduit and cable jackets to the protective conductor system to prevent electrical shock due to contact with live components.
- 4.2.24 Overcurrent and ground fault current safety devices must be used to automatically cut the power supply.
- 4.2.25 Control cabinets must be sufficiently shielded to prevent faulty indicators of the monitoring systems due to interference from electromagnetic fields in signal cables.
- 4.2.26 Wearing suitable hearing protection is mandatory for noise emissions above 85 dB(A).
- 4.2.27 For maintenance and service, the on-site work zone must be sufficiently illuminated.
- 4.2.28 For operation on frequency inverters, the maximum rotational speed must be physically locked out.
- 4.2.29 No automatic restart after the power supply is restored.
- 4.2.30 Physically lockable central switches must be used on-site, and emergency shutoff switches must be installed on-site
- 4.2.31 Bearing lubrication must be ensured by strictly complying with lubrication instructions and regular maintenance, including monitoring of bearing temperatures.
- 4.2.32 Only operate the machine with installed guards, while also using the original fasteners.
- 4.2.33 If protective gases are used on shaft through holes, such gases must not be harmful. They must be compatible with the conveyed medium.
- 4.2.34 On speed-controlled drives, controllers must be adjusted such that resonances with the natural frequencies of the mechanical system are ruled out.
- 4.2.35 Perform regular maintenance according to our installation manual.

5 Operators

The equipment must only be commissioned by operators who – based on their subject-matter training – are sufficiently knowledgeable in:

- safety regulations,
- accident prevention regulations,
- guidelines and generally-accepted engineering practices.

Operators

- must be commissioned by the employer,
- must be able to assess their assigned work,
- must be able to recognize and avoid potential hazards,
- must be authorized by the designated safety representative to perform the required work and activities.

Only assign reliable and trained operators who are fully qualified on the machinery. We recommend that equipment is commissioned by our subject-matter experts.

Only trained electricians (as per the definition for trained staff in DIN VDE 0105 and IEC 364) are authorized to work on and inspect electrical components.

While observing the respectively valid

- national regulations,
- safety regulations,
- accident prevention regulations.

The regulations (VDE etc.) governing work on and with electrical systems, such as

- master switch actuation,
- lock out/tag out,
- establishing that systems are disconnected from power,
- grounding and short-circuiting,
- covering or guarding adjacent live components,

must be observed.

Trained electricians are defined as individuals who based on their subject-matter training, experience, and instruction are knowledgeable in governing standards, regulations, and accident prevention codes. They must also be able to assess the assigned work and to recognize potential hazards.

6 Conditions for Electrical Connections

The respectively valid national standards apply for connecting electrical components. It must be verified for these purposes that the regulations of the respective electrical utilities are observed.



Only trained electricians (as per the definition for trained staff in DIN VDE 0105 and IEC 364) are authorized to work on and inspect electrical components.

7 Warnings, Labels

Notices attached on the fan (such as rigging points, load center locations, rotational direction arrows, lubricant notices (if any), notices on belt drives (if any)) must be observed and maintained in legible condition.

8 Residual Risks

In spite of measures to integrate safety during design, in spite of safety devices and supplemental safety measures, the hazards identified as follows remain and special attention must therefore be paid to these.

8.1 Hazard Overview

Type of hazard	Hazard	Hazard location	Countermeasures
Crushing due to falling parts / machinery	Death, property damage	Installation and assembly	Observe transportation regulations
Shearing while installing machinery components	Injury hazard	Installation and assembly	Observe user manual, use guide mandrels
Body parts and clothing ingested into drive elements	Injury hazard, property damage	All rotating components	Observe user manual, do not remove guards
Loss of stability	Injury hazard, property damage	Transport and operation	Observe user manual, Observe transportation regulations, Professional transportation procedures, Professionally installed foundation and anchoring
Slipping, tripping	Injury hazard	Installation, assembly, and maintenance	Observe user manual, Implement appropriate tripping and falling safety procedures
Electrical shock	Death	Direct hazard due to contact with live components, indirect hazard due to malfunctioning live components	Observe user manual, Observe safety regulations
Electrical shock due to electrostatic discharge	Death	Contact during operation	Observe user manual, Observe safety regulations, Component grounding
Burn or freeze injuries due to hot/cold machinery components	Injury hazard, Explosion hazard due to elevated ignition risk	Hot/cold machinery components	Observe user manual, Labeling, Wear personal protective gear,
Hearing loss or physiological harm due to machinery noise	Injury hazard	Noise emissions above 70 dB(A)	Observe user manual, Labeling, Wear personal protective gear,

Type of hazard	Hazard	Hazard location	Countermeasures
Hazard due to materials and other substances	Injury hazard, property damage	Installation, assembly, maintenance, and operation	Observe user manual, Prevent ingestion of foreign objects, ensure sufficient ventilation, labeling, Wear personal protective gear,
Combinations of hazards	Injury hazard, death, property damage, environmental damage	Inappropriate installation and commissioning, operator error	Observe user manual
Unexpected startup	Death	Maintenance, repair	Observe user manual, Observe safety regulations, physically lockable central switch
High-pressure fluid discharge of sealing fluids on shaft seals	Injury hazard	Maintenance and operation	Observe user manual, Observe safety regulations, limit sealing fluid supply pressure
Inadequate monitoring	Injury hazard, property damage	Operation	Observe user manual, Observe safety regulations, Connect and activate monitoring functions
Impeller fractures, propelled fragments	Injury hazard, death, property damage, environmental damage	Operation	Observe user manual, Observe safety regulations, intended use

9 Product Description

9.1 Motor

General Information

Live and rotating components are located in the interior of electrical motors. Any work related to connecting, commissioning, and servicing electrical motors must therefore generally be performed by qualified subject-matter experts according to the manufacturer's instructions. DIN VDE 0105 or IEC 364 must be observed. Serious bodily injury and property damage can otherwise result. The respectively valid national, local, and system-specific regulations and requirements must be observed.

Intended Use

The motors are appropriately designed iaw. DIN VDE 0530.
Operating motors without conformity certification is prohibited in Zone 1 ATEX zones (observe supplemental notices).

The rated output of the motors is stated for ambient temperatures up to +40°C and for installation elevations ≤ 1000 m above standard sea level. Operating motors may be possible under different circumstances after consulting with the motor or fan manufacturer.

Electrical Connection



The electrical connection must only be made while the system is disconnected from power.
The system must be locked out/tagged out against restart.

The parameters on the rating plate, the connection diagram in the connection box, and the additional instructions in the manufacturer's assembly manual must be observed

In order to ensure a permanently safe electrical connection, the connection must be made according to the motor manufacturer's installation manual.

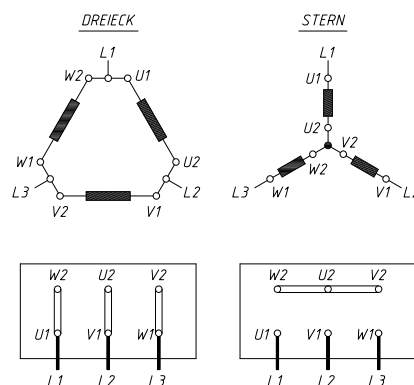
The tightening torque specifications for terminal panel connections must be observed. These can be found in the motor manufacturer's installation manual.

While making the connection, verify that neither foreign objects and dirt nor moisture are in the connection box. Cable gland openings that are not required must be sealed against dust and water using a blind cap. When closing the terminal box, verify that the gasket of the terminal box lid is seated properly.

The power supply voltage and power supply frequency must match the rating plate data on the motor. Motors with a wide voltage range coil can be operated at several power supply voltages. In this case, verify that the available power supply voltage is within the voltage range specified on the rating plate on the motor. For 60 Hz power supplies, the fan manufacturer can attach a supplemental plate informing that the motor can also be operated on 60 Hz power supplies with 60 Hz output.

The jumper arrangement on the terminal panel depends on the available power supply voltage (see diagram).

Coil circuitry in



Location of jumpers on the terminal panel

Two examples for coil configurations and operating voltages:

Coil configuration – 230 V:

Operating voltage:	230 V	/	400 V	50 Hz
			460 V	60 Hz or
	220-240 V	/	380-420 V	50 Hz

Coil configuration – 400 V:

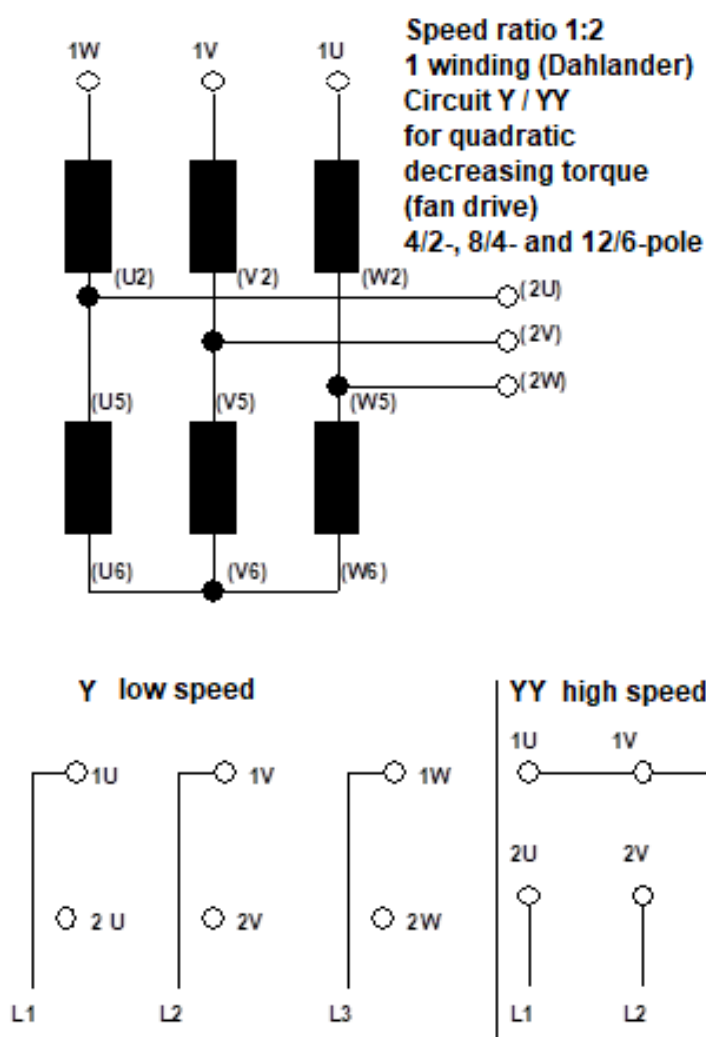
Operating voltage:

400 V	/	690 V	50 Hz
460 V	/		60 Hz or
380-420 V	/	660-725 V	50 Hz
440-480 V	/		60 Hz

The protective conductor must be connected to the terminal.



When using reverse polarity motors (see diagram):



The motor supply voltage is found on the motor type plate.

9.2 Installation Plate

The installation plate is a weldment with a bracket to attach the motor.

Facing the furnace, and depending on the conveyed material temperature, the installation plate is equipped with an

insulation plate made of pressed mineral fiber material, or with an insulation box packed with ceramic fibers, that seals the furnace opening together with the flange in the installation plate.

9.3 Impeller

Depending on the conveyed material temperature and speed, the dynamically-balanced impeller is fabricated from standard steel with higher strength or heat-resistant material.



The maximum rated speed (specified on the type plate) must never be exceeded under any circumstances.

9.4 Cooling Disc

In order to evacuate heat conducted from the fan through the shaft, a segmented cooling disk is clamped onto the hub upstream of the A-side (DE) motor bearing.



The cooling disc must be securely seated to function properly. If not seated securely, the cooling disc can become detached and be propelled outward, which can cause serious bodily injury.

9.5 Inlet nozzle (if present)

The inlet nozzle creates better air inflow and airflow over the impeller, resulting in improved efficiency. It is supplied as separate hardware that must be attached on-site in the furnace. When doing so, the installation dimensions or the airgap to the impeller must be observed.

10 Performance data overview (excerpt)

Type	Temperature limit [°C]	Density [kg/m³]	Volumetric flow [m³/s]	Rotational speed [min⁻¹]	Power requirements [kW bei 20°C.]	Motor output [kW]	Weight [kg]
UMA	400	0.53					54
8093 UMB 80200	600	0.404	0.25-0.71	2900	0.45-0.9	3.0	55
UMC/UMD	800	0.33					57
UMA	400	0.53					59
8093 UMB 80250	600	0.404	0.25-0.71	1450	0.19-0.38	2.2	60
UMC/UMD	800	0.33					62
UMA	400	0.53					92
8093 UMB 80315	600	0.404	0.5-1.4	1450	0.5-1.1	2.2	94
UMC/UMD	800	0.33					98
UMA	400	0.53					97
8093 UMB 80355	600	0.404	0.8-2.0	1450	1.1-2.0	2.2	99
UMC/UMD	800	0.33					104
UMA	400	0.53					127
8093 UMB 80400	600	0.404	1.0-2.8	1450	1.6-3.4	4.0	129
UMC/UMD	800	0.33					134
UMA	400	0.53					180
8093 UMB 80450	600	0.404	1.8-4.0	1450	3.5-6.0	7.5	183
UMC/UMD	800	0.33					187
UMA	400	0.53					231
8093 UMB 80500	600	0.404	1.8-4.0	960	1.9-3.5	4.0	236
UMC/UMD	800	0.33					243
UMA	400	0.53					296
8093 UMB 80560	600	0.404	2.0-5.0	960	2.8-5.5	7.5	301
UMC/UMD	800	0.33					309
UMA	400	0.53					407
8093 UMB 80630	600	0.404	2.5-7.1	960	4.3-9.5	11.0	412
UMC/UMD	800	0.33					423
UMA	400	0.53					583
8093 UMB 80710	600	0.404	3.15-8.0	725	4.2-9.0	11.0	589
UMC/UMD	800	0.33					600
UMA	400	0.53					802
8093 UMB 80800	600	0.404	4.0-12.6	740	6.5-16.5	18.5	809
UMC/UMD	800	0.33					823
UMA	400	0.53					1087
8093 UMB 80900	600	0.404	6.0-17.0	740	13.0-28.5	30.0	1095
UMC/UMD	800	0.33					1135

11 Supplied Scope and Temporary Storage

Upon receiving, verify that the shipment is complete based on the delivery ticket. Missing parts and/or transportation damage must be reported in writing immediately.

The fan must be protected against ingress of humidity and dust and against inadmissible vibrations of the foundation. The influence of high temperature fluctuations must be avoided. Failure to observe the above can result in damage to electrical motors, wiring boxes, bearings, paint, seals, etc. and in corrosion, and result in associated elevated ignition risk.

For temporary storage, the fan must be stored in its transportation packaging.

12 Transportation Instructions

Only the designated and labeled transportation eyelets and/or load pins must be used to transport and lift the fan and accessories, taking load centers into account.

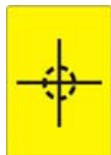
Load cables and slings must be in proper operating condition and must only be rigged to the designated transportation eyelets and/or load pins.

The rigging points for the transportation lifecycle phase are labeled on the individual transportation eyelets using the following symbol:



Other rigging points, for example on the housing and motors for the repair and maintenance lifecycle phases, are sealed with plastic caps and must not be used for the transportation lifecycle phase.

The load center of the fan is labeled on the fan using the following symbol:



The fan must only be lifted and transported by operators who have read this user manual, who understand the cited safety regulations, accident prevention regulations and the instructions for transporting the fan, and who are familiar with the hoist, the required load cables, and slings.

12.1 Safety Instructions for Transportation



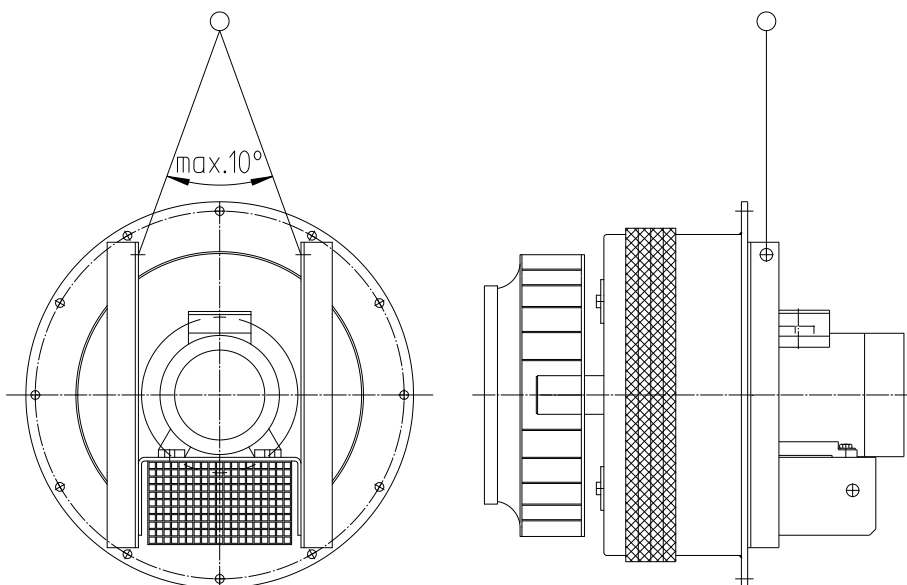
Safety Instructions for Transportation

- The customer is responsible for transporting and lifting at the construction site, which should be performed by qualified staff.
- The accident prevention regulations must be observed.
- Do not move the suspended load over personnel.
- Fans must only be lifted and transported by equipment intended for this purpose.
- Assuming sufficient load capacity of the lifting equipment, the complete fan can be lifted for transportation at the construction site.
- Load cables must only be rigged to the designated load points.
- When lifting the fan, verify that the load cables will not damage any components – use a spreader frame as needed.
- Any collisions of the fan will result in damage and must be avoided.
- Load cables and spreader frames must be rated for the fan weight.
- Do not make knots in fiber ropes.
- Do not twist cables/ropes and chains.
- Suspension links must be freely movable on the load hook.
- Wear personal protective gear (helmets, gloves, etc.).
- Do not use transportation eyelets on motors and housings to lift the entire fan.
- The fan must be lifted and lowered softly to avoid damage.
- The manufacturer assumes no liability for damage caused by transportation at the construction site.

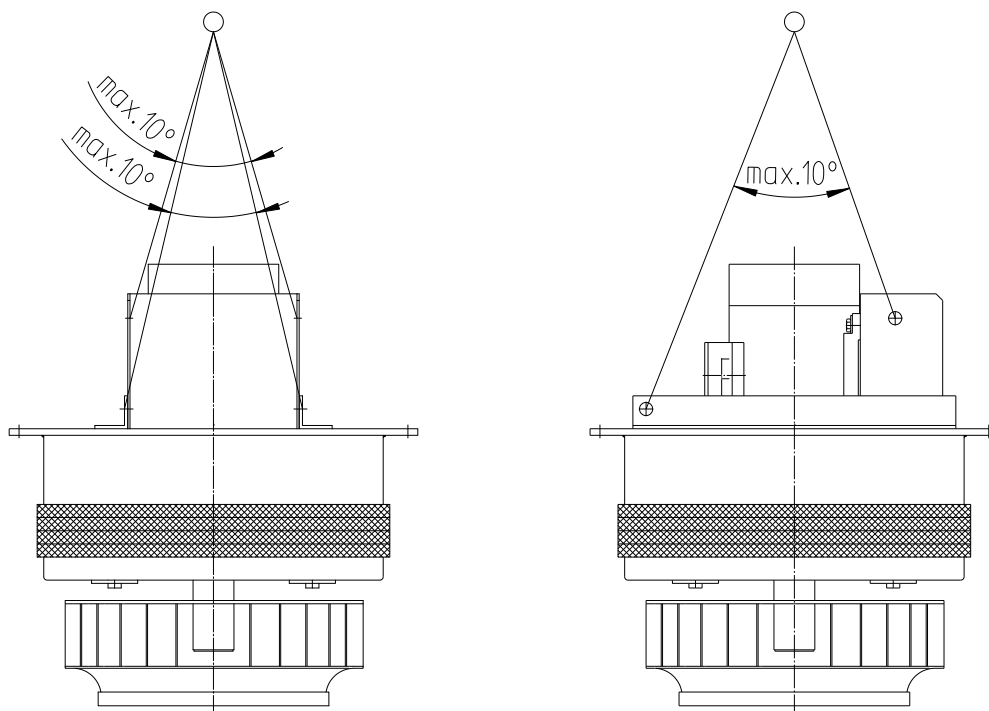
12.2 Transportation Regulations



Only lift and transport the fan on designated transportation eyelets and load pins, with suitable hoists and slings.
Note the dimension sheet and the following sketch.



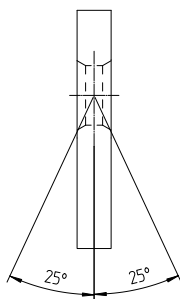
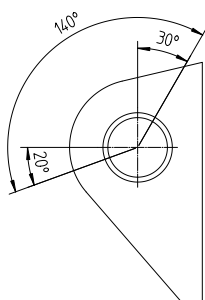
HORIZONTAL INSTALLATION ORIENTATION



VERTICAL INSTALLATION ORIENTATION



- Fans must only be lifted and transported on equipment intended for this purpose. Do not rig load cables and slings on bearings, intake and outlet flanges, motors, and other components.
- Only use load cables and slings of the same length and verify uniform weight distribution. Do not exceed an angle of 10° . See the above sketch.
- When lifting the fan, verify that the load cables and slings will not damage any components – use a load spreader as needed.



Permitted load directions

13 Commissioning / test run

- We recommend involving our subject-matter experts for commissioning.
- Verify that lubricant reservoirs are filled. Do not operate unlubricated bearings.
- Only specified lubricants or their equivalent must be used. Dirt buildup is not permitted.
- No liability is assumed for defects caused by improper commissioning by the customer.
- The ingress of foreign objects into the impeller is prohibited.
- Prior to the test run, verify that the shaft and impeller rotate freely (on explosion-protected fans, the impeller gap must be measured and recorded).
- Verify the rotational direction (rotating direction arrows are located on the fan housing).
- Check mechanical and electrical safety devices for proper attachment and installation.
- Check that the power supply type, voltage, and frequency match the drive motor parameters and that connections are in compliance with standards.
- Verify that all guards are properly installed with original components, including fasteners
- The employed materials, fluids, and supplies must be suited for the intended use and must be compatible with the conveyed medium.
- Fans and motors must be grounded by trained staff in compliance with industry standards using the designated grounding connections (see the dimensional sheet).



Prior to commissioning, the fan must be equipped with one or several EMERGENCY OFF command devices by which imminent or incident hazards can be avoided. These devices must be clearly labeled and must be readily accessible at all times. The EMERGENCY OFF command device must only be reset by suitable actuation. This reset must not restart the fan, but must instead only permit restarting.

14 Switching on the Fan



The fan must only be permitted to ramp up when sufficient acceleration torque is present over the entire ramp up range, up to the nominal rotational speed.

During and after fan ramp up, the following points must be checked:

- Current draw
- Voltage
- Fan vibrations
- Unusual operating noise
- Bearing temperatures



If the fan exceeds the rated limits or exhibits unusual operating noise, the fan must be shut down immediately and the manufacturer's service team must be notified.

15 Switching off the Fan

Allow the fan to idle to a full stop without braking.



Observe safety regulations in DIN VDE 0105.



Without exception, the fan must only be restarted after the impeller has come to a full stop. This avoids negative torque peaks that can lead to substantial damage on components, such as bearings, impellers, and clutches.



In order to avoid bearing damage, only switch off the fan after the furnace temperature has dropped below 150°C. The bearings may otherwise heat up beyond their rated temperature. If higher furnace temperatures occur during idle, the bearings must be lubricated prior to operating the fan.

Only subject-matter experts commissioned by the individual responsible for the system are authorized to switch the fan on and off.

16 Maintenance and Service



The accident prevention regulations must be observed.

Any service must be performed in compliance with generally-accepted mechanical engineering principles. Only appropriately trained staff are authorized to perform maintenance and service procedures. Sufficient space must be provided for maintenance and repairs. This applies to service staff and for storing fan components, such as impellers and housings, etc. Moreover, structural measures must be implemented for lifting and moving these components, such as gantry cranes or carriers for suspending trailing chains. Sufficient lighting for the maintenance and service level must also be implemented on site, such as appropriate countermeasures against falling hazards. Use of guide mandrels for maintenance and repairs.

Only perform maintenance and repairs with suitable personal protective gear and suitable tools.



NOTICE wear hearing protection.

When working on the equipment, hearing protection may have to be worn, depending on ambient noise.



NOTICE wear safety shoes.

Wear safety shoes when working on the machinery.



NOTICE wear gloves.

Wear appropriate safety gloves when working on the machinery.



NOTICE wear safety goggles.

Depending on the activity, wear safety goggles when working on the machinery.

From time to time, the fan must be checked for imbalances while in operation. If the fan is out of balance, the impeller must be cleaned and may have to be rebalanced.



The fan must be locked out and tagged out before starting maintenance work. Verify that the impeller has come to a full stop.
Establish that systems are disconnected from power, Cover or guard adjacent live components, The accident prevention regulations must be observed. All safety devices must be reinstalled prior to restart.



Verify that hot surfaces have sufficiently cooled down.
Burn injury hazard due to prematurely removing insulation or opening inspection hatches.

If the system is shut down for an extended time frame (longer than 3 months), the impeller unit must be rotated at biweekly intervals to ensure that the rolling bearings are continuously coated by lubricant and to avoid point loads on the rolling bearings.



Take into account harmful and hazardous residual materials in the machine.



Use suitable cleaning agents and equipment for cleaning work.



Cleaning the fan with high-pressure steam jets is prohibited.
Any moisture ingress, for example into bearings and gaskets, and the associated possibility of corrosion must be avoided.



After maintenance and repairs are completed, verify that all solid and liquid foreign substances were removed from the fan and adjacent system components, that all openings are closed, and that all mechanical and electrical safety devices are reinstalled.

We ask that you notify us immediately if damage occurs in spite of compliance with all regulations and notices. Further measures following consultation

- Request a service technician, or
- repair or new part fabrication at our factory

A general inspection must include the following checks and maintenance:

16.1 Motor

When maintaining and servicing the motor, the motor manufacturer's regulations must be observed.
If the electric motor is equipped with a relubrication system, the specifications on the plate attached on the motor must be followed.

At bearing temperatures from 85°C to 100°C, the lubrication intervals specified by the motor manufacturer are cut in half.

On smaller motors, we recommend replacing the bearings entirely.

16.2 Installation Plate

Inspect the installation plate (annually) for any identifiable

- damage / cracks.

16.3 Impeller

Inspect the impeller (annually) for any identifiable

- wear

- damage / cracks
- corrosion
- burnishing discoloration
- balancing weights (secure seat, wear).

The manufacturer must be informed if unusual changes are identified.

16.4 Dismantling / Installation of the Impeller

We recommend to have our subject-matter experts perform this work.
The required tools and spare parts must be ordered through our service department.

Dismantling

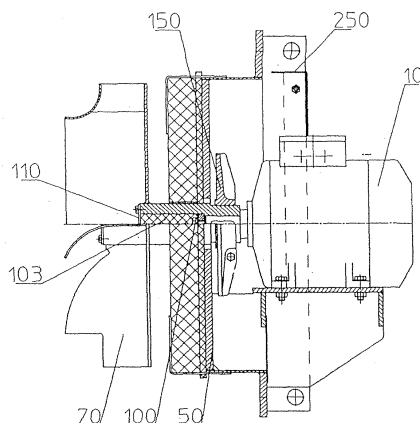
Dismantle and securely store the fan horizontally

Only transport the fan on the installation plate and carefully protect the impeller against impact, shock, or pressure

1. Remove cooling fin guard, pos. 250.
2. Loosen and remove segmented cooling wheel, pos. 150.
3. Loosen and remove bolt fasteners for the disc, pos. 110, and remove insulating wool, pos. 103.
4. Loosen and extract the locking bolt, pos. 100.
5. Thread one bolt (one thread size larger than the locking bolt) into the disc of the impeller hub, and tighten it against the shaft collar. Push the impeller away from the shaft journals by continuing to thread the bolt clockwise. If the wheel does not come loose, heat the hub (at most lukewarm) on the motor side.
6. Loosen the motor bolts and lift off the motor.

Installation

1. Position the impeller on the intake side.
2. Position the installation plate onto the impeller and brace the sides with blocks and wedges under the flange. The impeller hub projects through the insulation box.
3. Heat the impeller hub (at most lukewarm).
4. Push or allow the motor to slide vertically into the hub until it comes to rest on the shaft. First apply a thin film of graphite to the motor journal, if present.
5. Align the motor with impeller to the bore in the installation plate and fasten with screws.
6. Securely store the fan horizontally
7. Thread in and tighten the locking bolt, pos. 100
8. Pack the hub with insulation, pos. 103, then fasten the disc, pos. 110, with screws.
9. Install the cooling wheel, pos. 150.
10. Fasten the cooling fin guard, pos. 250, with screws. The cooling fin guard may have to be reworked in the area of the terminal box.



Example sketch – hot gas circulation fan

16.5 Threaded Fastener Inspections

All threaded fasteners must be regularly inspected for seat and completeness.

16.6 Tightening Torque Specifications



The tightening torque specifications shown in the table below apply when no specific tightening torque specifications are stated in the installation drawing or the dimension sheet:

Grade 8.8										
Thread (nominal diameter)	20 °C		100 °C		200 °C		250 °C		300 °C	
	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)
M 6	5930	8	5467	7	5004	7	4726	6	4448	6
M 8	10848	19	10000	18	9153	16	8644	15	8136	14
M 10	17236	38	15889	35	14543	32	13735	30	12927	28
M 12	25094	65	23134	60	21173	55	19997	52	18821	49
M 16	47117	155	43436	143	39755	131	37546	124	35338	117
M 20	73527	303	67782	280	62038	256	58592	242	55145	228
M 24	105938	523	97662	482	89385	441	84420	417	79454	392
M 30	168874	1042	155681	960	142488	879	134572	830	126656	781
M 36	246420	1805	227169	1664	207917	1523	196366	1439	184815	1354
M 42	338576	2885	312125	2659	285673	2434	269803	2299	253932	2163
M 48	445342	4342	410550	3558	375757	3664	354882	3460	334006	3256

Grade 10.9										
Thread (nominal diameter)	20 °C		100 °C		200 °C		250 °C		300 °C	
	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)
M 6	8710	12	8108	11	7320	10	6903	9	6533	9
M 8	15933	28	14831	26	13390	23	12627	22	11949	21
M 10	25315	56	23565	52	21276	47	20064	44	18986	42
M 12	36858	95	34309	89	30976	80	29212	75	27643	71
M 16	69203	228	64418	212	58160	192	54847	181	51902	171
M 20	107992	446	100525	415	90760	375	85590	353	80994	334
M 24	155597	768	144838	715	130768	646	123319	609	116698	576
M 30	248034	1530	230883	1424	208454	1286	196580	1212	186025	1147
M 36	361930	2651	336902	2468	304175	2228	286848	2101	271447	1989
M 42	497283	4237	462897	3944	417929	3561	394123	3358	372962	3178
M 48	654096	6377	608866	5936	549719	5360	518406	5054	490572	4783

Grade A4-70	20 °C		100 °C		200 °C		300 °C		400 °C	
	Thread (nominal diameter)									
	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)	F _M (N)	M _a (Nm)
M 6	4170	6	3540	5	3336	4	3123	4	2919	4
M 8	7627	13	6475	11	6102	11	5712	10	5339	9
M 10	12119	27	10288	23	9695	21	9076	20	8483	19
M 12	17645	46	14978	39	14116	36	13214	34	12351	32
M 16	33129	109	28123	93	26503	87	24810	82	23190	76
M 20	51698	213	43886	181	41359	171	38716	160	36189	149
M 24	74488	368	63232	312	59590	294	55783	275	52142	257
M 30	118740	732	100797	622	94992	586	88923	548	83118	513
M 36	173264	1269	147082	1077	138611	1015	129756	951	121285	889
M 42	238061	2028	202087	1722	190449	1623	178281	1519	166643	1420
M 48	313131	3053	265813	2592	250505	2442	234500	2286	219192	2137

The clamping force F_M specifies the threading force in relation to an exploitation of the yield strength $R_{p0.2}$ of 90%.
The tightening torque M_a implies use of a torque wrench, $\alpha=1.8$ and a friction coefficient of 0.08 for head and thread friction.

16.7 Storage and Corrosion Inhibitor Regulations

The following must be observed when storing and corrosion-inhibiting the fan for temporary storage for **a maximum of 3 months**:

- Seal the intake and outlet openings.
- Any machinery components without a paint film must be protected with a corrosion inhibitor.
- The impeller unit must be rotated from time to time to prevent bearing damage.
- Protect the fan against weather influences with appropriate measures (cover with a tarp or store in fully-enclosed buildings).

The following must be observed when storing and corrosion-inhibiting the fan for temporary storage for **a maximum of 6 months**:

- Store the fan protected against rain and frost.
- Seal the intake and outlet openings.
- Any machinery components without a paint film must be protected with a corrosion inhibitor.
- The impeller unit must be rotated from time to time to prevent bearing damage.
- To avoid moisture and water ingress or gap corrosion on weld seams not fully closed on both sides, seal these with a filler using appropriate materials.
- Surfaces on shafts and shaft nuts fabricated from standard steel without a paint film must be protected with a coating of corrosion-inhibiting wax. The shaft is protected in the bearing housing using oil-resistant enamel..
- Shaft through-holes on bearings must be wrapped with Denso wraps (wax-soaked jute wraps).
- Packed bushings and packings must be wrapped to the outside with a Desno wrap (wax-soaked jute wrap). A Molykote film must be applied on journals of bushings with corrosion damage.
- Shaft through-holes on shaft seals must be wrapped with Denso wraps (wax-soaked jute wraps).
- Machined surfaces on impellers must be sealed with a corrosion inhibitor.
- A corrosion inhibitor must be applied on impellers without a paint film or coating.
- A corrosion inhibitor wax must be applied on exposed bushings made of non-stainless materials.
- A corrosion inhibitor must be applied on motors according to supplier instructions.

The following must be observed when storing and corrosion-inhibiting the fan for **longer than 6 months**:

- The protective films of corrosion-inhibiting wax must be repeated.
- Any Denso wraps must be pressed back in place without gaps after the motor is rotated.

If extended shutdowns occur after commissioning during the warranty period, Karl Klein Ventilatorenbau GmbH must be informed to prepare specific corrosion protection regulations. If we are not notified, we will not honor any warranty claims for subsequent damage due to inappropriate storage.

16.8 Removing Corrosion Inhibitors

Prior to commissioning,

- the Denso wraps,
- the corrosion inhibitor wax films on journals, and on the process side depending on process conditions (such as fan housing)

must be removed

17 Malfunctions and Corrective Actions

ATTENTION: The work described below must only be performed by subject-matter experts, while observing governing safety regulations. To avoid damage due to inappropriately performed work, you should have repairs only performed by our qualified subject-matter experts.
The manufacturer assumes no warranty claims of any kind for damage due to inappropriately performed repairs.

Malfunction	Potential cause	Corrective actions
Fan exhibits vibrations	Material has baked onto the impeller. Worn impeller. Impeller was deformed due to thermal influences.	Clean impeller. ATTENTION: Only clean the impeller while at a full stop. During this time, the fan must be locked out/tagged out against restart. Replace impeller. Replace impeller.
Grinding noise on fan.	Motor noise.	Check motor for bearing damage – replace bearings as needed.
The current draw stated on the motor plate is continuously exceeded.	Other rotational speed at 60 Hz power supply.	Check frequency.
Fan does not start.	Drive motor connected incorrectly. On a star-delta circuit, the motor hangs up in the star. Motor protective device is underrated. Defective drive motor.	Check connection. Shorten switchover time from star to delta. The cable cross-section and protective device must be rated for the startup current on startup. Check motor and replace or repair as needed.

18 Dismantling

Dismantle the fan for repositioning to another location or for scrapping.

We recommend requesting service staff from the manufacturer to professionally dismantle the fan. The fan must only be dismantled by subject-matter experts who – based on their subject matter training, experience, and instruction – are sufficiently knowledgeable about safety regulations, accident prevention regulations, and generally accepted engineering practices (such as VDE regulations, DIN standards). Subject-matter experts must be able to (1) assess their assigned work, (2) recognize and avoid potential hazards, and (3) must be authorized by the individual responsible for system safety to perform the required work and activities.

19 Disposal

Assemblies and components of the fan that have reached the end of their service life, for example due to wear & tear, corrosion, mechanical load, fatigue, and/or due to other not immediately evident influence factors, must be dismantled and then professionally disposed in accordance with national and international laws and regulations. The same also applies for operating fluids/substances, such as oil and grease, or other substances in use. The intentional or unintentional continued use of worn-out components, such as impellers, rolling bearings, drive belts, etc. can result in hazards for operators, the environment, and for machinery and systems.



Oils, grease, or rags / cleaning wool soiled with oil must be collected in properly labeled containers and disposed.

20 Spare Parts

An inventory of the most-important spare parts and serviceable parts at the operating location of the system is an important prerequisite for continuous function and operational readiness.

We will only grant a warranty on original spare parts supplied by us.


We expressly note that any spare parts and accessories not supplied by us were also neither inspected nor approved by us. Installing and/or using such products can therefore negatively modify design-based properties of the equipment and/or the system, and can therefore compromise active and/or passive safety.

The manufacturer refuses any and all liability and warranty for damage caused by using not-original spare parts and accessories.

Please note that special manufacturing and supply specifications frequently exist for in-house and third-party components and that we will at all times supply you with spare parts according to the latest technical state of the art and in compliance with the latest statutory regulations.

When ordering spare parts, please state the

VA number
Machine Number
Part identifier
Position number
Ordered quantity.

		Karl Klein Ventilatorenbau GmbH 73773 Aichwald – Waldstrasse 24	
Type	8093 UMAX 80200		
No.	<input type="text"/>	anno	<input type="text"/>
V	<input type="text"/>	m ³ /s	P _w <input type="text"/> kW
Δ P _{tot}	<input type="text"/>	kPa	Q <input type="text"/> kg/m ³
Δ P _{stat}	<input type="text"/>	kPa	n <input type="text"/> 1/min
t	<input type="text"/>	°C	t _{max} <input type="text"/> °C

The machine number is located on the type plate of the fan.

Please address inquiries and purchase orders to the following address:

Karl Klein Ventilatorenbau GmbH Telephone: +49 711 36-906-0 Fax: +49 711 36-906-950 Email: info@karl-klein.de	Waldstr. 24 D-73773 Aichwald Germany
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21 Declaration for Installing an Incomplete Machine



Karl Klein Ventilatorenbau GmbH
Waldstrasse 24
D-73773 Aichwald

Declaration of incorporation of partly completed machinery

According to Directive 2006/42/EC, Annex II part 1 B

This is to declare that the products:

Radial fans, Types: EEG... / DEG... / ENG... / DNG... / EMV... / DMV ... / EMVL.../ DMVL ... /
ESV... / DSV... / EHV... / DHV... /EHG... /DHG... , all from year of manufacture 2010 on,
NHV... / MHV... / HHV... / MVG... / TVG... / HF... / PF..., all from year of manufacture 2012 on,
FLN... from year of manufacture 2019 on
U(M, R or K)(A, B, C, D, E, G, L or P) ..., all from year of manufacture 2023 on

as far as possible regarding our scope of delivery, generally comply with the directives as follows:

Council Directive 2006/42/EC (Machine Directive)

Furthermore effectual directives:

The safety objectives of the low voltage directive (2014/35/EC), accordingly annex I, No. 1.5.1 of the machine directive 2006/42/EC are fulfilled.

Note: For ATEX- types only exists a separate EC-Declaration of Conformity according ATEX Directive.

Note: There are separate declarations of conformity of the manufacturers for the electrical components.

Following harmonized standards were applied:

EN ISO 12100:2010

EN 15085-2...-5:2007 Railway applications - Welding of railway vehicles and components – Certification degree CL2.

Information: EN 15085 part 2 to 5:2007 ist maintained if it is agreed with an order only.

We furthermore declare, that the special technical documents for partly completed machinery were prepared according appendix VII part B and we commit to deliver these documents on demand to the commercial supervisory authorities.

Note: ***Initial operation of the incomplete machinery is prohibited as long as it is not installed into a complete machine which complies with the Council Directive 2006/42/EC and as long as the appropriate Declaration of Conformity according annex II A is not on hand.***

The authorized person for the compilation of the technical documents is the subscriber.

City / date

Aichwald, june, 20th 2023

Signature and functioning of subscriber

Siegfried Seidler, Technical Manager



Annex

Followed Requirements of the annex I of 2006/42/EC. The figures are refering to paragraphs of annex I: 1.1.2, 1.1.3, 1.3.4, 1.7.4.2 (partly)