

1. General information

The requirements in the assembly, operating and maintenance manual must be observed to avoid damage to the motors and the driven equipment. In particular, the safety instructions enclosed separately must be observed to avoid risk. For reasons of clarity, the assembly, operating and maintenance manual cannot provide detailed information for every conceivable specialized field of use or every area requiring special conditions. The owner must take appropriate safety precautions at installation.

2. Description

The motors comply with IEC 34-1, DIN EN 60034-1, DIN VDE 0530 and other relevant DIN standards. Motors can be supplied in compliance with specific standards, e.g. classification specifications, explosion protection regulations and the like. Additional instructions apply to these.

3. Transport and storage

The motors should be stored as far as possible in closed, dry rooms. Outdoor storage undercover is only permitted temporarily for short periods, with the motors protected against any damaging environmental effects during this time. They must also be safeguarded against mechanical damage. Never transport or store the motors resting on their fan cowl. Always transport using the eye bolts and suitable means of attachment. These eye bolts are intended for lifting of the motors only, without additional attachments such as base plates, gears etc. If the eye bolts are removed after installation, permanently block off the threaded holes in accordance with the relevant degree of protection.

3.1. Removing the shaft block fitted for transport

For motors which have a shaft block fitted for transport, undo the bolt used to fix it in place and remove together with the shaft block. Then refit the bearing cap bolt. With some motor types, the bearing cap bolt and a lock washer are inside a bag in the terminal box. Thread the lock washer onto the bearing cap bolt before screwing it in.

4. Mounting and installation

Surface temperatures of more than 100 °C can arise during normal operation of electric motors. Thus ensure that motors cannot be touched accidentally when installed in accessible areas. Also, do not attach or rest against the motors any temperature-sensitive components.

For mounting arrangements IM B14 and IM B34, ensure that the maximum depth of engagement specified in the catalogue is not exceeded (damage to winding).

Do not obstruct ventilation holes. Observe the minimum clearances specified in the dimensioned drawings to ensure unimpeded flow of cooling air. Make sure that the discharged warm cooling medium is not sucked back in. Standard motors are suited to an ambient temperature of between -35 °C and +40 °C. If applicable, lower or higher temperatures will be noted on the type plate.

The feather key in the end of the shaft is secured by the shaft end guard sleeve for transport and storage only. It is strictly forbidden to perform a startup or trial run with the feather key retained solely by the shaft end guard sleeve because of the risk of injury from the feather key flying out.

When mounting the transmission element (such as coupling, pinion or belt pulley) use mounting tools or heat up the transmission element. The shaft ends have threaded cantering holes to DIN 332 part 2 for mounting purposes. Never hammer transmission elements onto the shaft, because the shaft, bearing or other parts of the motor may be damaged. Careful dynamic balancing of all elements to be mounted on the shaft end is essential, and the motors must be mounted to give minimum vibration. The rotors are balanced in accordance with DIN EN 60034-14 with half feather key. If the motors have been balanced with full feather key, this is indicated by an F after the motor number. Observe special instructions for motors with low-vibration design.

Direct coupling to the driven machine requires particularly accurate alignment. The shafts of each machine must be in alignment. Use appropriate shims on the driven machine to achieve an identical shaft height.

Belt drives exert relatively large radial forces on the motor. Belt drives must be designed not only in accordance with the regulations and design software from the belt manufacturer, but also in compliance with our data for maximum permitted radial force on the motor shaft end from belt tension and initial tensioning. In particular, the initial belt tension must be set precisely in accordance with the specifications from the belt manufacturer.

4.1. Degree of protection and mounting arrangement

The motor degree of protection is specified on the rating plate; the degree of protection of built-on attachments may differ from that of the motor – check when installing the motors. When motors are installed outdoors (degree of protection > IP 54), ensure that they are protected from the immediate effects of the weather (fan freezing up due to direct rain, incident snow and ice).

The motor mounting arrangement is specified on the rating plate. The manufacturer's approval must be obtained before mounting in any other arrangement, and if applicable, conversion performed in accordance with their instructions. The owner must ensure that foreign matter cannot fall into the fan cowl, in particular for mounting arrangements with vertical shaft (option: cover guard)

5. Startup

All work must be performed with the motor de-energized. The motor must be installed in accordance with the applicable regulations and by suitably trained technical personnel.

5.1 Initial operation and starting up after prolonged storage

When starting up for the first time, and especially after prolonged storage, measure the insulation resistance of the winding with respect to ground, and between the phases. The applied voltage must not exceed 500 V. The terminals carry dangerous voltages during and immediately after the measurement: never touch the terminals and follow the operating instructions for the insulation resistance meter carefully. Readings must not lie below the following minimum values, in relation to the rated voltage UN and for a winding temperature of 25 °C:

Table 1	Rated power P_N	Insulation resistance in relation to the rated voltage
	[kW]	[$k\Omega/V$]
	$1 > P_N \leq 10$	6.3
	$10 > P_N \leq 100$	4
	$100 < P_N$	2.5

If the insulation resistance is below the minimum values, dry the winding properly until the insulation resistance meets the required value. After prolonged storage, check the appearance of the bearing grease prior to startup; re-place with new grease if hard areas or other irregularities are visible. If the motors are initially operated more than three years after delivery from the manufacturer, the bearing grease must be replaced whatever. For motors with covered or sealed bearings that have been in storage for more than four years, replace the bearings by new ones of the same type.

5.2 Comparing mains supply conditions with type plate

First, compare the mains supply conditions (voltage and frequency) with the motor data on the rating plate.

The transitional period for the harmonisation of mains voltages with increased tolerances within the EU expired on 1 January 2008. From that date onwards, only the following mains tolerances apply throughout Europe: 230/400 V \pm 10% at 50 Hz and 400/690 V \pm 10% at 50 Hz. Therefore IE1, IE2 and IE3 motors no longer state a voltage range on the type plate. Only a rated voltage is stated (230/400 V, 50 Hz or 400/690 V, 50 Hz). Here a general voltage tolerance of \pm 10% is applicable per EN 60034-1 range B.

Select connecting cables of suitable dimensions for the rated motor currents. The motor terminals are labelled in accordance with DIN EN 60034-8. The most common wiring diagrams to be used for connecting the standard-design three-phase motor are reproduced at the end of this manual. For other designs, special wiring diagrams are supplied, either affixed to the terminal box lid or placed in the terminal box. An additional terminal box meeting the same standards as the main terminal box can be provided for connecting attachments and protective devices (e.g. anti-condensation heater, PTC thermistor, external fan).

The motors must be operated with an overcurrent cut-out set in accordance with the rated data of the motor. Otherwise any winding damage is not covered by the warranty.

Check the direction of rotation of the motor before coupling to the working machine in order to avoid any possible damage to the driven machine. When the mains supply lines are connected to the terminals U, V, W in the phase sequence L1, L2 and L3, the motor rotates clockwise viewed from the shaft end. The direction of rotation can be changed by swapping over the connection of two phases.

The permitted tightening torques for the terminal plate studs are given in Table 2:

Table 2	Terminal stud thread	Permitted tightening torque in Nm	Terminal stud thread	Permitted tightening torque in Nm
		M 4	$1.2 + 0.5$	M 10
	M 5	2.5 ± 0.5	M 12	20 ± 4
	M 6	4 ± 1	M 16	30 ± 4
	M 8	7.5 ± 1.5	M 20	52 ± 4

Before closing the terminal box, it is essential to check that

- wiring is in accordance with the wiring diagram
- all terminal box connections have been tightened securely, including the lower terminals (nuts) on the winding leads
- all minimum clearances have been observed (up to 500 V: greater than 8 mm; up to 750 V: greater than 10 mm; up to 1000 V: greater than 14 mm)
- the terminal box is clean inside and contains no foreign matter
- unused cable entries are blanked off and the screw plugs with seals have been tightened firmly
- the seal in the terminal box lid is clean and securely bonded, with all sealing surfaces in the proper state to guarantee the relevant degree of protection.

Before switching on the motor, check that all safety regulations have been observed, that the machine is installed and aligned properly, that all fixing parts and ground terminals are securely tightened, that attachments and add-on devices are operational and connected properly, and that the feather key for a possible second shaft end is secured against spinning out.

If possible, switch on the motor under no load. If it runs quietly without abnormal noises, attach the machine to the motor. When starting the motor up, it is best to monitor the current consumption when the motor is loaded by the working machine so that any possible overloading or asymmetries in the mains can be detected immediately.

Always observe the safety instructions both during operation and when switching off the motor.

6. Maintenance

Your attention is drawn once again to the safety instructions, in particular to disconnecting the motor and safeguarding against unintentional restarting, and checking that all parts connected to a voltage source are de-energised.

When disconnecting the motor from the mains supply for maintenance work, it is particularly important to ensure that any auxiliary circuits (e.g. anti-condensation heaters, external fans, brakes) are also disconnected from the mains.

If the motor needs to be dismantled for maintenance work, then remove the sealing compound from around the centering shoulders; reseal with a suitable motor sealing compound at re-assembly. Any copper sealing gaskets must always be refitted.

6.1 Bearings and lubrication

Motor sizes 56-160 are fitted with lifetime-lubricated bearings. **For motor sizes 180 and above, the bearings must be regreased within the specified grease service life in order to maintain the rated bearing lifetime.** Under normal load and normal environmental conditions, the grease quality should allow the motor to run **for about 10,000 hours for 2-pole motors and 20,000 hours for multipole motors** (four or more poles) without replacing the anti-friction bearing grease, unless otherwise agreed. The grease level should be checked occasionally before this time however. The specified number of running hours only applies to operation at the rated speed.

For motors operated with a frequency inverter, if the rated speed is exceeded then the regreasing period decreases approximately in inverse proportion to the increase in speed.

When regreasing bearings without regreasing facility, they must first be cleaned thoroughly with suitable solvents. Always use the same type of grease. Only use replacement grease having the equivalent quality specified by the motor manufacturer.

Note that the free space around the bearing must be approximately 2/3 filled with grease. If the bearing and bearing cap are completely filled with grease then the bearing temperature rises with a corresponding increase in wear.

Motors with relubrication device are indicated by NV on the type designation. Apply new grease to the grease nipple with the motor running; use the quantity specified for the given motor. The grease drain plug should be opened at the same time. We recommend regreasing for the first time after just 300-500 operating hours. Subsequent regreasing periods are given in Table 3.

	Size	2-polige model	Multipole model
	up to 280	2000 h	4000 h
	315	2000 h	4000 h
	355 to 400	2000 h	3000 h

The quantities of grease required for regreasing are given in Table 4. Use roughly twice the amount for the first regreasing because the lubrication pipes are still empty. Used grease is collected in the grease chamber of the external bearing cap and must be removed after about five regreasings, for instance during inspection work. The grease chambers are screwed closed.

	Frame size	Poles	Quantity of grease Type KDG		Quantity of grease Type KTE6	
			D-side	N-side	D-side	N-side
	160	2 to 12	9 g	9 g		
	180	2 to 12	11 g	11 g		
	200	2 to 12	15 g	15 g		
	225	2 to 12	16 g	16 g		
	250	2 to 12	20 g	20 g	28 g	28 g
	280	2	20 g	20 g	28 g	28 g
	280	4 to 12	28 g	28 g	28 g	28 g
	315	2	28 g	28 g		
	315	4 to 12	32 g	32 g		
	355	2	28 g	28 g		
	355	4 to 12	45 g	45 g		

Standard anti-friction bearing grease

Klüberquiet BQH 72-102 (acc. DIN 51825 KE2R-40 polyresin-based)

replacement greases:
(recommended by us:

Setral: SYN-setral-PU 2
Klüberquiet BQ 72-72
Klüber: Asonic GHY 72
SKF GXN (HT)

6.2 Operating the motor with a frequency inverter

In general, all KÜENLE standard motors are suitable for operation with a frequency inverter. Motors must generally be earthed. For motor sizes 225 and above, we recommend additionally earthing the motor housing. Check the functional safety of the earth connection between the earthed base plate and the motor housing that is mounted on it.

Motors with the suffix SK in the type designation are equipped with at least one *K safety kit* on the D and/or N side. This kit is fitted into the bearing cap and must not be removed.

In motors with a built-in K safety kit, bearings are fitted without insulation. Bear this in mind when replacing a bearing. Motors with the suffix IL in the type designation are provided with electrically insulated bearings. When replacing these bearings, take care not to damage the insulating layer of the outer and inner ring during assembly. We recommend heating the bearing on a hot plate (approx. 150-180 °C) and carefully mounting it onto the shaft. The bearing plate should only be fitted once the bearing has cooled to ambient temperature.

6.3 Draining of condensation water

A condensation-water drain outlet (option) should be provided for installation locations where condensation and hence condensation water inside the motor is likely. The condensation water that has accumulated at the lowest point of the bearing plate must be drained off from this outlet at regular intervals, and then the outlet re-closed.

6.4 Cleaning

All motor parts must be cleaned regularly so as to maintain the flow of cooling air. It is usually sufficient to clean with compressed air free from oil and water. It is particularly important to keep the air vents and areas between the ribs clean. We recommend including the electric motors in the regular inspection of the machine.

7. Motors with PTC thermistors as thermal winding protection (KT)

It is strictly forbidden to perform a continuity test on the PTC thermistor detector circuit using test lamp, magneto ohmmeter or the like, because this would cause immediate damage to the detector.

Should it be necessary to check the cold resistance of the detector circuit (at about 20 °C), the measurement voltage must not exceed 2.5 V DC. We recommend using a Wheatstone bridge with a supply voltage of 4.5 V DC for the measurement. The cold resistance of the detector circuit must not be greater than 810 Ohms; the warm resistance need not be measured. For motors whose windings have thermal cutout protection, take steps to prevent any risk from unexpected automatic restarting of the motor once it has cooled down following tripping of the winding thermal cutout.

8. Attached sensors, external fans, holding brake or other attachments

Observe the additional instructions and wiring diagrams for these attachments.

9. Warranty, repair, spare parts

Unless expressly agreed otherwise, the KÜENLE Customer Service workshop is responsible for performing repair work under warranty. Any other repairs that may be required can also be performed here by skilled personnel. Information on the Customer Service network and spare parts lists are available on request. Proper maintenance as specified in the "Maintenance" section does not constitute a breach of warranty provisions. The contractual warranty liability on the part of the manufacturer is not prejudiced by this.

For flexible and straightforward assistance outside our normal working hours, please contact our 24-hour on-call service. *Emergency phone number +49 (0)7150 942 112.*

10. Electromagnetic compatibility

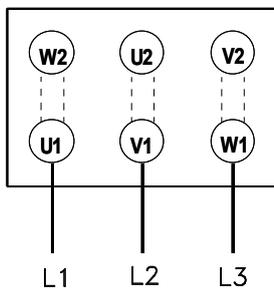
The motors, as units that do not operate individually, have been tested for EMC conformance. The owner of the installation is responsible for taking suitable measures to ensure that equipment and plant in their entirety comply with the relevant electromagnetic compatibility standards. For motor sizes 250 and above, an equipotential bonding connection should be made via the earthing terminal on the outside of the motor. The earthing terminal is located on the motor feet on B3 motors and near the terminal box on flange-mounted motors.

11. Terminal board circuits

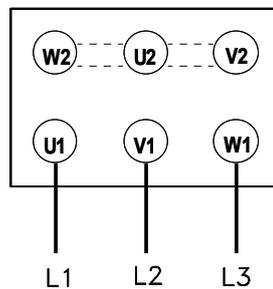
Single-speed three-phase K motor:

low voltage

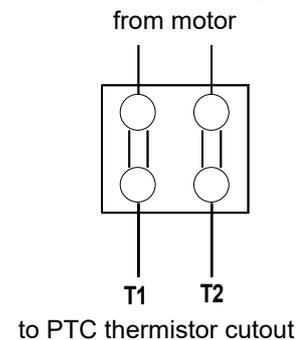
(Delta connection)



high voltage
(Star connection)



with thermal cutout for winding protection



Star delta starting

No bridges are inserted for star delta starting using switch or contactor controller. All 6 terminals are used, and must be connected as shown in the circuit diagram for the switch or controller.

12. Disposal

The disposal of the machines has to be effected under compliance with local and national regulations during the regular material flow. Alternatively the restoration to the manufacturer is also possible.

For disposing the motors have to be considered the following:

Oil and greases according to directives for waste oil; no mixture with solvent, degreaser and varnish residues permitted
Components have to be separated for recycling of – electronic scrap (f. e. resolver plate) – iron scrap – aluminium – non-ferrous metal
(f. e. windings, worm wheels) – plastics (f. e. Polyamide - even fibre-glass reinforced, Polypropylene).