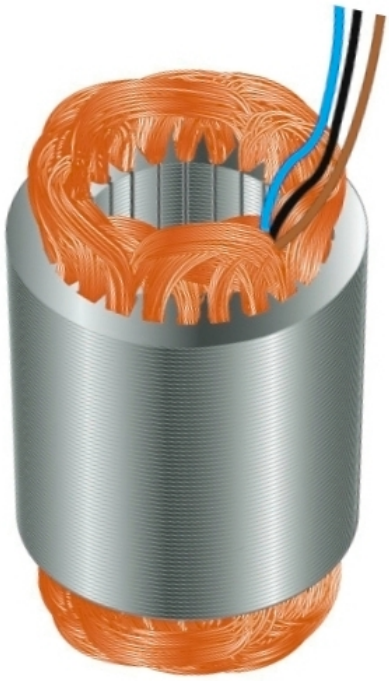
e+a Induction- and Synchronous Stator Manual



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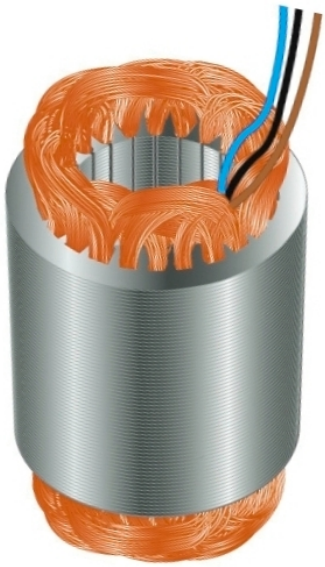
1 General Instructions

In this manual, induction and synchronous stators are not described individually, since their handling and processing is identical.

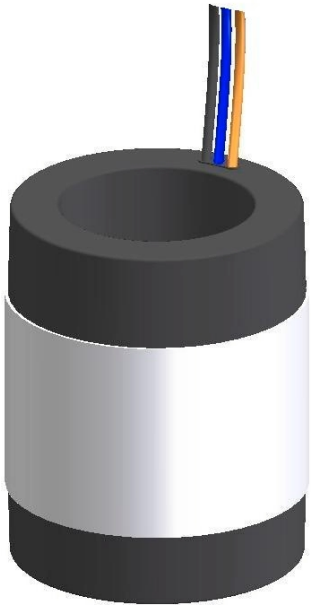
However, when installing synchronous stators and synchronous rotors, special safety instructions must be observed. Please refer to the documentation in the **e+a instruction manual for synchronous built-in motors**.

2 Stator types

e+a has three different stator types in its range, which have different impregnations, and different coil end turn versions.
The conventional variant consists of non-encapsulated vacuum-impregnated coil end turns.
For greater protection of windings from electrical, as well as mechanical damage, stators are encapsulated by vacuum casting. The stators of the encapsulated variant are referred to as ENCA™ stators.
With particularly high power densities, coil end turns are additionally covered with a special aluminium cap, and then vacuum cast. This way the stator windings are completely enclosed, and ideally protected from mechanical damage and moisture. The stators with aluminium caps are referred to as ALKA™ stators.



non-encapsulated,
vacuum impregnated stator



ENCA™
stator

ALKA™
stator

3 Delivery mode

The stator bore is ready to be built in and must not be processed.
The outer diameter of the stators of the conventional and ENCA™ versions are not finished. However, it is possible to have both versions finished by e+a. The ALKA™ stator is finished and ready to be built in.

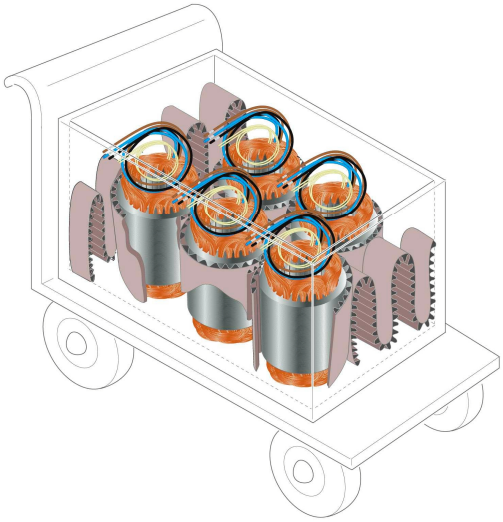
Depending on the order specification, the stators have at least three power connections, and further connections for a variety of thermal sensors, or temperature control sensors. The stators of ENCA™ and ALKA™ versions have defined positions for connections.

4 Storage

For transportation and storage, leave stators in their original packaging until the moment of further processing. Alternatively, they can be stored according to the following instructions.

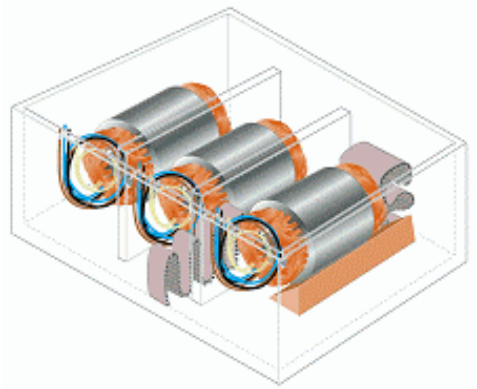
When storing vertically, place the stators on their coil end turns, and not on their connection sides. Do not bend the connection leads (power connections, sensors). Separate the stators with corrugated cardboard to prevent them from knocking against one another.
As long as stators are secured against rolling away, they can also be stored horizontally.

Store in a dry, dust-free and vibration-free interior environment.



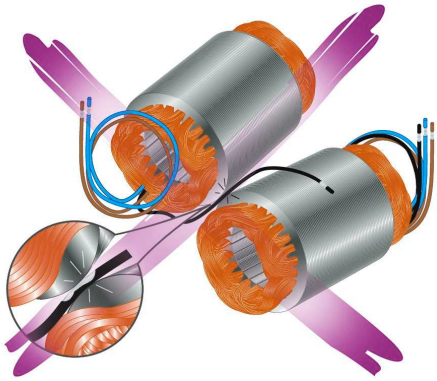
Secured **vertical** storage:

- Secure from slipping or toppling over;
- Prevent contact between individual stators;
- Always keep connection leads standing on the top, or carefully place inside stator bore;
- Place on clean base surface.

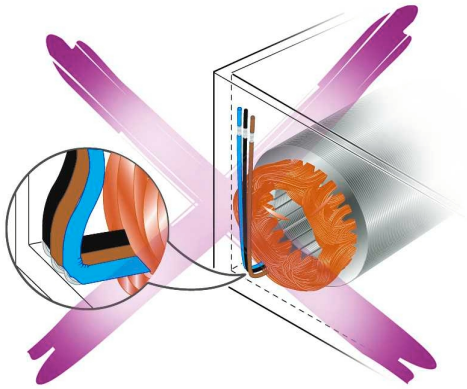


Secured **horizontal** storage:

- Secure from slipping or rolling;
- Prevent contact between stators;
- Prevent direct contact with box sides.



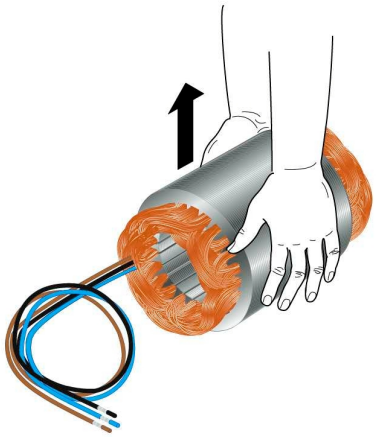
Never:
squash power or sensor connection leads between laminated cores!

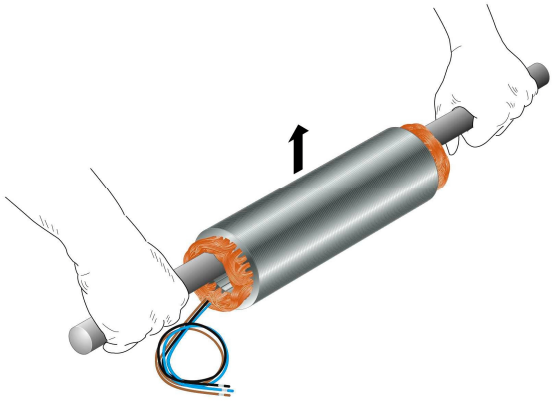


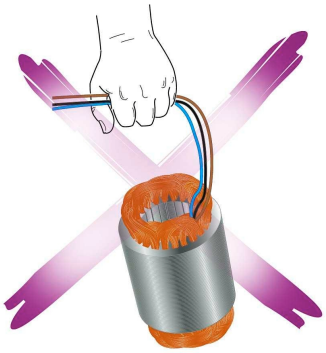
Never:
bend power or sensor connections!

5 Transportation

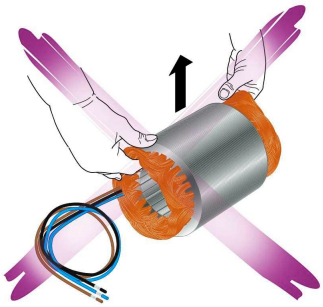
When transporting stators over short distances, during processing, it is permissible to lift the stators by hand, by reaching into the stator bore, or lift the stators by gripping them on the outside with two hands. In the case of the conventional, non-encapsulated version, insure that the insulation of the windings does not get damaged by sharp-edged objects. Lift heavy stators with a round, straight bar, which is introduced through the bore. Never lift or pull stators by their connection leads!
Never push or pull upright non-encapsulated stators on their coil end turn across surfaces.



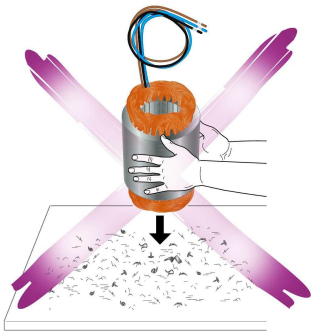




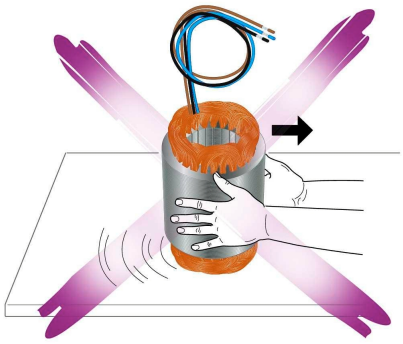
Never:
lift, pull or tear a stator by its connection leads!



Never:
lift a stator by its coil end turns only!



Never:
place a stator on a dirty work surface!

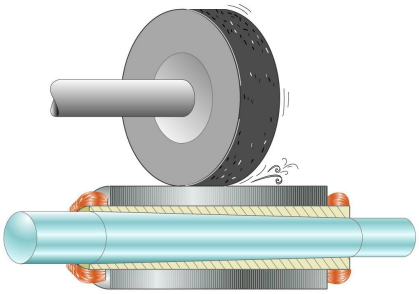


Never:
pull a stator across a work surface!

6 Processing/machining

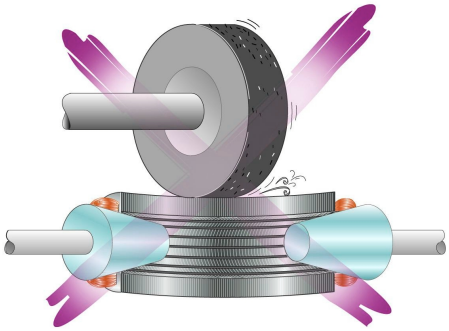
6.1 Basic rules for processing

Use full-surface clamping tools when processing stators!
Do not process the stator bore! Use the stator bore as reference contour for the processing of the outer diameter of the stator! For this process, clamp the full surface of the stator bore! Use cutting tools with polished cutting edges. During processing, choose a moderate feed and cut speed. Ignoring these instructions may lead to axial stretching of the stator core. The original stator length must be retained.



Correct lifting of work piece

- Expanding mandrel passes through the entire stator bore.



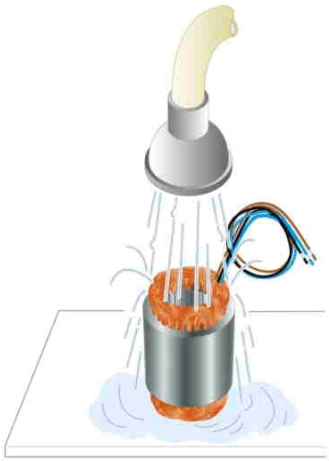
Incorrect clamping process

- Do not clamp at the ends only!

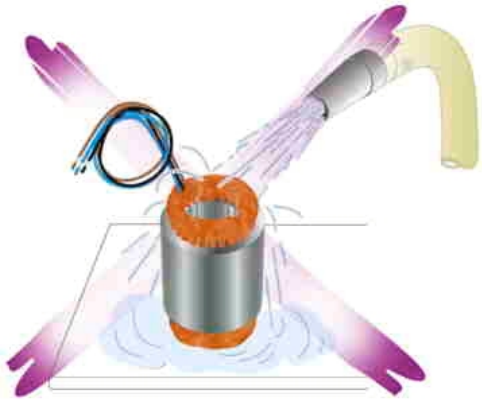
Grinding dust and cooling lubricant can reduce the quality of the insulation rigidity of the windings. Therefore, protect coil end turns against grinding dust and cooling lubricant, during processing. Any processing of coil end turns is not permissible, since this would result in damage to the windings.

6.2 Washing of soiled stators

Wet and dirty stators can be washed and then dried. ENCA™- and ALKA™ stators are very well protected against the possible mechanical and electrical damages mentioned, and are comparatively rugged. They can be washed without problems, should this become necessary. It is recommended to dry the stators afterwards, in order to remove moisture that may have entered the laminated core, during the washing process.



Correct washing of the stators:
Use low-pressure water source!



Incorrect washing of the stators:
Do not wash stators with high pressure!

6.3 Drying of washed stators

The drying of wet, washed stators in the oven is permissible.
The maximum temperature for non-encapsulated stators and ENCA™ stators is 110°C, that for ALKA™ stators is 60°C.
Do not exceed these temperature maximums, since this may damage the stators.

Drying temperatures:

- Non-encapsulated stator and ENCA™ stator: max. 110°C
- ALKA™ stator: max. 60°C

Ideally, the stators should be dried under vacuum.

After cooling down fully to room temperature, check the insulation resistance of the windings to earth. An insulation meter can be used to create a test voltage of 500V between the three parallel wired phases and the earth. The insulation resistance must be greater than 500MΩ. During the testing process, all temperature sensors must be short-circuited to prevent their destruction. In the case of the ALKA™ version, insure that the aluminium cap is connected to the laminated core on both sides. This can be done simply by using magnets, which connect the cap with the core on either side. Measurements carried out on a hot stator are not valid.

7 Assembly of e+a stators

The stator, with a finished outer diameter, is built into a cooling housing.

It is the user's responsibility to choose an appropriate build-in method.

7.1 Thermal joining

Thermal joining through shrinking is a suitable joining process. Stator and cooling housing are joined to form one firm unit.

Precautions:

During the thermal joining process, the temperature of the windings and isolation must not exceed 155°C!

Danger of hot surfaces during the thermal joining process!

Heatproof gloves, goggles and sealed protective clothing must be worn.

7.2 Step-by-step assembly of stators by thermal joining

The user is responsible for the details regarding the work process.

1. Clean assemblies.
2. Warm cooling housing.
3. Push the stator into the cooling housing with the aid of a lifting device, proceed without delay.
4. Let the shrunk cooling housing cool.

7.3 High voltage test

Once the motor is finished, the customer must carry out a high voltage test according to VDE 0530, as outlined in the e+a documentation.

7.4 Power connections

The power leads must be connected as described in the e+a documentation.
When extending original power leads, appropriate conductor cross sections must be inserted in compliance with the voltage used.

The terminals and leads must be designed for the maximum power present!

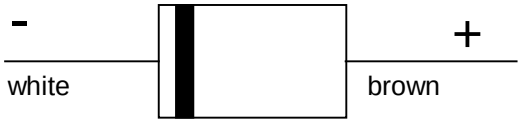
The spindle must be earthed by a device in accordance with usual standards.

7.5 Temperature sensors

Depending on the version, various temperature sensors are built in. Information on the types of sensors, as well as the colours of the power leads can be found in the e+a documentation.

Correct polarity/connection must be observed with regard to the following sensors:

Polarity of temperature sensor type KTY:



Internal connection of temperature sensor type NTC P1H104T: