Protection

Protection against electrical parts

Touching live parts with voltages of 50 Volts and more with bare hands or conductive tools or touching ungrounded housings can be dangerous and cause electric shock. In order to operate electrical equipment, certain parts must unavoidably have dangerous voltages applied to them.

High electrical voltage! Danger to life, severe bodily harm by electric shock!
* Only those trained and qualified to work with or on electrical equipment are permitted to operate, maintain or repair this equipment.
* Follow general construction and safety regulations when working on high voltage installations.
* Before switching on power the ground wire must be permanently connected to all electrical units according to the connection diagram.
* Do not operate electrical equipment at any time, even for brief measurements or tests, if the ground wire is not permanently connected to the points of the components provided for this purpose.
* Before working with electrical parts with voltage higher than 50 V, the equipment must be disconnected from the mains voltage or power supply.
* Make sure the equipment cannot be switched on again unintended.
* The following should be observed with electrical drive and filter components:
* Wait five (5) minutes after switching off power to allow capacitors to discharge before beginning to work. Measure the voltage on the capacitors before beginning to work to make sure that the equipment is safe to touch.
* Never touch the electrical connection points of a component while power is turned on.
* Install the covers and guards provided with the equipment properly before switching the equipment on. Prevent contact with live parts at any time.
* A residual-current-operated protective device (RCD) must not be used on electric drives! Indirect contact must be prevented by other means, for example, by an overcurrent protective device.
* Electrical components with exposed live parts and uncovered high voltage terminals must be installed in a protective housing, for example, in a control cabinet.

High electrical voltage on the housing! High leakage current! Danger to life, danger of injury by electric shock!
* Connect the electrical equipment, the housings of all electrical units and motors permanently with the safety conductor at the ground points before power is switched on. Look at the connection diagram. This is even necessary for brief tests.
* Connect the safety conductor of the electrical equipment always permanently and firmly to the supply mains. Leakage current exceeds 3.5 mA in normal operation.
* Use a copper conductor with at least 10 mm² cross section over its entire course for this safety conductor connection!
* Prior to startups, even for brief tests, always connect the protective conductor or connect with ground wire. Otherwise, high voltages can occur on the housing that lead to electric shock.

Protection against dangerous movements

Dangerous movements can be caused by faulty control of the connected motors. Some common examples are:

- improper or wrong wiring of cable connections
- incorrect operation of the equipment components
- wrong input of parameters before operation
- malfunction of sensors, encoders and monitoring devices
- defective components
- software or firmware errors

Dangerous movements can occur immediately after equipment is switched on or even after an unspecified time of trouble-free operation.
The monitoring in the drive components will normally be sufficient to avoid faulty operation in the connected drives. Regarding personal safety, especially the danger of bodily injury and material damage, this alone cannot be relied upon to ensure complete safety. Until the integrated monitoring functions become effective, it must be assumed in any case that faulty drive movements will occur. The extent of faulty drive movements depends upon the type of control and the state of operation.

Dangerous movements! Danger to life, risk of injury, severe bodily harm or material damage!

Ensure personal safety by means of qualified and tested higher-level monitoring devices or measures
ne motion is possible if monitoring devices are
other malfunction in any mode of operation.
otion and moving parts.
entally entering the machine's range of motion.

resist maximum possible momentum, especially if
there is a possibility of loose parts flying off.
Mount the emergency stop switch in the immed ate reach of the operator.
Verify that the emergency stop works before startup. Don't operate the machine if the emergency stop is not working.
Isolate the drive power connection by means of an emergency stop circuit or use a starting lockout to prevent unintentional start.
Make sure that the drives are brought to a safe standstill before accessing or entering the danger zone. Safe standstill can be achieved by switching off the power supply contactor or by safe mechanical locking of moving parts.
Secure vertical axes against falling or dropping after switching off the motor power by, for example:
ne vertical axes
motor brake or an external brake controlled directly by the drive controller

Health hazard for persons with heart pacemakers, metal implants and hearing aids in proximity to electrical equipment!

Persons with heart pacemakers, hearing aids and metal implants are not permitted to enter the following areas:
- Areas in which electrical equipment and parts are mounted, being operated or started up.
- Areas in which parts of motors with permanent magnets are being stored, operated, repaired or mounted.

If it is necessary for a person with a heart pacemaker to enter such an area, then a doctor must be consulted prior to doing so. Heart pacemakers that are already implanted or will be implanted in the future, have a considerable variation in their electrical noise immunity. Therefore there are no rules with general validity.
Persons with hearing aids, metal implants or metal pieces must consult a doctor before they enter the areas described above. Otherwise, health hazards will occur.

Protection against contact with hot parts

Housing surfaces could be extremely hot! Danger of injury! Danger of burns!
Do not touch housing surfaces near sources of heat! Danger of burns!
After switching the equipment off, wait at least ten (10) minutes to allow it to cool down before touching it.
Do not touch hot parts of the equipment, such as housings with integrated heat sinks and resistors. Danger of burns!

nued equipment use

Prevent the operation of high-frequency, remote control and radio equipment near electronics circuits and supply leads. If the use of such equipment cannot be avoided, verify the system and the installation for possible malfunctions in all possible positions of normal use before initial startup. If necessary, perform a special electromagnetic compatibility (EMC) test on the installation.

Protection during handling and mounting

Under certain conditions, incorrect handling and mounting of parts and components may cause injuries.

Protection against magnetic / electromagnetic fields during operation and mounting

Risk of injury by incorrect handling! Bodily harm caused by crushing, shearing, cutting and mechanical shock!
Observe general installation and safety instructions with regard to handling and mounting.
Use appropriate mounting and transport equipment.
Take precautions to avoid pinching and crushing.
Use only appropriate tools. If specified by the product documentation, special tools must be used.
Use lifting devices and tools correctly and safely.
For safe protection wear appropriate protective clothing, e.g. safety glasses, safety shoes and safety gloves.
Never stand under suspended loads.
Clean up liquids from the floor immediately to prevent slipping.