AMKASYN
Safety instructions

Version: 2004/44
Part No.: 27849

Please read these safety and warning instructions before the installation and commissioning of the AMKASYN drive system

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Explanation of the symbols used:

Danger

In the case of directly threatening danger!
Possible consequences: Death or very severe injuries!

Warning

In a possibly dangerous situation!
Possible consequences: Severe injuries or death!

1 Safety instructions

1.1 Basic instructions

The AMKASYN drive systems are electrical devices intended for installation in the control cabinet of industrial power systems. They are designed for controlling the AMK AC motors with variable speed and with complex drive functions in plant or machinery.

The AMKASYN drive systems theirselfs are not machines within the meaning of the EC Machinery Directive 89/392 EEC.

The safety instructions do not claim to be complete. In the occurrence of special problems, which are not dealt with here or in the technical documentation or not sufficiently dealt with, please consult AMK for your own safety.

1.2 Use in accordance with regulations

The AMKASYN drive systems are built according to the state of the art and they are safe in operation.

Warning

Nevertheless dangers can arise in the use of the drive systems if they are used incorrectly by untrained personnel or for use not in accordance with regulations.
The drive systems generate dangerous electrical voltages.
Mechanical movements in the plant or machinery arise due to the drives.
In this way danger for the life and limb of the user or third persons threatens. Damage to the plant or machinery or to other material assets of the operator can occur.

The AMKASYN drive systems may be used only in accordance with regulations in the assigned plant or machinery:

- The respective AMKASYN drive system must be incorporated in the safety concept of the overall plant or machinery.
- The plant or machinery may be operated only in a technically perfect condition.
- Work on the electrical equipment of the plant or machinery may be performed only by qualified skilled personnel.
  Qualified persons must be authorized and trained to perform the safe isolation of the control cabinet as well as the operation and maintenance of the plant or machinery. Safety standards and technical rules must be taken into account. The personnel must be familiar with the interrelationships in the plant and with possibly occurring dangers.
- The instructions for handling the AMKASYN drive systems contained in the technical documentation must be followed.

1.3 Notes on electrical safety

The AMKASYN modules are designed as built-in units of the protective class 1 (according to EN 50178) and must be installed in a closed control cabinet (IP54) with fixed connection. The protection against direct contact must be assured by the control cabinet.

The units are intended for use in industrial areas. Other standards apply on use in residential areas. Additional filtering measures must be taken by the user under certain circumstances here.

The standards and regulations valid for the machine/plant must be observed in the installation. Within the EU the machine/plant must correspond to the provisions of the Machinery Directive 89/392/EEC, the Low Voltage Directive 73/23/EEC and the EMC Directive 89/336/EEC.

The AMKASYN drive systems require a symmetrical three-phase power supply.
Input voltage range: 3 x 400V ... 480V ± 10 %, 50/60 Hz.

All inverters with controlled or uncontrolled input rectifiers can lead in the case of a fault to a ground current incompatibility according to EN 50178. Connection of such units to the power supply using only the residual current operated circuit breaker is not permissible.

In operation of the AMKASYN modules as intended an earth leakage current greater than 3.5 mA flows.
EN 50178 requires in this case a fixed connection of the units on the power side!
The PE connection must be designed with at least 10 mm^2 conductor cross-section!

Danger

Caution:
Voltages dangerous to touch can arise on the housing on interruption of the PE connection!

All equipment connected to the AMKASYN system must be designed and created so that in use as intended the electrical safety according to EN 50178 / EN61800-2 / EN61800-3 / EN60204 is guaranteed.
Only devices, electrical components or cables which show a “safe separation” of the connected circuits according to EN 50178 may be connected to the signal interface of the AMKASYN modules.

Caution:
Before all work on the AMKASYN modules:
Separate the power supply by the main switch. There is danger to life when working under voltage!

After switching off the power supply the buffer capacitors for the DC BUS can still contain charge and carry dangerous direct voltage.
Wait for a discharge time of at least 3 minutes before working on the modules!
For safety measure the voltage in the DC BUS (at terminals UZP / UZN).

Caution:
LED displays on the unit fronts do not signal in the OFF condition the voltage-free condition of the unit terminals!

The plug-in cards as well as all plugs may be plugged in or pulled out only with units free of voltage!

Never push in plugs in plug-in cards with force!

Loosen or tighten cables at terminals only in an voltage-free condition!

Because of possible destruction of components due to static discharge, touching the electrical connections on the plug-in modules must be avoided.

All work on the AMKASYN modules may be performed only by instructed and authorized specialist personnel.
These are persons who are sufficiently trained about the product and familiar with transport, installation and operation and who have the qualification corresponding to their professional activity.
The specialist personnel must know and apply the directives and standards valid for the electrical plant/machine and safety.
(EU: Low Voltage Machinery Directive, EN 60204, EN 292, EN 50178, national: accident prevention regulations).

Option cards and the parameter module (only on KW) may be replaced only by authorized persons or by the AMK service.

All documentation for the used components and the AMK safety regulations must be observed.

Generally there is with electrical drives danger **due to use not as intended, due to uncontrolled movements resulting from component defects, software errors, errors in operation, errors in installation and in components, errors due to environmental influences and due to touching parts conducting voltage.**


Warning

Wrong phase sequence on motor connection leads to uncontrolled rotation of the motor shaft!
Incorrect handling of the units and non-observation of the warnings can lead to material damage and physical injuries.
System parameters may be set or changed only by the machine manufacturer!
The value in the parameter for the speed limit (ID 113) must be adapted to the process and may not exceed the maximum permissible speed of the motor.
The values for the torque limits, the acceleration and deceleration time must be adapted to the machine / mechanics.
Entry of faulty parameters influences the behaviour of the drive system and provokes an increased accident and damage risk!

Caution:
Synchronous motors DS, which are operated in the field weakening range generate on failure of the control (e.g. on power failure) on coasting a very high countervoltage, which leads to damage in the inverter module.

Suitable measures for protection against this overvoltage must be installed in consultation with AMK.

Remark on operation of synchronous motors (DS / DT):

Under extremely rare conditions a malfunction in the power stages of the inverter module can cause a jerky motor shaft rotation of a synchronous motor. The rotational angle is depending on the number of the motor's magnet pole pairs.
The probability that this jerk happens is extremely low, that means that it has no adverse affect on the safety. It complies with the SIL 3 limit according to IEC 61508.

The AMKASYN drive systems are used for controlling AMK AC servo and main spindle motors.
The manufacturer / operator of the total plant is liable for damage due to use not as intended, faulty installation, operation, exceeding the nominal data and conditions of use.

1.4 Safety instructions for commissioning

On commissioning of a drive system there is an increased risk of accident and damage due to:


Warning

- **Wiring errors, especially in the motor/motor encoder connection area.**
  Wrong phase sequence at the motor, wrong encoder connection, missing or faulty encoder signal for instance lead directly after switching on to uncontrolled rotation of the motor shaft and thus to an unintended movement of the machine/plant. The drive cannot follow a prescribed setpoint value in this condition!
- **Errors in parameter setting,**
  e.g. wrong motor parameters, wrong setpoint scaling, wrong limits, wrong operating mode, wrong synchronous ratio
- **Error in the overall control system,**
  e.g. due to faulty programming, errors in the sequence, errors in the monitoring logic
- **Ineffective or only limitedly effective monitoring and protective devices in the plant or machinery.**

To minimize the risk of accident/damage, the commissioning must be performed by trained, experienced skilled personnel with great care and taking account of the interrelationships in the machine/plant.

1.5 Safety instructions for maintenance / repair

The drive system generates dangerous electrical voltages. Due to the drive there arise mechanical movements in the plant or machinery which can represent a danger for persons and material assets.

To minimize the risk of accident/damage, the maintenance/repair must be performed by trained experienced skilled personnel with great care and taking account of the interrelationships in the plant or machinery.

Danger

Before all work on the AMKASYN drive system:
Disconnect the mains supply by MAIN SWITCH OFF. There is danger to life when working under voltage!
After switching off the mains the capacitors for the DC BUS are still charged. There is a dangerous direct voltage at the terminals UZP and UZN.
To avoid dangerous electric shocks, a discharge time of at least 3 minutes must be waited before working on the modules.

- Plug-in cards and cable plugs may be plugged in or pulled out only with the devices free of voltage.
- Terminals may be loosened or tightened only in a condition free of voltage.
- Never push in plugs/option cards with force! Because of possible destruction of components due to static discharge, avoid contact of the electrical connections on the plug-in modules.
- The instructions for the replacement of the AMKASYN components shall be observed!
- The drive parameters specified by the machine manufacturer may not be changed. (Errors in the drive parameter setting lead to malfunctions and can cause damage in the plant).

2 Imprint

Title **PDK_027849_Sicherheit_en**

Purpose **Safety instructions**

Part number **27849**

History

Publication date
1997/47
2004/44

Reservation Modifications to the content of the documentation and the delivery options for the products are reserved.

Service Tel. no. **+49/(0)7021 / 5005-191, Fax -193**

Office hours:
Mon.-Fri. 7:30 - 16:30, on weekends and public holidays the phone number of the standby service personnel is available on the answering machine.

You can assist us in finding a fast and reliable solution for the malfunction by providing our service personnel with the following:

- Information located on the ID plate of the devices
- The software version
- The device setup and the application
- The type of malfunction, suspected cause of the failure
- The diagnostic messages (error codes)

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