General Installation Instructions

User Manual: 49'0085e (06)

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Safety and Operating Instruction for Electrical Installation of Drives

1. Low Voltage-Directive 2006/95/EC

1.1 General

In operation, parts of the equipment including adjustable speed electric power drive systems, depending on their degree of protection, may have live, uninsulated, and possibly also moving or rotating parts, as well as hot surfaces. In case of inadmissible removal of the required covers, of improper use, wrong installation or maloperation, there is the danger of serious personal injury and damage to property.

All activities for transport, installation and commissioning as well as maintenance have to be carried out by skilled technical personnel complying to IEC 60364 or CENELEC HD 384 and IEC 60664 and applicable national accident prevention rules. For the purpose of these basic safety instructions, 'skilled technical personnel' means a person being familiar with duties of installing, erecting, commissioning and operating of the product, having the qualification needed for the performance of their functions.

1.2 Installation

The electrical installation shall be carried out in accordance to relevant requirements. Care shall be taken for proper connection of protective conductors (PE) and selection of conductors and cables (with respect to current carrying capacity, electric strength, temperature, physical environment and operating conditions) and corresponding fuses.

1.3 Commissioning and Maintenance

- When working on live parts of electrical equipment including drives, the applicable national accident prevention regulations must be observed.
 Never touch live connection devices.
- When working on devices with power on
 - Keep service time as short as possible (for longer interventions switch off).
- Wear insulating protection devices (insulating clothes, -gloves, eye protecting glasses) and use safe, insulating tools.
 - Stand on an insulated floor. (Remove all metal decoration from wrists and fingers).
 - Make sure the test instruments are safe and proofed.
- Before carrying out visual checks and maintenance servicing, ensure isolation of mains supply from line inputs and lock isolator. After disconnection from the voltage supply, live appliance parts and power terminals must not be touched immediately. Wait 3 minutes for capacitors to discharge to safe voltage levels.
- The corresponding signs and markings on the drives together with notes in the User Manual must be respected.
 - During operation, all protection covers and doors shall be kept closed.

2. Intended Use

2.1 Machinery Safety Directive (MSD) 2006/42/EC



Electrical power drive devices are intended for implementation in machinery.

The start-up of the electrical power drives in the European market is not permitted until it has been confirmed that the machine into which the electrical power drives are built is in conformance with the regulations of the Council Directive Machinery **2006/42/EC**.

2.2 Directive Electromagnetic Compatibility EMC-Directive 2004/108/EC



The operating of electrical power drives in the European market is only permitted if the Council Directive Electromagnetic Compatibility **2004/108/EC** has been observed.

It is the responsibility of the manufacturer of the machinery to observe the immunity and emission limits, requested by the Council Directive EMC in the European market. Guidelines for the installation according EMC-regulations - for shielding, grounding and filter arrangement as well as wiring instructions - are summarized in this installation instruction and in Appendix *CE-Conformance* of the corresponding instruction manual of the device.

3. Requirements for Cabling According EMC Regulations

Properly interconnected signal wiring will eliminate interference problems caused by galvanic, capacitive or inductive coupling.

3.1 Signal Wires

3.1.1 Definitions

Signal wire: Wire conductor or cable in analogue regulator reference,

feedback and measuring circuits.

Cable for analogue signals (stranded wire)
 Cable for digital signals (stranded wire)

Fiber optic signal cables

Shielding, screening: Tinned copper braid with at least 85% coverage

External protective conductor: PE bus or PE terminal in cabinet or operator's switchboard

Regulator common: Rockwell Automation regulators shall not be grounded

Electronic ground: Connection between shield and PE conductor or PE terminal

as indicated in wiring diagram.

Stranded wire: Two or three conductor cable with at least 25 twists per meter

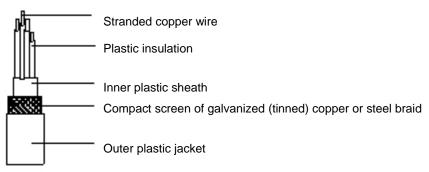


Figure F-1: Specification for screened cable

3.1.2 Signal Wire Specifications and Cable Types

APPLICATION EXAMPLE	ROCKWELL Catalog. No.	Dierikon Part No.	CONDUCTORS NUMBER mm ² AWG			AWG	TYPE OF CABLE SCREENING TWISTS	
Analog signal		380.33.00		2x	0.5	20 2)	common screened	four stranded
RS-232 Comm.		380.33.10	2x	2x	0.34	22 2)	common screened	two stranded
RS-422 Comm.		380.39.00	2x	2x	0.08	28 2)	per pair	two stranded
AMX-Network		380.36.00	1 coaxial, 75 Ω, RG59B/U (fastener: P/N 771.73.00)					
ControlNet	1786-RG6	380.36.01	1		coaxial, 75 Ω, RG-6/U (fastener: P/N 771.73.10)			
AMX-AB remote E/A Interface	1770-CD	380.45.00		2			per pair	two stranded
DeviceNet Thick	1485C-P1C	380.45.05	Data Power	2x 2x	0.82 1.65	18 15	per pair	two stranded
DeviceNet Thin	1485C-P1A	380.45.06	Data Power	2x 2x	0.21 0.32	24 22	per pair	two stranded
Resolver Resolver		380.38.01 380.38.12	3x 4x	2x 2x	0.76 0.50		without	two twisted ca. 40/m
Bus-Link Pulstacho		380.34.00 380.34.01	2x 3x	2x 2x	0.34 0.34	2/	without	two stranded ca. 25/m

¹⁾ Crimp tool for fastener:

²⁾ **Note:** The conductor cross sections of these cables are limited to maximum 0.50 mm² because of wave impedance. That of all other signal leads is permitted up to 1.50 mm².

The minimum insulating rating of the signal cables shall be 300 Volt electric strength and 70°C temperature.

3.1.3 General Signal Wire Instructions

Keep signal wire connections as short as possible and observe the limits for maximum cable length according to the instruction manuals of the connected devices.

Separate signal cables from power cables or control signal conductors (relay circuits) and use separate conduit. The minimum distance between noise sensitive signal cables and power cables should be 30 cm.

Cross signal with non-signal cables at angle of between 90 degree and 60 degree.

For analogue or digital signals (e.g. reference, feedback) screened cable as specified in figure F-1 and the Table above must be used.

The screen shall be grounded at both ends, if no product-dependent exceptions are defined. Recommendations regarding kinds of signal conductors should be observed.

For better protection of signals against inductive interference, screened or coaxial cables should additionally be run in a solid steel conduit. The steel conduit shall be grounded with large cross section. This is mandatory near electromagnetic fields of high energy (e.g. motors, transformers).

e.g. Manufacturer Weidmueller, Type HTG8-59, No. 901202

3.2 Motor Cables

3.2.1 Definitions

Motor cable: Conductor or cable between drive output and motor

Field cable: Conductor or cable between converter field supply output and

motor field terminals

Shielding, screening: Tinned copper or steel braid with at least 85% coverage

3.2.2 Types of Power Cables

Screened power cables: 4-wire-motor cable (3 leads + PE conductor green/yellow)

3-wire-motor cable (2 leads + PE conductor green/yellow)

2-wire-motor field cable (2 leads)

3.2.3 Motor Cable Instructions

The cable between drive output and motor, as well as motor field connection on DC-motors shall be screened cables.

The screen must be connected with large connection area and good conductivity to the ground potential (PE terminal) of the drive or control cabinet output.

The screen on the motor side must be solidly connected to the motor housing providing large connection area with good conductivity (e.g. with EMC-tested cable glands).

If screened cables are not available (limited by the obtainable cross sections) individual conductors and protective conductors must be run in a

 steel conduit, grounded at both ends or enclosed metal EMC cable duct, grounded at both ends.

The grounding procedure for this kind of installation is the same as for screened cables. If 4-wire cables are used for converter outputs, the unused wire will be isolated on both ends of the cable.

3.3 Minimum Cross-sectional Area of the External Protective Copper Conductor

Cross-sectional area of phase conductors supplying the equipment S (mm ²)	Minimum cross-sectional area of the external protective conductor $S_p \ (mm^2)$			
S ≤ 16 16 < S ≤ 35	S 16			
35 < S ≤ 400	S/2			
400 < S ≤ 800	200			
S > 800	S/4			

3.4 Electromagnetic Devices

To reduce noise transients, a suppressor combination (RC-module, varistors, diodes) must always be fitted across the coils of contactors, relays, solenoids, electrically operated brakes etc.

4. Installation Test

The following tests must be performed and documented

 Continuity of the protective bonding circuit Insulation resistance tests according to: EN 60204-1/18.2 according to: EN 60204-1/18.3

5. Standard Notes

- 13 Parts not supplied by Rockwell Automation AG.
- 14 Parts supplied by Rockwell Automation AG.

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