Kemro

MM 280/A
Motor Control Module
Project engineering manual 1.04

Translation of the original instructions

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Automation by innovation.

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Record of Revision

Version	Date	Change in chapter	Description	changed by
V1.00	10-2005		Newly created.	meis
V1.01	11-2005	Configuration	Updated	meis
V1.02	11-2005	Technical data	Detailed power ratings	meis
1.03	08-2010	EC directives and standards, Declaration of conformity	update to EN 61131-2:2007	hasl
1.04	08-2011	Introduction	Hint "not for end customers" added, various minor updates.	fstl

Table of Contents

1 Introduction

1.1 Purpose of the document

This document describes the structure of the MM 280/A (motor control module).

Information

This manual is not adressed to end costumers! Necessary safety notes for the end costumer have to be taken into the costumer manual in the respective national language by the machine builders and system providers.

1.2 Preconditions

This document contains information for persons with the following skills:

Target group	Knowledge and skills pre-requirement
Project engineer	Basic technical training (University of Applied Science/University level, engineering degree or corresponding professional experience). Knowledge in: ● working mode of a PLC, ● safety regulations, ● the application.
Operator	Basic technical training (Vocational high school, engineering degree or corresponding professional experience). Knowledge in: ● safety regulations, ● working mode of machine or plant, ● principal functions of the application, ● system analysis and troubleshooting, ● setting options at the operating installations.
Service technician	Basic technical training (Vocational high school, engineering degree or corresponding professional experience). Knowledge in: ● working mode of a PLC, ● safety regulations, ● working mode of machine or plant, ● diagnosis possibilities, ● systematic error analysis and rectification.

1.3 Intended use

The MM 280/A was developed for control applications in industrial machines. The typical applications areas include injection molding machines, robots, presses, machine tools and similar.

The MM 280/A may only be used for the types of use described in the technical descriptions and only in conjunction with recommended/approved third-party equipment/installations.

The MM 280/A has been developed, manufactured, tested and documented in accordance with the appropriate safety standards. Therefore, the products do not pose any danger to the health of persons or a risk of damage to other property or equipment under normal circumstances, provided that the instructions and safety precautions relating to the intended use are properly observed.

1.4 Notes on this document

This manual is integral part of the product. It is to be retained over the entire life cycle of the product and should be forwarded to any subsequent owners or users of the product.

1.5 Documentation for further reading

The following documents are to be observed depending on the system solution used:

If you are using the KeStudio U2 tool suite:

Doc.No.	Name	Target group
DE: 65352 EN: 65353	K2-200 automation system manual	• Project engineer • Electrician • Programmer • Commissioning foreman • Service technician

If you are using the KeStudio U3 tool suite:

Doc.No.	Name	Target group
DE: 1000868 EN: 1000869	System manual Kemro automation system	• Project engineer • Electrician • Programmer • Commissioning foreman • Service technician

2 Safety notes

2.1 Representation

At various points in this manual you will see notes and precautionary warnings regarding possible hazards. The symbols used have the following meaning:

DANGER!

- **indicates an imminently hazardous situation which will result in death or serious bodily injury if the corresponding precautions are not taken.**

WARNING!

- **indicates a potentially hazardous situation which can result in death or serious bodily injury if the corresponding precautions are not taken.**

CAUTION!

- **means that if the corresponding safety measures are not taken, a potentially hazardous situation can occur that may result in property injury or slight bodily injury.**

CAUTION

- **CAUTION used without the safety alert symbol indicates a potentially hazardous situation which, if not avoided, may result in damage to property.**

- **This symbol reminds you of the possible consequences of touching electrostatically sensitive components.**

Information

Useful practical tips and information on the use of equipment are identified by the “Information” symbol. They do not contain any information that warns about potentially dangerous or harmful functions.

2.2 General safety instructions

WARNING!

- **It is absolutely essential to observe the safety instructions in the system manual.**
- **The module is defined as "open type equipment" (UL508) or as "offenes Betriebsmittel" (EN 61131-2) and must therefore be installed in a control cabinet.**

CAUTION

Improper use of the assembly or the control system leads to irreparable damage!

- **Turn off the power supply before inserting or removing the module. Otherwise, the module can be destroyed or undefined signal states can lead to damage of the control system.**

3 Description of the module

The MM 280/A is an motor control module with 2 motor bridges and 2 encoder inputs.

3.1 Front view

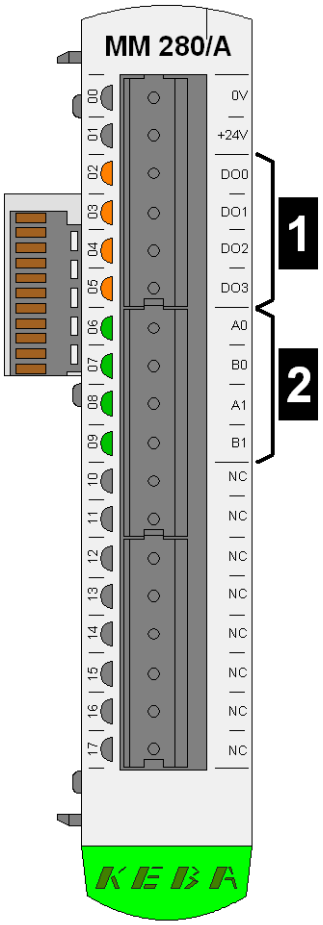


Fig.3-1: MM 280/A Front view

1	... 2 motor bridges (DO0/DO1 and DO2/DO3)
2	... 2 encoder inputs

Information

- *The incremental interface module MM 280/A is not designed for drive control.*
- *The type plate is stored on the module in an EEPROM and can be read out by the application.*

3.2 Accessories

3.2.1 Connector strip

Input-/output signals: Standard male connectors with grid dimension 5.08 mm

The following female connectors can be used for the MM 280/A:

Female connector	Color	Order no. Weidmüller
2-pole	sw	BLZF 5.08/2 SN SW - 170769
4-pole	sw	BLZF 5.08/4 SN SW - 170771
6-pole	sw	BLZF 5.08/6 SN SW - 170773
8-pole	sw	BLZF 5.08/8 SN SW - 170775

Information

Larger terminal blocks may be used to group multiple signals. The current carrying capacity of the terminal block is thus, however, reduced (according to derating curve of the terminal block manufacturer.)

The appropriate female connectors are not included in the delivery of KEBA, but can be purchased from KEBA.

The technical data for the terminals are contained in the technical data sheet of the manufacturer of the female connectors.

For further information see System manual.

4 Connections and wiring

4.1 Power supply

WARNING!

Danger of personal injury due to electric shock!

- **Supply the device exclusively from power sources that have an extra low voltage (e.g. SELV or PELV according to EN 61131-2)**
- **Connect only voltages and power circuits to connections, terminals and interfaces up to 50 V rated voltage that have a secure disconnect for hazardous voltages (e.g. with sufficient isolation).**

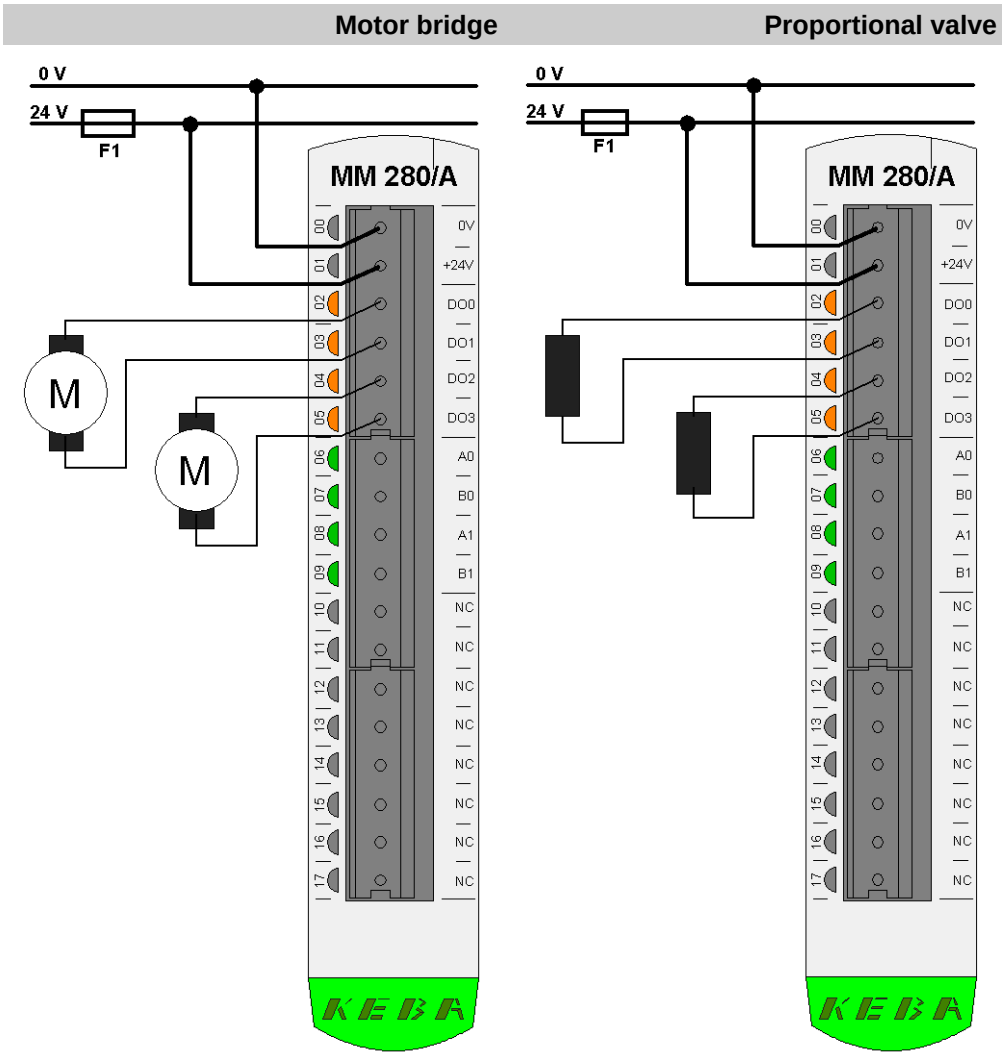
CAUTION!

Fire hazard during module failure!

- **Provide suitable fuses for the 24 V DC power supply for the final application. Only fuses with a maximum nominal disconnecting current of 10 A may be used.**

4.2 Motor bridges (PWM outputs)

4.2.1 Connection example



Tab.4-1: Connection example for PWM outputs

4.2.2 Connection digramm

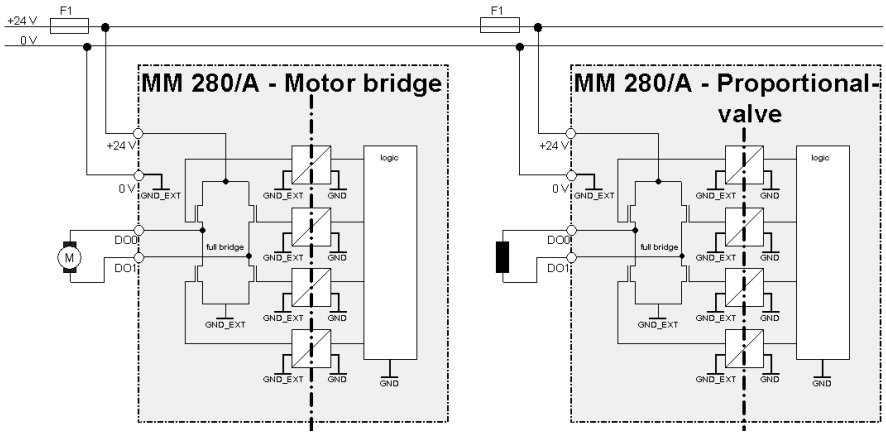


Fig.4-2: Connection diagramm motor bridges

4.3 Encoder inputs

The MM 280/A has 2 encoder outputs with 12-bit resolution.

4.3.1 Connection example

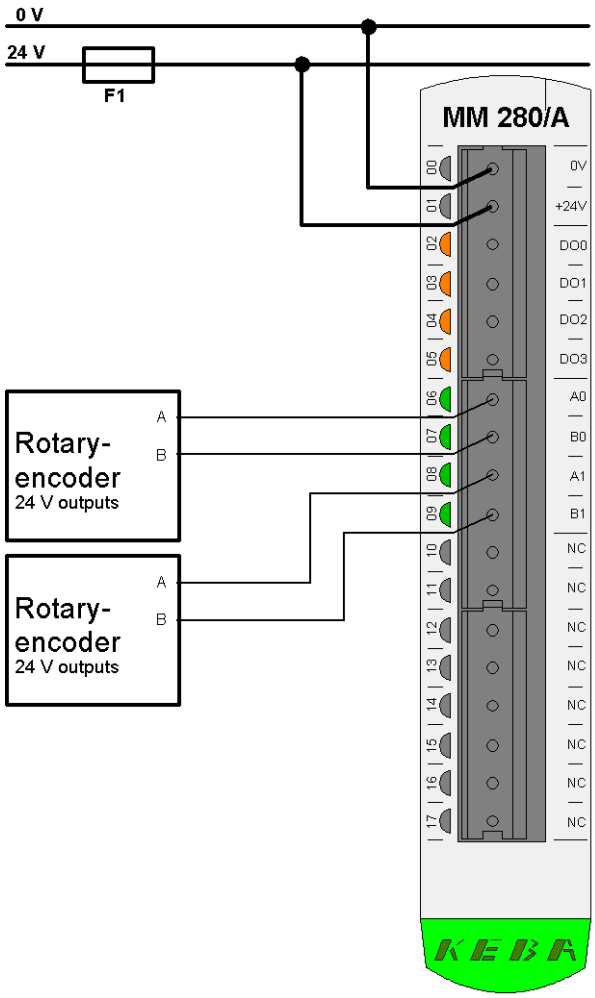


Fig.4-3: Connection example for encoder inputs

Information

- *The terminal 0 V determine the reference potential for the encoder inputs.*
- *To run the rotary encoders, it is necessary to supply the MM 280/A via the terminals 0 V and 24 V.*

Power supply is via the 24 V terminal at the front. The 24 V are looped through secured. In addition, 5 V are generated internally from the 24 V. The 5 V transducer supply can carry loads of up to 100 mA each.

4.3.2 Connection diagramm

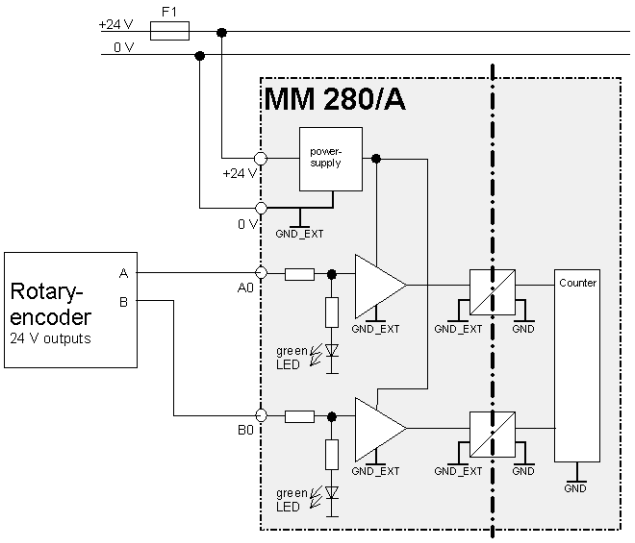


Fig.4-4: Encoder input diagramm

4.4 EMC and wiring guidelines

Pay attention from the outset to careful wiring and shielding.

Further information: See system manual.

5 Configuration

General information

A Kemro system needs data for the configuration of system performance, its I/O-devices and interfaces. The system reads this data during the start-up operation and allocates them to its components and devices.

Configuration data is created by included configuration tools or by editing configuration files.

For further information to the configuration see the documentation of the included configuration tool.

For further information to the configuration see the documentation of the included configuration tool.

5.1 Setting the K-Bus address

The module is addressed via the address switch.

The number of modules that can be added on is limited as follows:

- 8 pieces MM 280/A to a CPU module (permitted address switch positions 0 - 7).
- 5 pieces MM 280/A to a bus link module BL 250/A (permitted address switch positions 0 - 4).
- 2 pieces MM 280/A to a bus link module BL 210/A (permitted address switch positions 0, 1).

The address switch is located on the right side underneath the lower cover (the K-Bus plug is located underneath the upper cover).

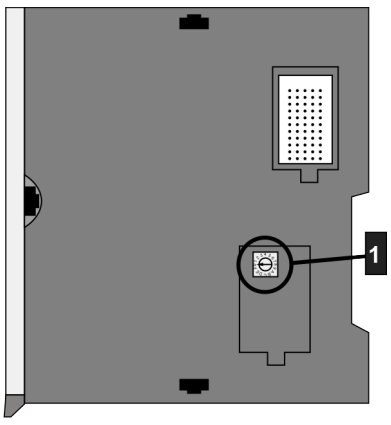


Fig.5-1: Position of the address switch

1 ... Address switch

On leaving the factory all modules are set to address 0 and both covers are closed.

Information

Modules of the same type that are installed within the same line must have different address switch positions. Different modules (e.g.: AI 240/A and DI 260/A) may have the same address switch positions.

The two covers for the K-Bus plug and the address switch must remain locked at the last module in the line (to protect against dirt and damage through electrostatic discharge on contact).

6 Functional description

6.1 Overview of functions

The MM 280/A provides the following function:

- Position measurement: Forward/backward counter of increments (position measurement) via A and B track with 4-fold evaluation.

6.2 Position measurement

Position measurements are taken from the evaluation of an incremental pulse position transducer with 2 pulse signals (A, B), which are phase-shifted by 90°. All edges can be evaluated. The possible resolution amounts 1/4 of the period's duration (4-fold evaluation).

Position measurement 4-fold

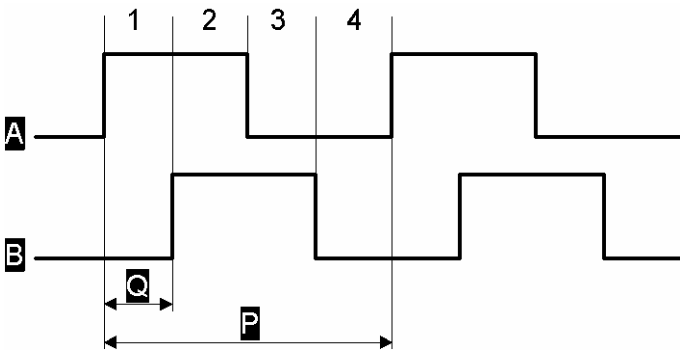


Fig.6-1: Impulse signals of the position transducer, resolution 4-fold

A, B ... Pulse signals of the position transducer	P ... Cycle Time
Q ... Resolution 4-fold	

The direction of the movement is detected by the evaluation of the phase position of the pulse signals A and B. See following figure:

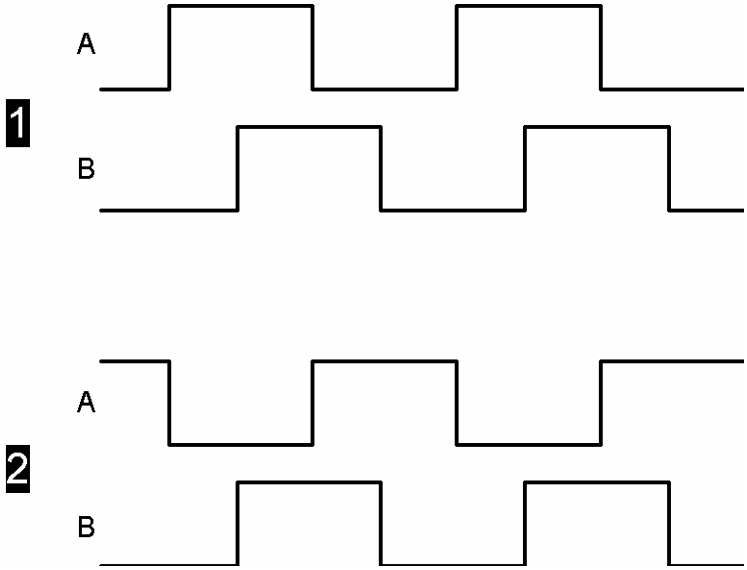


Fig.6-2: Pulse signals of the position transducer, identification of the movement direction

1	... forward
2	... backward

6.3 Position counter

The position counter is a relative counter, that starts at Zero and is updated permanently.

7 Operating behavior

7.1 Status displays

There are 4 green LEDs for the signal status display on the encoder inputs and 2 orange LEDs each for indicating the signal status at a motor bridge:

- If no LED is lit: PWM switched off.
- One of the two LEDs is lit: Motor is active (depending of the rotational direction)

7.2 Behavior of motor bridges (PWM outputs)

7.2.1 Switching inductive loads:

At switch-of the energy of the coil is fed back into the 24 V power supply.

7.2.2 Motor bridges

The motor bridge is built as complete bridge and has galvanic isolation.

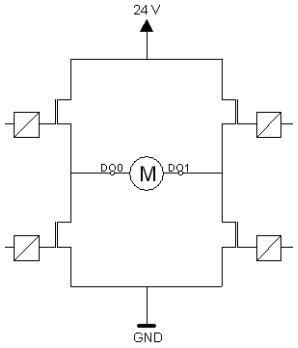


Fig.7-1: Schematic diagram full bridge

The complete bridge provides protection against:

- Short circuit of the motor
- Accidental ground contact of the motor
- Overload

7.2.3 Short circuit and overload response

The HighSide driver enters into the pulsating mode. Once the error has been recitified, the motor bridge will continue to function unchanged.

Information

At reversed polarity of the 24 V input terminals an fuse will be triggered. This fuse can only be exchanged by the KEBA customer service.

8 Disposal

8.1 Disposal of the module

CAUTION

Please observe the regulations regarding disposal of electric appliances and electronic devices!

- The symbol with the crossed-out waste container means that electrical and electronic devices including their accessories must not be disposed of in the household garbage.
- The materials are recyclable in accordance with their labeling. You can make an important contribution to protecting our environment by reusing, renewing and recycling materials and old appliances.

9 Technical data

9.1 In general

Power supply voltage:	24 V DC from the front connection (19.2 V to 30 V, acc. to EN 61131-2:2007), 24 V DC vom K-Bus, 5 V DC vom K-Bus.
Overvoltage category:	II
Equipment class:	III according to EN 61131-2:2007
Power supply of the digital IOs:	Via front connection
Addressing at K-Bus:	Via 16-digit address switch, on the side
Displays on the front panel:	8 signal status-LEDs for digital IOs
Connection terminals:	Open terminals, grid dimensions 5.08 mm
Max number of add-on modules:	to CP modules: 8, to a BL 210/A: 2, to a BL 250/A: 5.
Max. power consumption K Bus 24 V:	0 W
Max. power consumption K Bus 5 V:	0,7 W

9.2 Environmental conditions

Operating temperature:	+5 °C to +55 °C
Storage temperature:	-40 °C to 70 °C
Relative humidity of air:	10 % to 95 % (non condensing)
Vibration resistance:	according to EN 61131-2:2007
Shock resistance:	according to EN 61131-2:2007

9.3 Position counter

Counter depth:	32 Bit.

9.4 Motor bridges (PWM outputs)

Number of motor bridges:	2
Resolution:	8-bit
Output type:	Digital outputs
Nominal voltage:	24 V DC
Processing time:	1 ms
Nominal current:	1 A

Galvanic isolation:	ja Electric strength: 707 V with unsewed ground connection
Status display:	orange LED
Protection against motor short circuit:	yes
Protection against ground short circuit:	yes
Protection against short circuit of 24 V:	no
Protection against reverse polarity:	yes
PWM frequency:	16 kHz

9.5 Encoder inputs

Number of inputs:	2
Resolution:	12-bit
Input type:	Digital input type 1 (according to EN 61131-2)
Voltage range for "1":	15 V ≤ UH ≤ 30 V
Voltage range for "0":	-3 V ≤ UH ≤ 5 V
Galvanic isolation:	yes Electric strength: 707 V with unsewed ground connection
Status display:	green LED
max. resistance:	5,2 kΩ
max. encoder frequency:	5 kHz
Input filter limiting frequency:	20 kHz
Evaluation:	4-fold evaluation

9.6 Interfaces

K-Bus:	Parallel Bus-interfaces, plug-in on side.

9.7 Dimensions

Footprint:	
• Module height:	120 mm
• Mounting depth:	100 mm
• Front panel width:	22,5 mm
• Module width (incl. K-Bus plug):	32,5 mm
Weight:	130 g.

10 EC directives and standards

10.1 EC directives

Guideline 2004/108/EG	EC guideline on electromagnetic compatibility
Guideline 2002/95/EG	RoHS guideline

10.2 Standards

To check the conformity of the system with the directives, the following non-binding legal European standards were applied:

10.2.1 General procedures and safety principles

EN 61131-1:2003	Programmable controllers - Part 1

Information

This product was developed for the use in industrial areas and can cause radio interference when used in residential areas.

10.2.2 EMC guideline

EN 61131-2:2007	Programmable controllers - Part 2

10.2.3 Electrical safety and fire protection

EN 61131-2:2007	Programmable controllers - Part 2

10.2.4 Environmental and surrounding conditions

EN 61131-2:2007	Programmable controllers - Part 2

10.3 Standards for the American market

10.3.1 UL test for industrial control equipment

UL 508, 2005	Industrial Control Equipment

11 Declaration of conformity

EC Declaration of Conformity

CE

KEBA AG
Gewerbepark Urfahr
4041 Linz
AUSTRIA

Document No.: 65505/CE/2

We declare that the following product(s)

Name of product: MM 2x0
Variants: MM 240/A, MM 280/A
From: revision 04 (Mat.Nr. 73983)
revision 02 (Mat.Nr. 76796)
revision 05 (Mat.Nr. 71784)
revision 09 (Mat.Nr. 65505)
revision 05 (Mat.Nr. 71476)

is/are in conformity with the essential requirements of the following European Council Directive(s):

- EC-Directive relating to electromagnetic compatibility 2004/108/EC

Conformity to the directive 2004/108/EC is assured by the compliance with the applicable parts of the following harmonized european standards:

- EN 61131-2:2007

Important notes:

Any modification on the product(s), that is performed without KEBA's consent will render this declaration invalid.

This declaration certifies the conformity with the directives mentioned, but does not imply any warranty of the features of the product(s).

The safety instructions contained in the documentation supplied with the product(s) must be followed.

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