M0010836

SANMOTION

MOTION CONTROLLER

C

AM 280/A

Analog hybrid module

Project engineering manual

SANYO DENKI

Record of Revision

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V1.01	11-2005	Configuration	updated	meis
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Table of Contents

1 Introduction 5
1.1 Purpose of the document 5
1.2 Preconditions 5
1.3 Intended use 6
1.4 Notes on this document 6
1.4.1 Contents of the document 6
1.5 Documentation for further reading 6
2 Safety notes 8
2.1 Representation 8
2.2 General safety instructions 8
3 Description of the module 10
3.1 Front view 10
3.2 Accessories 10
3.2.1 Connector strip 10
4 Connections and wiring 12
4.1 Connection of the shield-rail for analog signals 12
4.1.1 Notes on wiring the analog lines 12
4.2 Analog inputs (single ended) 12
4.2.1 Connection example 13
4.2.2 Connection diagram 14
4.3 Analog inputs (differentially) 14
4.3.1 Connection example 15
4.3.2 Connection diagram 16
4.4 Analog outputs 16
4.4.1 Connection example 17
4.4.2 Connection diagram 18
4.5 EMC and wiring guidelines 18
5 Configuration 19
5.1 Setting the K-Bus address 19
6 Operating behavior 21
6.1 Response of the analog inputs 21
6.2 Behavior during a fault 21
6.2.1 Response to module errors 21
6.2.2 Response to sensor failure 21
7 Disposal 22
7.1 Disposal of the module 22
8 Technical data 23
8.1 In general 23
8.2 Environmental conditions 23

8.3 Analog inputs 23
8.4 Analog outputs 24
8.5 Interface 24
8.6 Dimensions 24

9 EC directives and standards 25

9.1 EC directives 25
9.2 Standards 25
9.2.1 General procedures and safety principles 25
9.2.2 EMC guideline 25
9.2.3 Electrical safety and fire protection 25
9.2.4 Environmental and surrounding conditions 25
9.3 Standards for the American market 25
9.3.1 UL test for industrial control equipment 25

1 Introduction

1.1 Purpose of the document

This document describes the structure of the AM 280/A (analog input/output module).

Information

This manual is not addressed 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 AM 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 AM 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 AM 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.

1.4.1 Contents of the document

- Description of the module AM 280/A
- Description of wiring (including EMC guidelines)
- Technical data

1.5 Documentation for further reading

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

If you are using the CP23x:

Doc.No.	Name	Target group
M0007034	Automation system	• Project engineer • Electrician • Programmer • Commissioning foreman • Service technician

If you are using the CP24x:

Doc.No.	Name	Target group
M0010436	System manual	● 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 AM 280/A is a analog input/output module with 4 analog voltage inputs (alternatively differential or single-ended) and 4 analog voltage outputs .

3.1 Front view

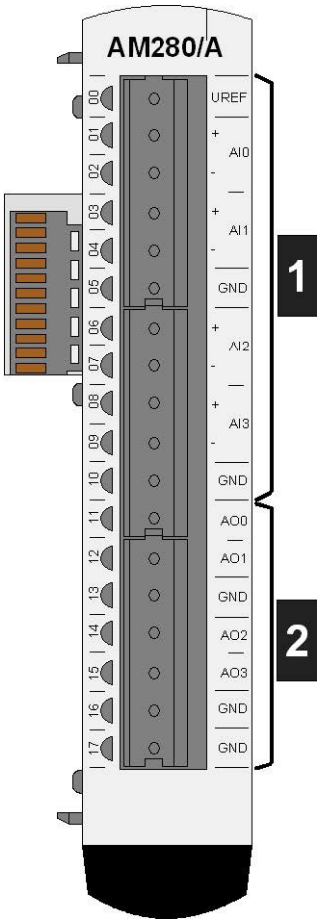


Fig.3-1: AM 280/A front view

1	... 4 analog inputs
2	... 4 analog outputs

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 AM 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 SANYO DENKI, but can be purchased from SANYO DENKI.

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

You can also use COMBICON Plugs made by Phoenix Contact

MSTB 2.5/2-ST-5.08 （For Power supply 1 block）

MSTB 2.5/8-ST-5.08 （For Digital input 2 block）

If you would like to order them to our company, please specify the following model number.

Model number	Contents
AL-00591171-02	MSTB 2.5/2-ST-5.08 x 1 MSTB 2.5/8-ST-5.08 x 2

4 Connections and wiring

4.1 Connection of the shield-rail for analog signals

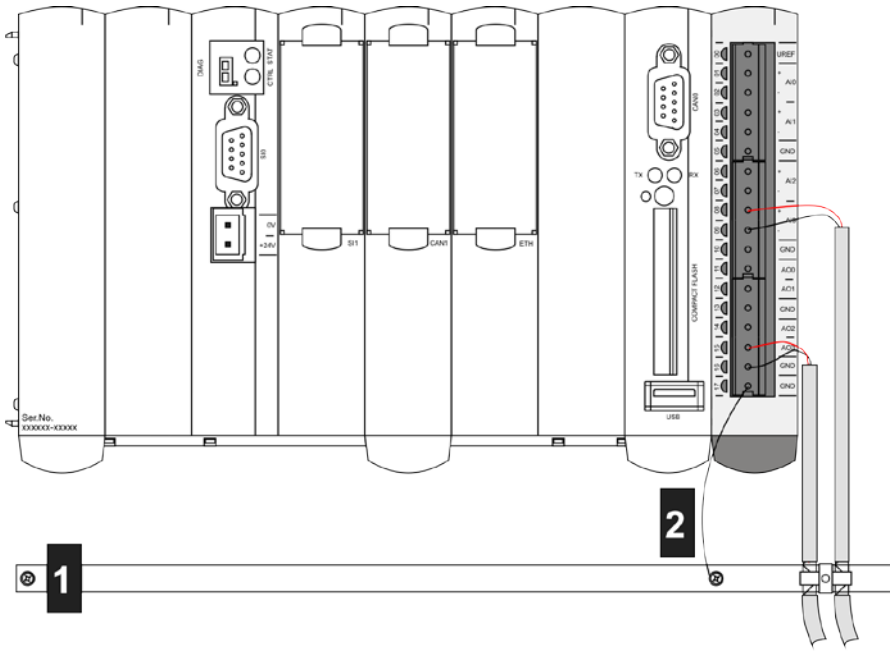


Fig.4-1: Connection of the shield-rail for analog signals

1 ... Shield rail
2 ... GND connection against 50 Hz field, length max. 1 m

4.1.1 Notes on wiring the analog lines

- Analog lines and reference voltage must be connected with a shielded cable.
- The shield rail must be connected to the GND terminal at one point.
- The shield must be placed on the shield rail as shown above.
- To attain optimum interference immunity, analog lines and reference voltage should not be laid out parallel to strong interfering lines (e.g. lines of converters for motors).

4.2 Analog inputs (single ended)

There are 4 analog inputs with 14-bit resolution available. These inputs can either be used "differentially" or "single-ended". The selection is effected by the configuration tool. By selecting "-10...+10V" the differential mode (double ended) is activ. By selecting "0...U_{REF}" the ratiometric mode (single ended) is activ, where the calibration is normalized on U_{REF}.

For further information on wiring and shielding of the analog inputs: See System manual.

WARNING!

Unintentional switching on of a drive possible!

- **If the power supply for the modules is not switched on, but a voltage is applied to the analog inputs (e.g. by the external supply of an encoder), there may still be a voltage on the analog outputs.**

  This enables drives to be switched on although they have not received an ON command.

  Remedy: The drives must only switch after the activation of an enable output. This may only be switched on after startup of the system is complete (e.g. via the output of digital output module).

4.2.1 Connection example

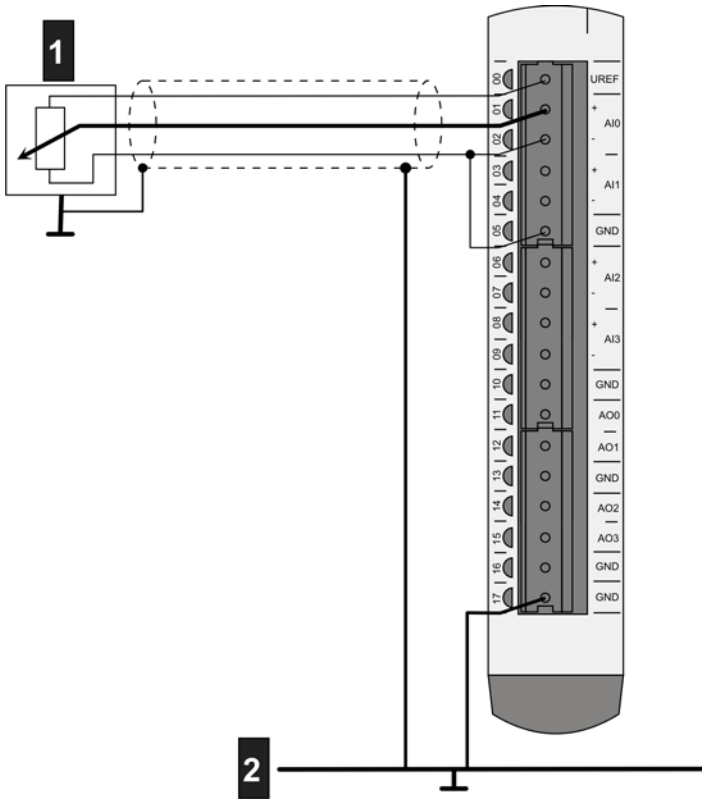


Fig.4-2: Connection example for analog inputs (single ended)

1	... Sensor
2	... Shield rail

The transducer supply U_{ref} can provide a maximum of 20 mA. Number and selection of the sensors must take account of the maximum current.

Example 1:

An analog input with a resistance sensor is to be used and supplied by the reference voltage:

I_{ref} max = 20 mA, this results in an $R_{min} \geq 500\ \Omega$.

Example 2:

All 4 analog inputs are to be used with a resistance sensor and supplied by the reference voltage:

I_{ref} max = 20 mA, this results in an $R_{min} \geq 4 \times 500\ \Omega = 2\ k\Omega$.

4.2.2 Connection diagram

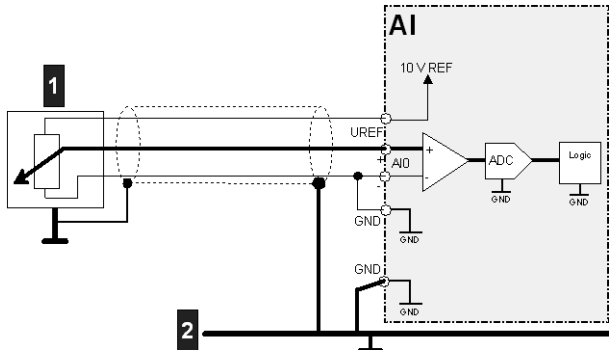


Fig.4-3: Connection diagram for analog inputs (single ended)

1 ... Sensor	2 ... Shield rail

Information on the hardware endpoints: See System manual.

4.3 Analog inputs (differentially)

There are 4 analog inputs with 14-bit resolution available. These inputs can either be used "differentially" or "single-ended". The selection is effected by the configuration tool. By selecting "-10...+10V" the differential mode (double ended) is activ. By selecting "0...U_{REF}" the ratiometric mode (single ended) is activ, where the calibration is normalized on U_{REF}.

For further information on wiring and shielding of the analog inputs: See System manual.

WARNING!

Unintentional switching on of a drive possible!

- **If the power supply for the modules is not switched on, but a voltage is applied to the analog inputs (e.g. by the external supply of an encoder), there may still be a voltage on the analog outputs.**

  This enables drives to be switched on although they have not received an ON command.

  Remedy: The drives must only switch after the activation of an enable output. This may only be switched on after startup of the system is complete (e.g. via the output of digital output module).

4.3.1 Connection example

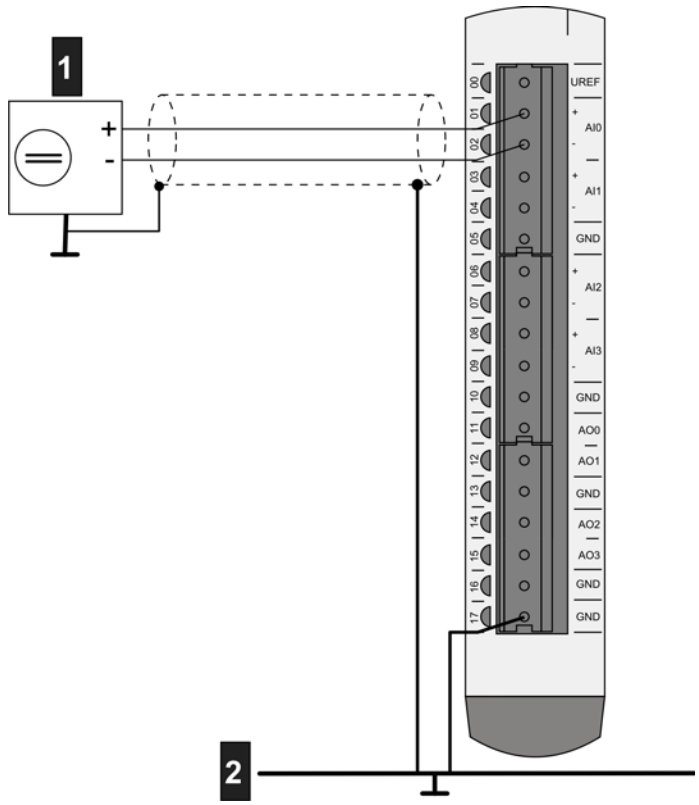


Fig.4-4: Connection example for analog inputs (differential)

1	... Sensor
2	... Shield rail

4.3.2 Connection diagram

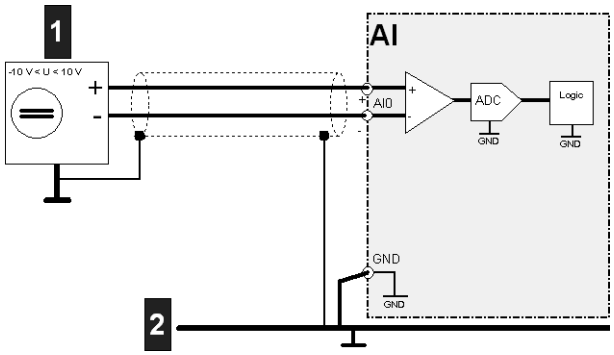


Fig.4-5: Connection diagram for analog inputs (differential)

1 ... Sensor	2 ... Shield rail

Information on the hardware endpoints: See System manual.

4.4 Analog outputs

4 outputs with 12-bit resolution and a voltage range of ±10 V are available.

4.4.1 Connection example

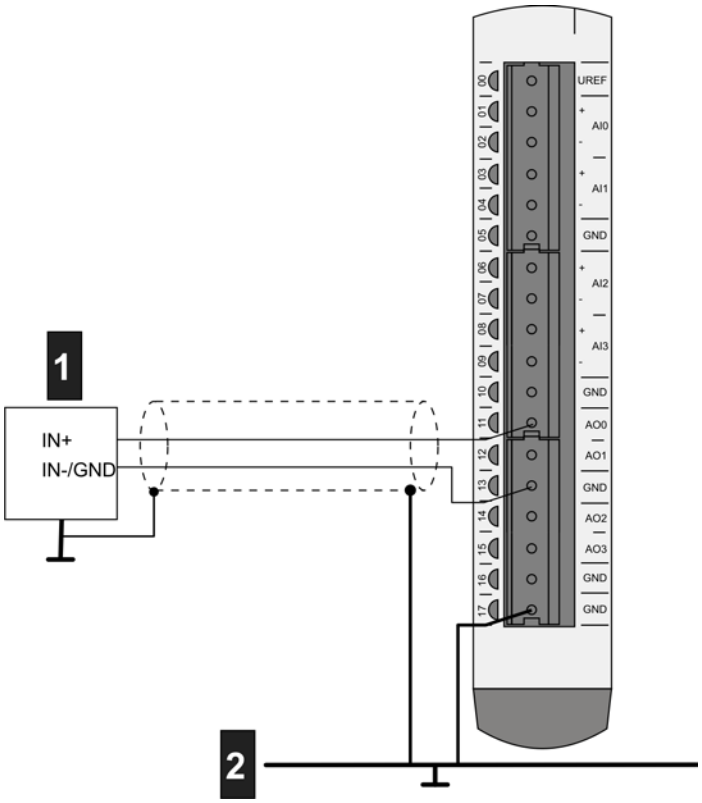


Fig.4-6: Connection example for analog outputs

1	... Actor
2	... Shield rail

For further information on wiring and shielding of the analog outputs: See System manual.

4.4.2 Connection diagram

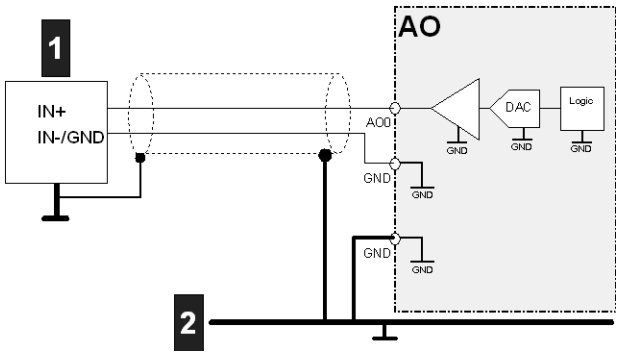


Fig.4-7: Connection diagram for analog output

1 ... Actor
2 ... Shield rail

Information on the hardware endpoints: See System manual.

4.5 EMC and wiring guidelines

Pay attention from the outset to careful wiring and shielding.

Further information: See system manual.

5 Configuration

General information

A SANMOTION system needs data for the configuration of system performance, its I/O-devices and interfaces. The system reads this data during the start-up op- eration 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.

5.1 Setting the K-Bus address

The module is addressed via the address switch. A maximum of 12 modules of the same type can be distinguished on one line.

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

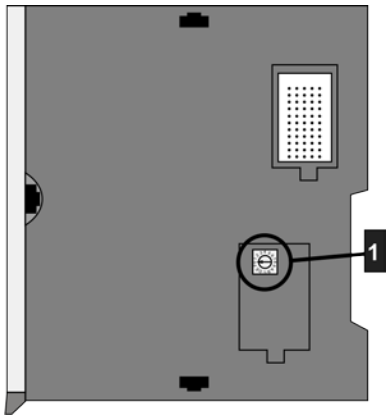


Fig.5-1: Position of the address switch

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. analog and digital modules) 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 Operating behavior

6.1 Response of the analog inputs

The input switch has a usable input voltage range of ± 10.4 V. The module returns correct measurement values in the full range of ± 10.4 V. The range +10.0 V … +10.4 V or -10.4 V … -10.0V is available as saturation range.

6.2 Behavior during a fault

6.2.1 Response to module errors

In case of a module error an internal watchdog monitor will be triggered. In this case the outputs will be set to 0 V, the module is reset and signals the module error to the CPU module or bus link module.

6.2.2 Response to sensor failure

In the event of a sensor failure, an internal sensor failure bit is set and a fault is signaled to the CPU. Once the sensor failure has been corrected the status "Sensor failure" will be automatically reset.

Information

In the case of open input pins, the expansion resistance will bring the input to an input differential voltage of > 10.4 V through an internal circuitry with expansion resistances (1 MΩ) which triggers the setting of the sensor failure bit. Approx. 30 V can thus be measured on open analog inputs.

7 Disposal

7.1 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.

8 Technical data

8.1 In general

Power supply voltage:	24 V DC from K Bus 5 V DC from K Bus
Overvoltage category:	II
Equipment class:	III according to EN 61131-2:2007
Addressing at K-Bus:	Via 16-digit address switch, on the side
Connection terminals:	Open terminals, grid dimension: 5.08 mm
Max. power consumption K Bus 24 V:	3.3 W
Max. power consumption K Bus 5 V:	0.3 W

8.2 Environmental conditions

Operating temperature:	0 °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

8.3 Analog inputs

Number of inputs:	4
Type:	Voltage input
Resolution:	14 Bit
Signal range:	± 10 V or 0 – Uref (10 V)
Maximum measurement signal:	± 10.4 V
Input type:	Differential or single-ended
Galvanic isolation:	No
Reference voltage output:	10 V ± 2.5 %; max. 20 mA
Scan repeat cycle:	1 ms
Input impedance at signal range:	10 MΩ
Input filter characteristic – order:	First order
Input filter characteristic – transition frequency:	250 Hz
Converter method:	Successive approximation
Monotonicity without error codes:	Yes
Synchroneity control:	±13.5 V
Synchroneity suppression:	> 80 dB
Value of the lowest-value Bit (LSB):	1.3 mV
Maximum permitted continuous overload (without damage):	± 30 V
Typ. temp. coefficient measurement error:	± 5 ppm of FSR / °C

Max. temp. coefficient measurement error:	± 20 ppm of FSR / °C
Biggest error at 77.00° F:	± 0.01 % of FSR

8.4 Analog outputs

Number of outputs:	4
Type:	Voltage output
Resolution:	12 Bit
Signal range:	±10 V
Galvanic isolation:	No
Conversion cycle:	1 ms
Value of the lowest-value Bit (LSB):	5.32 mV
Monotonicity:	Yes
Load resistance:	≥ 1000 Ω
Highest capacitive load:	≤ 10 nF
Differential non-linearity:	≤± 1 LSB
Settling time at change over the full range (atohmic load):	≤50µs
Typ. temp. coefficient analog output error:	±20 ppm of FSR / °C
Max. temp. coefficient analog output error:	±30 ppm of FSR / °C
Biggest error at 25°C:	± 0.15 % of FSR

SKE ... Scale end value

8.5 Interface

System bus interface:	Parallel bus interfaces, plug-in on side

8.6 Dimensions

Dimensions:	
● Module height:	120 mm
● Mounting depth:	100 mm
● Front panel width:	22.5 mm
● Module width (incl. K-Bus plug):	32.5 mm
Weight:	135 g

9 EC directives and standards

9.1 EC directives

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

9.2 Standards

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

9.2.1 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.

9.2.2 EMC guideline

EN 61131-2:2007	Programmable controllers - Part 2

9.2.3 Electrical safety and fire protection

EN 61131-2:2007	Programmable controllers - Part 2

9.2.4 Environmental and surrounding conditions

EN 61131-2:2007	Programmable controllers - Part 2

9.3 Standards for the American market

9.3.1 UL test for industrial control equipment

UL 508, 2005	Industrial Control Equipment

Release
Revision A Jan. 2014

ECO PRODUCTS

■ECO PRODUCTS
Sanyo Denki's ECO PRODUCTS are designed with the concept of lessening impact on the environment in the process from product development to waste. The product units and packaging materials are designed for reduced environmental impact.
We have established our own assessment criteria on the environmental impacts applicable to all processes, ranging from design to manufacture.

■Precautions For Adoption

Failure to follow the precautions on the right may cause moderate injury and property damage, or in some circumstances, could lead to a serious accident.
Always follow all listed precautions.

⚠ Cautions

- Read the accompanying Instruction Manual carefully prior to using the product.
- If applying to medical devices and other equipment affecting people's lives please contact us beforehand and take appropriate safety measures.
- If applying to equipment that can have significant effects on society and the general public, please contact us beforehand.
- Do not use this product in an environment where vibration is present, such as in a moving vehicle or shipping vessel.
- Do not perform any retrofitting, re-engineering, or modification to this equipment.
- The Products presented in this Instruction Manual are meant to be used for general industrial applications. If using for special applications related to aviation and space, nuclear power, electric power, submarine repeaters, etc., please contact us beforehand.

* For any question or inquiry regarding the above, contact our Sales Department.

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