M0007977E

SANMOTION

MOTION CONTROLLER

C

DM 276/A

Digital Input / Output Module

Hardware Manual

SANYO DENKI

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1 Introduction

1.1 Purpose of the document

This document describes the structure of the DM 276/A (digital 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 DM 276/A was developed for control applications in industrial machines. The typical applications areas include injection molding machines, robots, presses, machine tools and similar.

The DM 276/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 DM 276/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 DM 276/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 CPU module:

Doc.No.	Name	Target group
M0007034	automation system manual	●Project engineer ●Electrician ●Programmer ●Commissioning foreman ●Service technician

If you are using the CP24x CPU module:

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 "open equipment" (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 DM 276/A is a digital input/output module.

3.1 Front view

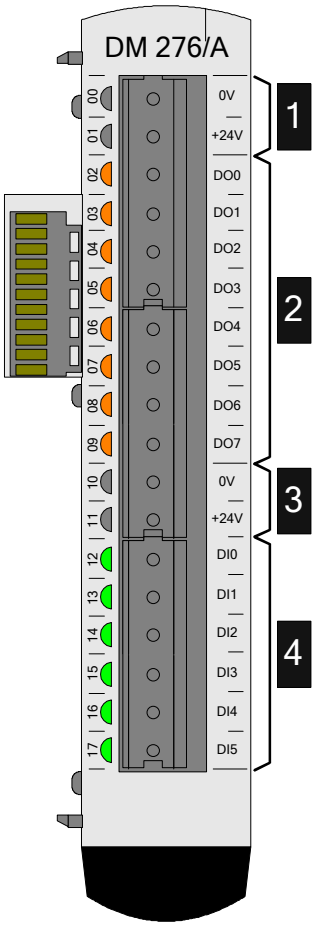


Fig.3-1: DM 276/A Front view

1 ... Power supply of the digital outputs	2 ... 8 digital outputs
3 ... Power supply of the digital inputs	4 ... 6 digital inputs (DI0 and DI1 interruptible)

Information

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 DM 276/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.

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

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

4 Connections and wiring

CAUTION

- **When switching off the control, the power supply of the DM 276/A must be disconnected before or at the same time as the power supply of the CPU module. In case of non-observance the outputs of the module may have undefined states for a short time.**

Digital inputs and outputs are supplied separately:

- Terminals 00 and 01: Supply of the 8 digital outputs
- Terminals 10 and 11: Supply of the 6 digital inputs

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 Digital inputs

For the processing of external digital signals, 6 digital inputs of type 1 (according to EN 61131-2) are available. They share a common ground potential but are isolated for the evaluation logic. The switching status "high" is indicated by green LEDs on the left side of the connector strip.

4.2.1 Connection example

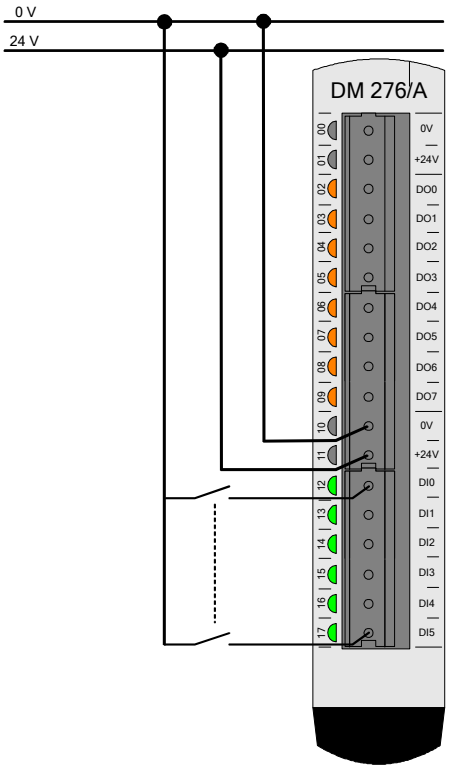


Fig.4-1: Connection example for digital inputs

Information

- *The reference potential for the isolated digital inputs is the 0 V terminal that is located on the front side.*
- *For operation of the digital inputs the DM 276/A must be supplied by the 0 V- and 24 V-terminals located on the front side.*

4.2.2 Connection diagram

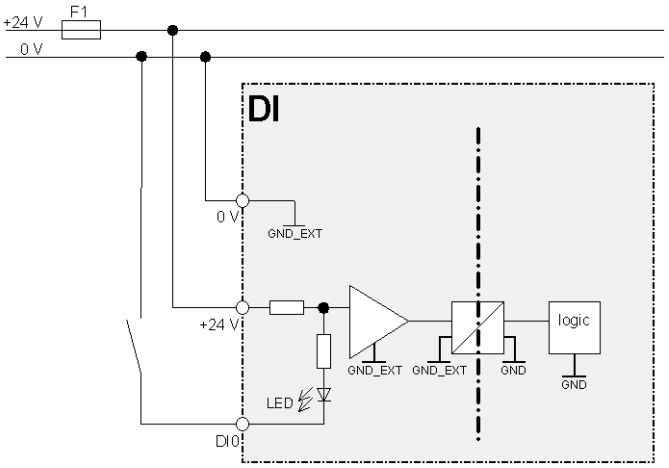


Fig.4-2: Input diagramm

4.2.3 Status display

Green LEDs for indicating the signal status on the left side of the inputs.

- LED is lit: Input on "1"
- LED is dark Input on "0"

4.3 Interrupt inputs

The digital inputs DI0 and DI1 can also be used as interrupt inputs for the speedy processing of external digital signals. They share a common ground potential but are isolated for the evaluation logic. The switching status "high" is indicated by green LEDs on the left side of the connector strip.

4.3.1 Connection example

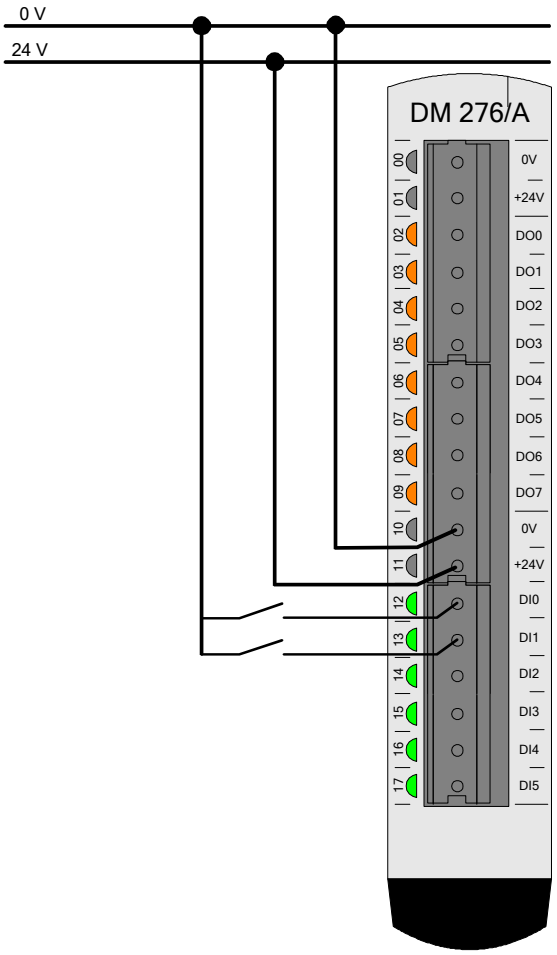


Fig.4-3: Connection example for interrupt inputs

CAUTION

Interfering impulses over 10 V may trigger an unwanted interrupt event.

4.3.2 Connection diagram

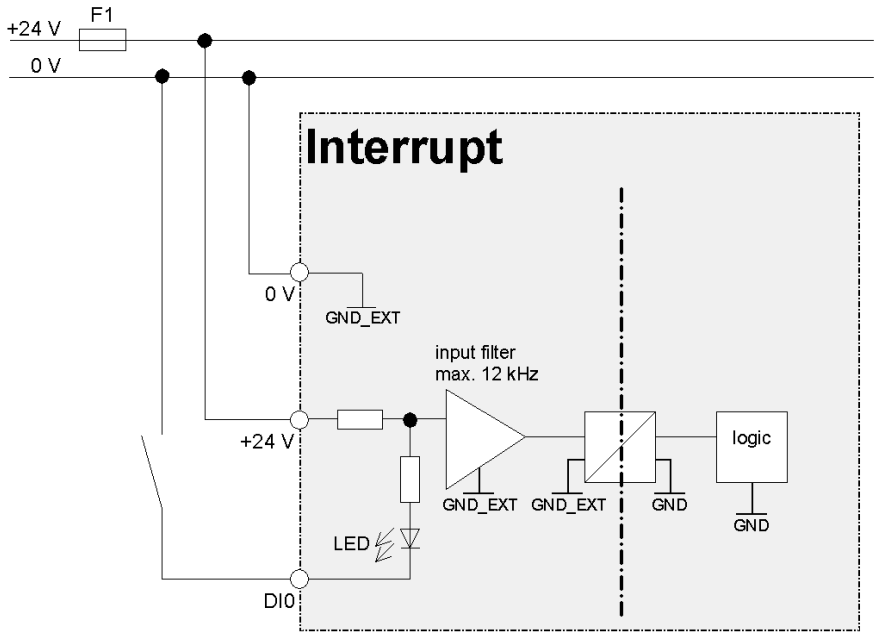


Fig.4-4: Interrupt diagram

4.4 Digital outputs

There are 8 digital outputs available to activate the digital actors. They share a common ground potential but are isolated for the evaluation logic.

DM 276/A: 2 A nominal current at 50% coincidence

The nominal voltage supplying the group is 24 V DC. The status of the corresponding output is indicated by the orange status LEDs.

4.4.1 Connection example

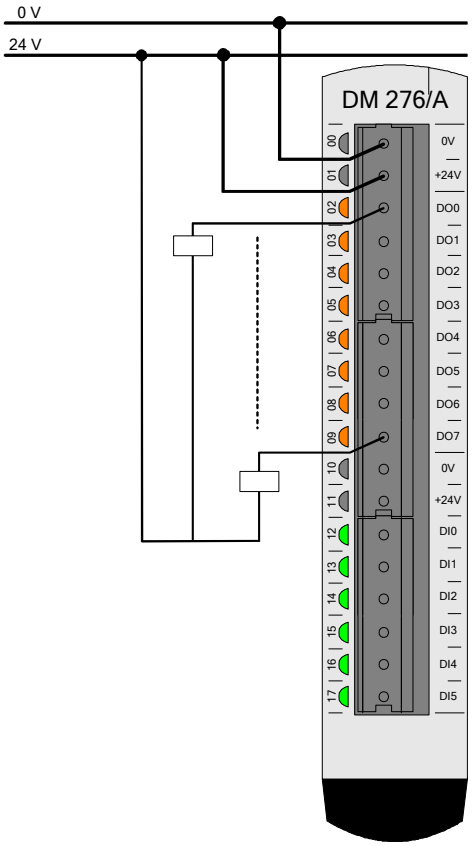


Fig.4-5: Connection example for digital outputs

CAUTION!

- **Wrongly plugging the supply terminal blocks one position downwards, can lead to the destruction of the module.**
- **Even if one of the 0V pins is not connected, the digital outputs still function. However, the LEDs do not light up in this case and the status of the digital outputs is not correctly indicated.**

4.4.2 Status display

Orange LEDs for indicating the signal status on the left side of the outputs.

●LED is lit:	Output to "1"
●LED is dark	Output to "0"

4.4.3 Connection diagram

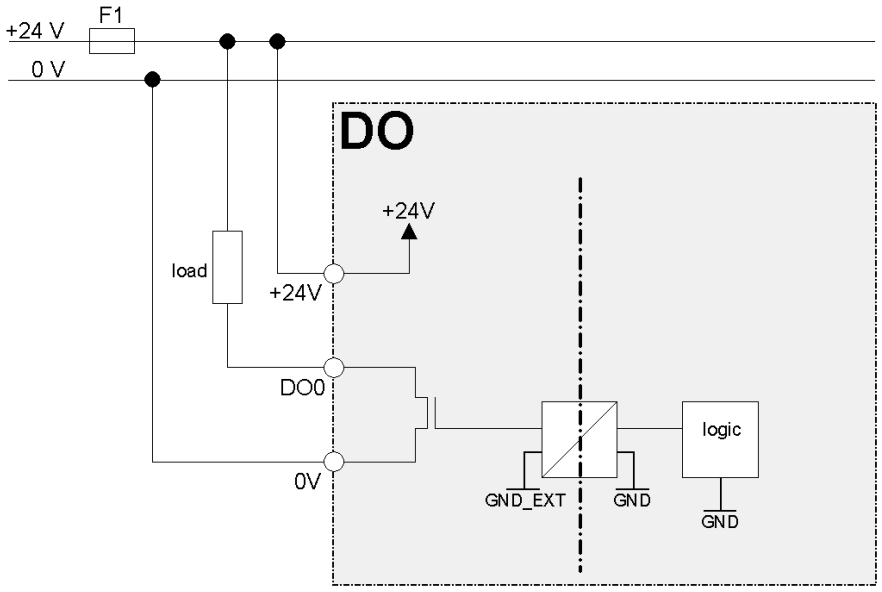


Fig.4-6: Output diagramm

4.5 EMC and wiring guidelines

Pay attention from the outset to careful wiring and shielding.

Further information: See system manual.

5 Configuration

5.1 General information

For configuration, the SANMOTION C system requires data that are read out from the configuration file during the start-up.
There are 2 possibilities for configuring:

- Use of the SANMOTION C studio
- Creation of cfg-files by text-editor

5.2 Creation of cfg-files by text-editor

All .cfg-files must be located in the directory “\\application\control\config" and are read-in during the start-up of the control-CPU.

Example Configuration of the K-Bus:

```
[IO.ONBOARD.KBUS:0]
name="KBUS"
cycleTime=0.001
```

Example Configuration of the DM276/A:

```
[IO.ONBOARD.KBUS:0.DM276A:0]
name="DM276A"
cycleTime=0.001
optional=0              // optional configuration:
                        // 0 ... if the module does not exist,
                        //       an "Error" is output
                        // 1 ... if the module does not exist,
                        //       a "Warning" is output
```

Example Configuration of the DI0, DI1 inputs:

```
[IO.ONBOARD.KBUS:0.DM276A:0.DI:0]
name="system.DI0"
despikeTime=0           // despikeTime configuration:
                        // 0 ...    1 msec
                        // 1 ... 100 msec
interruptEnable=0       // interrupt enable configuration:
                        // 0 ... disable interrupt
                        // 1 ... enable interrupt
interruptEdge=0         // interrupt edge configuration:
                        // 0 ... disable interrupt
                        // 1 ... interrupt by falling edge of the input
                        // 2 ... interrupt by rising edge of the input
                        // 3 ... interrupt by both edge of the input
```

Information

The debouncing function is possible only when the digital input is not used as interrupt input.

If the input is configured as interrupt input, debouncing takes automatically place with 34 µs (the configuration parameter is not relevant).

```
[IO.ONBOARD.KBUS:0.DM276A:0.DI:1]
name="system.DI1"
despikeTime=0
interruptEnable=0
interruptEdge=0
```

Example Configuration of the DI2～DI5 inputs:

```
 [IO.ONBOARD.KBUS:0.DM276A:0.DI:2]
name="system.DI2"
despikeTime=0
...
[IO.ONBOARD.KBUS:0.DM276A:0.DI:5]
name="system.DI5"
despikeTime=0
```

Example Configuration of the DO0～DO7 outputs:

```
[IO.ONBOARD.KBUS:0.DM276A:0.DO:0]
name="system.DO0"
...
[IO.ONBOARD.KBUS:0.DM276A:0.DO:7]
name="system.DO7"
```

By configuring the digital input, the following hardware endpoints can be used.

- system.DI0 [BOOL] // The value of input
- system.DI0_stat [BOOL] // TRUE … error

By configuring the interrupt input (DI0, DI1), the following hardware endpoints can be used.

- system.DI0 [BOOL] // The value of input
- system.DI0_stat [BOOL] // TRUE … error
- system.DI0_parInt [KHW_Int_Param] // interrupt parameter

By configuring the digital output, the following hardware endpoints can be used.

- system.DO0 [BOOL] // The value of output
- system.DO0_stat [BOOL] // TRUE … error

5.3 Example how to use of SANMOTION C Studio

To configure lined-up IO modules, the node `ExtModules` of the PLC configuration must be selected. A right mouse key press on this node opens a menu, where you can select "Append Subelement" which shows a list of IO modules that can be added:

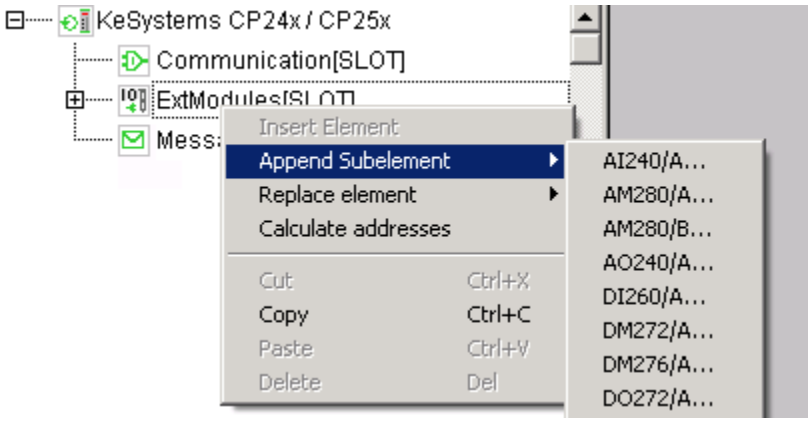


Fig5-1：Select I/O module

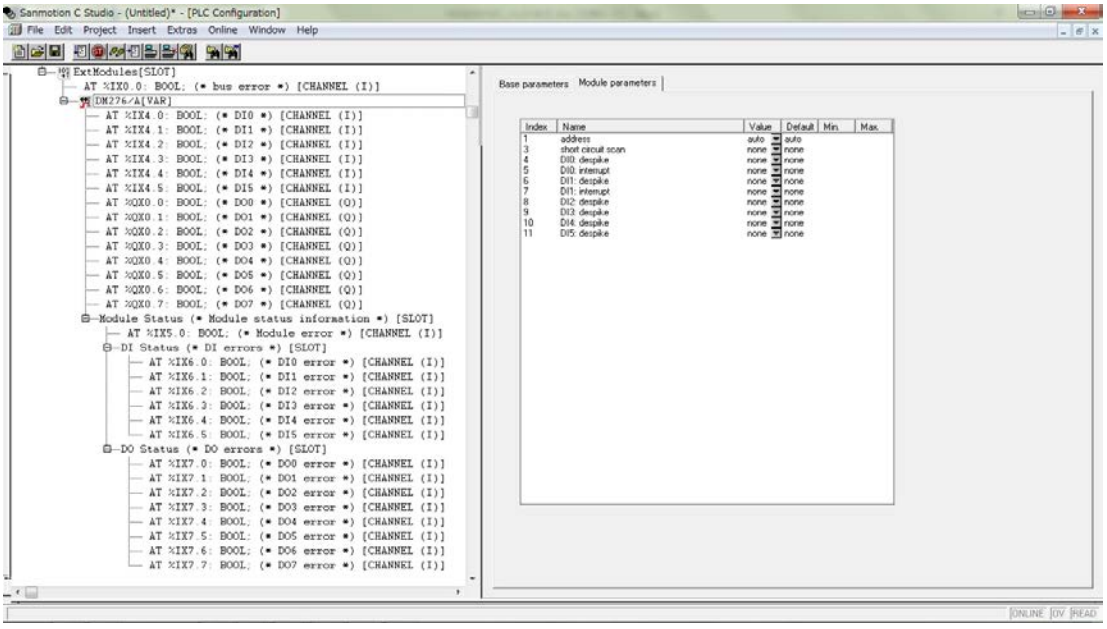


Fig5-2：hardware endpoint and module parameter

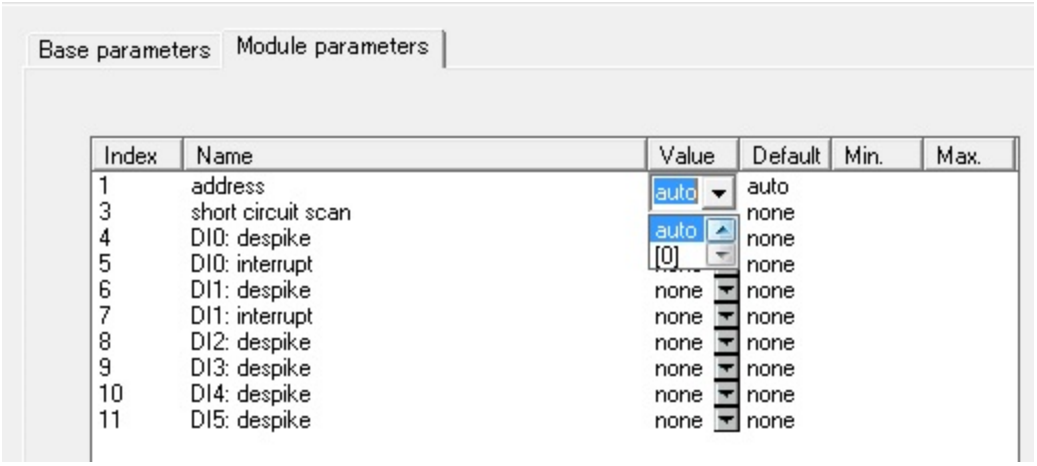


Fig5-3：module parameter : address

Index	Name	Value	Default
1	Address	Auto： Auto setting [0]～[F]： Specified setting	Auto

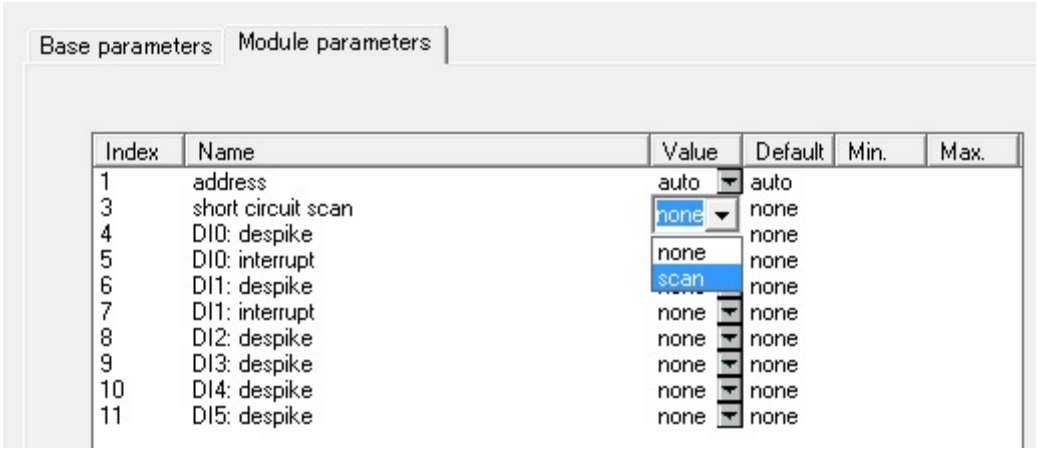


Fig5-4：module parameter : short circuit scan

Index	Name	Value	Default
3	Short circuit scan	none： refer to Chapter 6.1.1 scan： refer to Chapter 6.1.2	None

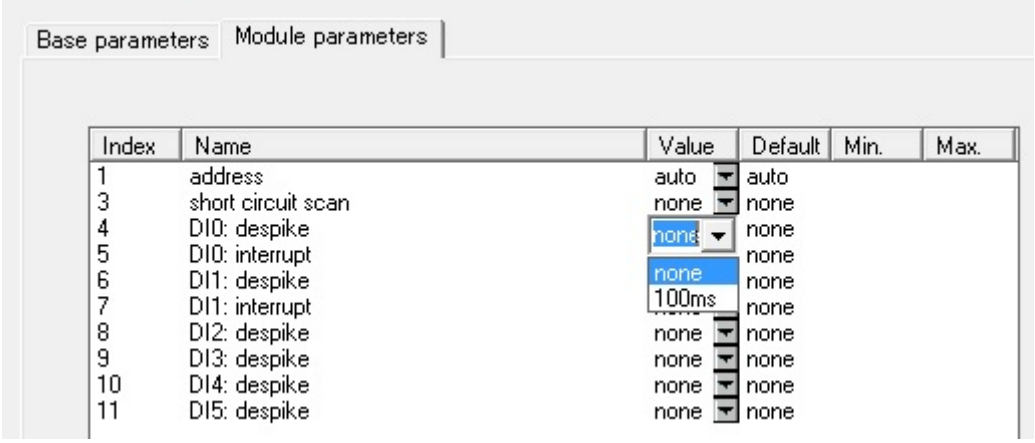


Fig5-5：module parameter : despike

Index	Name	Value	Default
4,6 8～11	DIx:despike	none： 1msec 100ms： 100msec	None

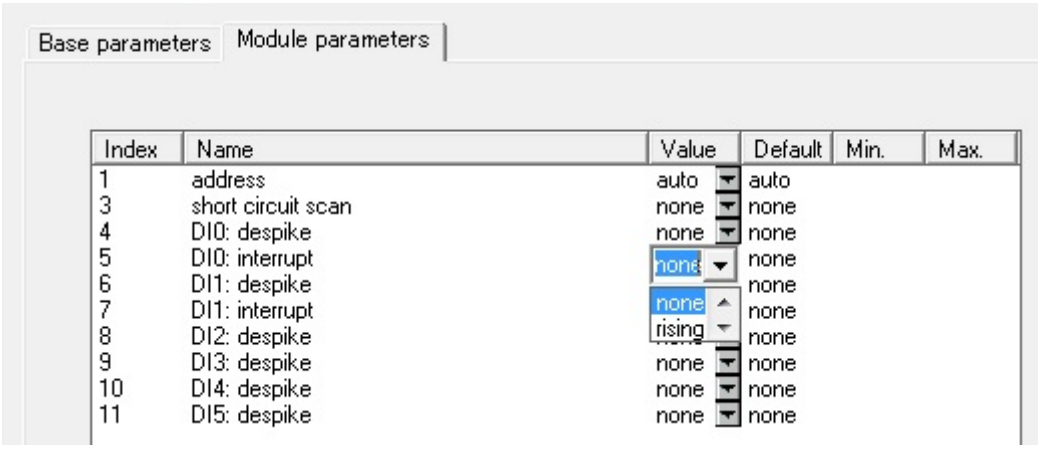


Fig5-6：module parameter : interrupt（only DI0，DI1）

Index	Name	Value	Default
5,7	DIx:interrupt	none： no use as interrupt raising： interrupt by raising edge for input falling： interrupt by falling edge for input both： interrupt by both edge for input	None

5.4 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).

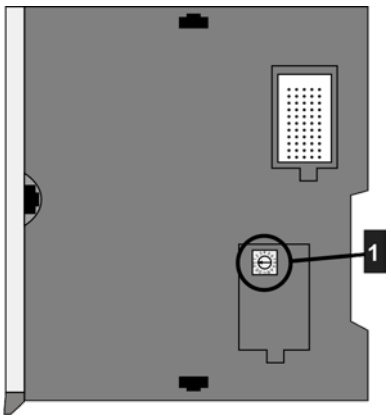


Fig.5-6: Position of the address switch

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 Short-circuit

The behavior of the module in the event of a short circuit is determined by the configuration.

6.1.1 Short circuit scan not activated (default configuration)

When a short circuit occurs, all active output of the affected group are switched off, the system variables of the outputs are set to TRUE and an error message is generated.

If the control continues to signal a logical 1 (output switched on) there is a cyclical test to see whether the blocked outputs are still short circuited. The periodic attempts to switch on can be set via a configuration entry. After the short circuit has been rectified, the status variables are reset, information about the rectification of the error is generated, and the outputs become available again. The outputs that were not active when the short circuit occurred continue to function without any restriction. If after a short circuit another short circuit occurs on a further output, the same procedure as for existing faulty outputs applies.

6.1.2 Short circuit scan activated

In order to clearly identify the output that is causing the short circuit, the short circuit scan can be activated in the configuration. In this case the outputs that were active during the short circuit are switched on in succession for approx. 10 ms and tested for a short circuit. The affected output is switched off, the status variable of the output is set to TRUE and the output is blocked. An error message for the short-circuited output is generated. The behavior during re-activation is the same as the one described above without a short-circuit scan. After the short circuit has been rectified, the status variables are reset, information about the rectification of the error is generated, and the output becomes available again.

6.2 Debouncing

The inputs are filtered with a default debouncing time of 1 ms.

To suppress interference signals from switches, keys etc, a debouncing time of 100 ms can be set in the configuration. The signal must therefore be applied for at least 100 ms at the input, for it to be recognized and processed by the system.

Information

The debouncing function is possible only when the digital input is not used as interrupt input.

If the input is configured as interrupt input, debouncing takes automatically place with 34 µs (the configuration parameter is not relevant).

6.3 Switching inductive loads

The module contains no internal freewheeling diode to take up the inductive energy when switching off the inductive loads.

The inductive load capability for each channel is 1 J at 0.2 Hz.

The inductive energy is transformed into heat by the switching transistor. It sets itself a voltage of approx. -60 V at the switching transistor. This allows for a swifter breakdown of the energy than would be possible when using the free-wheeling diode.

Information

The load capacity of the outputs for inductive loads can be raised by adding an external freewheeling diode, which will, however, significantly increase the switch-off time. In the case of high load currents, higher values of inductance or greater switching frequency, a freewheeling diode must always be used.

6.3.1 Connection diagram

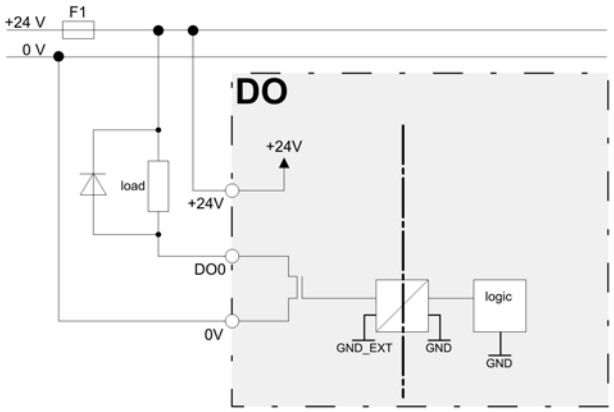


Fig.6-1: Schematic diagram for the use of a freewheeling diode

6.4 Parallel arrangement of digital outputs

Two digital outputs can be switched parallel. This doubles the nominal current. The inductive load capacity of the outputs, however, is not increased.

7 Disposal

7.1 Disposal of the module

CAUTION

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

- The 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 the front (19.2 V to 30 V, acc. to IEC61131-2) 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 dimensions
5.08 mm Max. power consumption K Bus 24 V:	1.9 W
Max. power consumption K Bus 5 V:	0.4 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 Digital inputs

Number of inputs:	6
Input type:	Type 1 (according to EN 61131-2:2007)
Voltage range for HIGH:	15 V ≤ UH ≤ 30 V
Voltage range for LOW:	-3 V ≤ UL ≤ 5 V
Cycle time:	1 ms
Status display:	Green LED
Galvanic isolation:	Yes Electrical strength 707 V with open ground
Circutry:	Source

8.4 Interrupt inputs

Number of inputs:	2 (DI0, DI1) of the digital inputs
Input type:	Type 1 (according to EN 61131-2:2007)
Voltage range for HIGH:	15 V ≤ UH ≤ 30 V
Voltage range for LOW:	-3 V ≤ UL ≤
5 V Response time of the K-Bus Interrupt:	50 µs

Status display:	Green LED
Galvanic isolation:	yes

8.5 Digital outputs

Number of outputs:	8
Rated voltage:	24 V DC
Processing time:	1 ms
Rated current:	2 A at 50% coincidence
Protection device:	Short circuit protection
Max. inductive load:	1 J at max. 0.2 Hz
Status display:	Orange LED
Galvanic isolation:	Yes, to selection electronics and among them- selves. Electric strength: 707 V with unsewed ground connection

8.6 Interface

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

8.7 Dimensions, weight

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:	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	Jul. 2007
Revision B	Dec. 2008
Revision C	Mar. 2008
Revision D	Jun. 2008
Revision E	Apr. 2015

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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