Helmholz
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DEA 300
Digital Input and Output Modules

700-321-1BL00/-1BH02/-1BH50/-7BH01/-1EL00/-1FH00

700-322-1BL00/-1BH01/-1BF01

700-322-1HF10/-1HF20/-1HF30/-1HF01/-1HH01

700-323-1BL00/-BH01

700-370-0AA01/-0AL01

Manual

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Note:

We have checked the content of this manual for conformity with the hardware and software described. Nevertheless, because deviations cannot be ruled out, we cannot accept any liability for complete conformity. The information in this manual is regularly updated. When using purchased products, please heed the latest version of the manual, which can be viewed in the Internet at www.helmholz.com, from where it can also be downloaded.

Our customers are important to us. We are always glad to receive suggestions for improvement and ideas.

Revision history of this document:

Edition	Date	Revision
10	12.12.2011	New module 700-332-1HF30 DO 16 x Rel. DC60V/0.5 A bistable added. Updated version.
11	08.11.2013	Module 700-332-1HF30 DO 16 x Rel. DC60V/0.5 A bistable chapter 4.5.5.1 Parameterising and 4.5.5.2 Aktivating the relays added. Updated version.
12	5.12.16	Hazloc chapter deleted Change of company name

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1 Safety Information

Please observe the safety information given for your own and other people's safety. The safety information indicates possible hazards and provides information about how you can avoid hazards.

The following symbols are used in this manual.

Caution, indicates hazards and sources of error

gives information

hazard, general or specific

*danger of **electric shock***

1.1 General

The DEA 300 Digital Input and Output Modules are only used as parts of a complete system.

The operator of a machine system is responsible for observing all safety and accident prevention regulations applicable to the application in question.

During configuration, safety and accident prevention rules specific to the application must be observed.

Emergency OFF facilities according to EN 60204 / IEC 204 must remain active in all modes of the machine system. The system must not enter an undefined restart.

Faults occurring in the machine system that can cause damage to property or injury to persons must be prevented by additional external equipment. Such equipment must also ensure entry into a safe state in the event of a fault. Such equipment includes, for example, electromechanical safety buttons, mechanical interlocks, etc. (see EN 954-1, risk estimation).

Never execute or initiate safety-related functions using the modules.

Make sure in the software that uncontrolled restarts cannot occur.

1.2 Restriction of access

Only authorized persons must have access to the modules!

The modules are open equipment and must only be installed in electrical equipment rooms, cabinets, or housings. Access to the electrical equipment rooms, barriers, or housings must only be possible using a tool or key and only permitted to personnel having received instruction or authorization. See also Chapter 2.

1.3 Information for the user

During configuration it is imperative to observe the safety and accident prevention rules applicable in the particular application.

This manual is addressed to anyone wishing to configure, use, or install the DEA 300 modules.

It is intended to show the user how to operate the DEA 300 and explain the signaling functions. It provides the installing technician with all the necessary data.

The DEA 300 module is exclusively for use with an S7-300 programmable controller from Siemens or with a PAS 153 PROFIBUS Slave Interface from Helmholz.

DEA 300 modules are only used as part of a complete system. For that reason, the configuring engineer, user, and installing technician must observe the standards, safety, and accident prevention rules applicable in the particular application. The operator of the automation system is responsible for observing these rules.

1.4 Use as intended

The DEA 300 modules must only be used as a communication and signaling system as described in the manual.

1.5 Avoiding use not as intended!

Uncontrolled restarts must be prevented in the software.

Safety-related functions must not be controlled using the DEA 300 modules alone. Make sure in the software that uncontrolled restarts cannot occur. The modules must only be operated in slots connected to a 5 V data bus.

1.6 Installation and mounting

Before you start installation work, all system components must be disconnected from their power source.

Installation and mounting must be effected in compliance with VDE 0100 IEC 364. Because it is an IP20 (OPEN type) module, you must install it in a (switching) cabinet.

During configuration, safety and accident prevention rules specific to the application must be observed.

Note these instructions:

- Use 60/75 °C copper wire only and use 95 °C copper wire only for model 700-321-1EL00 and 700-321-1FH00.
- Use Class 1 wire only or equivalent.
- Suitable for pollution degree 2 environment only.
- Connected to 5 V bus only.
- See manual for all input and output ratings.
- Maximum surrounding air temperature is 40 °C or 60 °C for following modules:

  700-321-1BH02
  700-321-1BL00
  700-322-1BH01
  700-322-1BL00
  700-323-1BH01
  700-323-1BL00
  700-321-1EL00
  700-321-1FH00)
- Date code in year and month of the manufacture on module.
- For Analog Output device 700-332-5HDxx and 700-332-5HBxx: These modules are intended to be powered by LVLC programmable controllers S7 series from Siemens.

2 Mounting

2.1 Foreword

This section describes planning of mechanical assembly, preparation of components for mounting, and final mounting itself.

2.2 Restriction of access

Only authorized persons must have access to the modules!

The DEA 300 module must be installed according to VDE 0100 IEC 364. The modules are open equipment and must only be installed in electrical equipment rooms, cabinets, or housings. Access to the electrical equipment rooms, barriers, or housings must only be possible using a tool or key and only permitted to personnel having received instruction or authorization. See also 1.6.

2.3 Planning assembly

The modules can be mounted either vertically or horizontally.

Permissible surrounding air temperature:

- for vertical mounting: from 0 to +40 °C
- for horizontal mounting: from 0 to +60 °C

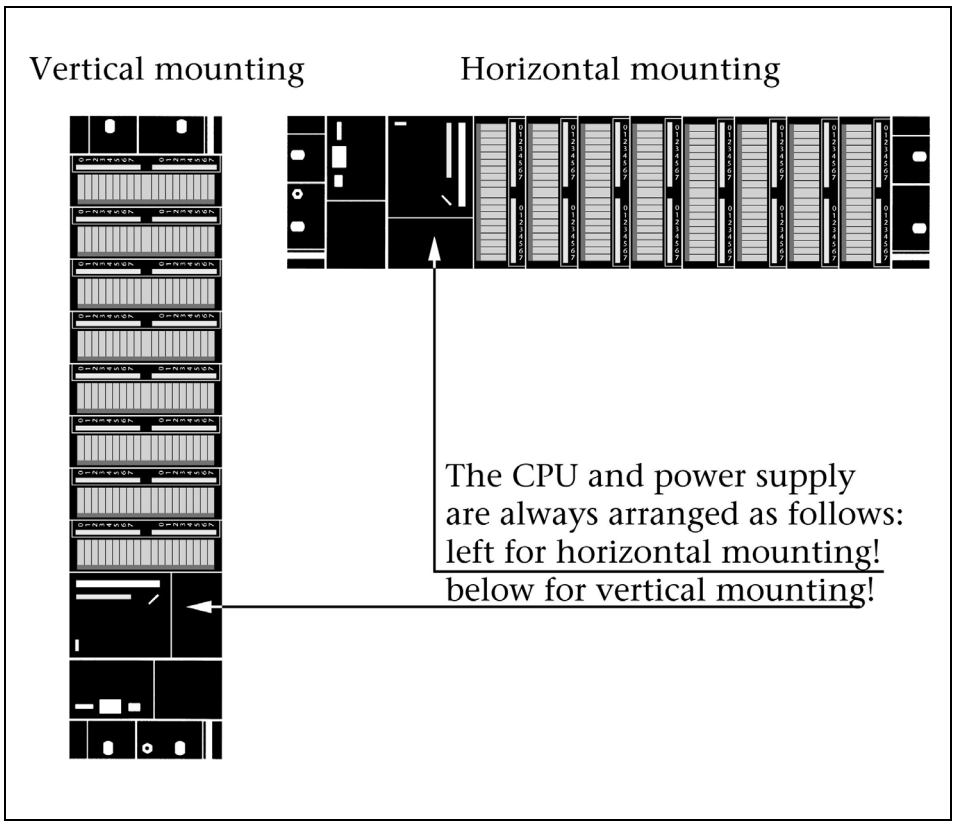


Fig. 2-1: Vertical and horizontal mounting

2.4 Minimum clearance

Non-observance of the minimum distances can destroy the module at high surrounding air temperature!

Minimum clearances must be observed because

- it ensures cooling of the DEA 300 modules
- it provides space to insert and remove modules
- it provides space to route cables
- it increases the mounting height of the module rack to 185 mm, although the minimum spacing of 40 mm must still be observed

Fig. 2-2 shows the minimum spacing between the module racks and between these and any adjacent cabinet walls, equipment, cable ducts, etc. for DEA 300s mounted in several module racks.

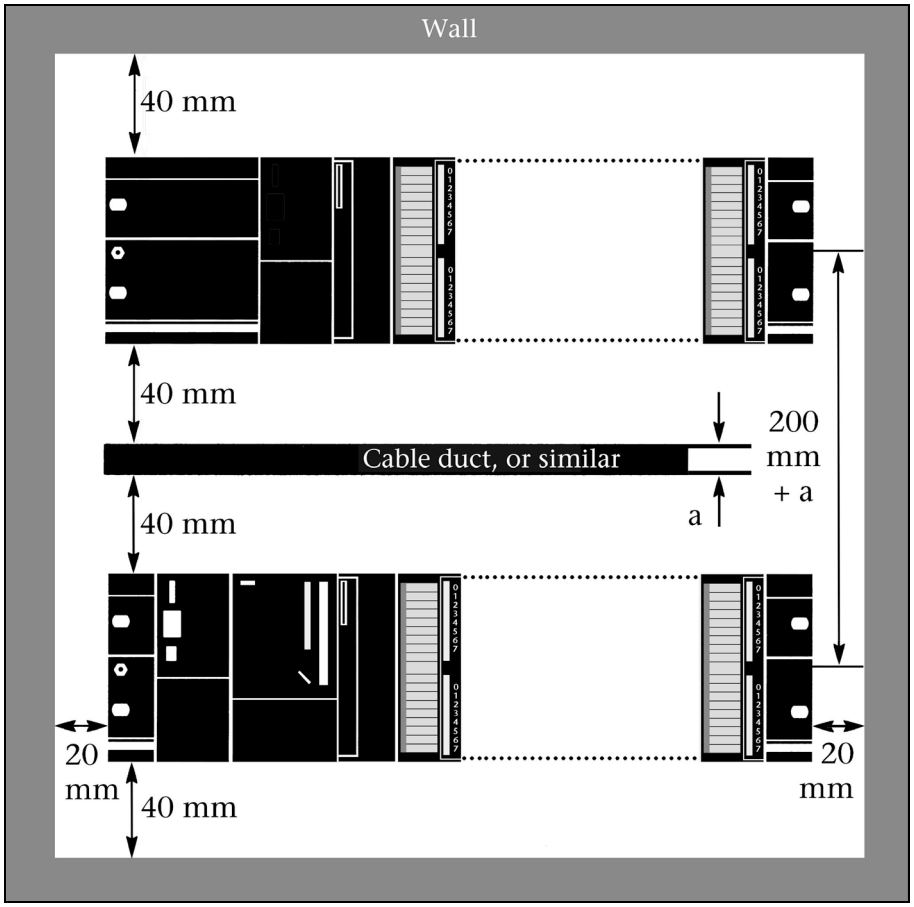


Fig. 2-2: Minimum clearances for mounting

2.5 Mounting of the modules on the DIN rail

Sectional rail 700-390-1xxxx length see chapter 5 Ordering data.

A bus connector is included with each signal module but not with the CPU. When connecting the bus connector, always start with the CPU.

Take the bus connector off the last module and insert it into the CPU. Do not plug a bus connector into the last module of the tier.

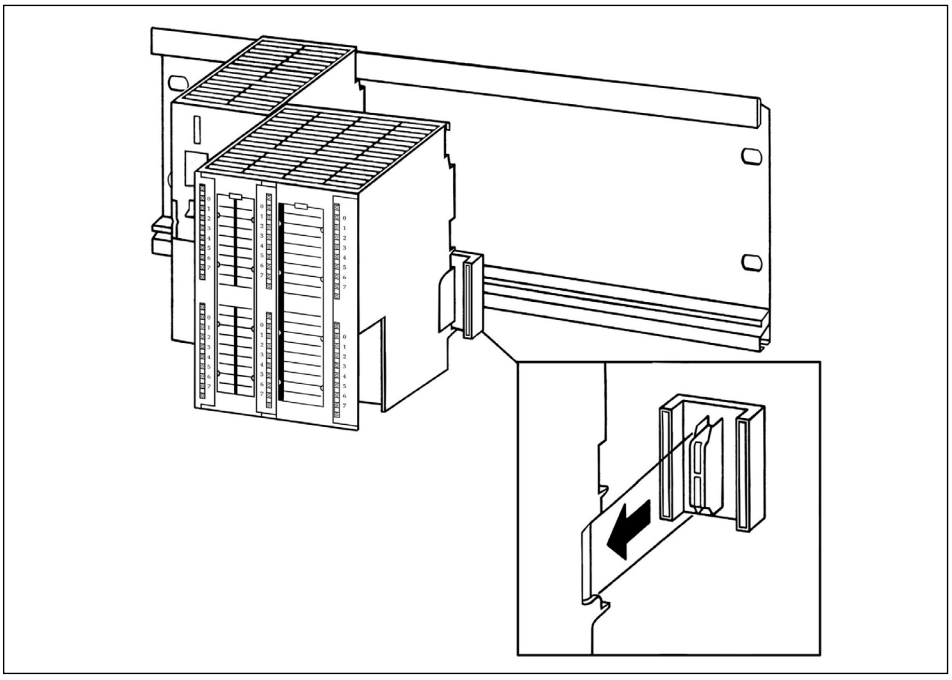


Fig. 2-3:
Plugging in bus connectors

Hook on the modules (1), slide them up to the left module (2), and click them downward (3).

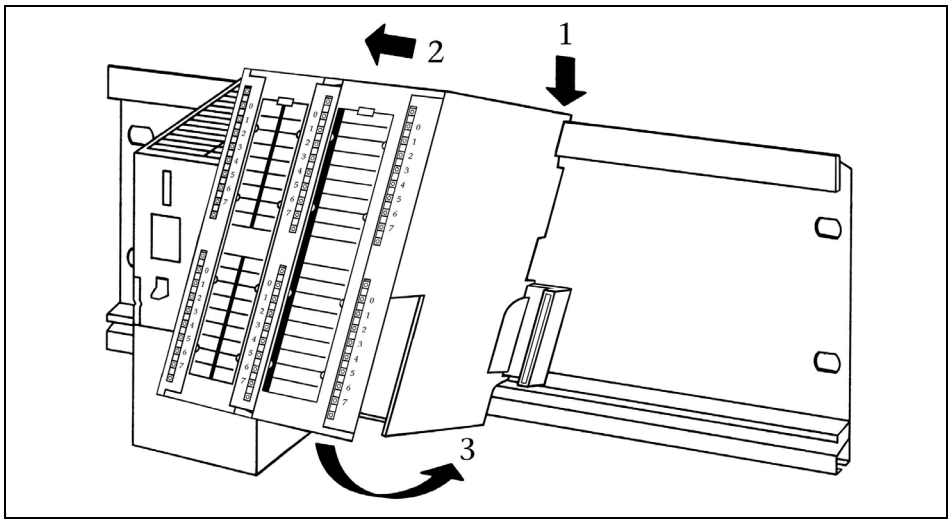


Fig. 2-4:
Using modules

Screw the modules on with a torque of 0.8 to 1.1 Nm.

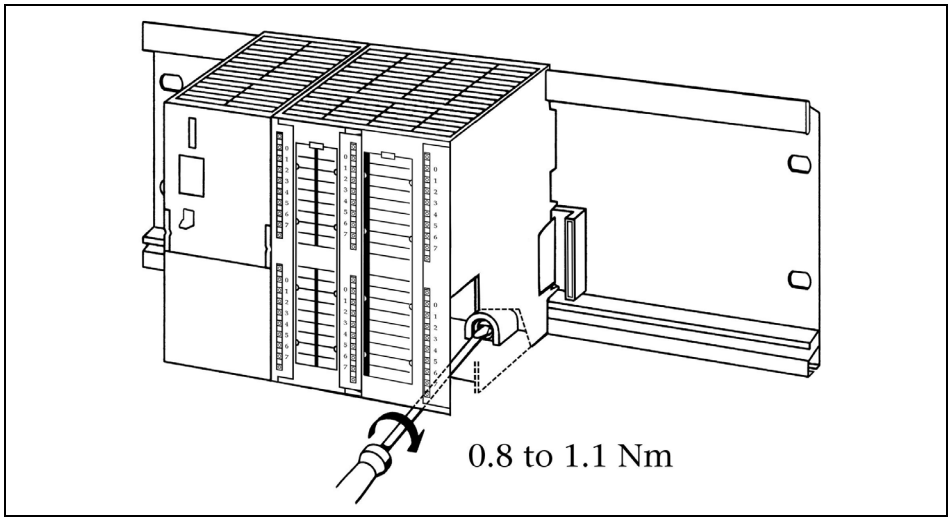


Fig. 2-5:
Screwing modules tight

3 Wiring

3.1 Protection from external electric interference

On all systems and plants in which the DEA 300 modules are installed, it is important to ensure that the system or plant is connected to a protective ground conductor to remove electromagnetic interference.

Makes sure that all supply, signal, and bus cables are correctly installed and that cable routing is correct.

Make sure, for all signal and bus cables, that a conductor or cable break cannot cause undefined states of the system or plant.

3.2 Current consumption and power loss

When dimensioning the cabinet make sure the temperature in the cabinet does not exceed 60 °C even if the outside temperature is high.

DEA 300 modules draw the power they require to operate from the backplane bus. Where required, they can be powered from an external source.

- The total current consumption of **all** signal modules drawn from the backplane bus must **not** exceed the current the CPU can supply to the backplane bus.
- The power loss of **all** modules used in a cabinet must not exceed the maximum cabinet power that can be dissipated.

For information about current consumption and power loss of a module, see the technical data of the module in question.

3.3 Mounting isolated modules

Isolated modules can be used irrespective of whether the reference potential of the controller is grounded or not.

In an assembly containing isolated modules, the reference potentials of the control circuit (GND internal) and the external load circuit (GND external) are mutually isolated.

Isolated modules are used for DC load circuits with a separate reference potential.

Examples of load circuits with a separate reference potential:

- DC load circuits whose sensors have different reference potentials, for example, if grounded sensors are used at a great distance from the controller making equipotential bonding between them impossible.
- DC load circuits, whose plus pole (L +) is grounded.

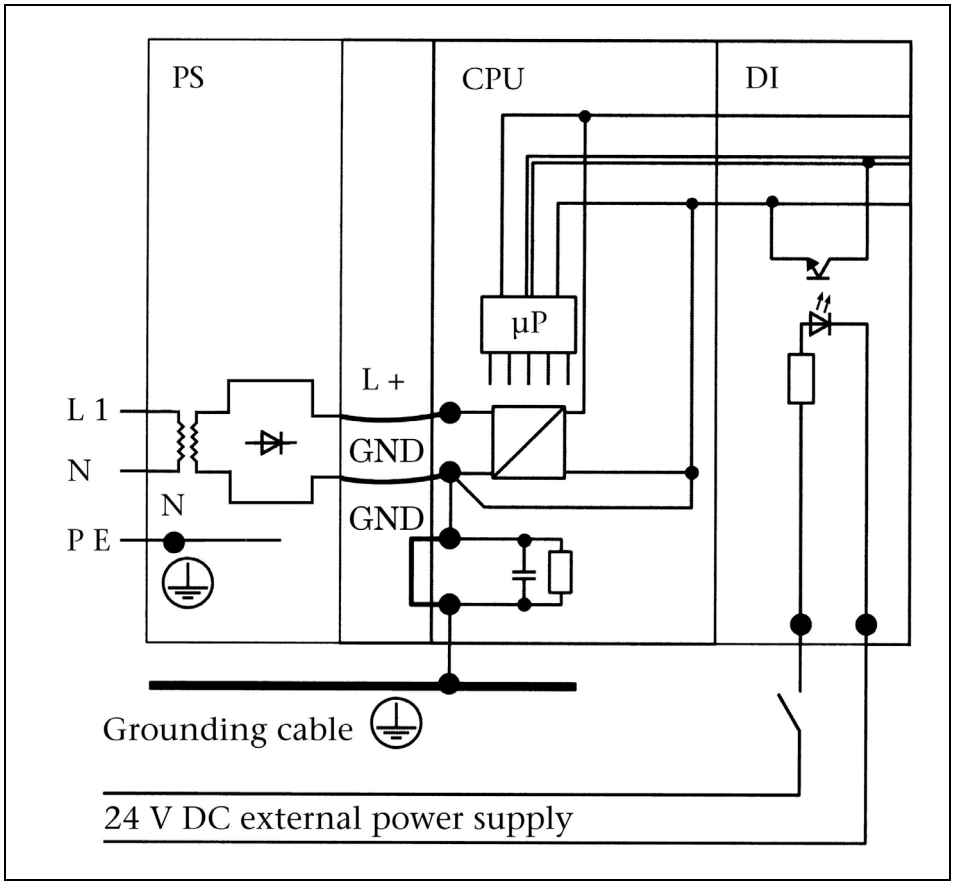


Fig. 3-1:
Potentials in an isolated module assembly

3.4 Outdoor cable laying

Lighting protection must always be based on an individual assessment of the overall plant.

- The same guidelines apply as for indoor cable laying.
- The cables must be laid on metal cable trays.
- Joints between cable trays must be conductively connected.
- Cable trays must be grounded.
- Adequate equipotential bonding between connected devices must also be ensured.
- Interior and exterior lightning protection must be ensured and such grounding measures must be taken as are suitable for the application in question.

3.5 Protection from inductive overvoltages

The inductor supplier will provide information about the dimensioning of overvoltage protection equipment.

The DEA 300 digital output modules feature integrated overvoltage protection. Overvoltages arise when inductors are switched off, for example, relay solenoids and contactors.

Inductors only have to be provided with additional overvoltage protection if:

- the outputs can be switched off by additional built-in contacts, such as relay contacts.
- the inductors are not controlled by the modules.

Fig. 3-2 shows an example of an output circuit requiring additional overvoltage protection.

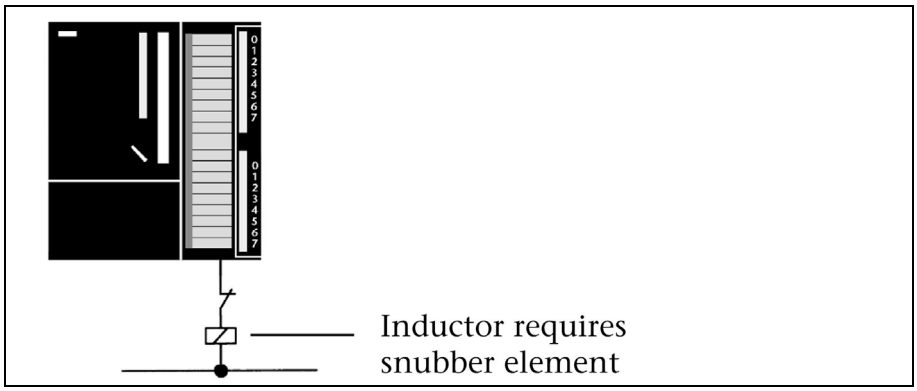


Fig. 3-2:
Relay contact for EMERG. OFF in the output circuit

DC-operated solenoids must be connected with diodes or Zener diodes.

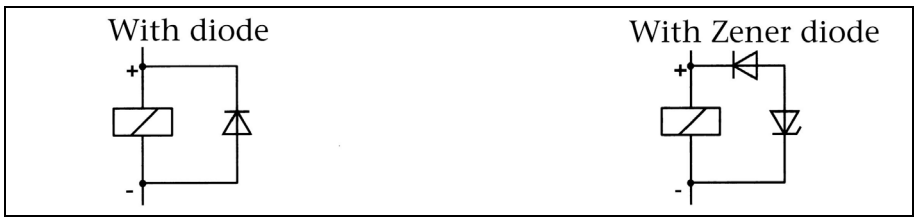


Fig. 3-3:
Relay with snubber element

AC-operated solenoids are operated with Varistors or RC elements.

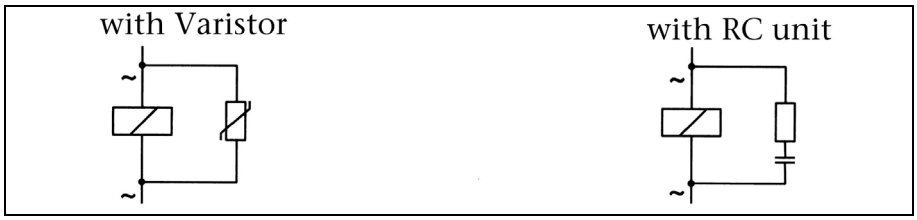


Fig. 3-4:
Relay with snubber element

3.6 Wiring the DEA 300 front connector

40-way front connector with screw-type terminal:
Order No 700-392-1AM01

20-way front connector with screw-type terminal:
Order No 700-392-1AJ10

40-way front connector with spring-type terminal:
Order No 700-392-1BM01

20-way front connector with spring-type terminal:
Order No 700-392-1BJ01

40-way front connector with **EasyConnect**®:
Order No 700-392-1AM10

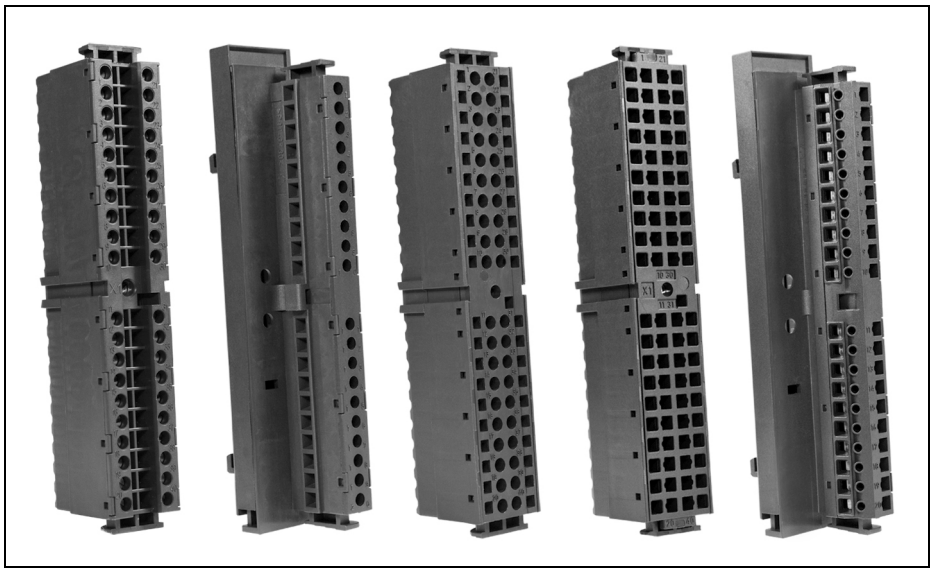


Fig. 3-5:
Helmholz 20- and 40-way front connector

3.6.1 Wire 40-way connector with screw-type terminal

Technical specifications

Order number	700-392-1AM01
Number of terminals	**40**
Terminal type	screw-type terminal
Connectable cables	flexible, fixed
Cross-section with/without end ferrules	0,125 – 1,5 mm²
Strip-back length	6 - 8 mm
end ferrules	with or without
Required torque, clamp	0,5 Nm
Required torque, screw	0,7 Nm
Weight	120 g

- With the cables brought out from the module at the bottom, start with terminal 40 or 20 and then proceed wiring alternately, in the sequence of order terminal 39, 19, 38, 18 etc.
- With the cables brought out from the module at the top, start with terminal 1 or 21 and then proceed wiring alternately in the sequence of order terminal 2, 22, 3, 23, etc. up to terminals 20 and 40.
- Close unused terminals.
- Lay the supplied strain relief around the cable loom and around the front connector.
- Screw the strain relief for the cable loom tight, press the lock of the strain relief to the left inside so that the cable space can be utilised more efficiently.

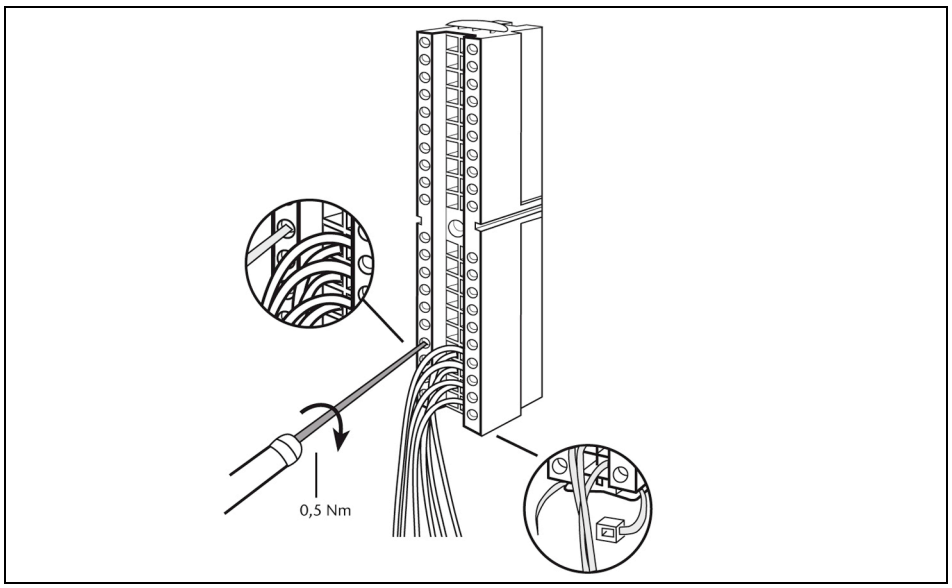


Fig. 3-6:
Wiring the 40-way front connector

3.6.2 Wire 20-way connector with screw-type terminal

Technical specifications

Order number	700-392-1AJ10
Number of terminals	**20**
Terminal type	screw-type terminal
Connectable cables	flexible, fixed
Cross-section with/without end ferrules	0,25 – 1,5 mm²
Strip-back length	6 mm
end ferrules	with or without
Required torque, clamp	0,5 Nm
Weight	60 g

- Open the DEA 300 modules (1).
- Snap the front connector into the signal module (2)

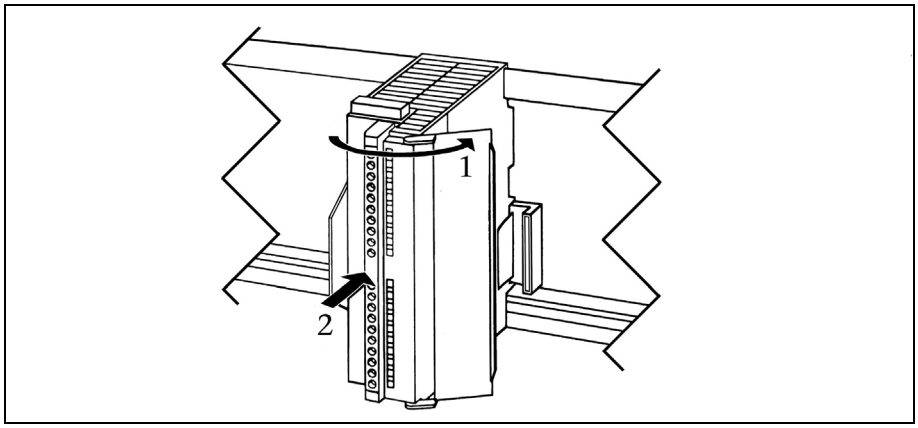


Fig. 3-7:
Bringing the front connector into the wiring position

- Strip the isolation from the cables.
- When using connector sleeves, crimp the sleeves with the cables.
- Insert the supplied strain relief for the loom of cables into the front connector (0).
- With the cables brought out from the module at the bottom, start with terminal 20 and then proceed wiring in the sequence of order terminal 20, 19, etc. (1) up to terminal 1 (2). Wiring front connectors

CAUTION: When the power supply module and, in some cases, additionally, the load power supplies are turned on, make absolutely sure that nobody is able to come into contact with alive lines or cables.

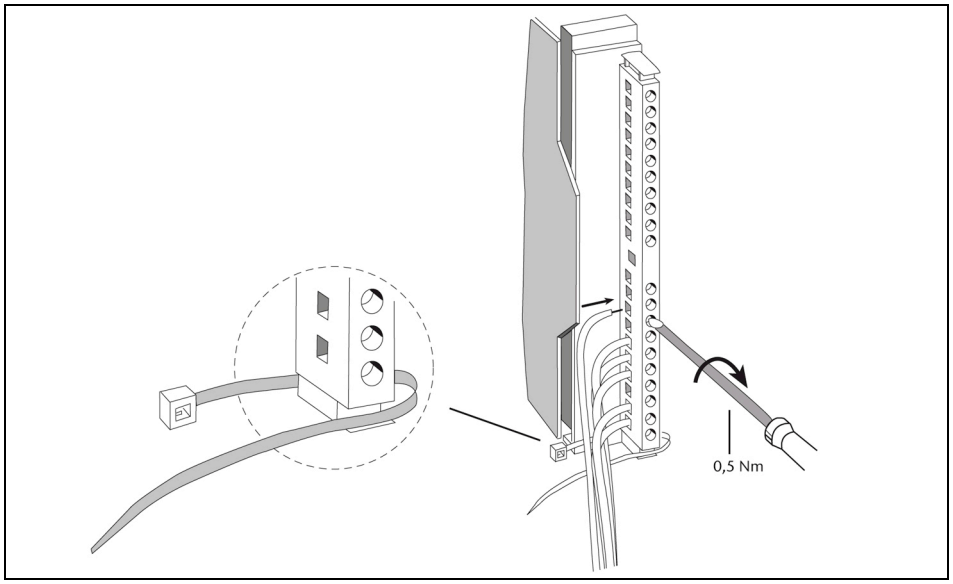


Fig. 3-8:
Wiring the 20-way front connector

- With the cables brought out from the module at the top, start with terminal 1 and then proceed wiring in the sequence of order terminal 1, 2, etc. up to terminal 20.
- In the case of screw-type terminals (3), screw tight also the connection screws of those screw-type terminals which are not wired.
- Tighten the strain relief for the loom of cables (4).
- Press the lock of the strain relief to the left inside so that the cable space can be utilised more efficiently.

3.6.3 Wire 40-way connector with spring contacts

Technical specifications

Order number	700-392-1BM01
Number of terminals	**40**
Terminal type	spring contacts
Connectable cables	flexible, fixed
Cross-section with/without end ferrules	0,34 – 1,5 mm²
Strip-back length	8 mm
Weight	Approx. 70 g

The unlock mechanism of the front connector with spring contacts could be damaged easily by edgewise movements of the screwdriver or by using the wrong screwdriver.
Use always the right tool to open the unlock mechanism!

Easy wiring of front connector with spring contacts: put a screwdriver (for slotted grub screws 0,6 x 3,5) vertically into the chamber with the unlock mechanism until mechanical stop, plug the wire into the spring contact and remove the screwdriver.

Cable routing is similar to the 40 way front connector with screw contacts.

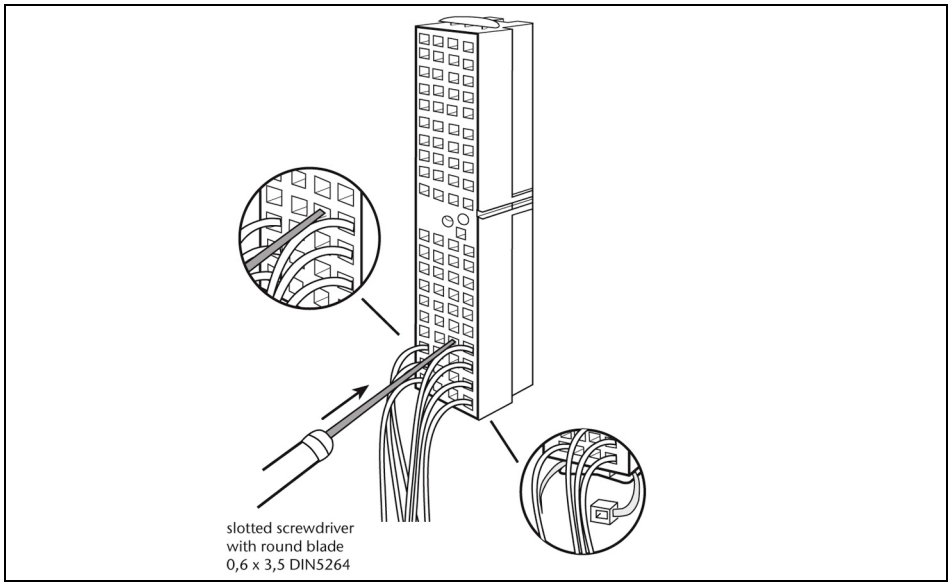


Fig. 3-9:
Wiring the 40-way front connector

3.6.4 Wire 20-way connector with spring contacts

Technical specifications

Order number	700-392-1BJ01
Number of terminals	**20**
Terminal type	spring contacts
Connectable cables	flexible, fixed
Cross-section with/without end ferrules	0,34 – 1,5 mm²
Strip-back length	8 mm
Weight	Approx. 50 g

The unlock mechanism of the front connector with spring contacts could be damaged easily by edgewise movements of the screwdriver or by using the wrong screwdriver.
Use always the right tool to open the unlock mechanism!

Easy wiring of front connector with spring contacts: put a screwdriver (for slotted grub screws 0,6 x 3,5) vertically into the chamber with the green unlock mechanism until mechanical stop, plug the wire into the spring contact and remove the screwdriver.

Cable routing is similar to the 20 way front connector with screw contacts.

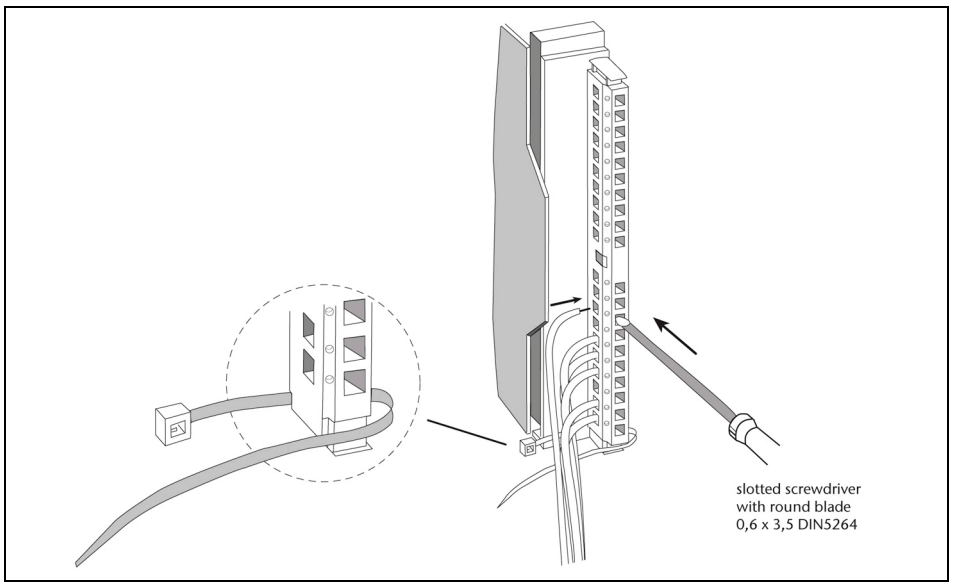


Fig 3-10:
Wiring the 20-way front connector

3.6.5 Wire 40-way connector with **EasyConnect®** clamp connection technique

Technical specifications

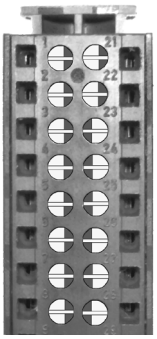
Order number	700-392-1AM10
Number of terminals	**40**
Terminal type	Spring
Connectable cables	Flexible cables
Cross-section without end ferrules	0.34 – 1 mm²
Strip-back length	8 – 10 mm
Wire end ferrules	Not required
Open terminal	180° turn counter clockwise
Close terminal	180° turn clockwise
Required torque, clamp	0.15 Nm
Required torque, screw	0.7 Nm
Weight	70 g

Tighten terminals with fingers only, do not use a power screwdriver!

The terminals are supplied closed.

The eccentric screws are marked with a beveled side. If the beveled – darker side – is turned toward the terminal, the terminal opens.

Counter clockwise - Open terminal
Clockwise - Close terminal



The figure shows Terminals 21 and 22 open.

To avoid material fatigue, always close unused terminals!

The eccentric screw is only used to open the terminal, it has no fixing function. Although the screw will still turn a few degrees on a closed terminal, this will not make the connection any more secure!

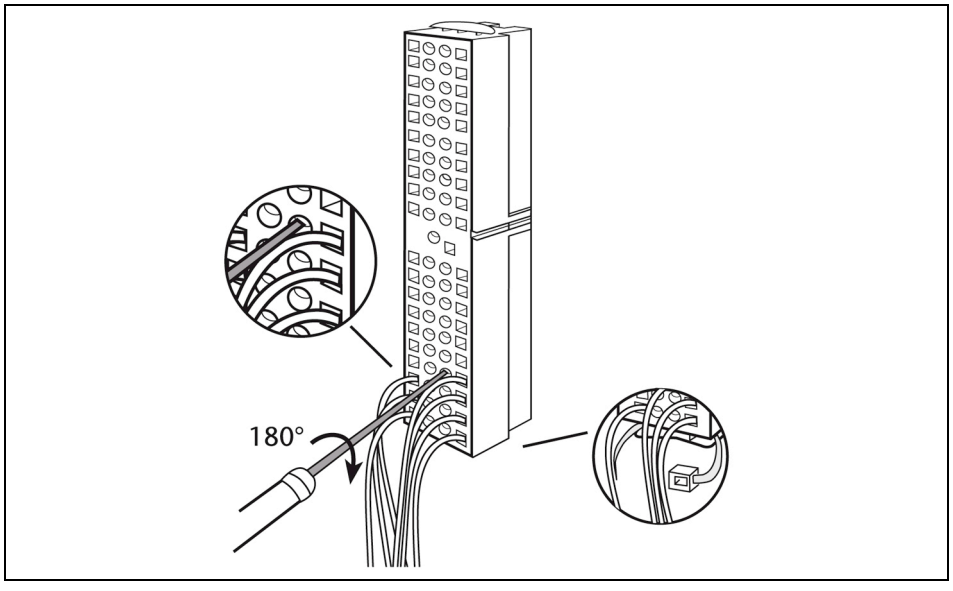


Fig 3-11: Wiring the 40-way front connector

4 Digital Modules

4.1 Foreword

Different digital modules are available for connection of sensors and encoders and/or loads and actuators.

This section provides the technical data of the digital modules. It also provides information about features, exceptions, module view, and block diagrams of the digital modules.

4.2 Digital input modules

The following digital input modules are described in this section:

- 700-321-1BL00 DI 32 x 24 V DC
- 700-321-1BH02 DI 16 x 24 V DC
- 700-321-1BH50 DI 16 x 24 V DC Source Input
- 700-321-7BH01 DI 16 x 24 V DC with Hardware and Diagnostic Interrupts
- 700-321-1EL00 DI 32 x 120 V AC
- 700-321-1FH00 DI 16 x 120/230 V AC

4.2.1 DEA DI 32 x 24 V DC

Order number: 700-321-1BL00

The DI 32 x 24 V DC has the following features:

- 32 inputs, isolated from the backplane bus
- Nominal input voltage 24 V DC
- Connection of 2-wire proximity switches is possible

Fig. 4-1 shows the block diagram of the DEA DI 32 x 24 V DC, followed by the technical data.

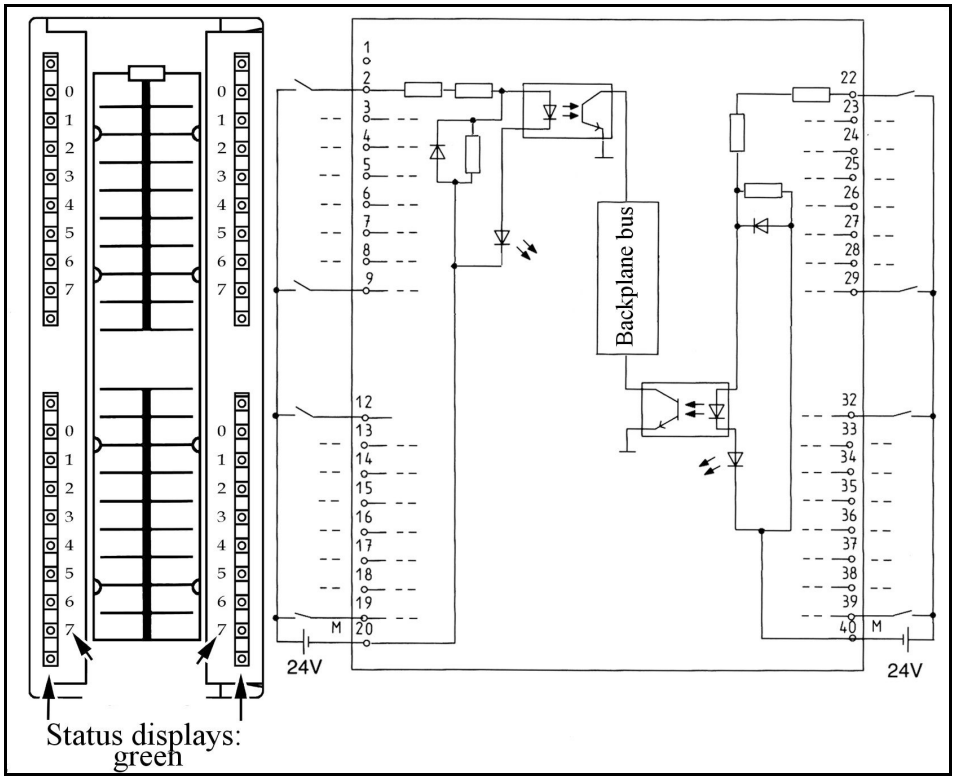


Fig. 4-1:
View of module and block diagram of DI 32 x 24 V DC

Technical data

Order number	**700-321-1BL00**
Number of inputs	**32**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	16
Input voltage	
• nominal value	DC 24 V
• for signal "0"	-3 ... +5 V
• for signal "1"	+13 ... +30 V
Input current	
• for signal "1"	typ. 7 mA
Delay time	typ. 1.2 ... 4.8 ms
Connection of 2-wire initiator	yes
permissible quiescent current for signal "0"	max. 1.5 mA
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 20 mA
• external	-
Power loss (nominal operation)	typ. 6.8 W
• surrounding air temperature	0 °C ... +60 °C
• temperature during transport and storage	-25 °C ... +75 °C

Weight	260 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	40-way

4.2.2 DEA DI 16 x 24 V DC

Order number: 700-321-1BH02

The DI 16 x 24 V DC has the following features:

- 16 inputs, isolated from the backplane bus
- Nominal input voltage DC 24 V
- Connection of 2-wire proximity switches is possible

Fig. 4-2 shows the block diagram of the DEA DI 16 x 24 V DC, followed by the technical data.

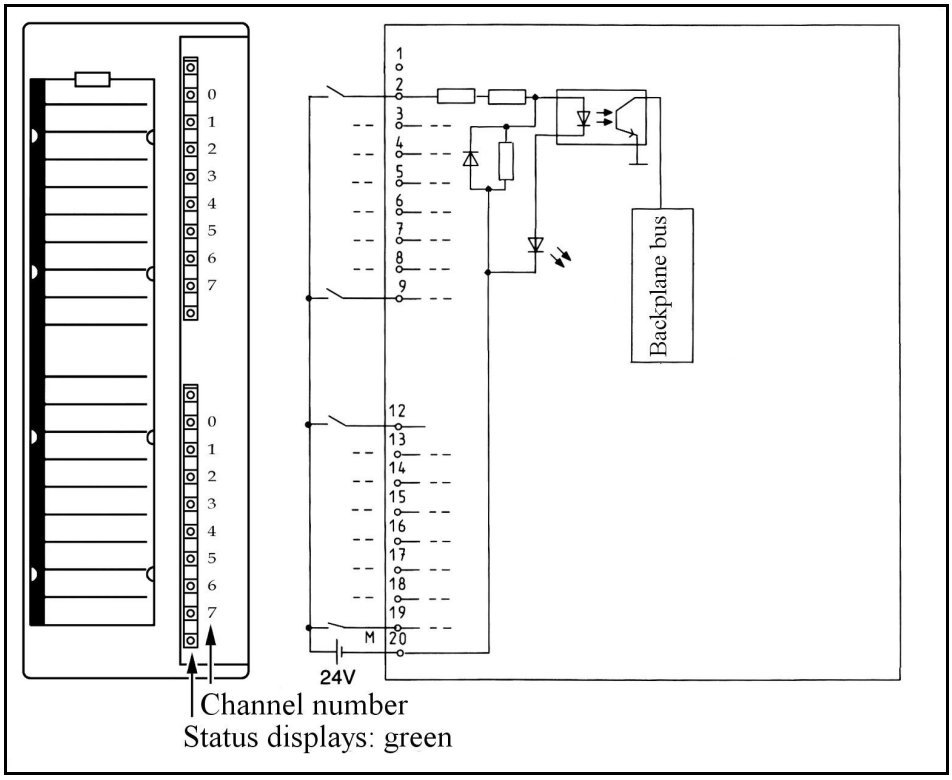


Fig. 4-2: View of module and block diagram of DI 16 x 24 V DC

Technical data

Order number	**700-321-1BH02**
Number of inputs	**16**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	16
Input voltage	
• nominal value	DC 24 V
• for signal "0"	-3 ... +5 V
• for signal "1"	+13 ... +30 V
Input current	
• for signal "1"	typ. 7 mA

Delay time	typ.1.2 ... 4.8 ms
Connection of 2-wire initiator • permissible quiescent current for signal "0"	yes max. 1.5 mA
Cable length unshielded Cable length shielded	max. 600 m max. 1000 m
Current consumption • internal • external	 typ. 20 mA max. 140 mA
Power loss (nominal operation)	typ. 3.5 W
• surrounding air temperature • temperature during transport and storage	0 °C ... +60 °C -25 °C ... +75 °C
Weight Dimensions W x H x D [mm] Front connector	180 g 40 x 125 x 117 20-way

4.2.3 DEA DI 16 x 24 V DC Source Input

Order number: 700-321-1BH50

The DI 16 x 24 V DC source input has the following features:

- 16 inputs, source input, isolated in groups of 16
- 24 V DC rated input voltage
- Suitable for switches and two / three / four-wire proximity switches (BEROs)

Fig. 4-3 shows the block diagram of the DI 16 x 24 V DC (source input), followed by the technical data.

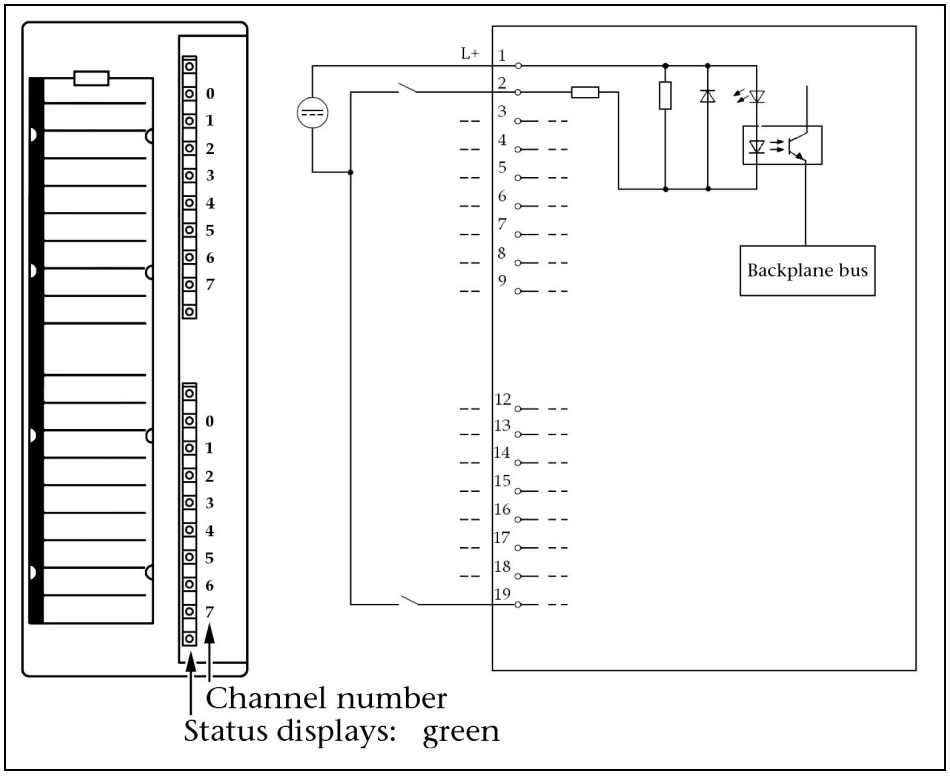


Fig. 4-3: View of module and block diagram of DI 16 x 24 V DC (source input)

Technical data	
Order number	**700-321-1BH50**
Number of inputs	**16**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	16
Input voltage, reference potential L+	
• nominal value	24 V DC
• for signal "0"	+30 ... -5 V
• for signal "1"	-13 ... -30 V
Input current	
• for signal "1"	typ. 7 mA
Delay time	typ. 1,2 ... 4,8 ms
Connection of 2-wire initiator	yes
• permissible quiescent current for signal "0"	max. 1,5 mA
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 10 mA
Power loss (nominal operation)	typ. 3,5 W
• surrounding air temperature	0 ... +60 °C
• temperature during transport and storage	-25 ... +75 °C
Weight	180 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	20-way

4.2.4 DEA DI 16 x 24 V DC with Hardware and Diagnostic Interrupts

Order number: 700-321-7BH01

The DI 16 x 24 VDC with hardware and diagnostic interrupts has the following features:

- 16 inputs, isolated in one group
- 24 VDC rated input voltage
- Input characteristic curve according to IEC 61131, Type 2
- Suitable for switches and two / three / four-wire BEROs (proximity switches)
- 2 short-circuit-proof sensor supplies for 8 channels each
- External redundant power supply possible to supply sensors
- “Sensor supply (Vs)” status display
- Group error display (SF)
- Supports the “parameter changing during the RUN” function
- Programmable diagnostics

- Programmable diagnostic interrupt
- Programmable hardware interrupt
- Programmable input delays

Fig. 4-4 shows the block diagram of the DEA DI 16 x 24 VDC with hardware and diagnostic interrupts, followed by the technical data.

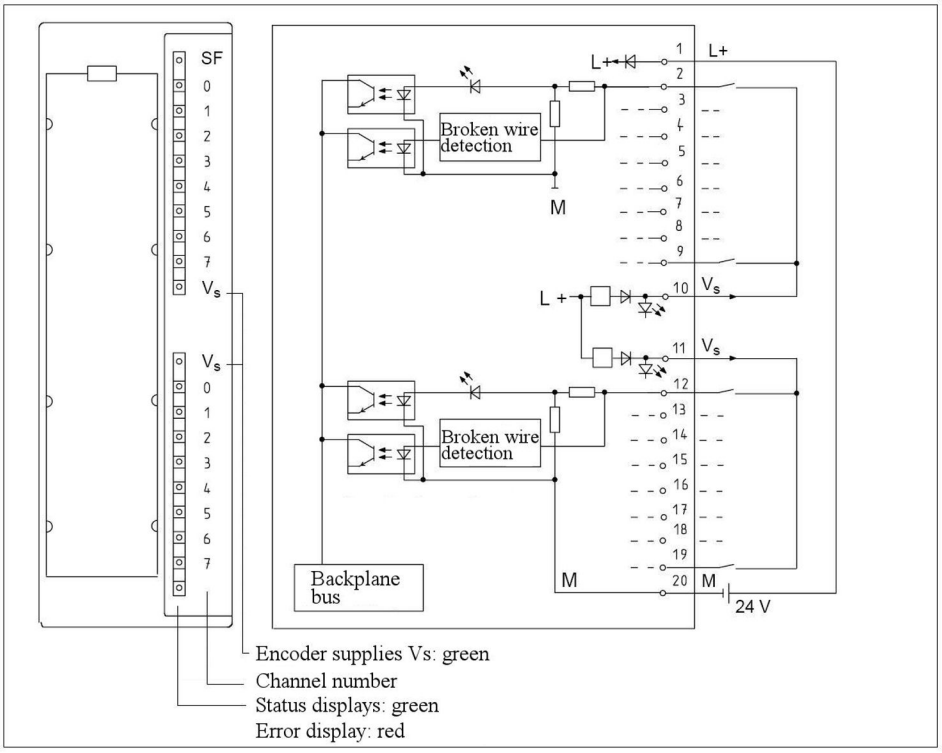


Fig. 4-4: View of module and block diagram of DI 16 x 24 V DC with hardware and diagnostic interrupts

Technical data **Order number**	**700-321-7BH01**
Number of inputs	**16**
Isolation (from backplane bus) in groups of	yes (via optocoupler) 16
Supports clocked operation	no
Parameter changing during the RUN is possible	yes
Behavior of the non parameterized inputs	gives the last valid output value before the parameterization
Interrupts	
• Diagnostic interrupt	Parameters can be assigned
• Hardware interrupt	Parameters can be assigned
Diagnostic functions	Parameters can be assigned
• Group error display	Red LED (SF)
• Diagnostics information read-out	Possible
Status display	
• Inputs	Green LED per channel

• Sensor power supplies (Vs)	Green LED per output
Monitoring of Wire-break	yes, at I < 1 mA
Power rated voltage of the electronics and encoder L+	DC 24 V
Sensor Power Supply Outputs	
• Number of outputs	2
• Output voltage with load	min. L+ (-2,5 V)
• Output current - Rated value	120 mA
• Output current - Permitted range	0 … 150 mA
• Additional redundant supply	Permitted
• Short-circuit protection	Yes, electronic
Input voltage	
• Rated value	DC 24 V
• For signal "1"	-30 … +5 V
• For signal "0"	+13 … +30 V
Input current	
• At signal "1"	typ. 7 mA
Input characteristic curve	According to IEC 61131, type 2
Connection of Two-Wire BEROs	Possible
Permitted bias current for Signal "0"	max. 2 mA
Resistive circuit of the sensor for detecting broken wires	10 … 18 kΩ
Length of cable unshielded	max. 600 m
Length of cable shielded	max. 1000 m
Time/Frequency	
Internal processing time for status processing (in non synchronous operation)	
• Release of process and diagnosis alarm	< 2 µs
Input delay (EV)	
• Parameters can be assigned	yes
• Rated value	typ. 0,1/0,5/3/15/20 ms
Current consumption	
• internal	max. 130 mA
• From load voltage L + without sensor supply V_s	max. 90 mA
Power loss (nominal operation)	typ. 4 W
• Surrounding air temperature	0 … +60 °C
• temperature during transport and storage	-25 … +75 °C
Weight	200 g
Dimensions W x H x D (in millimeters)	40 x 125 x 117
Front connector	40-way

4.2.4.1 Parameterising the module

Use STEP 7 to parameterise the digital module for 16 x 24 V DC with process and diagnostic interrupts. The parameterisation must be performed with the CPU in the STOP condition.

Once all parameters are defined, they can be loaded from the PG (programming device) into the CPU. When the mode state of the CPU changes from STOP to RUN, the parameters are transferred to the relevant digital modules.

4.2.4.2 Static and dynamic parameters

The parameters are divided into static and dynamic parameters.

The static parameters are set with the CPU in the STOP condition, as described above.

The dynamic parameters can also be modified in the currently running user program of the S7 control via SFC. In this case, please note that after a RUN → STOP / STOP → RUN change of the CPU the parameters set using STEP 7 are valid again.

Parameter	Settable with	CPU Operating State
Static	PG (STEP 7 HW CONFIG)	STOP
Dynamic	PG (STEP 7 HW CONFIG)	STOP
Dynamic	SFC 55 in the user program	RUN

4.2.4.3 Terminal assignment for redundant supply of encoders

The figure below shows how encoder can additionally be supplied by means of Vs with a redundant voltage source, for example, via another module.

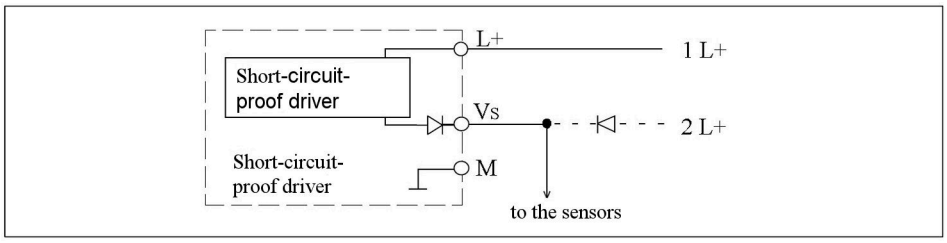


Fig. 4-5: Terminal assignment for redundant supply of encoders

4.2.4.4 Terminal assignment for resistive circuit of the encoder

In order to detect a broken wire, it is necessary to wire the encoder contact with a resistor.

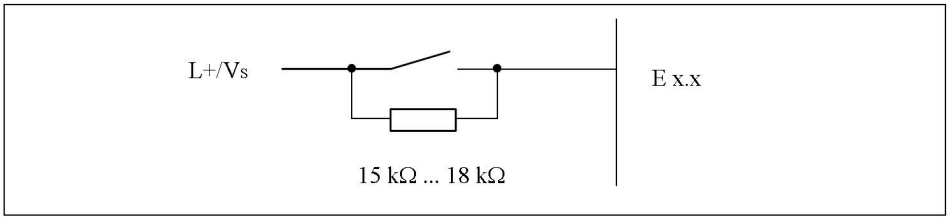


Fig. 4-6: Terminal assignment for resistive circuit of the encoder

4.2.4.5 Parameterisable and non-parameterisable diagnostic messages

Parameterisable and non-parameterisable diagnostic messages

A distinction is made between parameterisable and non-parameterisable diagnostic messages.

Parameterisable diagnostic messages are only available if diagnosis has been enabled by way of parameterisation. The parameterisation is performed in the parameter block "Diagnosis" in STEP 7.

The non-parameterisable diagnostic messages are always provided by the digital module, irrespective of whether or not diagnostics are enabled.

Actions after a diagnostic message in STEP 7

Each diagnostic message results in the following actions:

- The diagnostic message is entered in the diagnostics for the digital module and transferred to the CPU.
- The SF LED on the digital module lights up.
- If "Enable diagnostic interrupt" has been parameterised using STEP 7, a diagnostic interrupt is triggered, and OB 82 is called.

Reading out diagnostic messages

The individual diagnostic messages can be read out in detail using SFCs in the user program.

The corresponding error causes can be displayed in the module diagnostics of STEP 7 (see STEP 7 online help).

Display of diagnostic messages via the SF LED

Errors on digital modules which are capable of performing self-diagnostics are displayed using the SF LED (group error LED). The SF LED is lit as soon as a diagnostic message is triggered by the digital module. It goes out once all errors are rectified.

The SF LED will also light up in case of external errors (short-circuit of the encoder supply), irrespective of the operating condition of the CPU (with POWER ON).

Diagnostic messages interrupt processing by the digital modules

See Section 4.2.4.8.

4.2.4.6 Parameters of the 700-321-7BH01 DI 16 x DC 24 V

The table below provides an overview of the parameters which can be set, with their default settings for the module

700-321-7BH01 DI 16 x DC 24 V.

The default settings are only effective if no parameterisation has been performed with STEP 7.

Parameter	Value Range	Default Settings	Parameter Type	Scope
Enable				
• Diagnostic interrupt	Yes/no	No	Dynamic	Module
• Hardware interrupt	Yes/no	No	Dynamic	Module
Input delay/voltage type	0,1 ms DC 0,5 ms DC 3 ms DC 15 ms DC 20 ms DC/AC	3 ms DC	Static	Module
Diagnostics				
• Sensor supply missing	Yes/no	No	Static	Module
• Wire-break	Yes/no	nein	Static	Module
Trigger for hardware interrupt				
• Rising edge	Yes/no	No	Dynamic	Channel group
• Falling edge	Yes/no	No	Dynamic	Channel group

Assignment of the encoder supplies to the channel groups

The two encoder supplies for the module serve as the power supplies for two channel groups:

- Inputs 0 to 7;
- Inputs 8 to 15.

The diagnosis for this encoder supply is also parameterised in these channel groups.

Assigning interrupt parameters to channel groups

The table below shows the channels that can be combined to create a channel group if you would like to parameterize interrupt processing.

The channel group number is needed to set the parameters in the user program with an SFC.

Parameter	Can Be Set in Following Channel Groups	Channel Group Number
Hardware interrupt	0 and 1	0
for falling, rising or both	2 and 3	1
types of pulse	4 and 5	2
edges	6 and 7	3
	8 and 9	4
	10 and 11	5
	12 and 13	6
	14 and 15	7
Diagnostic interrupt	0 to 7	-
for missing sensor supply	8 to 15	-
Diagnostic interrupt	0 and 1	0
for wire–break	2 and 3	1
		:

Tolerances of the programmable input delays

Programmed Input delay	Tolerance
0,1 ms	60 to 140 µs
0,5 ms	400 to 900 ms
3 ms (preset)	2,6 to 3,3 ms
15 ms	12 to 15 ms
20 ms	17 to 23 ms

4.2.4.7 Behavior and Diagnostics of the Module 700-321-7BH01 DI 16 x DC 24 V

Effect of operating and mode supply voltage on the input values

The input values of the Module 700-321-7BH01 DI 1 x DC 24 V depend on the operating mode of the CPU and on the supply voltage of the module.

CPU Operating State		Power Supply L+ to Digital Module	Input Value of Digital Module
POWER ON	RUN	L+ exists	Process value
		L+ missing	0 signal
	STOP	L+ exists	Process value
		L+ missing	0 signal
POWER OFF	–	L+ exists	–
		L+ missing	–

4.2.4.8 Diagnostic Messages of the Module 700-321-7BH01 DI 16 x DC 24 V

Diagnostics Message	LED	Scope of the Diagnostics	Parameters can be assigned
Sensor supply missing	SF	Channel group	Yes
Wire-break	SF	Channel group	Yes
Module not parameterized	SF	Channel group	Yes
External auxiliary supply missing	SF	Module	No
Internal auxiliary power missing	SF	Module	No
Fuse blown	SF	Module	No
Incorrect parameter on module	SF	Module	No
Hardware interrupt lost	SF	Module	No

Note

If any errors are to be detected and displayed by way of parameterisable diagnostic messages, the digital module must be parameterised accordingly in STEP 7.

Behavior upon failure of the supply voltage

A failure of the supply voltage of the Module 700-321-7BH01 DI 16 x DC 24 V is always indicated by the SF LED on the module. In addition to the SF LED, this information is made available on the module.

The input value is initially held for 20 to 40 ms before the 0 signal is transferred to the CPU. Supply voltage dips < 20 ms do not modify the process value.

Failure of the supply voltage with redundant encoder incoming supply

Note

If an external redundant power supply is provided for the encoder supply (Vs), no failure of the encoder supply is signalled in case of failure of the supply voltage L+. However, a failure of the internal and/or external auxiliary voltage and/or a tripped fuse will be signalled.

Short-circuit of sensor supply Vs

In case of a short-circuit of the encoder supply Vs, the relevant Vs LED goes out, irrespective of the parameterisation.

Causes of error and remedial measures

Diagnostics Message	Possible Error Cause	Remedy
Lack of encoder supply	Overload of sensor supply	Eliminate overload
	Short circuit of sensor supply to M	Eliminate short circuit
External auxiliary voltage missing	Power supply L+ to module missing	Feed supply L+
Internal auxiliary voltage missing	Power supply L+ to module missing	Feed supply L+
	Fuse in module defective	Replace module
Fuse blown	Fuse in module defective	Replace module
Wrong parameters in module	One parameter or the combination of parameters is not plausible	Reassign module parameter
Hardware interrupt lost	The module cannot send an interrupt, since the previous interrupt was not acknowledged; configuration error possible	Change interrupt processing in CPU and reconfigure module parameters, if Required. The error continues until the module is configured with new parameters.
Module not parameterized	Fault during startup	Reassign module parameters

4.2.4.9 Interrupts of the Module 700-321-7BH01 DI 16 x DC 24 V

The interrupts are divided into:

- Diagnostic interrupt
- Hardware interrupt

Enabling interrupts

The interrupts are not preset – in other words, they are inhibited without appropriate parameter assignment. Assign parameters to the Interrupt Enable in STEP 7

Diagnostic interrupt

If diagnostic interrupts are enabled, then active error events (initial occurrence of the error) and departing error events (message after troubleshooting) are reported by means of an interrupt.

The CPU interrupts the execution of the user program and processes the diagnostic interrupt block (OB 82).

In the user program, you are able to call SFC 51 or SFC 59 in OB 82 to obtain more detailed diagnostic information from the module.

This diagnostic information is logical until such time as OB 82 is exited. When OB 82 is exited, the diagnostic interrupt is acknowledged on the module.

Hardware interrupt

The module 700-321-7BH01 DI 16 x DC 24 V can trigger a hardware interrupt for every channel group with a rising or falling edge, or both, of a signal status change.

Perform parameter assignment one channel group at a time. It can be modified at any time. In RUN mode using the user program.

Pending hardware interrupts trigger hardware interrupt processing in the CPU (OB 40). The CPU interrupts the execution of the user program or of the priority classes with low priority.

In the user-program of the hardware interrupt OB (OB 40) it can be established how the programmable logic controller has to react to should react to a flank-change. The process-alarm is acknowledged to with the abandonment of the Prozeßalarm-OBs on the module.

The module 700-321-7BH01 DI 16 x DC 24 V can buffer one interrupt per channel. If no higher priority run-time levels are waiting to be processed, the buffered interrupts of all modules are serviced one after the other by the CPU in accordance with the order in which they occurred.

Hardware interrupt lost

A diagnostic interrupt “hardware interrupt lost” will be triggered, if an interrupt has been buffered for a channel and another interrupt occurs on that channel before it has been processed by the CPU.

Further interrupts on this channel are not acquired until processing of the interrupt buffered on this channel has been executed.

Interrupt-triggering channels

The channel triggered by the hardware interrupt is entered in the start information of the OB 40 in the OB40_POINT_ADDR variable. Fig. 4-7 shows the assignment of the bits to the local data double word 8.

Byte	Variable	Data type		Description
6/7	OB40_MDL_ADDR	WORD	B#16#0	Address of the interrupt triggering module
from 8	OB40_POINT_ADDR	DWORD	See Fig. 4-7	Display of the interrupt triggering inputs

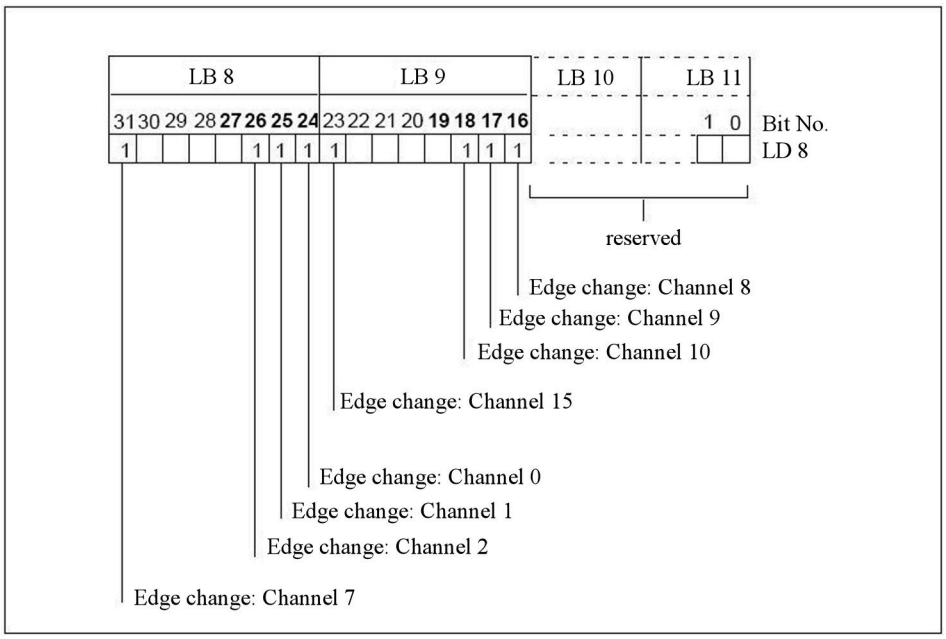


Fig. 4-7: Startinformation of OB 40

4.2.5 DEA DI 32 x 120 V AC

Order number: 700-321-1EL00

The DI 32 x 120 V AC has the following features:

- 32 inputs, isolated in 4 groups of 8 inputs, isolated from the backplane bus in 4 groups
- Nominal input voltage 120 V AC
- Inputs suitable for switches
- Inputs suitable for 2/3-wire proximity switches (AC)

Fig. 4-8 shows the block diagram of the DEA DI 16/DO 16 x 24 V DC/0.5 A, followed by the technical data.

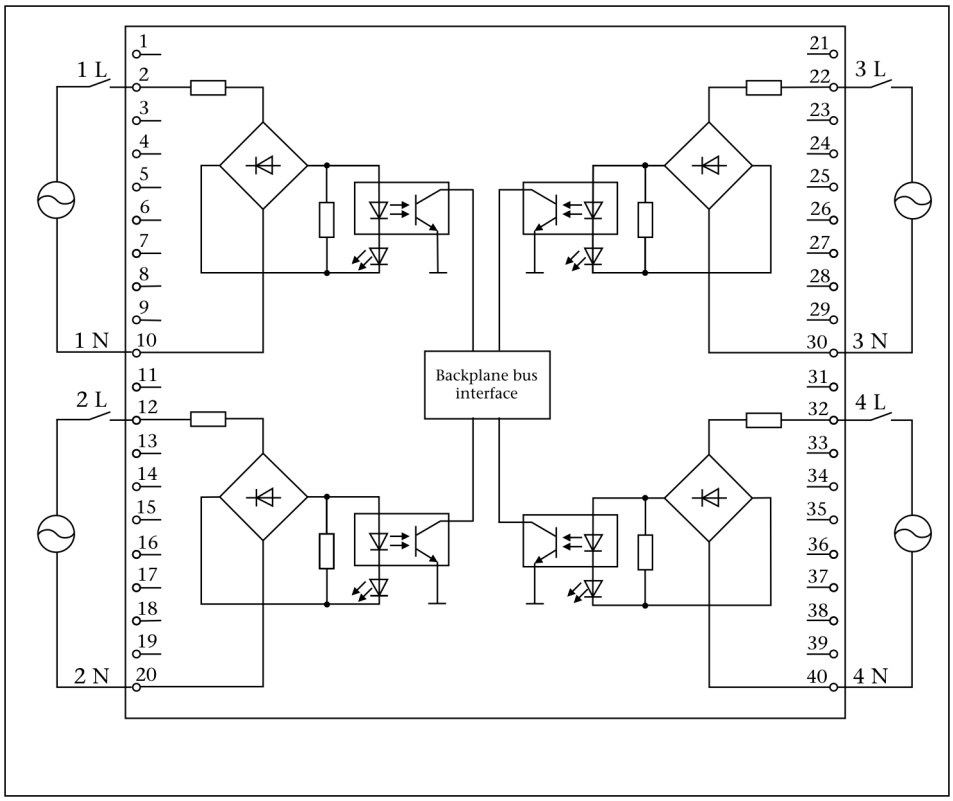


Fig. 4-8:
View of module and block diagram of DI 32 x 120 V AC

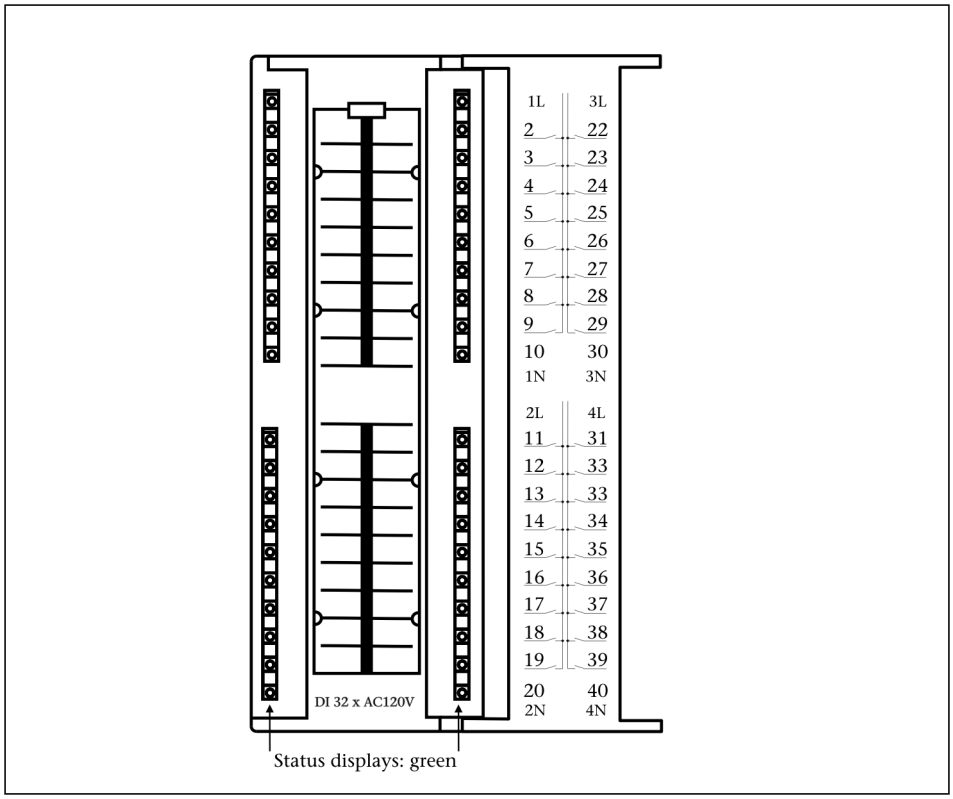


Fig. 4-9:
Module view of DI 32 x 120 V AC

Technical specifications

Order number	**700-321-1EL00**
Number of outputs	**32**
Isolation from backplane bus	Yes (optocoupler)
in groups of	8
Input voltage	
• nominal value	120 V AC
• for signal "0"	0 ... 20 V
• for signal "1"	74 ... 132 V
• Frequency range	47 … 63 Hz
Input current for signal "1"	
• 120 V, 60 Hz	typ. 22 mA
Delay time	
• form "0" to "1"	typ. 15 ms
• from "1" ro "0"	typ. 25 ms
Supports clocked operation	nein
Connection of 2-wire initiator	ja
• permissible quiescent current for signal "0"	max. 4 mA
Input characteristic curve	According to IEC 61131, type 2
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Permissible potential difference	
• between $GND_{internal}$ and the inputs	120 V AC
• between the inputs of different groups	250 V AC
Status display, Alarm, Diagnostic funktions	
Status display	green LED per channel
Alarm	no
Diagnostic functions	none
Current consumption internal	typ. 16 mA
Power loss (nominal operation)	typ. 5,8 W
• surrounding air temperature horizontal or vertical mounting number of inputs that can be triggered simultaneously	0 ... +40 °C 32
• surrounding air temperature only vertical mounting number of inputs that can be triggered simultaneously	0 ... +60 °C 24
• temperature during transport and storage	-25 ... +75 °C
Weight	240 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	40-way

4.2.6 DEA DI 16 x 120/230 V AC

Order number: 700-321-1FH00

The DI 16 x 120/230 V AC has the following features:

- 16 inputs, isolated in 4 groups of 4 inputs,
  isolated from the backplane bus in 4 groups
- Nominal input voltage 120/230 V AC
- Inputs suitable for 2/3-wire proximity switches (AC)

Fig. 4-10 shows the block diagram of the DEA DI 16 x 120/230 V AC, followed by the technical data.

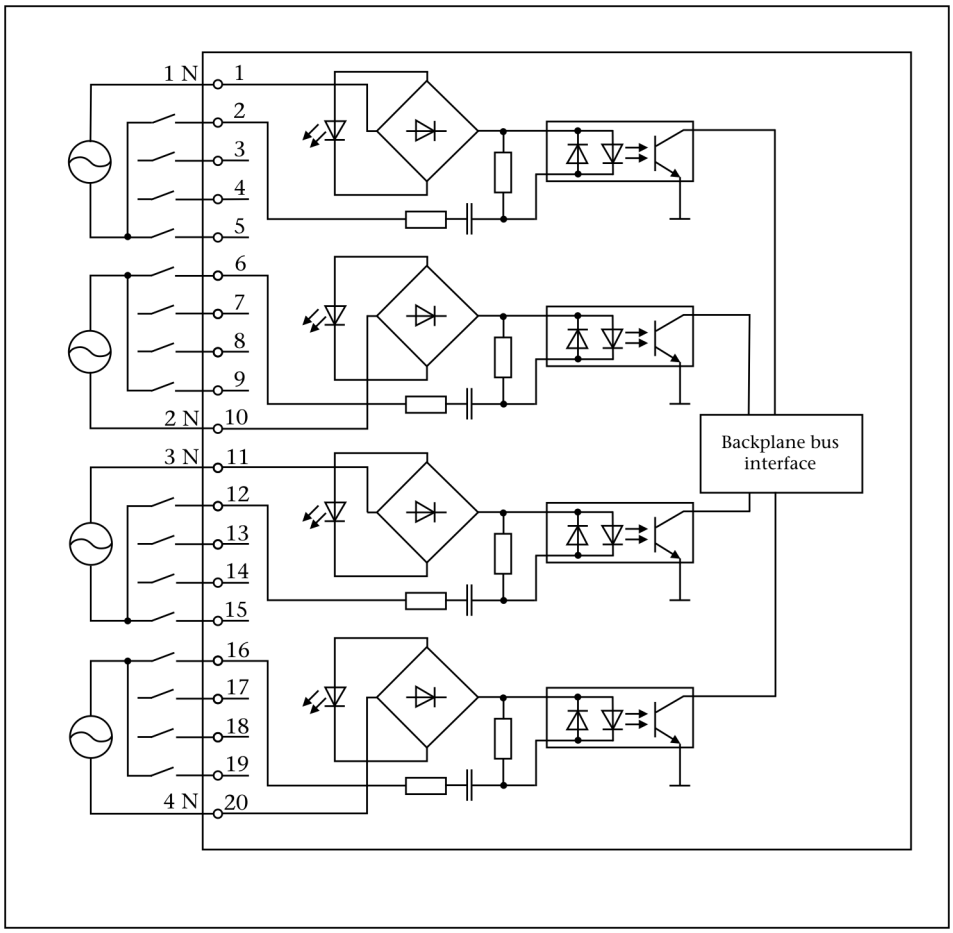


Fig. 4-10:
View of module and block diagram of
DI 16 x 120/230 V AC

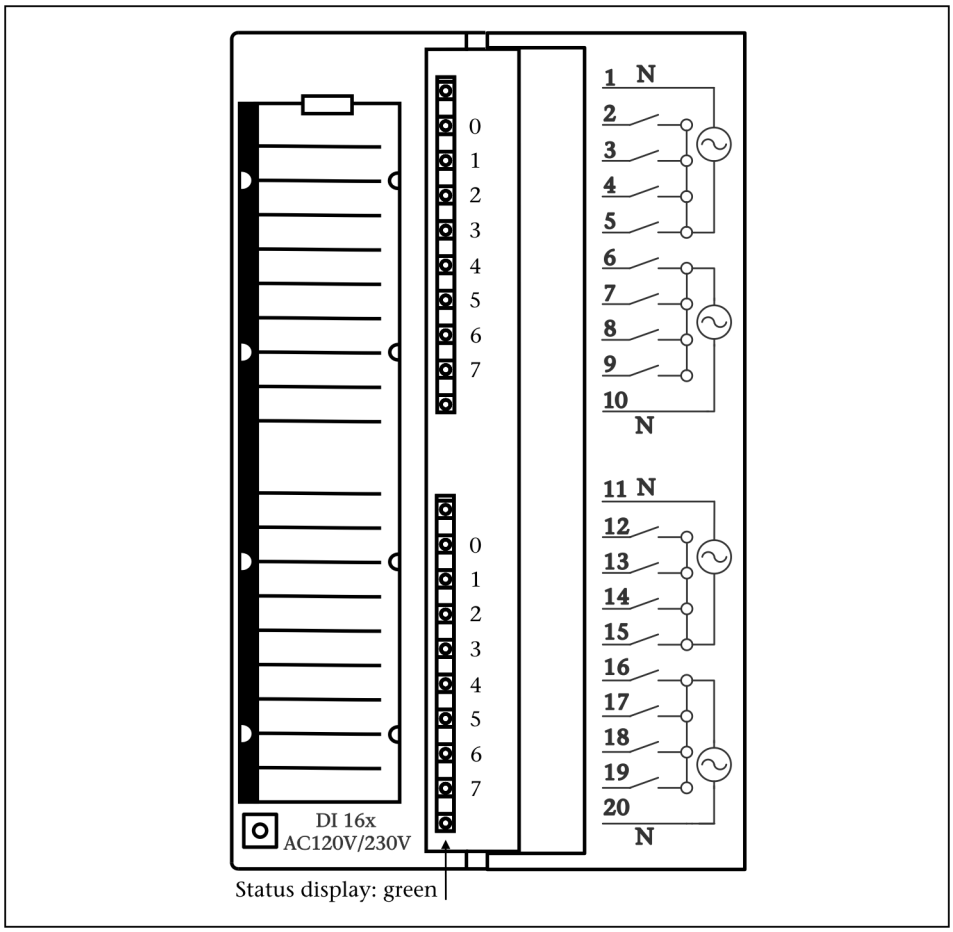


Fig. 4-11:
Module view of
DI 16 x 120/230 V AC

Technical specifications

Order number	**700-321-1FH00**
Number of outputs	**16**
Isolation from backplane bus	Yes (optocoupler)
in groups of	4
Input voltage	
• nominal value	120/230 VAC
all load voltages must be of the same phase	
• for signal "0"	0 ... 40 V
• for signal "1"	79 ... 264 V
• Frequency range	47 … 63 Hz
Input current for signal "1"	
• 120 V, 60 Hz	typ. 8,0 mA
• 230 V, 50 Hz	typ. 13 mA
Delay time	
• form "0" to "1"	typ. 25 ms
• from "1" ro "0"	typ. 25 ms
Input characteristic curve	According to IEC 61131, type 2
Supports clocked operation	nein
Connection of Two-Wire proximity switches	yes
• permissible quiescent current for signal "0"	max. 2 mA
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption internal	typ. 30 mA
Power loss (nominal operation)	typ. 4,5 W
Isolation	
• Between channels and backplane bus	yes
• Between channelsIn groups of	4
Permissible potential difference	
• between $GND_{internal}$ and the inputs	500 VAC
• between the inputs of different groups	230 VAC
Status display, Alarm, Diagnostic funktions	
Status display	green LED per channel
Alarm	no
Diagnostic functions	none
• surrounding air temperature	0 ... +40 °C
horizontal or vertical mounting	
number of inputs that can be triggered simultaneously	32
• surrounding air temperature	0 ... +60 °C
only vertical mounting	
number of inputs that can be triggered simultaneously	24
• temperature during transport and storage	-25 ... +75 °C
Weight	240 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	20-way

4.3 Digital output modules

This section describes the following digital output modules:

- 700-322-1BL00 DO 32 x 24 V DC /0.5 A
- 700-322-1BH01 DO 16 x 24 V DC /0.5 A

4.3.1 DEA DO 32 x 24 V DC/0.5 A

Order number: 700-322-1BL00

The DO 32 x 24 V DC/0.5 A has the following features:

- 32 outputs, isolated from the backplane bus
- Output current 0.5 A
- Nominal output voltage DC 24 V
- Suitable for solenoid valves, contactors, small-power motors, etc.

Fig. 4-12 shows the block diagram of the DEA DO 32 x 24 V DC/ 0.5 A, followed by the technical data.

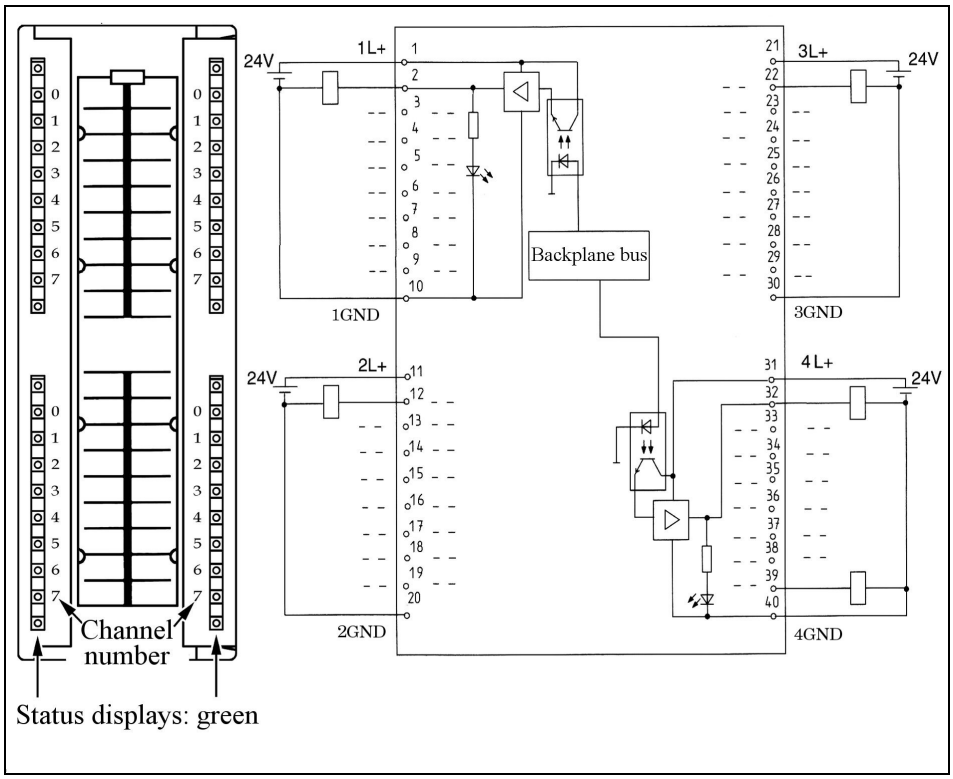


Fig. 4-12: View of module and block diagram of DO 32 x 24 V DC/0.5 A

Technical data

Order number	**700-322-1BL00**
Number of outputs	**32**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	8
Supply voltage U_P, U_S	
• nominal value	DC 24 V
• ripple V_{pp}	max. 3.6 V
• permissible range (with ripple)	20 ... 30 V
• value at 1 < 10 ms	max. 50 V
Output current	
• nominal value	0.5 A
• residual current	max. 0.5 mA
Short circuit protection	electronic
Limitation of inductive interrupting voltage to	-48 V
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 125 mA
• external without load	max. 200 mA
Power loss	typ. 6.8 W
• surrounding air temperature	0 °C ... +60 °C
• temperature during transport and storage	-25 °C ... +75 °C
Weight	260 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	40-way

4.3.2 DEA DO 16 x 24 V DC/0.5 A

Order number: 700-322-1BH01

The DO 16 x 24 V DC/0.5 A has the following features:

- 16 outputs, isolated from the backplane bus
- Output current 0.5 A
- Nominal output voltage DC 24 V
- Suitable for solenoid valves, contactors, small-power motors, etc.

Fig. 4-13 shows the block diagram of the DEA DO 16 x 24 V DC/0.5 A, followed by the technical data.

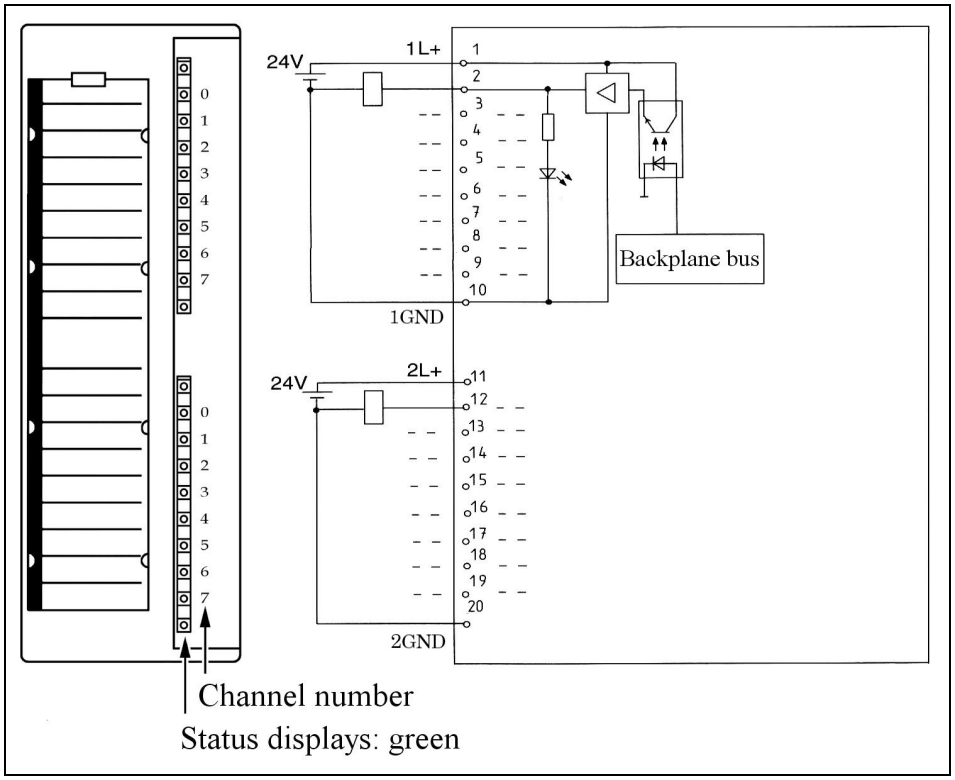


Fig. 4-13:
View of module and block diagram of DO 16 x 24 V DC/0.5 A

Technical data

Order number	**700-322-1BH01**
Number of outputs	**16**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	8
Supply voltage U_P, U_S	
• nominal value	DC 24 V
• ripple V_{pp}	max. 3.6 V
• permissible range (with ripple)	20 ... 30 V
• value at 1 < 10 ms	max. 50 V
Output current	
• nominal value	0.5 A
• residual current	max. 0.5 mA
Short circuit protection	electronic
Limitation of inductive interrupting voltage to	-48 V
Cable length unshielded	max. 600 m
Cable length shielded	max. 1 000 m
Current consumption	
• internal	typ. 100 mA
• external without load	max. 120 mA
Power loss	typ. 5 W
• surrounding air temperature	0 °C ... +60 °C
• temperature during transport and storage	-25 °C ... +75 °C
Weight	200 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	20-way

4.3.3 DEA DO 8 x 24 V DC/2.0 A

Order number: 700-322-1BF01

The DO 8 x 24 V DC/2.0 A has the following features:

- 8 outputs, isolated from the backplane bus
- Output current 2.0 A
- Nominal output voltage 24 V DC
- Inputs suitable for solenoid valves, contactors, small-power motors, etc.

Fig. 4-14 shows the block diagram of the DEA DO 8 x 24 V DC/2.0 A, followed by the technical data.

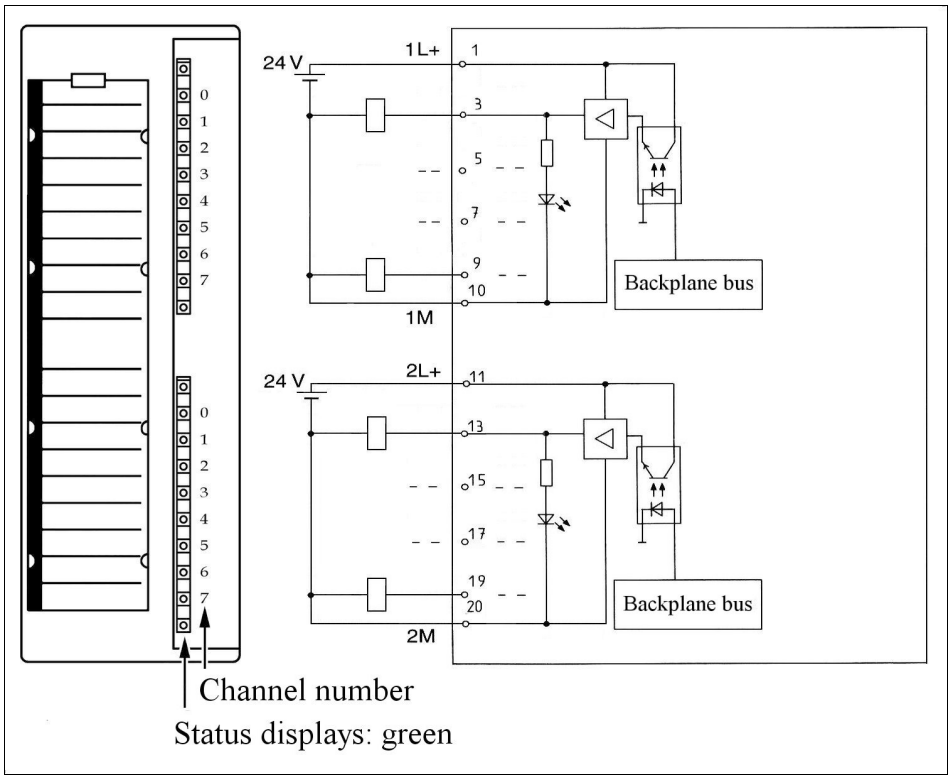


Fig. 4-14:
View of module and block diagram of DEA DO 8 x 24 V DC/2.0 A

Technical data

Order number	**700-322-1BF01**
Number of Outputs	**8**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	4
Supply voltage U_P, U_S	
• nominal value	DC 24 V
• ripple V_{pp}	max. 3.6 V
• permissible range (with ripple)	20 ... 30 V
Short circuit protection	electronic
Short circuit current - switched-mode	typ. 12 A
Limitation of inductive interrupting voltage to	-23 V
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 40 mA
• external without load	max. 60 mA
Power loss	typ. 6.8 W
• surrounding air temperature	0 °C ... +60 °C
• temperature during transport and storage	-25 °C ... +75 °C
Weight	190 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	20-way
Output voltage	
• at signal ”1”	min. L + (–0.8 V)
Output current	
• at signal ”1” rated value	2 A
permitted range	5 mA to 2.4 A
• at signal ”0” (leakage current)	max. 0.5 mA
Output delay (for resistive load)	
• from “0” to “1”	max. 100 µs
• from “1” to “0”	max. 500 µs
Load resistance range	12 Ω to 4 kΩ
Lamp load	max. 10 W
Parallel connection of 2 outputs	
• for redundant triggering of a load	possible (only outputs of the same group)
• to increase performance	not possible
Triggering a digital input	possible
Switch rate max.	
• for resistive load	max. 100 Hz
• Inductive loads according to IEC 947-5-1, DC 13	max. 0.5 Hz
• For lamp load	max. 10 Hz

4.4 Digital input/output modules

This section describes the following digital input/output modules:

- 700-323-1BL00 DI 16/DO 16 x 24 V DC / 0.5 A
- 700-323-1BH01 DI 8/DO 8 x 24 V DC / 0.5 A

4.4.1 DEA DI 16/DO 16 x 24 V DC/0.5 A

Order number: 700-323-1BL00

The DI 16/DO 16 x 24 V DC/0.5 A has the following features:

- 16 inputs, isolated from the backplane bus
- 16 outputs, isolated from the backplane bus
- Nominal input voltage DC 24 V
- Nominal output voltage DC 24 V
- Inputs suitable for switches and 2-wire proximity switches (BEROs)
- Inputs suitable for solenoid valves, contactors, small-power motors, etc.

Fig. 4-15 shows the block diagram of the DEA DI 16/DO 16 x 24 V DC/0.5 A, followed by the technical data.

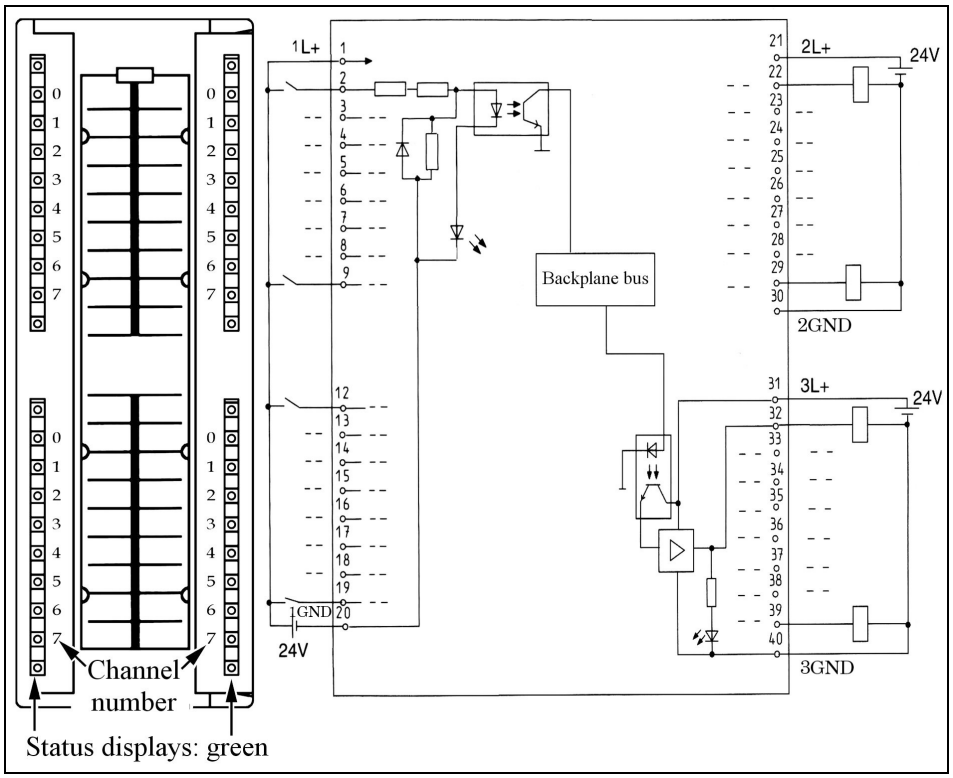


Fig. 4-15: View of module and block diagram of DI 16/DO 16 x 24 V DC/0.5 A

Technical data

Order number	**700-323-1BL00**
Number of inputs	**16**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	16
Input voltage	
• nominal value	DC 24 V
• for signal "0"	-3 ... +5 V
• for signal "1"	+13 ... +30 V
Input current	
• for signal "1"	typ. 7 mA
Delay time	typ. 1.2 ... 4.8 ms
Connection of 2-wire initiator	yes
permissible quiescent current for signal "0"	max. 1.5 mA
Number of outputs	**16**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	8
Supply voltage U_P, U_S	
• nominal value	DC 24 V
• ripple V_{pp}	max. 3.6 V
• permissible range (with ripple)	20 ... 30 V
• value at 1 < 10 ms	max. 50 V
Output current	
• nominal value	0.5 A
• residual current	max. 0.5 mA
Short circuit protection	electronic
Limitation of inductive interrupting voltage to	-48 V
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 90 mA
• external without load	max. 120 mA
Power loss	typ. 6.8 W
• surrounding air temperature	0 °C ... +60 °C
• temperature during transport and storage	-25 °C ... +75 °C
Weight	260 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	40-way

4.4.2 DEA DI 8/DO 8 x 24 V DC/0.5 A

Order number: 700-323-1BH01

The DI 8/DO 8 x 24 V DC/0.5 A has the following features:

- 8 inputs, isolated from the backplane bus
- 8 outputs, isolated from the backplane bus
- Nominal input voltage 24 V DC
- Nominal output voltage 24 V DC
- Inputs suitable for switches and 2-wire proximity switches (BEROs)
- Inputs suitable for solenoid valves, contactors, small-power motors, etc.

Fig. 4-16 shows the block diagram of the DEA DI 8/DO 8 x 24 V DC/0.5 A, followed by the technical data.

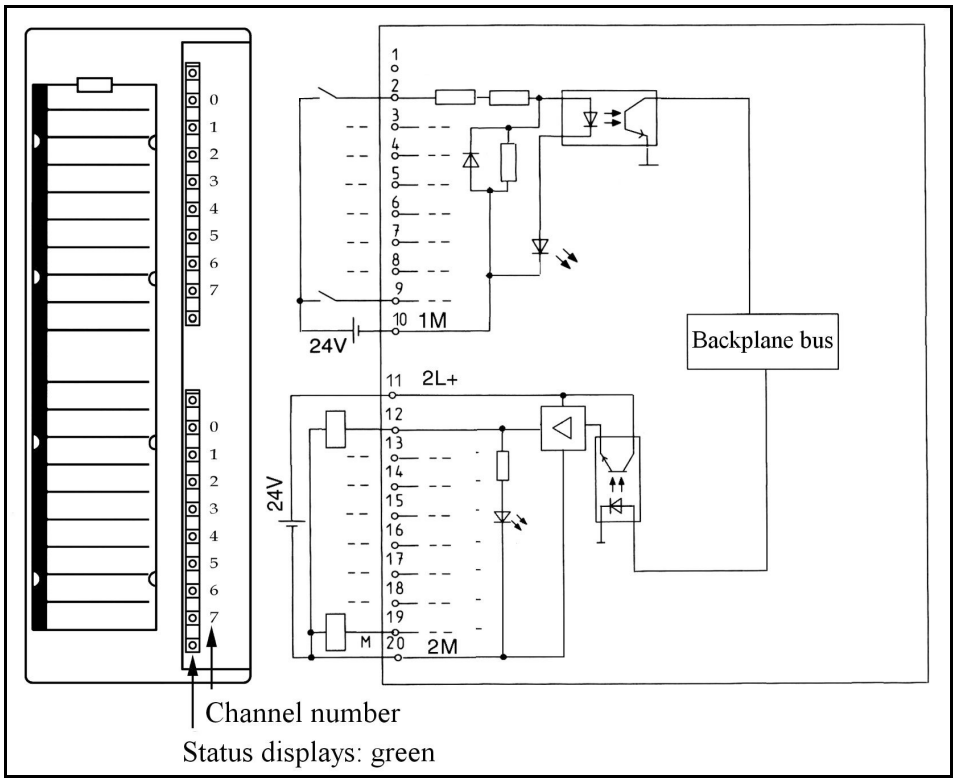


Fig. 4-16: View of module and block diagram of DI 8/DO 8 x 24 V DC/0.5 A

Technical data

Order number	**700-323-1BH01**
Number of inputs	**8**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	8
Input voltage	
• nominal value	DC 24 V
• for signal "0"	-3 ... +5 V
• for signal "1"	+13 ... +30 V
Input current	
• for signal "1"	typ. 7 mA
Delay time	typ. 1.2 ... 4.8 ms
Connection of 2-wire initiator	yes
• permissible quiescent current for signal "0"	max. 1.5 mA
Number of outputs	**8**
Isolation (from backplane bus)	yes (via optocoupler)
in groups of	8
Supply voltage U_P, U_S	
• nominal value	DC 24 V
• ripple V_{pp}	max. 3.6 V
• permissible range (with ripple)	20 ... 30 V
• value at 1 < 10 ms	max. 50 V
Output current	
• nominal value	0.5 A
• residual current	max. 0.5 mA
Short circuit protection	electronic
Limitation of inductive interrupting voltage to	-48 V
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 55 mA
• external without load	max. 60 mA
Power loss	typ. 3.5 W
• surrounding air temperature	0 °C ... +60 °C
• temperature during transport and storage	-25 °C ... +75 °C
Weight	200 g
Dimensions W x H x D [mm]	40 x 125 x 117
Front connector	20-way

4.5 Relay output modules

This section deals with the following relay output modules:

- 700-322-1HF10 8 outputs relay 5 A
- 700-322-1HF20 8 outputs relay 5 A with suppressor
- 700-322-1HH01 16 outputs relay 2 A
- 700-322-1HF01 8 outputs relay 2 A
- 700-322-1HF30 16 outputs relay 0.5 A bistable

4.5.1 DEA DO 8 x Rel. V AC 230/5 A

Order number: 700-322-1HF10

The DO 8 230 V AC/5 A has the following properties:

- 8 outputs, floating in groups of 1
- Load voltage DC 24 V to 120 V; AC 48 V to 230 V
- Suitable for AC/DC solenoid valves, contactors, motor starters, small-power motors, and indicator lights

Fig. 4-17 shows the block diagram of the DEA DO 8 relays 230 V/5 A AC, followed by the technical specifications.

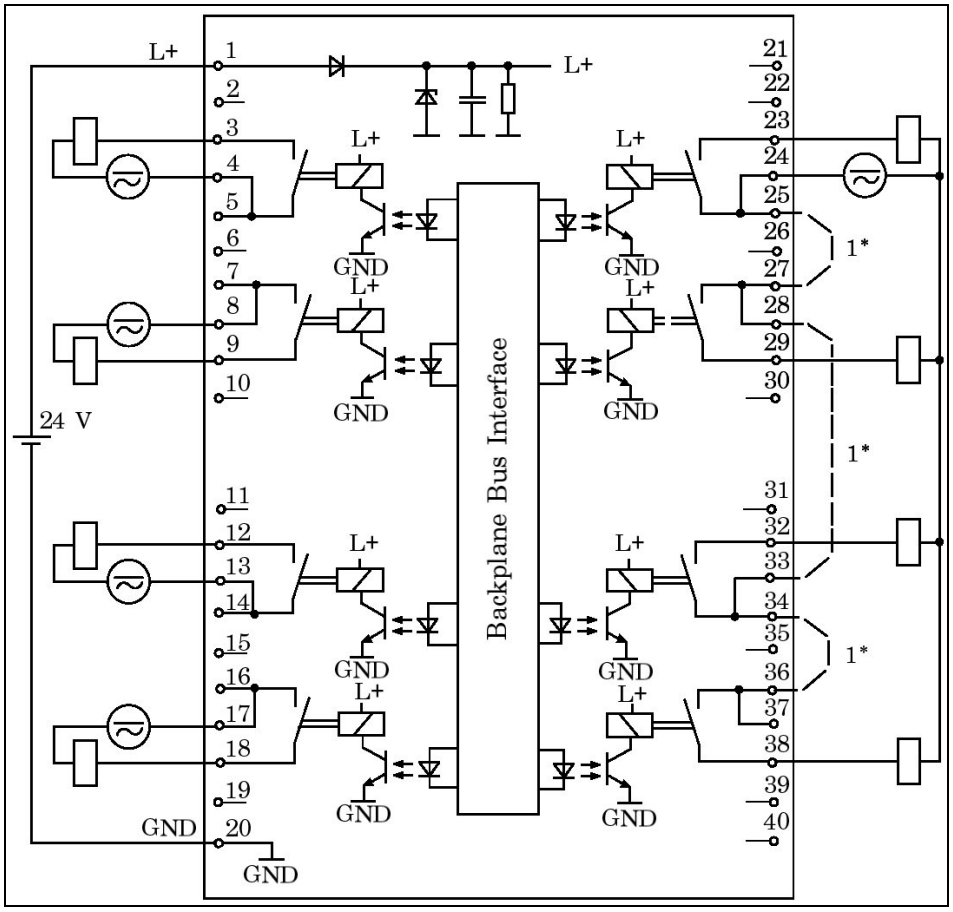


Fig. 4-17: View of module and block diagram of DO 8 x 230 V AC/5 A

1* Further wiring of the contact supply:
Total current ≤8 A at surrounding air temperature ≤30 °C
Total current ≤5 A at surrounding air temperature ≤60 °C

Technical specifications

Order number	**700-322-1HF10**
Number of outputs	**8**
Isolation from backplane bus	Yes (optocoupler)
Supply voltage of the relays L+	DC 24 V
Contact voltages	DC 24 to 120 V AC 48 to 230 V
Continuous thermal current	5 A per group
Horizontal mounting up to +30 °C	max. 8 A
up to +60 °C	max. 5 A
Vertical mounting up to +40 °C	max. 5 A
Minimum load voltage/load current	10 V/5 mA
Operation of a digital input	Possible
Short-circuit current acc. to IEC 947-5-1 with circuit-breaker with characteristic B	cos φ 1.0: 600 A cos φ 0.5...0.7: 900 A with fuse Diazed 8 A: 1000 A
Contact connection (internal)	none
Parallel connection of 2 outputs	
• for redundant operation of the load	Possible
• for power increase	Not possible
Operation of a digital input	Possible
Switching frequency	
• mechanical	max. 10 Hz
• with ohmic load	max. 2 Hz
• with inductive load, acc. to IEC947-5-1, DC13/AC15	max. 0.5 Hz
• with lamp load	max. 2 Hz
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 40 mA
• external	max. 125 mA
Power loss	typ. 4.2 W
Supports clocked operation	no
Status display	green LED per channel
Alarm	no
Diagnostic functions	none
• surrounding air temperature	0 °C to +60 °C
• Transportation and storage temperature	-25 °C to +75 °C
Dimensions W x H x D [mm]	40 x 125 x 120
Weight	approx. 350 g
Front connector	40-way

Permissible potential difference

• between $GND_{internal}$ and supply voltage of the relays	DC 75 V/ AC 60 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 250 V
• between the outputs of different groups	AC 500 V

Insulation test

• between $GND_{internal}$ and supply voltage of the relays	AC 500 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 1500 V
• between the outputs of different groups	AC 1500 V

Make/break capacity and life of contacts

Relay contact life can be extended using an external suppressor circuit.

	Voltage/current		Number of switching cycles, typical value [mill.]
• for ohmic load			
	DC 24 V	8.0 A	0.1
		4.0 A	0.3
		2.0 A	0.7
		0.5 A	4.0
	DC 60 V	0.5 A	4.0
	DC 120 V	0.2 A	1.6
	AC 48 V	8.0 A	0.1
		2.0 A	1.6
	AC 60 V	8.0 A	0.1
		2.0 A	1.2
	AC 120 V	8.0 A	0.1
		4.0 A	0.3
		2.0 A	0.5
		1.0 A	0.7
		0.5 A	1.5
	AC 230 V	8.0 A	0.1
		4.0 A	0.3
		2.0 A	0.5
		1.0 A	0.7
		0.5 A	1.5
• for inductive load acc. to IEC 947-5-1 DC13/AC15			
	DC 24 V	2.0 A	0.3
		1.0 A	0.5
		0.5 A	1.0
	DC 60 V	0.5 A	0.5
		0.3 A	1.0
	DC 120 V	0.2 A	0.5
	AC 48 V	3.0 A	0.5
		1.5 A	1.0
	AC 60 V	3.0 A	0.3
		1.5 A	1.0
	AC 120 V	3.0 A	0.2
		2.0 A	0.3
		1.0 A	0.7
		0.5 A	2.0
	AC 230 V	3.0 A	0.1
		2.0 A	0.3
		1.0 A	0.7
		0.5 A	2.0

Lamp load AC 230 V	Power	Number of switching cycles Typical value
	1000 W	25,000
	1500 W	10,000
Low-energy lamps/ fluorescent lamps with electronic ballast	10 * 58 W	25,000
Fluorescent lamps with conventional correction	1 * 58 W	25,000
Fluorescent lamps uncorrected	10 * 58 W	25,000

Operation with safety extra-low voltage

Operation with safety extra-low voltage

If the 322-1HF10 relay output module is used with isolated safety extra-low voltage, the following special aspect must be observed:

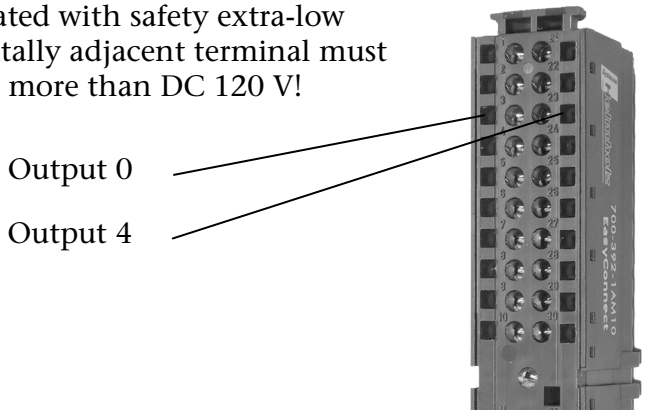
If a terminal is operated with isolated safety extra-low voltage, the (horizontally) adjacent terminal must only be operated with a nominal voltage of max. DC 120 V.

When operated with a voltage above DC 120 V, the clearances and creepage distances of the 40-way front connectors do not comply with the SELV requirements for safe electrical isolation.

Caution!
Special requirement of mixed operation with safety extra-low voltage.

If a terminal is operated with safety extra-low voltage, the horizontally adjacent terminal must be operated with no more than DC 120 V!

Example:



4.5.2 DEA DO 8 x Rel. 230 V AC/5 A with suppressor

Order number: 700-322-1HF20

The DO 8 x rel. 230 V AC/5 A with suppressor has the following properties:

- 8 outputs, floating in groups of 1
- Load voltage DC 24 V to 120 V; AC 24 V to 230 V
- Suitable for AC/DC solenoid valves, contactors, motor starters, small-power motors and indicator lights
- RC snubbers can be connected via jumper SJ to protect the contacts

Fig. 4-18 shows the block diagram of the DEA DO 8 x relay 230 V AC/5 A, followed by the technical specifications.

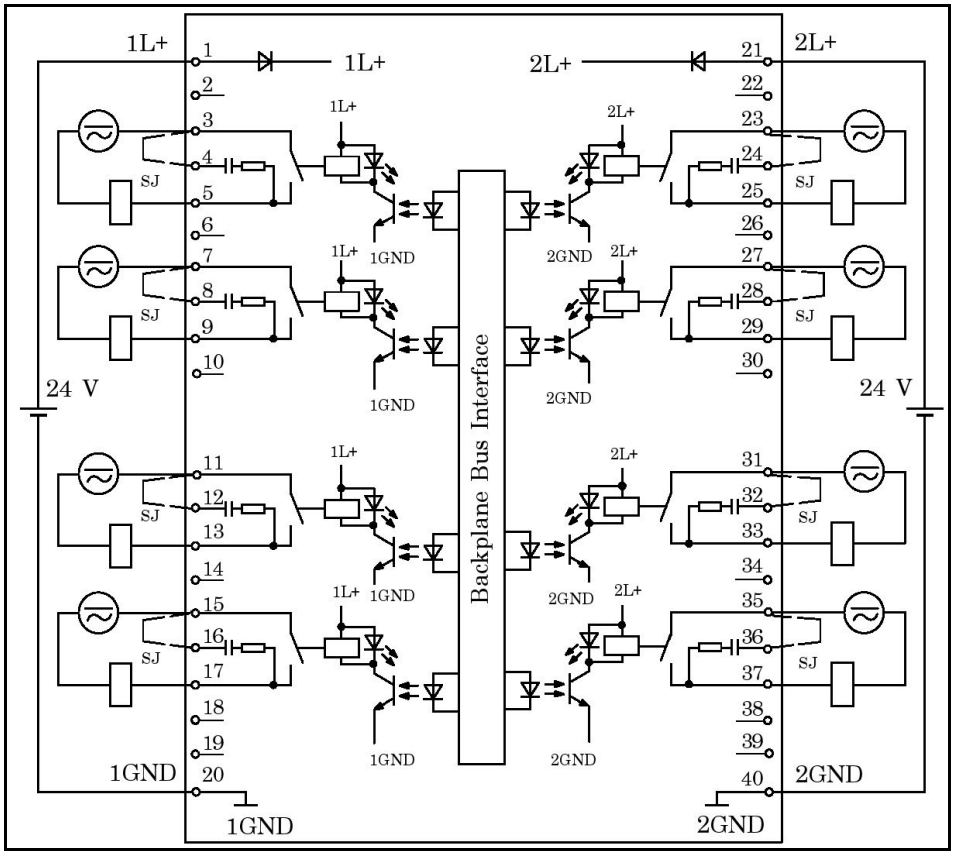


Fig. 4-18: View of module and block diagram of DO 8 x 230 V AC/5 A with suppressor

Technical specifications

Order number	**700-322-1HF20**
Number of outputs	**8**
Isolation from backplane bus	Yes (optocoupler)
Supply voltage of the relays L+	DC 24 V
Contact voltages	DC 24 to 120 V AC 48 to 230 V
Continuous thermal current	5 A per group
Horizontal mounting up to +30 °C	max. 8 A
up to +60 °C	max. 5 A
Vertical mounting up to +40 °C	max. 5 A
Minimum load voltage/load current without jumper "SJ"	10 V/5 mA
Residual current with AC load voltage	
• with jumper "SJ"	11.5 mA
• without jumper "SJ"	0 mA
Operation of a digital input	Possible
Short-circuit current acc. to IEC 947-5-1 with circuit-breaker with characteristic B	cos φ 1.0: 600 A cos φ 0.5...0.7: 900 A with fuse Diazed 8 A: 1000 A
Contact connection (internal)	RC snubber 330 Ω, 0.1 µF
Parallel connection of 2 outputs	
• for redundant operation of the load	Possible
• for power increase	Not possible
Operation of a digital input	Possible
Switching frequency	
• mechanical	max. 10 Hz
• with ohmic load	max. 2 Hz
• with inductive load, acc. to IEC947-5-1, DC13/AC15	max. 0.5 Hz
• with lamp load	max. 2 Hz
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 40 mA
• extern	max. 125 mA
Power loss	typ. 4.2 W
Supports clocked operation	no
Status display	green LED per channel
Alarm	no
Diagnostic functions	none
• surrounding air temperature	0 °C to +60 °C
• Transportation and storage temperature	-25 °C to +75 °C

Relay contact life can be extended using the internal suppressor circuit - insert jumper "SJ"

Residual current of the RC snubber (with jumper SJ) can cause incorrect signal states on connection of an IEC type 1 input!

Dimensions W x H x D [mm]	40 x 125 x 120
Weight	approx. 360 g
Front connector	40-way

Permissible potential difference

• between $GND_{internal}$ and supply voltage of the relays	DC 75 V / AC 60 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 250 V
• between the outputs of different groups	AC 500 V

Insulation test

• between $GND_{internal}$ and supply voltage of the relays	AC 500 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 1500 V
• between the outputs of different groups	AC 1500 V

Make/break capacity and life of contacts

Relay contact life can be extended using an external suppressor circuit.

	Voltage/current	Number of switching cycles, typical value [mill.]
• for ohmic load		
DC 24 V	8.0 A	0.1
	4.0 A	0.3
	2.0 A	0.7
	0.5 A	4.0
DC 60 V	0.5 A	4.0
DC 120 V	0.2 A	1.6
AC 48 V	8.0 A	0.1
	2.0 A	1.6
AC 60 V	8.0 A	0.1
	2.0 A	1.2
AC 120 V	8.0 A	0.1
	4.0 A	0.3
	2.0 A	0.5
	1.0 A	0.7
	0.5 A	1.5
AC 230 V	8.0 A	0.1
	4.0 A	0.3
	2.0 A	0.5
	1.0 A	0.7
	0.5 A	1.5
• for inductive load acc. to IEC 947-5-1 DC13/AC15		
DC 24 V	2.0 A	0.3
	1.0 A	0.5
	0.5 A	1.0
DC 60 V	0.5 A	0.5
	0.3 A	1.0
DC 120 V	0.2 A	0.5
AC 48 V	3.0 A	0.5
	1.5 A	1.0
AC 60 V	3.0 A	0.3
	1.5 A	1.0

AC 120 V	3.0 A	0.2
	2.0 A	0.3
	1.0 A	0.7
	0.5 A	2.0
AC 230 V	3.0 A	0.1
	2.0 A	0.3
	1.0 A	0.7
	0.5 A	2.0

Lamp load AC 230 V	Power	Number of switching cycles Typical value
	1000 W	25,000
	1500 W	10,000
Low-energy lamps/ fluorescent lamps with electronic ballast	10 * 58 W	25,000
Fluorescent lamps with conventional correction	1 * 58 W	25,000
Fluorescent lamps uncorrected	10 * 58 W	25,000

Operation with safety extra-low voltage

Operation with safety extra-low voltage

If the 322-1HF20 relay output module is used with isolated safety extra-low voltage, the following special aspect must be observed:

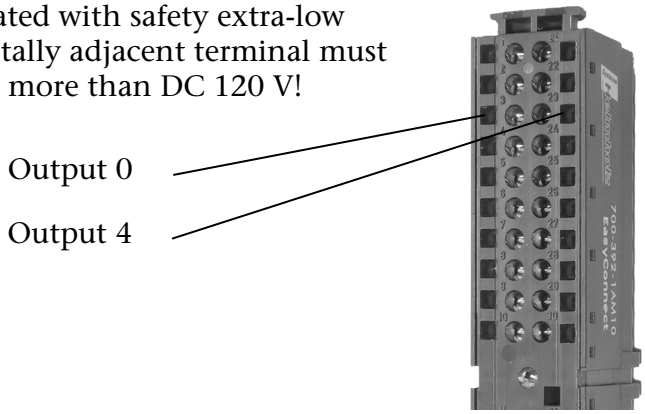
If a terminal is operated with isolated safety extra-low voltage, the (horizontally) adjacent terminal must only be operated with a nominal voltage of max. DC 120 V.

When operated with a voltage above DC 120 V, the clearances and creepage distances of the 40-way front connectors do not comply with the SELV requirements for safe electrical isolation.

Caution!
Special requirement of mixed operation with safety extra-low voltage.

If a terminal is operated with safety extra-low voltage, the horizontally adjacent terminal must be operated with no more than DC 120 V!

Example:



4.5.3 DEA DO 16 x Rel. 230 V AC/2 A

Order number: 700-322-1HH01

The DO 16 x rel. 230 V AC/2 A has the following properties:

- 16 Outputs, floating in groups of 2
- Load voltage DC 24 V to 120 V; AC 48 V to 230 V
- Suitable for AC/DC solenoid valves, contactors, motor starters, small-power motors and indicator lights

Fig. 4-19 shows the block diagram of the DEA DO 16 x Relay 230 V AC/2 A, followed by the technical specifications.

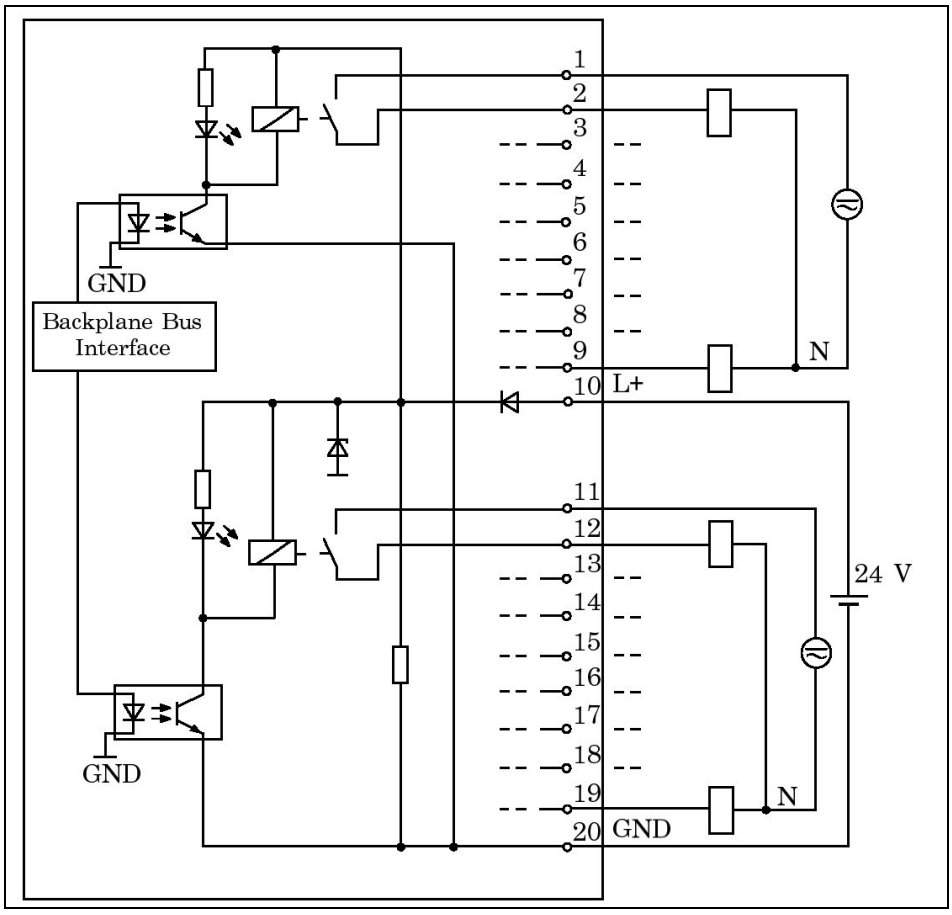


Fig. 4-19: View of module and block diagram of DO 16 x 230 V AC/2 A

Technical specifications

Order number	**700-322-1HH01**
Number of outputs	**16**
Isolation from backplane bus	Yes (optocoupler)
Supply voltage of the relays L+	DC 24 V
Contact voltages	DC 24 to 120 V AC 48 to 230 V
Continuous thermal current	max. 2 A per output max. 8 A per group
Operation of a digital input	Possible
Short-circuit current acc. to IEC 947-5-1 with circuit-breaker with characteristic B	200 A, with circuit-breaker B10/B16
Contact connection (internal)	none
Parallel connection of 2 outputs	
• for redundant operation of the load	Possible only outputs of the same group!
• for power increase	Not possible
Operation of a digital input	Possible
Switching frequency	
• mechanical	max. 10 Hz
• with ohmic load	max. 1 Hz
• with inductive load, acc. to IEC947-5-1, DC13/AC15	max. 0.5 Hz
• with lamp load	max. 1 Hz
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 70 mA
• extern	max. 250 mA
Power loss	typ. 4.5 W
Supports clocked operation	no
Status display	green LED per channel
Alarm	no
Diagnostic functions	none
• surrounding air temperature	0 °C to +60 °C
• Transportation and storage temperature	-25 °C to +75 °C
Dimensions W x H x D [mm]	40 x 125 x 117
Weight	approx. 240 g
Front connector	20-way

Relay contact life can be extended using an external suppressor circuit.

Permissible potential difference

• between $GND_{internal}$ and supply voltage of the relays	DC 75 V / AC 60 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 230 V
• between the outputs of different groups	AC 500 V

Insulation test

• between $GND_{internal}$ and supply voltage of the relays	AC 500 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 1500 V
• between the outputs of different groups	AC 1500 V

Relay contact life can be extended using an external suppressor circuit.

Make/break capacity and life of contacts

	Voltage/current		Number of switching cycles, typical value [mill.]
• for ohmic load			
	DC 24 V	2.0 A	0.1
		1.0 A	0.2
		0.5 A	1.0
	DC 60 V	0.5 A	0.2
	DC 120 V	0.2 A	0.6
	AC 24 V	1.5 A	1.5
	AC 48 V	1.5 A	1.5
	AC 60 V	1.5 A	1.5
	AC 120 V	2.0 A	1.0
		1.0 A	1.5
		0.5 A	2.0
	AC 230 V	2.0 A	1.0
		1.0 A	1.5
		0.5 A	2.0
• for inductive load acc. to IEC 947-5-1 DC13/AC15			
	DC 24 V	2.0 A	0.05
		1.0 A	0.1
		0.5 A	0.5
	DC 60 V	0.5 A	0.1
	DC 120 V	0.2 A	0.5
	AC 24 V	1.5 A	1.0
	AC 48 V	1.5 A	1.0
	AC 60 V	1.5 A	1.0
	AC 120 V	2.0 A	0.7
		1.0 A	1.0
		0.5 A	1.5
	AC 230 V	2.0 A	0.7
		1.0 A	1.0
		0.5 A	1.5

Lamp load	Power	Number of switching cycles Typical value
	AC 230 V 50 W	25,000
	DC 24 V 5 W	10,000

Motor starter acc. to NEMA	max. size 5

Operation with safety extra-low voltage

Operation with safety extra-low voltage

The 700-322-1HH01 module can be used with safety extra-low voltage without any restrictions.

4.5.4 DEA DO 8 x Rel. 230 V AC/2 A

Order number: 700-322-1HF01

The DO 8 x rel. 230 V AC/2 A has the following properties:

- 8 Outputs, floating in groups of 2
- Load voltage DC 24 V to 120 V; AC 48 V to 230 V
- Suitable for AC/DC solenoid valves, contactors, motor starters, small-power motors and indicator lights

Fig. 4-20 shows the block diagram of the DEA DO 8 x relay 230 V AC/2 A, followed by the technical specifications.

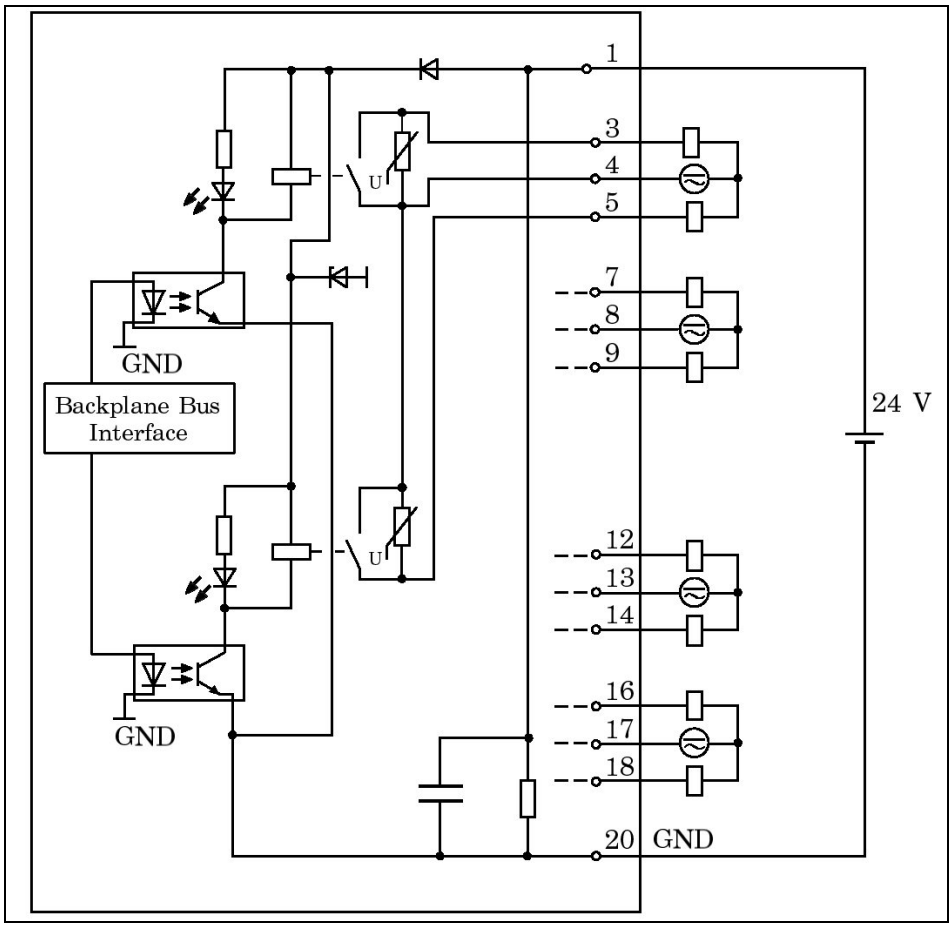


Fig. 4-20: View of module and block diagram of DO 8 x 230 V AC/2 A

Technical specifications	
Order number	**700-322-1HF01**
Number of outputs	**8**
Isolation from backplane bus	Yes (optocoupler)
Supply voltage of the relays L+	DC 24 V
Contact voltages	DC 24 to 120 V AC 48 to 230 V

Continuous thermal current	max. 3 A per output max. 4 A per group
Operation of a digital input	Possible
Short-circuit current acc. to IEC 947-5-1 with circuit-breaker with characteristic B	cos φ 1.0: 600 A cos φ 0.5...0.7: 900 A with fuse Diazed 8 A: 1000 A
Contact connection (internal)	Varistor K275
Parallel connection of 2 outputs	
• for redundant operation of the load	Possible only outputs of the same group!
• for power increase	Not possible
Operation of a digital input	Possible
Switching frequency	
• mechanical	max. 10 Hz
• with ohmic load	max. 2 Hz
• with inductive load, acc. to IEC947-5-1, DC13/AC15	max. 0.5 Hz
• with lamp load	max. 2 Hz
Cable length unshielded	max. 600 m
Cable length shielded	max. 1000 m
Current consumption	
• internal	typ. 40 mA
• extern	max. 160 mA
Power loss	typ. 3.2 W
Supports clocked operation	no
Status display	green LED per channel
Alarm	no
Diagnostic functions	none
• surrounding air temperature	0 °C to +60 °C
• Transportation and storage temperature	-25 °C to +75 °C
Dimensions W x H x D [mm]	40 x 125 x 117
Weight	approx. 240 g
Front connector	20-way
Permissible potential difference	
• between $GND_{internal}$ and supply voltage of the relays	DC 75 V / AC 60 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 230 V
• between the outputs of different groups	AC 500 V
Insulation test	
• between $GND_{internal}$ and supply voltage of the relays	AC 500 V
• between $GND_{internal}$ or supply voltage of the relays and the outputs	AC 1500 V
• between the outputs of different groups	AC 1500 V

Make/break capacity and life of contacts

Relay contact life can be extended using an external suppressor circuit.

	Voltage/current		Number of switching cycles, typical value [mill.]
• for ohmic load			
	DC 24 V	2.0 A	0.7
		1.0 A	1.6
		0.5 A	4.0
	DC 60 V	0.5 A	1.6
	DC 120 V	0.2 A	1.6
	AC 48 V	2.0 A	1.6
	6 AC 0 V	2.0 A	1.2
	AC 120 V	2.0 A	0.5
		1.0 A	0.7
		0.5 A	1.5
	AC 230 V	2.0 A	0.5
		1.0 A	0.7
		0.5 A	1.5
• for inductive load acc. to IEC 947-5-1 DC13/AC15			
	DC 24 V	2.0 A	0.3
		1.0 A	0.5
		0.5 A	1.0
	DC 60 V	0.5 A	0.5
	DC 120 V	0.2 A	0.3
	AC 48 V	1.5 A	1.0
	AC 60 V	1.5 A	1.0
	AC 120 V	2.0 A	0.2
		1.0 A	0.7
		0.7 A	1.0
		0.5 A	2.0
	AC 230 V	2.0 A	0.3
		1.0 A	0.7
		0.5 A	2.0

Lamp load AC 230 V	Power	Number of switching cycles Typical value
	1000 W	25,000
	1500 W	10,000
Low-energy lamps/ fluorescent lamps with electronic ballast	10 x 58 W	25,000
Fluorescent lamps with conventional correction	1 x 58 W	25,000
Fluorescent lamps uncorrected	10 x 58 W	25,000

Operation with safety extra-low voltage

Operation with safety extra-low voltage

The 700-322-1HF01 module can be used with safety extra-low voltage without any restrictions.

4.5.5 DEA DO 16 x Rel. DC 60 V/0.5 A bistable

Order number 700-322-1HF30

The DO 16 x Rel. DC 60 V/0.5 A bistable has the following features:

- 16 outputs, isolated in groups of 1 or more
- Load voltage DC to 60V, AC to 50 V
- suitable for AC/DC solenoid valves, contactors, motor starters, low-power motors and signal lamps
- the last switch state is preserved in the event of a failure

Fig. 4-21 shows the block diagram of the DEA DO 16 x Rel. DC 60 V/0.5 A bistable relay, followed by the technical specifications.

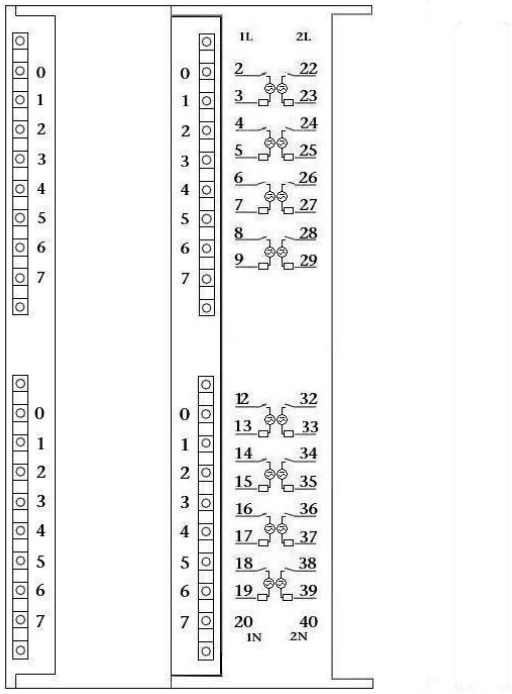


Fig. 4-21:
Assembly view and block diagram of the DO 16 x Rel. DC 60 V/0.5 A bistable

Technical data

Order number	**700-322-1HF30**
Number of outputs	**16**
Isolation from backplane bus	yes (via optocoupler)
Relay supply voltage L+	24 V DC
Switching voltage	DC to 60 V max. AC to 50 V max.
Continuous thermal current	max. 0.5 A per output
can be used to control	digital inputs
Short circuit current per IEC 947-5-1 with line safety switch with tripping characteristic B	cos φ 1.0: 600 A cos φ 0.5...0.7: 900 A with safety fuse Diazed 8 A: 1000 A
Contact switching (internal)	Varistor SIOV-CU4032-K50G
Parallel switching of 2 outputs • for redundant control of load • For increased performance	 not allowed not allowed
Switching frequency • mechanical: • with resistive load	 max. 180 Hz max. 20 Hz
Energisation of the solenoid to ensure relay switching	min. 10 ms
Cable length unshielded Cable length shielded	max. 600 m max. 1000 m
Power consumption • internal • external Power loss	 max. 150 mA max. 500 mA typically 6.5 W
Supports isochronous operation	no
Status indicator alarm Diagnostic functions	green LED per channel no none
• Ambient temperature • Temperature during transport and storage	0 °C ... 60 °C -25 °C ... 75 °C
Dimensions W x H x D [mm] Weight Front connector	40 x 125 x 117 approx.:320 g 40-pin

As the varistor becomes low impedance during surges, a suitable safety fuse is required on the inputs.

Rated potential difference

• between M_{intern} and relay supply voltage	DC 75 V / AC 60 V
• between M_{intern} or relay supply voltage and the outputs	AC 1000 V
• between outputs in different groups	AC 1000 V

Switching capacity and lifetime of contacts

	voltage/current	Number of switching cycles, typical (million)
• for resistive load	DC 24 V/0.5 A	0.7

4.5.5.1 Parameter Configuration

Relay module DO 16 x Rel. DC 60 V/0.5 A bistable needs to be configured in the hardware configuration in STEP 7 as DO 32 x DC 24 V/0.5A with order number
6ES7 322-1BL00-0AA0.

4.5.5.2 Activating the Relays

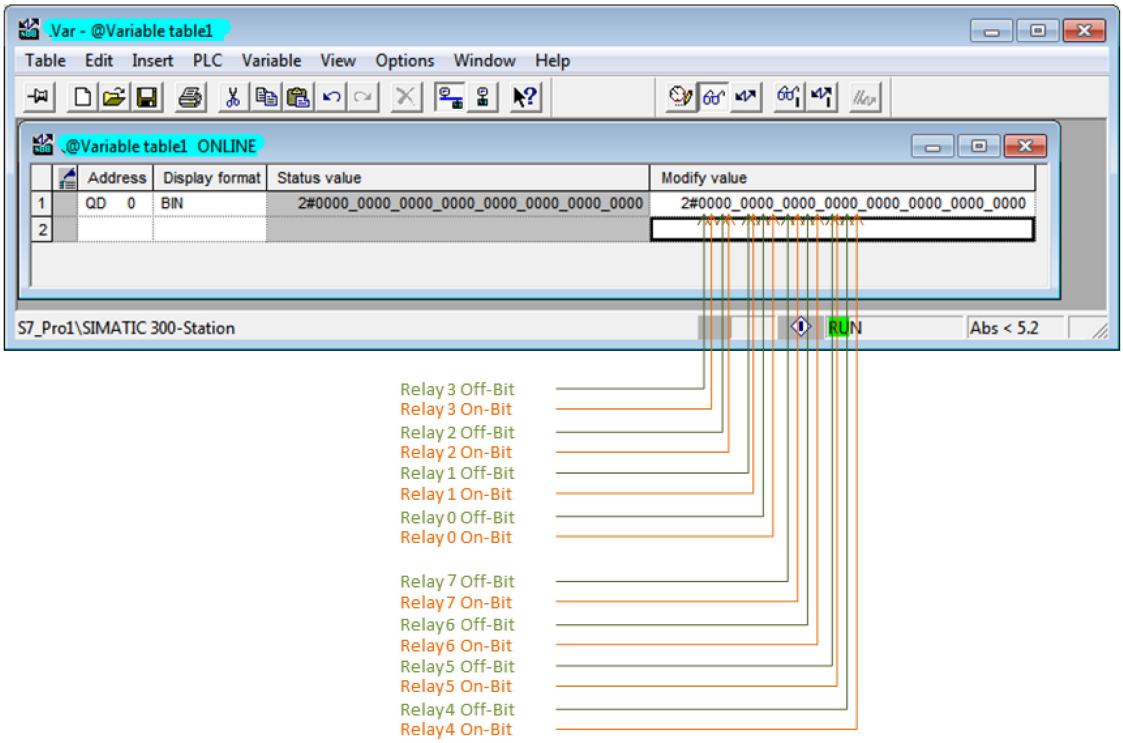
The state of each relay is controlled using 2 bits in the output double word. The even bits in the output double word are used to turn on the relays, while the odd bits are used to turn them off.

In order to ensure that the relays will switch states safely and reliably, every relevant bit must be "high" for the minimum time specified in the table. Due to the current draw that would result, it is not recommended to keep any bits "high" permanently. Simultaneously switching the "ON" bits and the "OFF" bits for a relay will create an illegal state – do not do this! When a relay is in this illegal state, it will be impossible to know whether the relay will switch states or not.

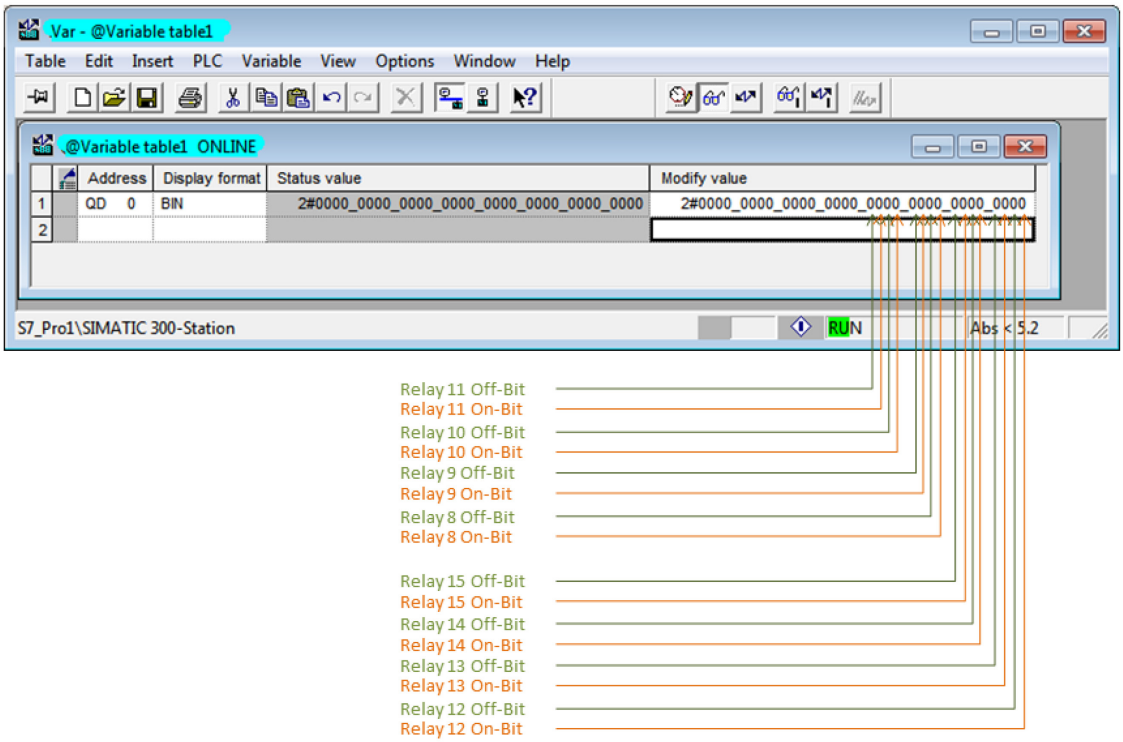
Relays and Their Corresponding Control Bits

Relay	Byte of Outputs	Bit ON	Bit OFF
0	0	0	1
1	0	2	3
2	0	4	5
3	0	6	7
4	1	0	1
5	1	2	3
6	1	4	5
7	1	6	7
8	2	0	1
9	2	2	3
10	2	4	5
11	2	6	7
12	3	0	1
13	3	2	3
14	3	4	5
15	3	6	7

Control Bits for Relays 0 through 7 on the Variable Table



Control Bits for Relays 8 through 15 on the Variable Table



4.6 Other modules

4.6.1 Dummy Module DM 370

Order number: 700-370-0AA01 20-pin
700-370-0AL01 40-pin

The dummy module DM 370 reserves a slot for a module not parameterised. It can be used as a dummy for:

- interface modules, without reserving address space
- non-parameterised signal modules, with reserved address space
- modules that occupy 2 slots, with reserved address space

When replacing the dummy module with another module from the S7-300*, the mechanical design and the address assignment or address allocation remain unchanged for the complete device.

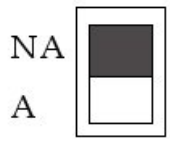
Configuring with STEP 7

When working with STEP 7, the dummy module DM 370 must only be configured if the module is to reserve a slot for a parameterised signal module. If the module is to reserve a slot for an interface module, the module DM 370 need not be configured.

Modules occupying 2 slots

For modules occupying 2 slots, it is imperative to plug 2 dummy modules. In this case, only the dummy module plugged into slot "x" reserves the address space, but not the module plugged into slot "x + 1" (see table).

Max. 8 modules (SM/FM/CP) may be plugged into one subrack. If, however, 2 dummy modules reserve a slot for a module 80 mm in width, 7 further modules (SM/FM/CP) may nevertheless be plugged, since the dummy module only occupies the address space for 1 module.

Switch Position	Function	Application
	The dummy module reserves one slot. The module will not be configured and does not occupy any address space.	• Without active backplane bus: A slot is reserved only physically, with electrical connection to the backplane bus. • With active backplane bus: no
	The dummy module reserves one slot. The module must be configured and occupies 1 byte address space (with specification from the system outside the process image).	• A slot with address is reserved.

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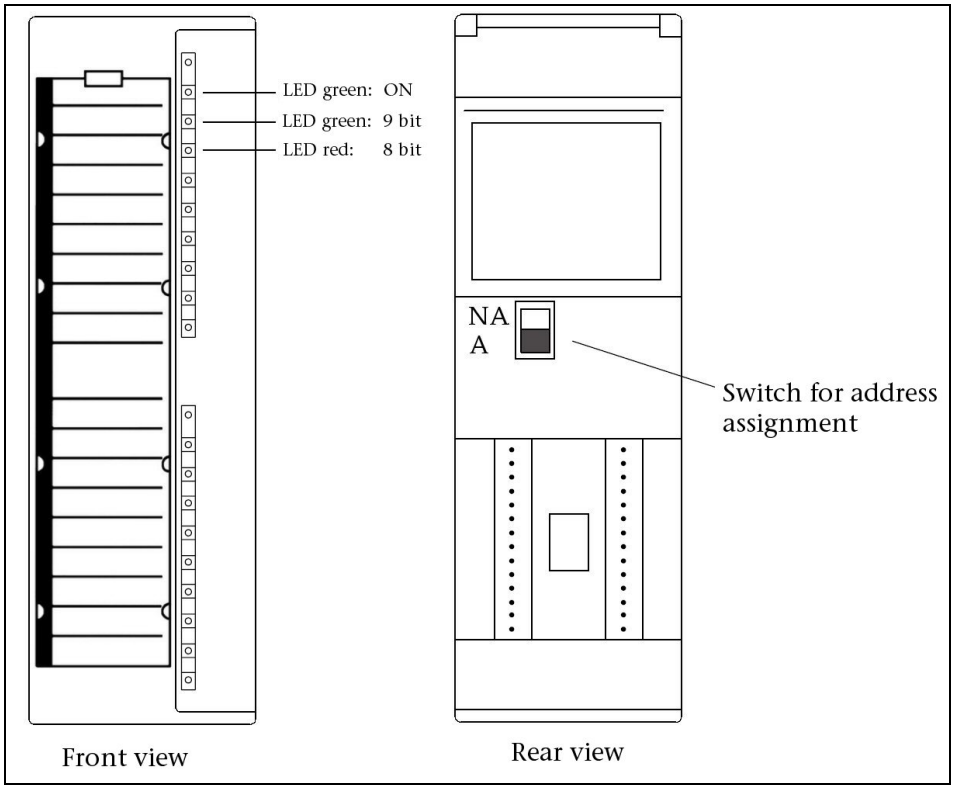

Fig. 4-22:
Module view of the dummy module front connector 20-way

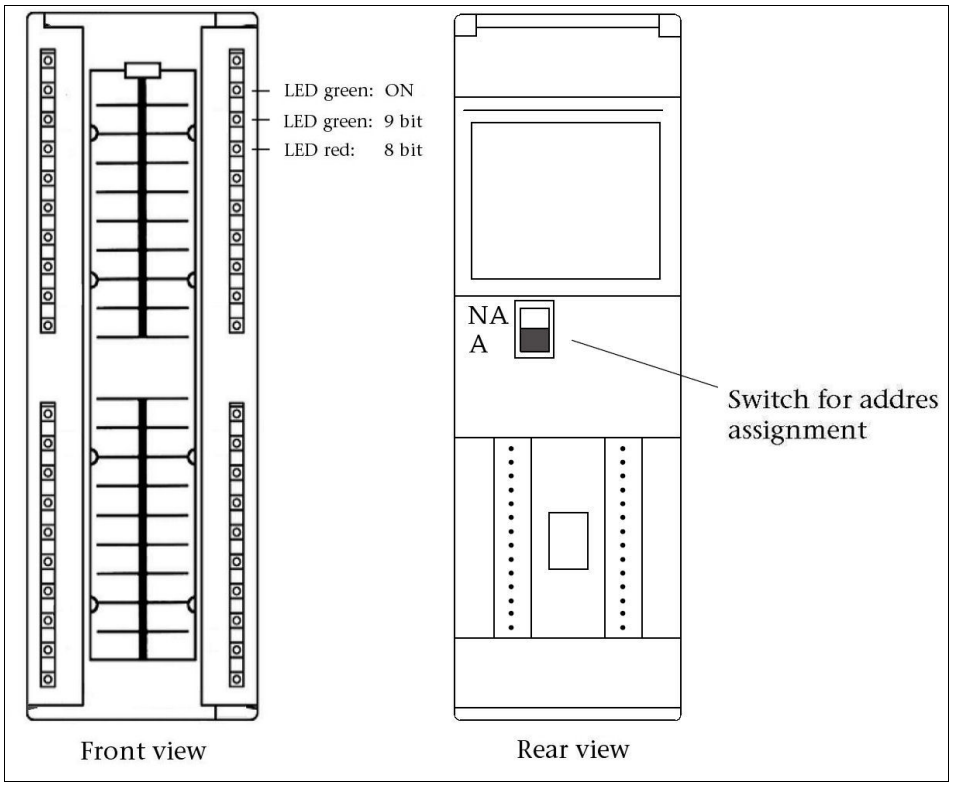

Fig. 4-23:
Module view of the dummy module front connector 40-way

Technical specifications

Order number	
Front connector 20-way	**700-370-0AA01**
Front connector 40-way	**700-370-0AL01**
Current consumption (from backplane bus)	ca. 5 mA
Power loss	typ. 0.03 W
Dimensions W x H x D [mm]	40 x 125 x 117
Weight	ca. 180 g
• surrounding air temperature	0 °C to +60 °C
• Transportation and storage temperature	-25 °C to +75 °C

Meaning of the 8/9-bit display of the dummy module

There are two different methods for transmission of the data along the S7 300* backplane bus:

- Without parity bit
  Only the data bytes (8 bits) are transmitted. This method is obsolete; errors in the data transmission cannot be recognised, and errors may occur in the I/O modules.
- With parity bit
  This newer, better method transmits a parity bit (9 bits per byte) in addition to the useful data. Thus, transmission errors can be recognised and errors can be avoided.

The CPUs are able to use both transmission methods. All I/O modules that handle the 9-bit transmission method can additionally switch back to the 8-bit method. This happens whenever one or several modules using the obsolete, less reliable 8-bit method are plugged into the system.

The 8/9-bit LEDs indicate the transmission method currently used by the entire system.

!

*If any 8-bit module is used, **all** 9-bit modules connected to the backplane bus will revert to using the 8-bit transmission method.*

The 9-bit method was introduced shortly after introduction of the S7-300* to the market. For reasons of downwards compatibility, however, new CPUs are still also able to use the 8-bit method.

Systeme Helmholz modules generally use the more reliable 9-bit transmission method.

There are, however, modules that only use the 8-bit method. To ensure a reliable data transmission on the backplane bus and to avoid errors in the I/O modules, we recommend not using such modules any longer. The presence of 8-bit modules can be recognised from the red LED on the dummy module, see Fig 4-22 and Fig. 4-23.

5 Ordering data

	Helmholz Order No.
Sectional rail	
Sectional rail length 160 mm	700-390-1AB60
Sectional rail length 482 mm	700-390-1AE80
Sectional rail length 530 mm	700-390-1AF30
Sectional rail length 830 mm	700-390-1AJ30
Sectional rail length 2000 mm	700-390-1BC00
Front connector	
40-way front connector with screw-type terminal	700-392-1AM01
20-way front connector with screw-type terminal	700-392-1AJ10
40-way front connector with spring-type terminal	700-392-1BM01
20-way front connector with spring-type terminal	700-392-1BJ01
40-way front connector with **EasyConnect**®	700-392-1AM10
Digital input modules	
DI 32 x 24 V DC	700-321-1BL00
DI 16 x 24 V DC	700-321-1BH02
DI 16 x 24 V DC Source Input	700-321-1BH50
DI 16 x 24 V DC with Hardware and Diagnostic Interrupts	700-321-7BH01
DI 32 x 120 V AC	700-321-1EL00
DI 16 x 120/230 V AC	700-321-1FH00
Digital output modules	
DO 32 x 24 V DC/0.5 A	700-322-1BL00
DO 16 x 24 V DC/0.5 A	700-322-1BH01
DO 8 x 24 V DC/2.0 A	700-322-1BF01
Digital input/output modules	
DI 16/DO 16 x 24 V DC/0.5 A	700-323-1BL00
DI 8/DO 8 x 24 V DC/0.5 V	700-323-1BH01
Relay output modules	
DO 8 x Rel. AC 230 V/5 A	700-322-1HF10
DO 8 x Rel. AC 230 V/5 A with suppressor	700-322-1HF20
DO 8 □x Rel. AC 230 V/2 A	700-322-1HF01
DO 16 x Rel. AC 230 V/2 A	700-322-1HH01
DO 16 x Rel. DC 60 V/0.5 A bistable	700-322-1HF30
Other modules	
Dummy Module 20-pin	700-370-0AA01
Dummy Module 40-pin	700-370-0AL01