8.6 DO710

8.6.1 Technical Data

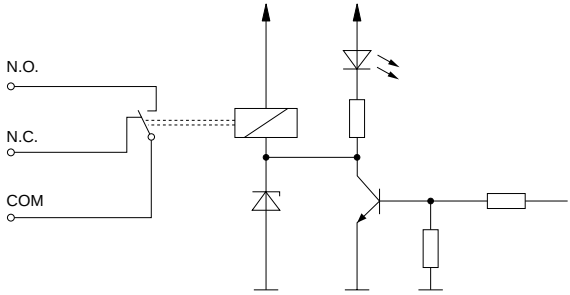
Module ID	DO710
General	
Model Number	2DO710.6
Description	2010 Digital Output Module, 16 relay outputs 240 VAC / 30 VDC, 4 A, single channel isolated outputs, Order terminal blocks separately!
C-UL-US Listed	Yes
B&R ID Code	$27
Base Plate Module	BP200, BP201, BP210
Output Circuit	see section "Output Circuit"
Static Characteristics	
Module Type	B&R 2010 I/O module single width
Number and Type of Outputs	8 change-over 8 normally open Single channel isolation
Maximum Switching Voltage	125 VDC / 264 VAC
Maximum Peak Voltage	Externally limited to max. 460 V
Rated Voltage	30 VDC / 240 VAC
Switching Voltage Range	Min. 5 VDC @ 1 mA
Rated Frequency	DC or 45 - 63 Hz
Rated Current (1-Signal) Ie	4 A (resistive load)

Module ID	DO710
Current Range for 1-Signal (continually at maximum voltage)	
DC	1 mA - 4 A (resistive load)
AC	100 mA - 8 A (resistive load)
Switching Power	2000 VA; 120 W @ 30 VDC (resistive load)
Contact Resistance (DC)	Max. 100 mΩ @ 6 VDC / 100 mA
Power Loss on Contact (AC)	Typ. 1 W (max. 5 W)
Fuse-R	External fuse
Connection	8 change-over / 8 normally open
Power Consumption	
Internal	Max. 7 W
External	Max. 8 W
Additional Characteristics	
Status Display	1 yellow LED per channel
Protective Characteristics	
Type of Protection	
Short Circuit Protection	
AC	Fuse 8 A slow-blow (required externally)
DC	Fuse 4 A slow-blow (required externally)
Overvoltage Protection for Contacts	Limited to 460 V (required externally)
For DC Connection	Spark suppression if necessary (connected externally)
Dynamic Characteristics	
Output Delay for Signal Change from	
log 0 - log 1	Max. 13 msec (incl. chatter time)
log 1 - log 0	Max. 13 msec (incl. chatter time)
Operating Characteristics	
Effect of Incorrectly Connecting the Outputs	No implications for the module
Behaviour of Outputs by Controller Failure through the Main Processing Unit, Voltage Breakdown, Interruption and when Switching On/Off	Outputs are reset in the event of malfunction (note normally closed contacts)
Relay Contact Life-span	see section "Switching Cycles"
Total Output Current	max. 64 A
Following Conditions must be Fulfilled	$\Sigma I_n^2 \leq 400$ see section "Total Output Current"
Wire Cross Section	2.5 mm², for currents≥4 A or one of the recommended values is reached
Isolation Voltage under Normal Operating Conditions between Channel and	
Bus	1 Minute 2800 VAC or 4 kV @ 1.2 x 50 µsec pulse
Other Channel	1 Minute 1000 VAC or 1.4 kV @ 1.2 x 50 µsec pulse
Supply Interface	---
Isolation between Open Relay Contacts	1 Minute 1000 VAC or 1.4 kV @ 1.2 x 50 µsec pulse

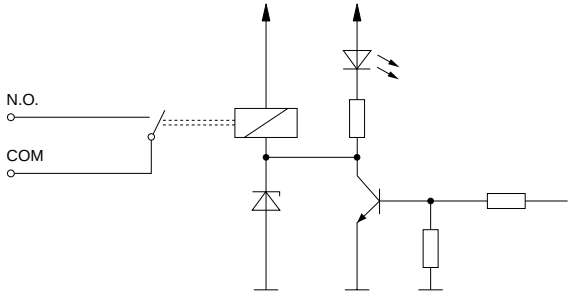
Module ID	DO710
Different Phases Possible	Yes, but only for 110 VAC
Starting Point of LED for a Channel	Control signal from relay coil
Method of Operation	Latches set on bus using transistor relay drivers
Typical Example for External Connections	Standard connection of normally open and change-over contacts, Sink and source connections possible
Mechanical Characteristics	
Dimensions	B&R 2010 single width
Terminal Assignments	see section "Terminal Assignments"

8.6.2 Output Circuit

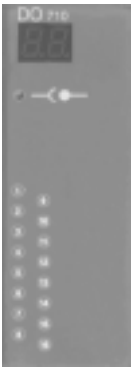
Change-over contact



Normally open contact



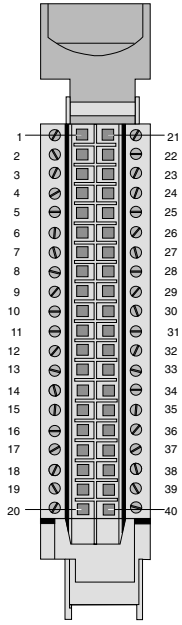
8.6.3 Status-LEDs



—≺ ●— Indicates the status of the terminal block, i.e if this LED is lit either no terminal block is connected or that it is not connected properly.

1 ... 16 LEDs 1 to 16 show the logical status of the corresponding output. The LED lights when the relay has a contact (normally open closes, normally closed opens).

8.6.4 Terminal Assignments



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Terminal	Description		Terminal	Description	
1	Output 1	COM	21	Output 9	COM
2	Output 1	Normally open	22	Output 9	Normally open
3	Output 1	Normally closed	23	Output 9	Normally closed
4	Output 2	COM	24	Output 10	COM
5	Output 2	Normally open	25	Output 10	Normally open
6	Output 3	COM	26	Output 11	COM
7	Output 3	Normally open	27	Output 11	Normally open
8	Output 4	Normally closed	28	Output 12	Normally closed
9	Output 4	Normally open	29	Output 12	Normally open
10	Output 4	COM	30	Output 12	COM
11	Output 5	COM	31	Output 13	COM
12	Output 5	Normally open	32	Output 13	Normally open
13	Output 5	Normally closed	33	Output 13	Normally closed
14	Output 6	COM	34	Output 14	COM
15	Output 6	Normally open	35	Output 14	Normally open
16	Output 7	COM	36	Output 15	COM
17	Output 7	Normally open	37	Output 15	Normally open
18	Output 8	Normally closed	38	Output 16	Normally closed
19	Output 8	Normally open	39	Output 16	Normally open
20	Output 8	COM	40	Output 16	COM

Note that the maximum potential difference may not be exceeded between terminal block contacts. This is valid for:

Potential difference between	Voltage
COM x ↔ PCC ground	250 VAC
COM x ↔ ground	250 VAC

8.6.5 Total Output Current

The DO710 digital output module is set for a total output current of 64 A. The following condition should be fulfilled to ensure protection against the module overheating:

$$\Sigma I_n \leq 64\ A \qquad \text{and} \qquad \Sigma I_n^2 \leq 400$$

n ... channel numbers 1 to 16

Cable Cross Section

Connection cables with a cross section of 2.5 mm² are required for currents of ≥4 A or when on of the above recommended values has been reached.

Calculation Example

Example 1

Each of the 16 channels is loaded with 4 A.

1) Recommended value 1: Total current ≤ 64 A
   $I_{total} = 16 \times 4\ A = 64\ A$ -> condition fulfilled
2) Recommended value 2: $\Sigma I_n^2 \leq 200$
   $\Sigma I_n^2 = 16 \times 4^2 = 256$ -> condition fulfilled

Both conditions are fulfilled. The load is therefore permitted. Connection cables with a cross section of 2.5 mm² are required.

Example 2

Three channels are supplied with a maximum current of 8 A.

1) Recommended value 1: Total current ≤ 64 A
   $I_{total} = 6 \times 8\ A = 48\ A$ -> condition fulfilled
2) Recommended value 2: $\Sigma I_n^2 \leq 400$
   $\Sigma I_n^2 = 6 \times 8^2 = 384$

Both conditions are fulfilled. The load is permitted. Connection wires with a cross section of 2.5 mm² are required.

8.6.6 Switching Cycles

Mechanical Load

Relay contacts are capable of 5 x 10^6 switching cycles.

Electrical Load

The following table contains an overview of switching cycles that can be supplied with electric loads by the DO710.

Valid for each specification:
- ❍ Maximum 30 switching cycles a minute
- ❍ Values for normally open and normally closed contacts, but not for both.

Load	Switching cycle
Nominal load 8 A, 230 VAC, resistive	1 x 10^5
Motor load 230 VAC (switching current 12 A, cos φ 0.5, nom. load 1.8 A)	4 x 10^5
Valve load 0.1 A, 230 VAC	1 x 10^6
Hydraulic valve 2 A, 24 VDC (with external spark extinguisher)	1 x 10^6
8 A, 30 VDC, resistive	>1000
1 A, 24 VDC	2 x 10^5

8.6.7 Variable Declaration

Function	Variable Declaration				
	Scope	Data Type	Length	Module Type	Channel
Single Digital Output (Channel x)	tc_global	BIT	1	Digital Out	1 ... 16
Read terminal block status Bit 0 = 1 ..... No terminal block connected Bit 0 = 0 ..... Terminal block connected properly	tc_global	BYTE	1	Status In	0