

# 1. DM435

## 1.1 Order data

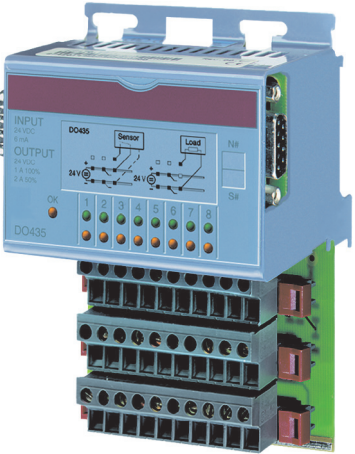
Model number	Short description	Figure
7DM435.7	2003 digital mixed module, 8 inputs 24 VDC, 1 ms, sink/source, 8 transistor outputs 24 VDC, 0.5 A, order terminal blocks separately!	
7TB710.9	Terminal block, 10-pin, screw clamps	
7TB710.91	Terminal block, 10-pin, cage clamps	
7TB722.9	2003 terminal block, 22-pin, screw clamps	
7TB722.91	2003 terminal block, 22-pin, cage clamps	
7TB733.9	2003 terminal block, 33-pin, screw clamps	
7TB733.91	2003 terminal block, 33-pin, cage clamps	
Terminal blocks are not included in the delivery.		

Table 1: DM435 - Order data

## 1.2 Technical data

Product ID	DM435
<b>General information</b>	
C-UL-US listed	Yes
B&R ID code	\$E3
Module type	B&R 2003 I/O module
Number	
CP430, EX270	4
CP470, CP770, CP474, CP476, CP774	8
EX470, EX770 EX477, EX777	8
Voltage and Output Monitoring (LED: OK)	Yes Supply voltage >18 V, outputs OK
Power consumption	Max. 0.5 W

Table 2: DM435 - Technical data

Product ID	DM435
<b>Inputs</b>	
Number of inputs	8
Wiring	Sink or source
Input voltage	
Minimum	18 VDC
Rated	24 VDC
Maximum	30 VDC
Switching threshold	
Low	<5 V
High	>15 V
Input delay	Max. 1 ms
Input current at rated voltage	Approx. 8 mA
Electrical isolation	Input - PLC
<b>Outputs</b>	
Number of outputs	8
Type	Highside driver IC (transistor)
Switching voltage	
Minimum	18 VDC
Rated	24 VDC
Maximum	30 VDC
Continuous current per	
Output	Max. 0.5 A
Module	Max. 4 A
Leakage current when switched off	12 µA
Overload protection	Yes
Permanent short circuit current	Typ. 4 A
Internal protective circuit	Yes
Braking voltage when switching off inductive loads	47 V
Switching delay	
log. 0 - log. 1	Max. 450 µs
log. 1 - log. 0	Max. 450 µs
Electrical isolation	Output - PLC
<b>Mechanical characteristics</b>	
Dimensions	B&R 2003 single-width

Table 2: DM435 - Technical data (cont.)

### 1.3 Status LEDs

The green/orange status LEDs 1 - 8 show the logical state of the corresponding input/output. The LED OK (orange) indicates that the supply voltage for the inputs and outputs is present. The LED is lit starting with a supply voltage of approx. 18 VDC.

If voltage is incorrectly placed on an output which is not set, the LED goes out.

### 1.4 Input circuit diagram

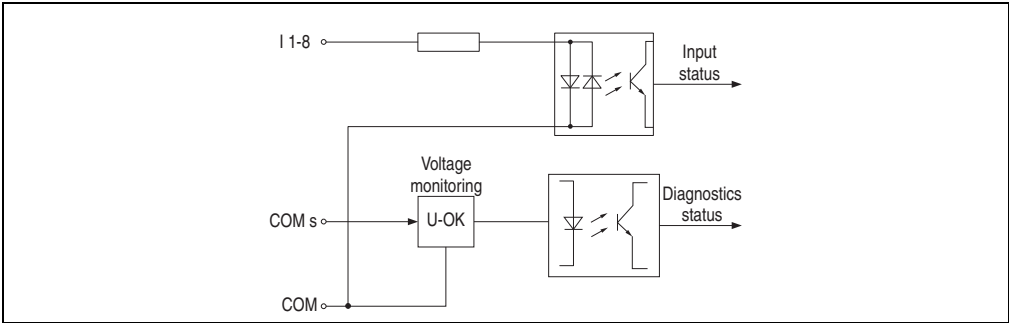


Figure 1: DM435 - Input circuit diagram

### 1.5 Output circuit diagram

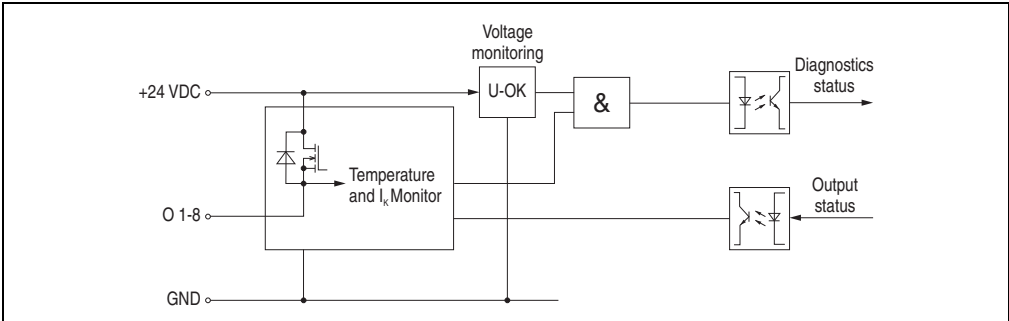


Figure 2: DM435 - Output circuit diagram

### 1.6 Legend strips

A legend sheet can be slid into the front of the module from above. The module circuit is shown on the back. The inputs/outputs can be labeled on the front.

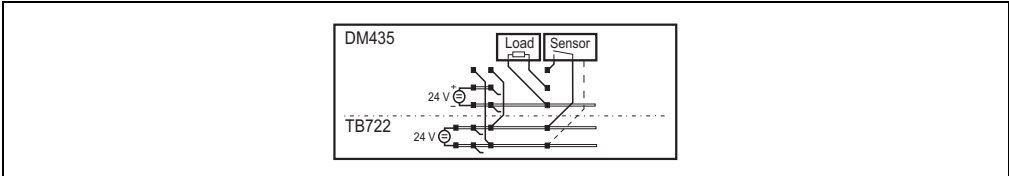


Figure 3: DM435 - Insert strips

## 1.7 Connections

Terminal block TB722 is used to supply the inputs.

### 1.7.1 Inputs - sink connection

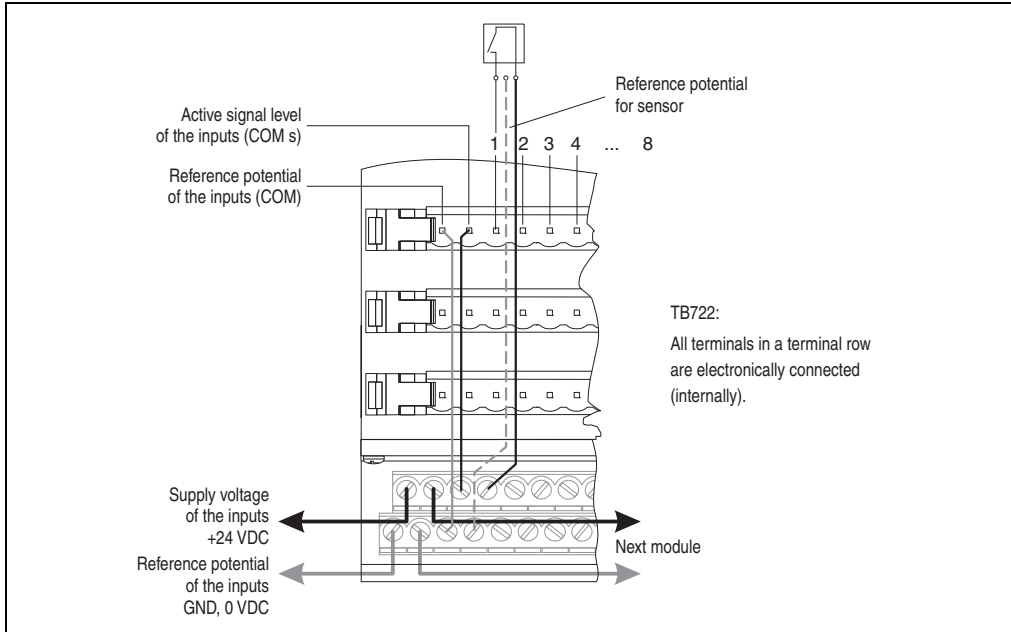


Figure 4: DM435 - Connections, inputs sink connection

1.7.2 Inputs - source connection

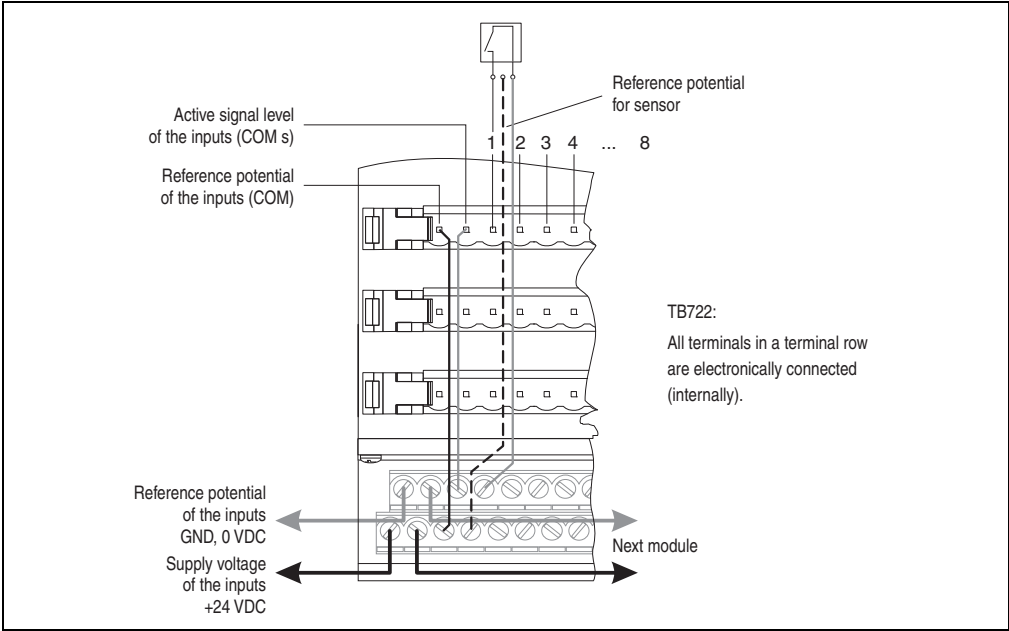


Figure 5: DM435 - Connections, inputs source connection

1.7.3 Output circuit

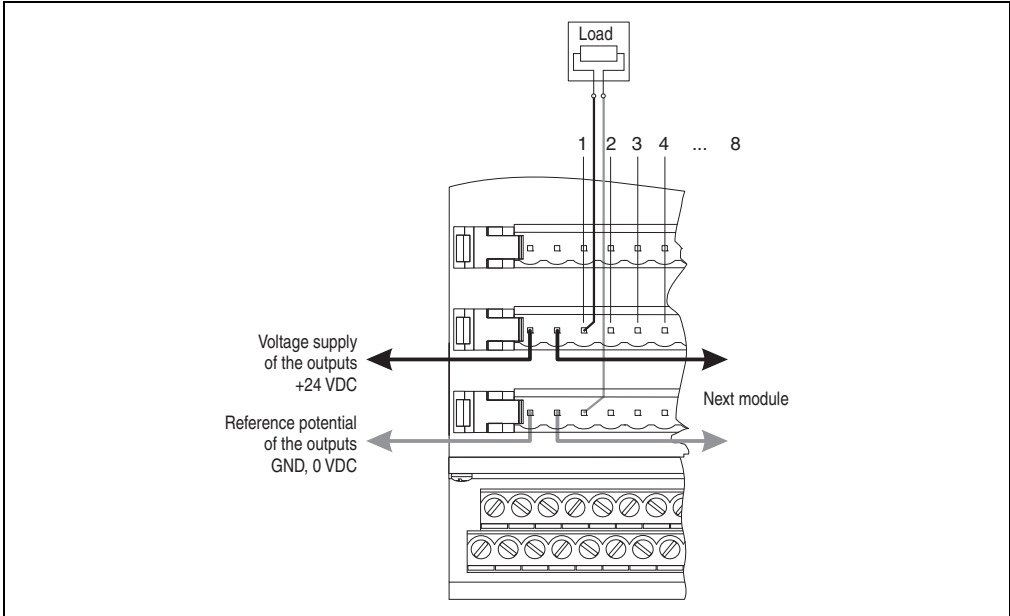


Figure 6: DM435 - Connections, outputs

#### 1.7.4 Output wiring for safety purposes: E-stop, stop category 0

An appropriate upstream safety switch must be used in safety-related applications in order to achieve category 4 shutdown according to EN 954-1.

### **Caution!**

The upstream safety switch must be category 4 according to EN 954-1. It must meet the technical requirements for the intended use. These include, for example, switching power, environmental conditions, etc.

### **Caution!**

Only the described wiring will ensure that the E-stop safety function securely shuts off the outputs according to category 4, EN 954-1.

If the status of the secure outputs is checked with a control element, it is important that a 24 VDC current is not fed into the module if the control element malfunctions.

### **Caution!**

A short circuit between the digital output and the 24 V supply can result in the 24 V supply being fed back into the module's internal supply voltage.

As a result, the safety function can no longer be guaranteed, which means that none of the module channels can be shutdown using the upstream safe switching device.

To prevent this error from occurring, one of the wiring methods listed in EN ISO 13849-2:2003, appendix D.5.2, table D.5 must be used for all the digital output channels to rule out short circuit errors.

The wiring can take place through the following examples:

- 1) Directly connect the actuators up to category 4 according to EN 954-1

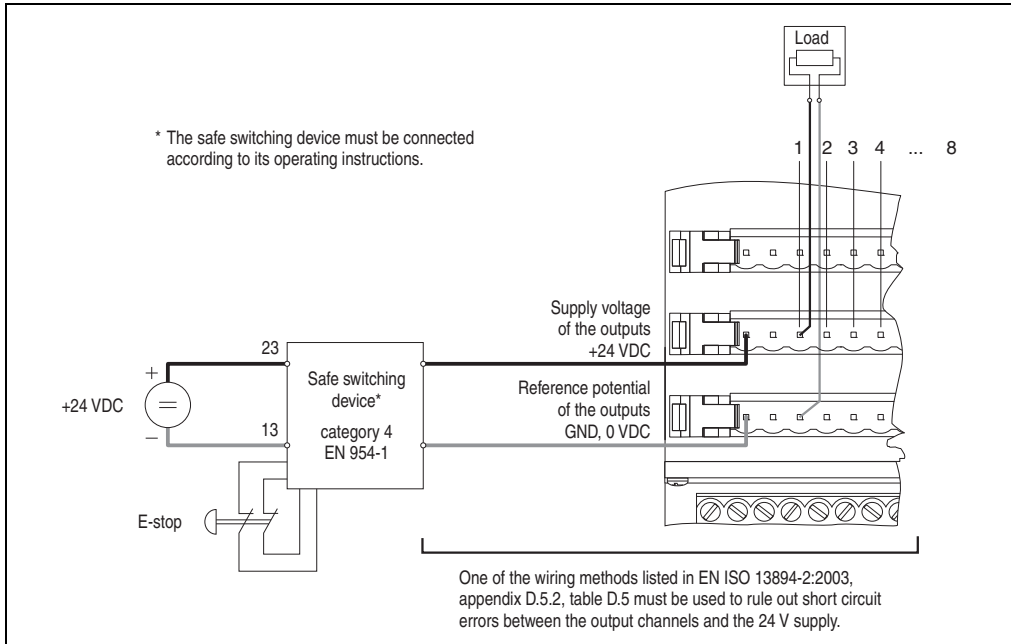


Figure 7: DM435 - Output wiring by directly connecting the actuators

### Caution!

Only properly functioning actuators can be connected using this wiring method!



2) Wiring using contactors up to category 4 according to EN 954-1

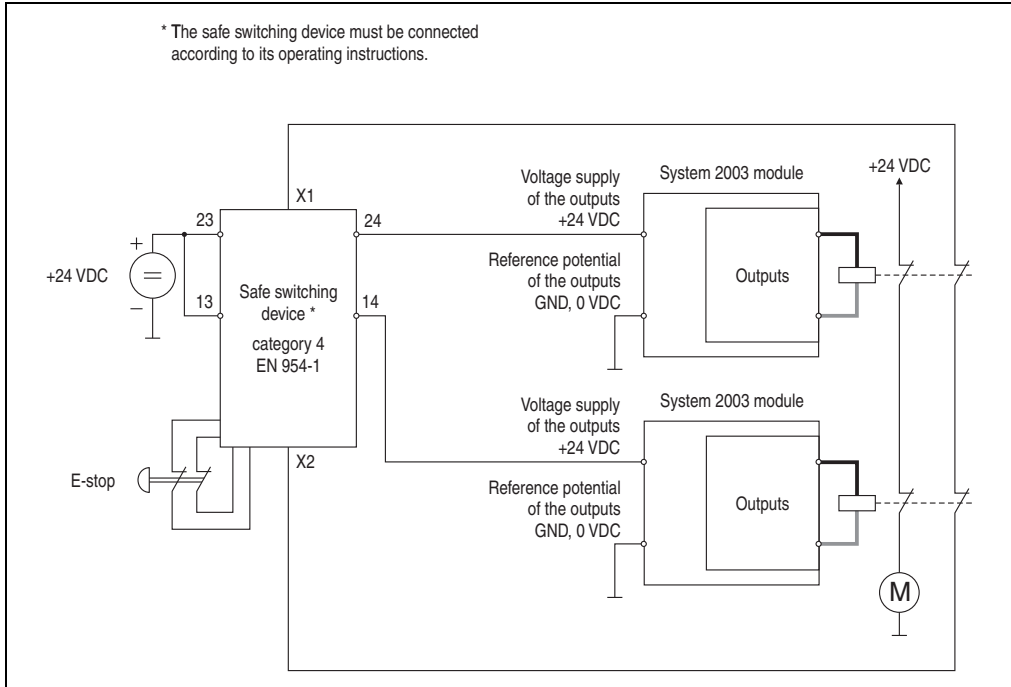


Figure 8: DM435 - Output wiring by wiring with contactors

- 2-channel execution necessary to avoid contactor error (contactor is faulty, e. g. contacts sticking).
- Evaluation of feedback contacts in order to prevent a restart in case of error.

## 1.8 Variable declaration

The variable declaration is valid for the following controllers:

- CPU for the PLC 2003
- Remote I/O bus controllers
- CAN bus controller

B&R Automation Studio Support: See B&R Automation Studio Help starting with V 1.40

### 1.8.1 Variable declaration with PLC 2003 CPU and remote slaves

Function	Variable declaration				
	Scope	Data type	Length	Module type	Channel
Single digital input (channel x)	tc_global	BOOL	1	Digit. In	1 ... 8
Single digital output (channel x)	tc_global	BOOL	1	Digit. Out	1 ... 8
Module status	tc_global	USINT	1	Status In	0

Table 3: DM435 - Variable declaration using the CPU and remote slaves

### 1.8.2 Variable declaration with CAN slaves

Function	Variable declaration				
	Scope	Data type	Length	Module type	Channel
Single digital input (channel x)	tc_global	BOOL	1	Digit. In	1 ... 8
Single digital output (channel x)	tc_global	BOOL	1	Digit. Out	1 ... 8

Table 4: DM435 - Variable declaration with CAN slaves

### Module status

The module status for CAN slaves can only be read using command codes. The command codes are explained in Chapter 5 "CAN Bus Controller Functions", section "Command Codes and Parameters". An example is provided in Chapter 4 "Module Addressing".

## 1.9 Access using CAN identifiers

Access via CAN identifiers is used if the slave is being controlled by a device from another manufacturer. Access via CAN identifiers is described in an example in Chapter 4 "Module Addressing". The transfer modes are explained in Chapter 5, "CAN Bus Controller Functions".

### 1.9.1 Digital inputs

A maximum of eight digital I/O modules can be run in the packed mode.

CAN ID <sup>1)</sup>	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
286	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7	Module 8

Table 5: DM435 - Access using CAN identifier, inputs, packed

- 1) CAN ID =  $286 + (nn - 1) \times 4$   
 nn ... Node number of the CAN slave = 1

A maximum of four digital I/O modules can be run in unpacked mode.

Module	CAN ID <sup>1)</sup>	Bytes
1	286	Inputs 1 - 8
2	287	Inputs 1 - 8
3	288	Inputs 1 - 8
4	289	Inputs 1 - 8

Table 6: DM435 - Access using CAN identifier, inputs, unpacked

- 1) CAN ID =  $286 + (nn - 1) \times 4 + (ma - 1)$   
 nn ... Node number of the CAN slave = 1  
 ma ... Module address of digital IO modules = 1 - 4

### 1.9.2 Digital outputs

A maximum of eight digital I/O modules can be run in the packed mode.

CAN ID <sup>1)</sup>	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
414	Module 1	Module 2	Module 3	Module 4	Module 5	Module 6	Module 7	Module 8

Table 7: DM435 - Access using CAN identifier, outputs, packed

- 1) CAN ID =  $414 + (nn - 1) \times 4$   
 nn ... Node number of the CAN slave = 1

A maximum of four digital I/O modules can be run in unpacked mode.

Module	CAN ID <sup>1)</sup>	Bytes
1	414	Outputs 1 - 8
2	415	Outputs 1 - 8
3	416	Outputs 1 - 8
4	417	Outputs 1 - 8

Table 8: DM435 - Access using CAN identifier, outputs, unpacked

- 1) CAN ID =  $414 + (nn - 1) \times 4 + (ma - 1)$   
 nn ... Node number of the CAN slave = 1  
 ma ... Module address of digital IO modules = 1 - 4

For more information on ID allocation, see Chapter 5, "CAN Bus Controller Functions".

### 1.10 Module status

The evaluation of the module status is described in an example in Chapter 4 "Module Addressing" .

Bit	Description
0 - 4	Module code = \$03
5	0 ... No error, the supply voltage for the digital outputs is OK 1 ... Short circuit, over-temperature or the supply voltage for the digital outputs is not OK
6	Digital module = 0
7	0 ... No supply voltage or supply voltage too low for digital inputs 1 ... Module voltage OK