# 1. DM465

### 1.1 Order data

Model number	Short description	Figure
7DM465.7	2003 digital mixed module, 16 inputs 24 VDC, 1 ms, sink, 16 transistor outputs 24 VDC, 0.5 A, order terminal blocks separately!	
7TB718.9	Terminal block, 18 pin, screw clamps	Alleger on Secretary accessors with the secretary and the secretary accessors with the secretary accessors and the secretary accessors accessors and the secretary accessors accessors and the secretary accessors and the secretary accessors accessors accessors accessors accessors accessors and the secretary accessors acc
7TB718.91	Terminal block, 18 pin, cage clamps	
7TB736.9	2003 terminal block, 36-pin, screw clamps	INPUT 24 VOC DM465 4 mA Load Sm637 N#
7TB736.91	2003 terminal block, 36-pin, cage clamps	24 VDC 0.5 A
7TB754.9	2003 terminal block, 54 pin, screw clamps	TB736 24 V 24 V 5
7TB754.91	2003 terminal block, 54 pin, cage clamps	DM465 OK[1[2]3[4[5]6[7]8]
7TB772.91	2003 terminal block, 72-pin, cage clamps	S# O O O O O S#+1
Terminal blocks not incl	uded in delivery.	

Table 1: DM465 - Order data

# 1.2 Technical data

Product ID	DM465				
General information					
C-UL-US listed	In preparation				
B&R ID code	\$F7				
Module type	B&R 2003 I/O module				
Amount <sup>1)</sup> CP430, EX270 CP470, CP770, EX470, EX770, EX477, EX777 CP474, CP774 CP476	2 4 6 8				
Voltage and output monitoring (LED: OK)	Yes Supply voltage >18 V, outputs OK				
Power consumption	Max. 1.1 W				

Table 2: DM465 - Technical data

Product ID	DM465
Inputs	
Number of inputs	16
Wiring	Sink
Input voltage Minimum Rated Maximum	18 VDC 24 VDC 30 VDC
Switching threshold Low High	<5 V >15 V
Input delay	Max. 1 ms
Input current at rated voltage	Approx. 4 mA
Electrical isolation Input - PLC Input - Output	Yes No
Outputs	
Number of outputs	16
Туре	Highside driver IC (transistor)
Switching voltage Minimum Rated Maximum	18 VDC 24 VDC 30 VDC
Continuous current per Output Module	Max. 0.5 A Max. 8 A
Leakage current when switched off	12 µA
Overload protection	Yes
Switching on after overload cutoff	Automatically within seconds (depends on the module temperature)
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 log. 1 - log. 0	Max. 450 μs Max. 450 μs
Electrical isolation Output - PLC Output - Input	Yes No
Mechanical characteristics	
Dimensions	B&R 2003 single-width

Table 2: DM465 - Technical data (cont.)

<sup>1)</sup> Two logical module slots are required by the module.

#### 1.3 Status LEDs

#### 1.3.1 Supply Voltage

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.

### 1.3.2 Inputs/outputs

Only 8 LEDs are available for each of the 16 inputs and outputs.

```
Green ... inputs
Orange ... outputs
```

To show all channels, they are divided into groups of eight. You can switch between the two groups using a toggle button on the module front. Two LEDs show which channels are currently being displayed.

```
LED S # ... channels 1 - 8
LED S # + 1 ... channels 9 - 16
```

### States of the green LEDs

Green LED				
Static On	The corresponding input = 1			
Static Off	The corresponding input = 0			

Table 3: DM465 - Green status LEDs

#### States of the orange LEDs

Orange LED				
Static On	The corresponding output = 1			
Static Off	The corresponding output = 0			
Blinking	An error has occurred on the respective output			

Table 4: DM465 - Orange status LEDs

#### States of LED S #

S#					
Static On	Shows channels 1 - 8 without output error				
Blinking Symmetrically	Error on one of the outputs 1 - 8				
Pulse	Error on one of the outputs 1 - 8 when showing outputs 9 - 16 (S # +1)				

Table 5: DM465 - Status LEDs

#### States of LED S # + 1

S#+1					
Static On	Shows channels 9 - 16 without output error				
Blinking Symmetrically	Error on one of the outputs 9 - 16				
Pulse	Error on one of the outputs 9 - 16 when showing outputs 1 - 8 (S #)				

Table 6: DM465 - Status LED S# + 1

# 1.4 Input circuit diagram

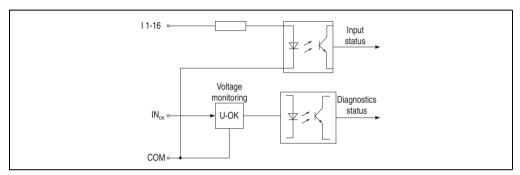


Figure 1: DM465 - Input circuit diagram

# 1.5 Output circuit diagram

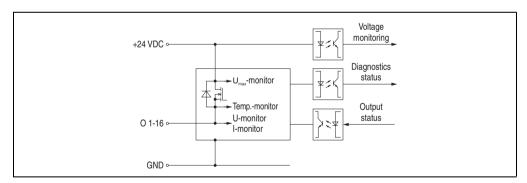


Figure 2: DM465 - Output circuit diagram

### 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.

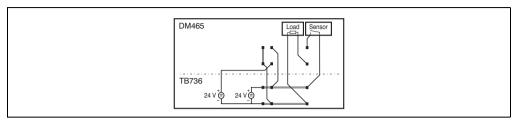


Figure 3: DM465 - Insert Strips

#### 1.7 Connections

The supply voltage for the inputs is applied using the terminal block TB722. A separate supply voltage is required for the inputs and outputs. The reference potential for both voltages is connected to the bottom pin connector on the TB736.

#### 1.7.1 Inputs - sink connection

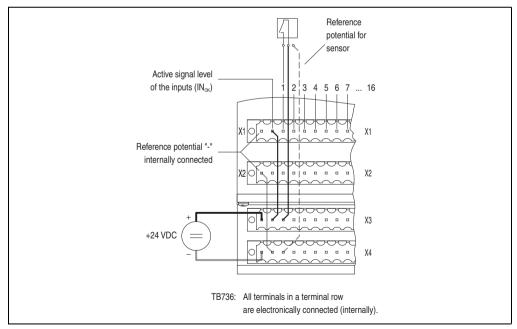


Figure 4: DM465 - Connections, inputs (sink)

# 1.7.2 Output circuit

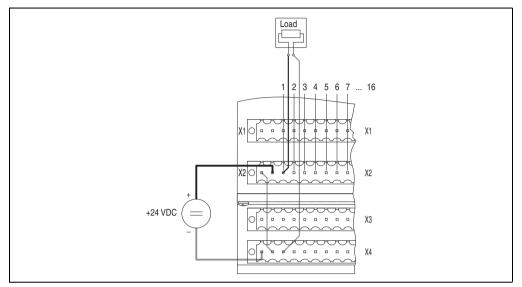


Figure 5: DM465 - Connections, outputs

### 1.7.3 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

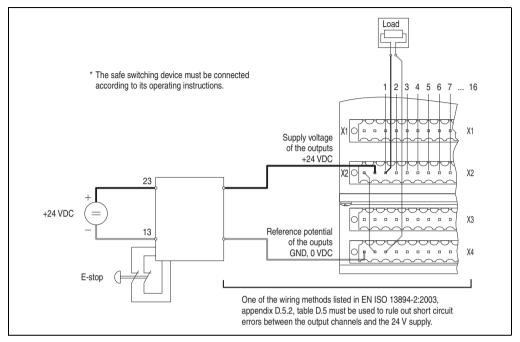


Figure 6: DM465 - Output wiring by directly connecting the actuators

# 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

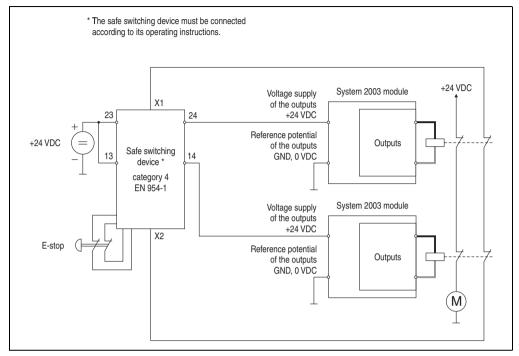


Figure 7: DM465 - Output wiring by wiring with contactors

- 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 Three line connection

If the digital mixed module DM465 is operated using a three line connection, the terminal block TB772 is used as additional jumper terminal.

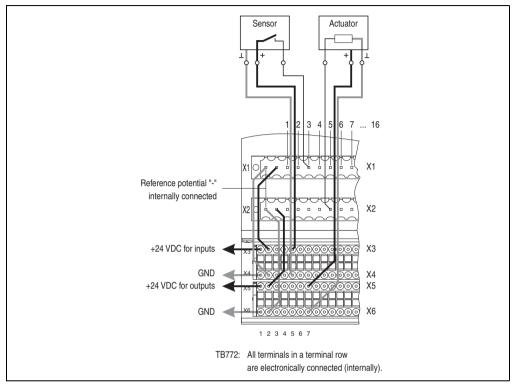


Figure 8: DM465 - Three line connection

#### 1.9 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

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

Name	VD Data type	VD Module Type	VD Channel	R	W	Description
Digital inputs 1 - 8	BOOL	Digit. In	18	•		Level of digital inputs 1 - 8
Digital outputs 1 - 8	BOOL	Digit. Out	18		•	Level of digital outputs 1 - 8
Module status 1	USINT	Status In	0	•		Module status for the first half of the module
Digital inputs 9 - 16 (module address + 1)	BOOL	Digit. In	18	•		Level of digital inputs 9 - 16
Digital outputs 9 - 16 (module address + 1)	BOOL	Digit. Out	18		•	Level of digital outputs 9 - 16
Module status 2 (module address + 1)	USINT	Status In	0	•		Module status for the second half of the module

Table 7: DM465 - Variable declaration using the CPU and remote slaves

#### 1.9.2 Variable declaration with CAN slaves

Name	VD Data type	VD Module Type	VD Channel	R	W	Description
Digital inputs 1 - 8	BOOL	Digit. In	18	•		Level of digital inputs 1 - 8
Digital outputs 1 - 8	BOOL	Digit. Out	18		•	Level of digital outputs 1 - 8
Digital inputs 9 - 16 (module address + 1)	BOOL	Digit. In	18	•		Level of digital inputs 9 - 16
Digital outputs 9 - 16 (module address + 1)	BOOL	Digit. Out	18		•	Level of digital outputs 9 - 16

Table 8: DM465 - 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".

### 1.10 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".

### 1.10.1 Digital inputs

A maximum of eight digital I/O modules can be run in the packed mode. The 16 channel module DM465 operates like two 8 channel modules next to each other. If two DM465 modules are used, only six additional digital I/O modules can be used. The following example shows the structure of the CAN object if four DI435 and two DM465 modules are used.

CAN ID 1)	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
286	DI435	DI435	DI435	DI435	DM465 I 1 - 8	DM465 I 9 - 16	DM465 I 1 - 8	DM465 I 9 - 16

Table 9: DM465 - Access via CAN identifiers, digital inputs, packed

```
1) CAN ID = 286 + (nn - 1) x 4
nn ... Node number of the CAN slave = 1
```

A maximum of four digital I/O modules can be run in unpacked mode. The following example shows the structure of the CAN object if two DI435 and one DM465 modules are used.

Module	CAN ID 1)	Bytes	
DI435	286	Inputs 1 - 8	
DI435	287	Inputs 1 - 8	
DM465	288	Inputs 1 - 8	
	289	Inputs 9 - 16	

Table 10: DM465 - Access via CAN identifiers, digital inputs, unpacked

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

### 1.10.2 Digital outputs

A maximum of eight digital I/O modules can be run in the packed mode. The 16 channel module DM465 operates like two 8 channel modules next to each other. If two DM465 modules are used, only six additional digital I/O modules can be used. The following example shows the structure of the CAN object if four DO722 and two DM465 modules are used.

CAN ID 1)	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7	Byte 8
414	DO722	DO722	DO722	DO722	DM465 O 1 - 8	DM465 O 9 - 16	DM465 O 1 - 8	DM465 O 9 - 16

Table 11: DM465 - Access via CAN identifiers, digital outputs, packed

```
1) CAN ID = 414 + (nn - 1) x 4
nn ... Node number of the CAN slave = 1
```

A maximum of four digital I/O modules can be run in unpacked mode. The following example shows the structure of the CAN object if two DO722 and one DM465 modules are used.

Module	CAN ID 1)	Bytes
DO722	414	Outputs 1 - 8
DO722	415	Outputs 1 - 8
DM465	416	Outputs 1 - 8
	417	Outputs 9 - 16

Table 12: DM465 - Access via CAN identifiers, digital outputs, unpacked

```
    CAN ID = 414 + (nn - 1) x 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".

### 1.11 Module status

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

# 1.11.1 Module Status 1

Bit	Description
0 - 4	Module code = \$17
5	No error, the supply voltage for the digital outputs 1 - 8 is OK     Short circuit, over-temperature or the supply voltage for digital outputs 1 - 8 is not OK. Bits 0 - 4 contain the channel number of the first faulty output.
6	Digital module = 0
7	No supply voltage or supply voltage too low for digital inputs/outputs     Module voltage OK

### 1.11.2 Module Status 2

Bit	Description
0 - 4	Module code = \$17
5	No error, the supply voltage for the digital outputs 9 - 16 is OK     Short circuit, over-temperature or the supply voltage for digital outputs 9 - 16 is not OK. Bits 0 - 4 contain the channel number of the first faulty output.
6	Digital module = 0
7	No supply voltage or supply voltage too low for digital inputs/outputs     Module voltage OK