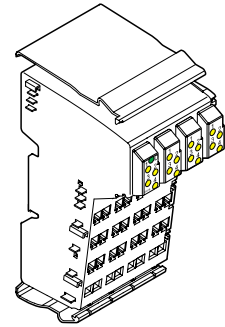


VARIO DO 16/24

I/O Extension Module With 16 Digital Outputs

User Manual

02/2003



5559A001



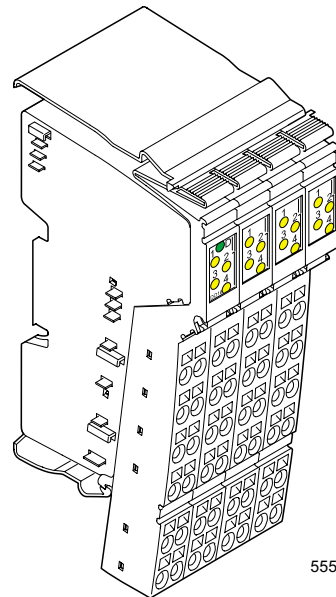
This data sheet is only valid in association with the documents of the used fieldbus coupler

Function

This terminal is designed for use within an Inline station. It is used to output digital signals.

Features

- Connections for 16 digital actuators
- Connection of 2- and 3-wire actuators
- Nominal current of each output: 0.5 A
- Total current of the terminal: 8 A
- Short-circuit and overload protected outputs
- Diagnostic and status indicators



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Figure 1 VARIO DO 16/24 terminal with the connectors plugged in



All modules will be delivered including connectors and labeling fields

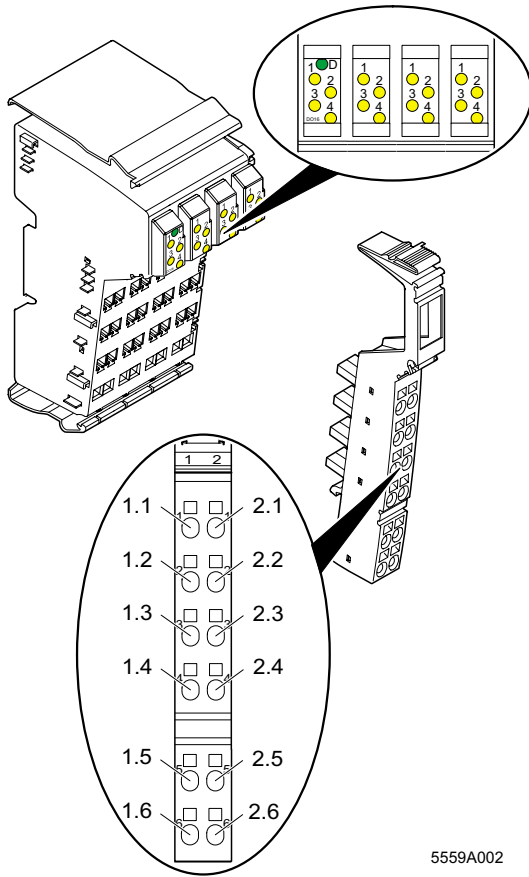


Figure 2 VARIO DO 16/24 terminal with an appropriate connector

Local Diagnostic and Status Indicators

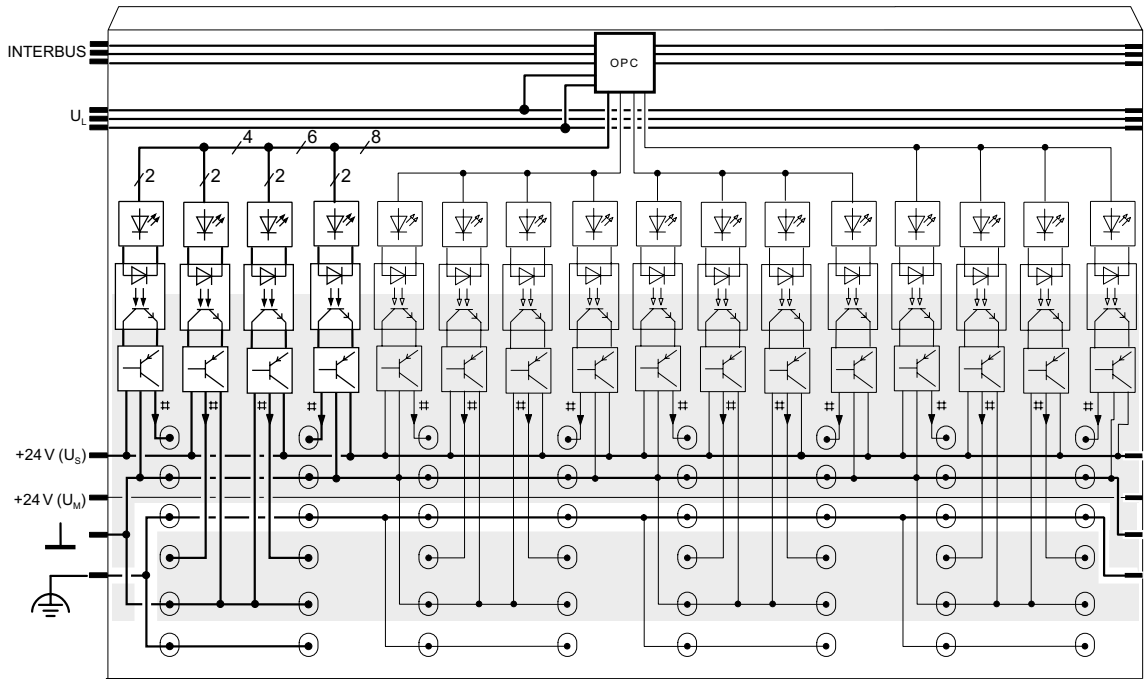
Des.	Color	Meaning
D	Green	Bus diagnostics
1, 2, 3, 4	Yellow	Status indication of the outputs

Terminal Assignment for Each Connector

Terminal Point	Assignment
1.1, 2.1	Signal output (OUT)
1.2, 2.2	Ground contact (GND) for 2- and 3-wire-termination
1.3, 2.3	FE (functional earth ground) connection for 3-wire-termination
1.4, 2.4	Signal output (OUT)
1.5, 2.5	Ground contact (GND) for 2- and 3-wire-termination
1.6, 2.6	FE connection for 3-wire-termination

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

Internal Circuit Diagram



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Figure 3 Internal wiring of the terminal points

Key:

- | | | | |
|---|--|---|----------------|
|  | INTERBUS protocol chip
(bus logic including voltage conditioning) |  | Digital output |
|  | LED (status indicators) |  | Isolated area |
|  | Optocoupler | | |
|  | Transistor | | |

Connection Example



When connecting the actuators, observe the assignment of the terminal points to the fieldbus output data (see page 5).

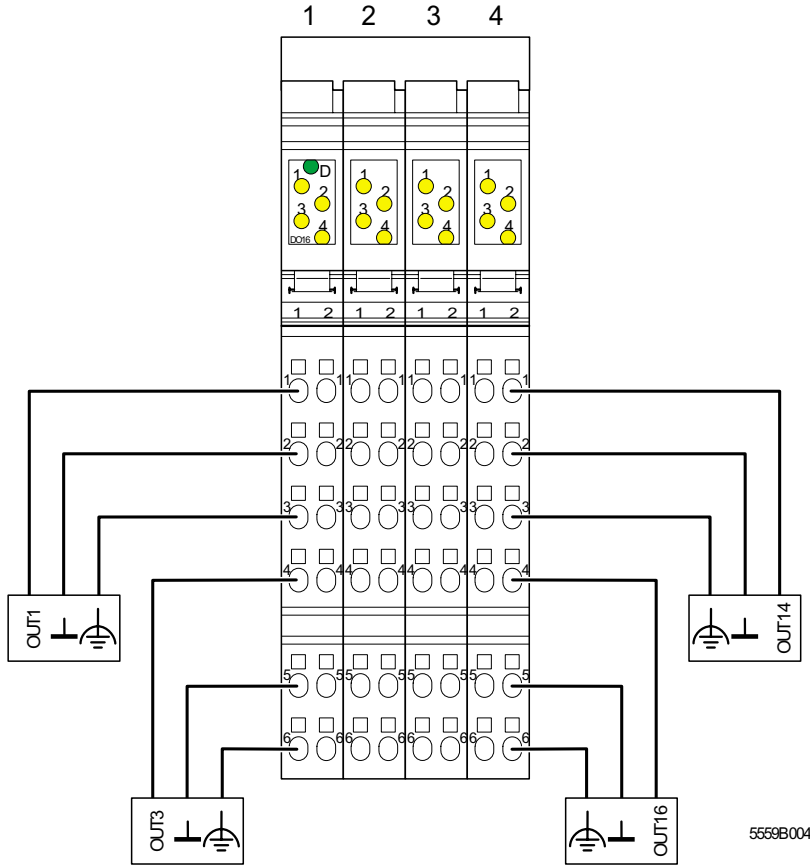


Figure 4 Typical actuator connections 3-wire termination

The numbers shown above the terminal indicate the mounting locations of the connectors.

Programming Data

ID code	BD _{hex} (189 _{dec})
Length code	01 _{hex}
Process data channel	16 bits
Input address area	0 bytes
Output address area	2 bytes
Parameter channel (PCP)	0 bytes
Register length (bus)	2 bytes

Process Data





The IN process data is not available.

Assignment of the Terminal Points to the OUT Process Data

(Byte.bit) view	Byte	Byte 0								Byte 1							
	Bit	7	6	5	4	3	2	1	0	7	6	5	4	3	2	1	0
Terminal	Slot	4				3				2				1			
	Terminal point (signal)	2.4	1.4	2.1	1.1	2.4	1.4	2.1	1.1	2.4	1.4	2.1	1.1	2.4	1.4	2.1	1.1
	Terminal point (GND)	2.5	1.5	2.2	1.2	2.5	1.5	2.2	1.2	2.5	1.5	2.2	1.2	2.5	1.5	2.2	1.2
	Terminal point (FE)	2.6	1.6	2.3	1.3	2.6	1.6	2.3	1.3	2.6	1.6	2.3	1.3	2.6	1.6	2.3	1.3
Status indication	Slot	4				3				2				1			
	LED	4	3	2	1	4	3	2	1	4	3	2	1	4	3	2	1

Technical Data

General Data	
Housing dimensions (width x height x depth)	48.8 mm x 120 mm x 71.5 mm (1.921 in. x 4.724 in. x 2.815 in.)
Weight	130 g (without connector)
Operating mode	Process data operation with 16 bits
Connection type of the actuators	2- and 3-wire technology
Permissible temperature (operation)	-25°C to +55°C (-13°F to +131°F)
Permissible temperature (storage/transport)	-25°C to +85°C (-13°F to +185°F)
Permissible humidity (operation)	75% on average, 85% occasionally
 Ranging from -25°C to +55°C (-13°F to +131°F) appropriate measures against increased humidity (> 85%) must be taken.	
Permissible humidity (storage/transport)	75% on average, 85% occasionally
 For a short period, slight condensation may appear on the housing if, for example, the terminal is brought into a closed room from a vehicle.	
Permissible air pressure (operation)	80 kPa to 106 kPa (up to 2000 m [6562 ft.] above sea level)
Permissible air pressure (storage/transport)	70 kPa to 106 kPa (up to 3000 m [9843 ft.] above sea level)
Degree of protection	IP 20 according to IEC 60529
Class of protection	Class 3 according to VDE 0106, IEC 60536


Interface	
local bus interface	Through data routing



Power Consumption	
Communications power	7.5 V
Current consumption from the local bus	90 mA, maximum
Power consumption from the local bus	0.675 W, maximum
Segment supply voltage U_S	24 V DC (nominal value)
Nominal current consumption of U_S	8 A (16 x 0.5 A), maximum

Supply of the Module Electronics and I/O Through Bus Terminal/Power Terminal

Connection method	Through potential routing
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Digital Outputs

Number	16
Nominal output voltage U_{OUT}	24 V DC
Differential voltage for I_{nom}	≤ 1 V
Nominal current I_{nom} per channel	0.5 A
Tolerance of the nominal current	+10%
Total current	8 A
Protection	Short-circuit; overload
 Channels are thermally coupled in groups of 4, i.e. an error in one channel can affect the other channels.	
Nominal load	
Ohmic	48 Ω / 12 W
Lamp	12 W
Inductive	12 VA (1.2 H, 50 Ω)
Signal delay: OFF to ON	
- Ohmic nominal load	500 μ s, typical
- Lamp nominal load	100 ms (with switching frequencies up to 8 Hz; above this frequency the lamp load responds like an ohmic load), typical
- Inductive nominal load	100 ms (1.2 H, 50 Ω), typical
Signal delay: ON to OFF	
- Ohmic nominal load	1 ms, typical
- Lamp nominal load	1 ms, typical
- Inductive nominal load	50 ms (1.2 H, 50 Ω), typical

Digital Outputs (continued)	
Switching frequency with	
- Ohmic nominal load	300 Hz, maximum
 This switching frequency is limited by the selected data rate, the number of bus devices, the bus structure, the software, and the control or computer system used.	
- Lamp nominal load	8 Hz, maximum
 This switching frequency is limited by the selected data rate, the number of bus devices, the bus structure, the software, and the control or computer system used.	
- Inductive nominal load	0.5 Hz (1.2 H, 50 Ω), maximum
Overload response	Auto restart
Response time with ohmic overload (12 Ω)	Approximately 3 s
Restart frequency at ohmic overload	Approximately 400 Hz
Restart frequency at lamp overload	Approximately 400 Hz
Response after inductive overload	Output can be destroyed
Response time after short-circuit	Approximately 3 s
Reverse voltage endurance against short pulses	Yes
Strength against permanently applied reverse voltages	Yes Maximum permissible current 2 A
Validity of output data after connection of 24 V power supply (power up)	5 ms, typical
Response upon US power down	The output follows the power supply without delay.
Limitation of the demagnetization voltage induced on circuit interruption	$-15 \text{ V} \leq U_{\text{demag}} \leq -45.8 \text{ V}$ (U_{demag} = demagnetization voltage)
Single maximum energy in free running	400 mJ, maximum
Protective circuit type	Integrated 45 V Zener diode in output chip

Digital Outputs (continued)	
Overcurrent shutdown	Minimum at 0.7 A
Output current when switched off	300 μ A, maximum
Output voltage when switched off	2 V, maximum
Output current with ground connection interrupted	25 mA, maximum
Switching power with ground connection interrupted	100 mW at 1 k Ω load resistance, typical
Inrush current with lamp load	1.5 A for 20 ms, maximum

Output Characteristic When Switched On (Typical)	
Output current (A)	Differential output voltage (V)
0	0
0.1	0.04
0.2	0.08
0.3	0.12
0.4	0.16
0.5	0.20

Power Dissipation	
Formula to calculate the power dissipation of the electronics	
$P_{\text{tot}} = 0.19 \text{ W} + \sum_{n=1}^{16} (0.10 \text{ W} + I_{\text{Ln}}^2 \times 0.4 \ \Omega)$	
With	
P_{tot}	Total power dissipation of the terminal
n	Index of the number of set outputs $n = 1$ to 16
I_{Ln}	Load current of the output n
Power dissipation of the housing P_{HOU}	2.7 W, maximum (within the permissible operating temperature)

Concurrent Channel Derating		
Ambient temperature T_U	Maximum load current at 100% simultaneity	Maximum load current at 75% simultaneity
$-25^{\circ}\text{C} (-13^{\circ}\text{F}) \leq T_U < +40^{\circ}\text{C}$ (104°F)	0.50 A	0.50 A
$+40^{\circ}\text{C} (104^{\circ}\text{F}) \leq T_U < +45^{\circ}\text{C}$ (113°F)	0.45 A	0.50 A
$+45^{\circ}\text{C} (113^{\circ}\text{F}) \leq T_U < +50^{\circ}\text{C}$ (122°F)	0.40 A	0.50 A
$+50^{\circ}\text{C} (122^{\circ}\text{F}) < T_U \leq +55^{\circ}\text{C}$ (131°F)	0.35 A	0.50 A

With 100% simultaneity, a load current of 0.4 A for each channel is permissible up to 50°C (122°F) (ambient temperature range). Above 50°C (122°F) a load current of 0.35 A is permissible. If a maximum of twelve channels are operated in the permissible ambient temperature range at the same time (75% simultaneity, maximum), a load current of 0.5 A can be tapped.

Safety Devices	
Overload/short-circuit in segment circuit	Electronic; with four 4-channel drivers
Surge voltage	Protective elements of the power terminal; Protection up to 33 V DC
Polarity reversal of power supply	Protective elements of the power terminal; It is necessary to protect the power supply. The power supply unit should be able to supply 4-times (400%) the nominal current of the fuse.
Reverse voltage	Integrated reverse voltage protection

Electrical Isolation

To provide electrical isolation between the logic level and the I/O area it is necessary to supply the bus terminal and the digital output terminal using the bus terminal or a power terminal from separate power supply units. Interconnection of the 24 V power supplies is not allowed!


Common potentials

24 V main power, 24 V segment voltage, and GND have the same potential. FE is a separate potential area.

Separate system potentials consisting of bus terminal/power terminal and I/O terminal

- Test distance	- Test voltage
5 V supply incoming remote bus / 7.5 V supply (bus logic)	500 V AC, 50 Hz, 1 min
5 V supply outgoing remote bus / 7.5 V supply (bus logic)	500 V AC, 50 Hz, 1 min
7.5 V supply (bus logic) / 24 V supply (I/O)	500 V AC, 50 Hz, 1 min
24 V supply (I/O) / functional earth ground	500 V AC, 50 Hz, 1 min

Error Messages to the Higher-Level Control or Computer System

Short-circuit/overload of an output	Yes
 An error message is generated when an output is shorted and switched on. Also, the diagnostic LED (D) flashes on the terminal at 2 Hz under these conditions.	
Operating voltage out of range	No

Ordering Data

Description	Order Designation	Order No.
Terminal with 16 digital outputs with connectors and labeling fields	VARIO DO 16/24	KSVC-102-00251

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