

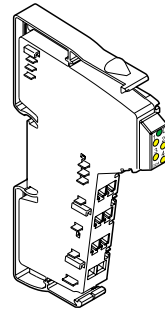
# VARIO DO 4/24

## I/O Extension Module With Four Digital Outputs

User Manual

02/2003

5557A001



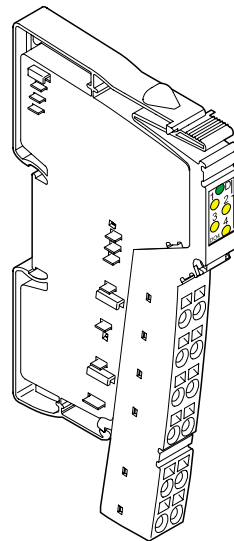
This data sheet is only valid in association with the documents of the used fieldbus coupler

### Function

The terminal is designed for use within an VARIO station.. It is used to output digital signals.

### Features

- Connections for four digital actuators
- Connection of actuators in 2- and 3-wire technology
- Nominal current per output: 0.5 A.
- Total current of the terminal: 2 A.
- Short-circuit and overload protected outputs
- Diagnostic and status indicators



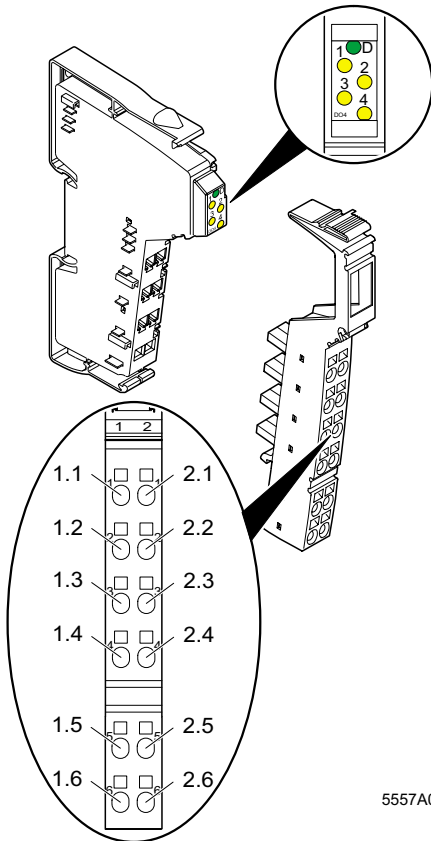
5557A006

Figure 1

VARIO DO 4/24 terminal  
with connector



All modules will be delivered including connectors and labeling fields



5557A002

Figure 2 VARIO DO 4/24 with appropriate connector

### Local Diagnostic and Status Indicators

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

### Terminal Assignment

Terminal Point	Assignment
1.1	Signal output (OUT 1)
2.1	Signal output (OUT 2)
1.2, 2.2	Ground contact (GND) for 2- and 3-wire termination
1.3, 2.3	FE connection for 3-wire termination
1.4	Signal output (OUT 3)
2.4	Signal output (OUT 4)
1.5, 2.5	Ground contact (GND) for 2- and 3-wire termination
1.6, 2.6	FE connection for 3-wire termination

# Internal Circuit Diagram

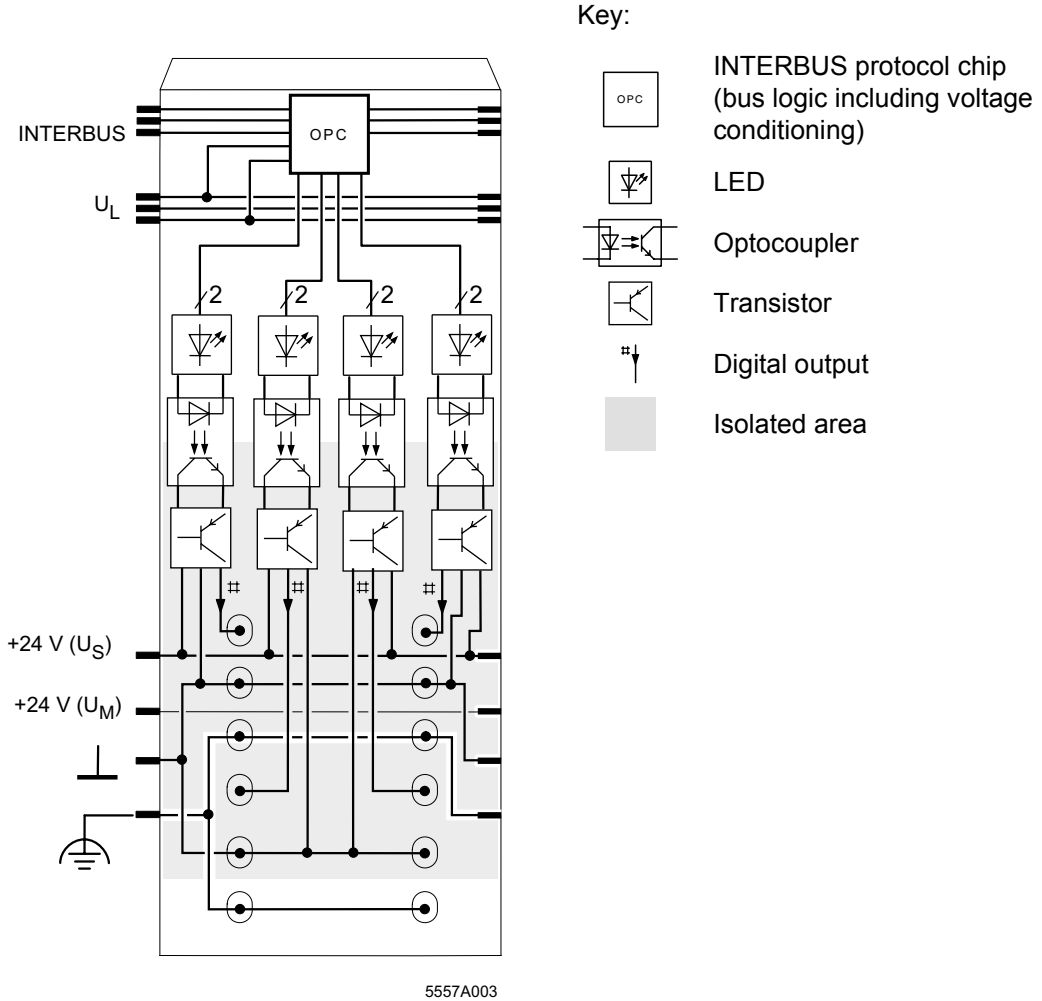


Figure 3 Internal wiring of the terminal points

## Connection Example



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

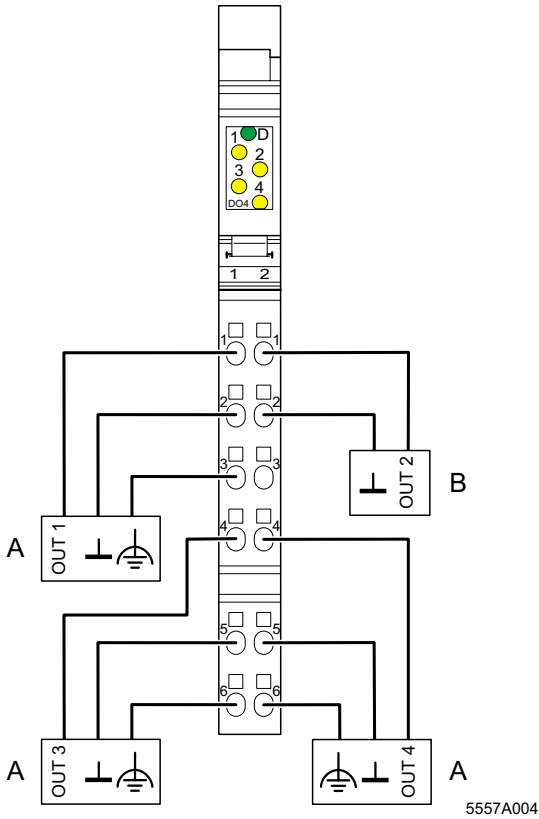


Figure 4 Typical actuator connections

A 3-wire termination

B 2-wire termination

## Programming Data

ID code	BD <sub>hex</sub> (189 <sub>dec</sub> )
Length code	41 <sub>hex</sub>
Process data channel	4 bits
Input address area	0 bits
Output address area	4 bits
Parameter channel (PCP)	0 bits
Register length (bus)	4 bits

## Process Data





IN process data is not available.

### Assignment of the Terminal Points to the OUT Process Data

Bit view	Bit	3	2	1	0
Assignment	Terminal point (signal)	2.4	1.4	2.1	1.1
	Terminal point (GND)	2.5	1.5	2.2	1.2
	Terminal point (FE)	2.6	1.6	2.3	1.3
Status indicator	LED	4	3	2	1


## Technical Data



General Data	
Housing dimensions (width x height x depth)	12.2 mm x 120 mm x 71.5 mm (0.480 in. x 4.724 in. x 2.815 in.)
Weight	44 g (without connector)
Operating mode	Process data operation with 4 bits
Connection method of the actuators	2-wire 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
 In the range 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	44 mA, maximum
Power consumption from the local bus	0.33 W, maximum
Segment supply voltage $U_S$	24 V DC (nominal value)
Nominal current consumption at $U_S$	2 A (4 x 0.5 A), maximum

Supply of the Module Electronics and I/O Through Bus Terminal/Power Terminal	
Connection method	Through potential routing

Digital Outputs	
Number	4
Nominal output voltage $U_{OUT}$	24 V DC
Differential voltage for $I_{nom}$	$\leq 1$ V
Nominal current $I_{nom}$ per channel	0.5 A
Tolerance of the nominal current	+10%
Total current	2 A
Protection	Short-circuit; overload
 All four channels are thermally coupled, i.e., an error in one channel can affect the other channels.	
Nominal load	
Ohmic	48 $\Omega$ /12 W
Lamp	12 W
Inductive	12 VA (1.2 H, 50 $\Omega$ )
Signal delay upon power up of	
- Ohmic nominal load	100 $\mu$ s, typical
- Lamp nominal load	100 ms, typical (with switching frequencies up to 8 Hz; above this frequency the lamp load responds like an ohmic load)
- Inductive nominal load	100 ms, typical (1.2 H, 50 $\Omega$ )
Signal delay upon power down of	
- Ohmic nominal load	1 ms, typical
- Lamp nominal load	1 ms, typical
- Inductive nominal load	50 ms, typical (1.2 H, 50 $\Omega$ )

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	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.	
- Inductive nominal load	0.5 Hz, maximum (1.2 H, 50 Ω)
Overload response	Auto restart
Response time with ohmic overload (12 Ω)	3 s, approximately
Restart frequency with ohmic overload	250 Hz, approximately
Restart frequency with lamp overload	250 Hz, approximately
Inductive overload response	Output may be damaged
Response time after short circuit	850 ms, approximately
Reverse voltage endurance against short pulses	Protected against reverse voltages
Strength against permanently applied reverse voltages	Up to 2 A DC
Strength against permanently applied surge voltage	No
Validity of output data after connection of 24 V voltage supply (power up)	5 ms, typical
Response upon power down	The output follows the supply voltage without delay.
Limitation of the demagnetization voltage induced on circuit interruption	$-15 \text{ V} \leq U_{\text{demag}} \leq -46 \text{ V}$ ( $U_{\text{demag}}$ = demagnetization voltage)
Single maximum energy in free running	400 mJ, maximum
Protective circuit type	Integrated 45 V Zener diode in output chip



<b>Digital Outputs (Continued)</b>	
Overcurrent shutdown	At 0.7 A, minimum
Output current when switched off	300 $\mu$ 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 $\Omega$ load resistance, typical
Inrush current with lamp load	1.5 A for 20 ms, maximum

<b>Output Characteristic When Switched On (Typical)</b>	
<b>Output Current (A)</b>	<b>Differential Output Voltage (V)</b>
0	0
0.1	0.04
0.2	0.08
0.3	0.12
0.4	0.16
0.5	0.20

<b>Power Dissipation</b>	
<b>Formula to Calculate the Power Dissipation of the Electronics</b>	
$P_{EL} = 0.19 \text{ W} + \sum_{n=1}^4 (0.10 \text{ W} + I_{Ln}^2 \times 0.4 \Omega)$	
Where	
$P_{tot}$	Total power dissipation of the module
$n$	Index of the number of set outputs $n = 1$ to $4$
$I_{Ln}$	Load current of the output $n$
<b>Power Dissipation of the Housing <math>P_{HOU}</math></b>	0.6 W, maximum (within the permissible operating temperature)

<b>Concurrent Channel Derating</b>			
<b>Ambient temperature (TA)</b>	<b>Maximum load current at</b>		
	<b>100% simultaneity</b>	<b>75% simultaneity</b>	<b>50% simultaneity</b>
≤ 35°C (95°F)	0.5 A	0.5 A	0.5 A
≤ 45°C (113°F)	0.375 A	0.5 A	0.5 A
≤ 55°C (131°F)	0.25 A	0.33 A	0.5 A

With 100% simultaneity, a load current of 0.5 A for each channel is permissible up to 35°C (95°F) (ambient temperature range), a load current of 0.375 A between 35°C and 45°C (95°F and 113°F), and a load current of 0.25 A up to 55°C (131°F).

If a maximum of two channels are operated in the permissible ambient temperature range (50% simultaneity), a load current of 0.5 A can be tapped.

If all four channels are used you must define the permissible working point according to the above formula.

<b>Safety Devices</b>	
Overload/short-circuit in segment circuit	Electronic; with 4-channel driver
Surge voltage	Protective circuits of the power terminal Protection up to 33 V DC
Polarity reversal of voltage supply	Protective circuits of the power terminal It is necessary to protect the voltage supply. The power supply unit should be able to supply 4 times (400%) the nominal current of the external fuse.
Reverse voltage	Protection up to 2 A DC

**Electrical Isolation**

To provide electrical isolation between the logic level and the I/O area, it is necessary to supply the station bus terminal and the digital output terminal described here 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 Potentials in the System 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 short-circuited and switched on. In addition, the diagnostic LED (D) flashes on the terminal at 2 Hz (medium) under these conditions.	
Operating voltage out of range	No

## Ordering Data

Description	Order Designation	Order No.
Terminal with four digital outputs	VARIO DO 4/24	KSVC-102-00231

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