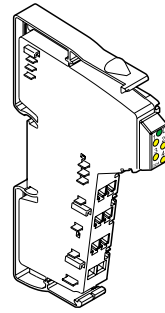


# VARIO DO 4/24

## I/O Extension Module With Four Digital Outputs



5557A001

User Manual

02/2003



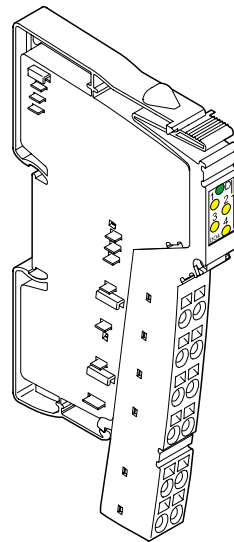
This data sheet is only valid in association with the documents of the used fieldbus coupler

## 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



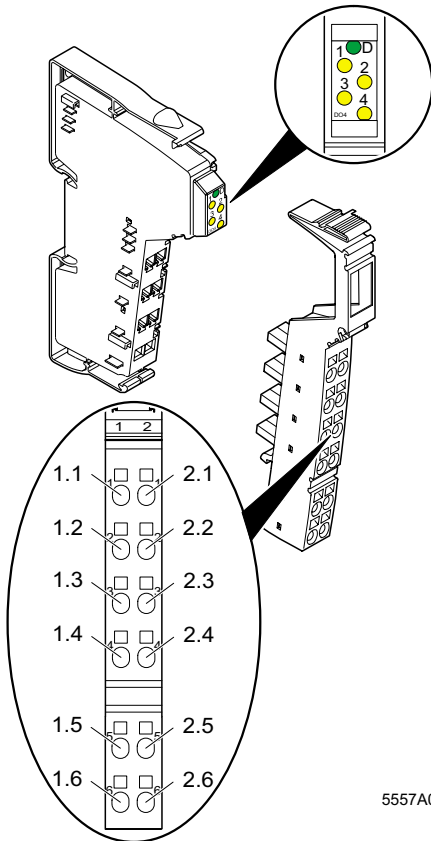
5557A006

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,<br>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

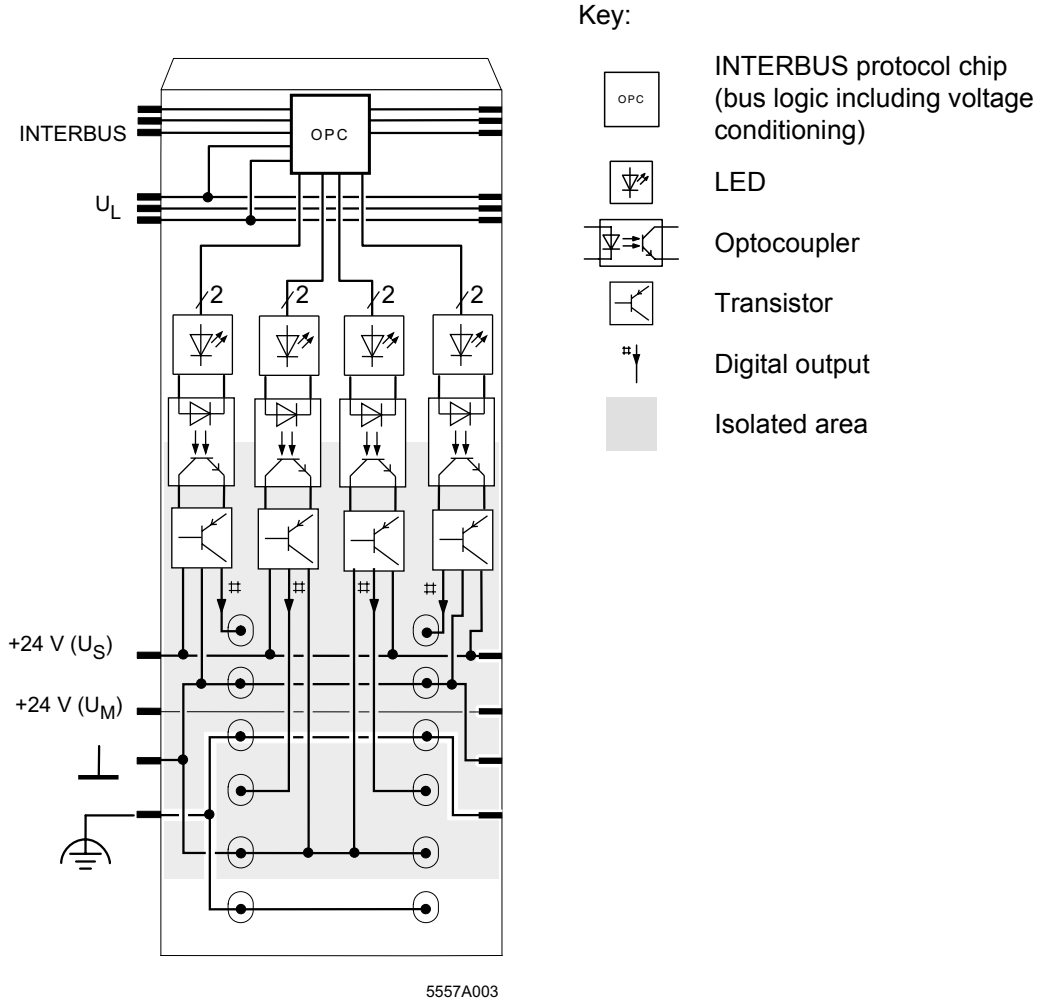


Figure 3 Internal wiring of the terminal points

## Connection Example



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

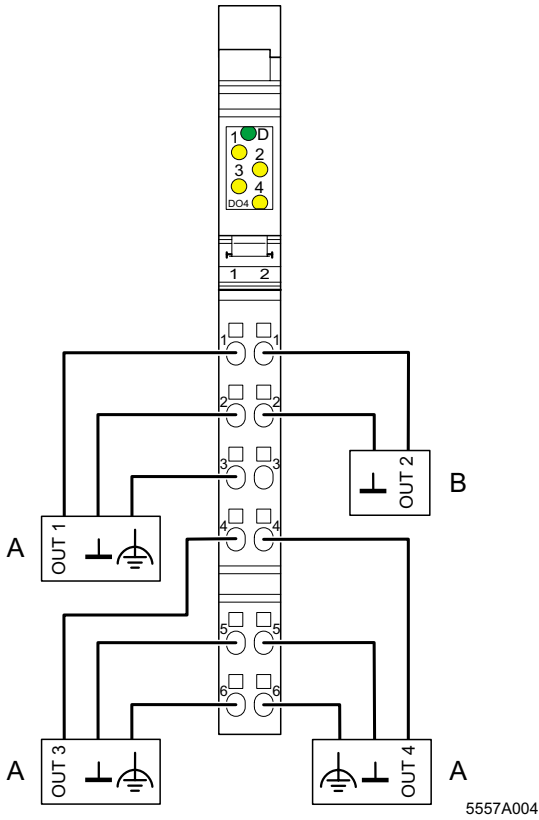


Figure 4 Typical actuator connections

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<br>(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  | $-15 \text{ V} \leq U_{\text{demag}} \leq -46 \text{ V}$<br>( $U_{\text{demag}}$ = 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<br>(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<br>Protection up to 33 V DC   |
| Polarity reversal of voltage supply       | Protective circuits of the power terminal<br>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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