

Chapter 7 Analog output module

Overview This chapter contains a description of the construction and the operation of the VIPA analog output module.

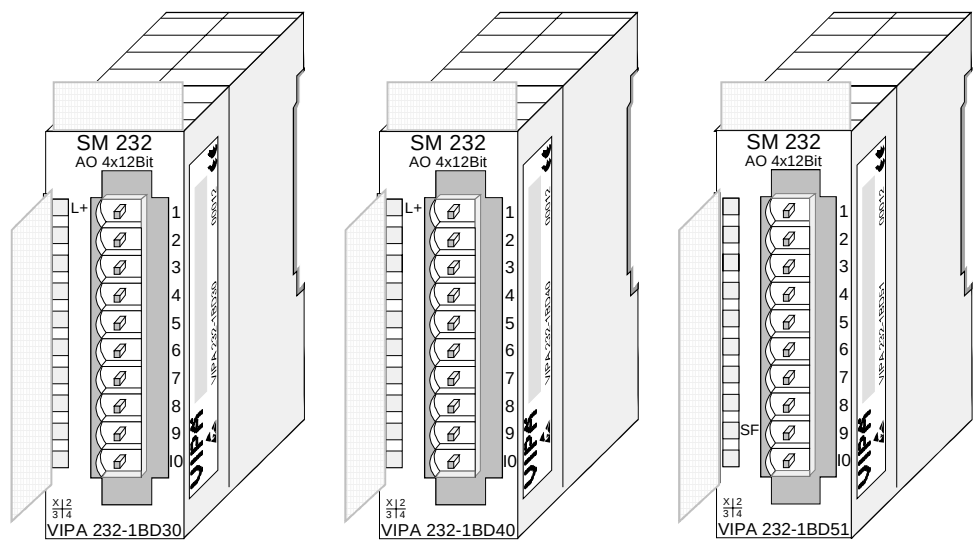
- Below follows a description of:
- Constructions of the analog output module
 - Properties
 - Interfacing and schematic diagram
 - Technical data

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System overview

Output module
SM 232

Here follows a summary of the analog output modules that are currently available from VIPA:



Order data
output module

Type	Order number	Page
AO 4x12Bit $\pm 10V$, 0...10V - ECO	VIPA 232-1BD30	7-6
AO 4x12Bit 0/4...20mA - ECO	VIPA 232-1BD40	7-11
AO 4x12Bit, multi-output	VIPA 232-1BD51	7-16

General

Cabling for analog signals

You must only use screened cable when you are connecting analog signals. These cables reduce the effect of electrical interference. The screen of the analog signal cable should be grounded at both ends. In situations with different electrical potentials, it is possible that a current will flow to equalize the potential difference. This current could interfere with the analog signals. Under these circumstances it is advisable to ground the screen of the signal cable at one end only.

Connecting loads and actuators

You can use the analog output modules to supply loads and actors with current or voltage.



Note!

Please take always care of the correct polarity when connecting actuators! Please leave the output clamps of not used channels disconnected and set the *output type* of the channel to "deactivated" in the hardware configurator from Siemens.

Parameterization and diagnosis during runtime

By using the SFCs 55, 56 and 57 you may change the parameters of the analog modules during runtime via the CPU 21x.

For diagnosis evaluation during runtime, you may use the SFCs 51 and 59. They allow you to request detailed diagnosis information and to react to it.

Numeric notation in Siemens S5-format

In Siemens S5 format, input data is saved in a word. The word consists of the binary value and the information bits.

Please regard only the Siemens S7 format (two's complement) is supported by the Siemens SIMATIC manager for decimal representation. When the Siemens S5 format is used the decimal values are incorrectly represented.

Numeric notation:

Byte	Bit 7 ... Bit 0
0	Bit 0: overflow bit 0: value within measuring range 1: measuring range exceeded Bit 1: error bit (set by internal errors) Bit 2: activity bit (always 0) Bit 7 ... 3: binary measured value
1	Bit 6 ... 0: binary measured value Bit 7: sign 0 positive 1 negative

+/- 10V

Voltage	Decimal	Hex
-10V	-16384	C000
-5V	-8192	E000
0V	0	0
5V	8192	2000
10V	16384	4000

Formulas for the calculation:

$$Value = 16384 \cdot \frac{U}{10}, \quad U = Value \cdot \frac{10}{16384}$$

U: voltage, Value: decimal value

0...10V

Voltage	Decimal	Hex
0V	0	0000
5V	8192	2000
10V	16384	4000

Formulas for the calculation:

$$Value = 16384 \cdot \frac{U}{10}, \quad U = Value \cdot \frac{10}{16384}$$

U: voltage, Value: decimal value

1...5V

Voltage	Decimal	Hex
1V	0	0
3V	8192	2000
5V	16384	4000

Formulas for the calculation:

$$Value = 16384 \cdot \frac{U-1}{4}, \quad U = Value \cdot \frac{4}{16384} + 1$$

U: voltage, Value: decimal value

4....20mA

Current	Decimal	Hex
4mA	0	0
12mA	8192	2000
20mA	16384	4000

Formulas for the calculation:

$$Value = 16384 \cdot \frac{I-4}{16}, \quad I = Value \cdot \frac{16}{16384} + 4$$

I: current, Value: decimal value

+/- 20mA

Current	Decimal	Hex
-20mA	-16384	C000
-10mA	-8192	E000
0mA	0	0
10mA	8192	2000
20mA	16384	4000

Formulas for the calculation:

$$Value = 16384 \cdot \frac{I}{20}, \quad I = Value \cdot \frac{20}{16384}$$

I: current, Value: decimal value

0...20mA

Current	Decimal	Hex
0mA	0	0
10mA	8192	2000
20mA	16384	4000

Formulas for the calculation:

$$Value = 16384 \cdot \frac{I}{20}, \quad I = Value \cdot \frac{20}{16384}$$

I: current, Value: decimal value

Numeric notation in Siemens S7-format

The analog values is represented in two's complement format.

Numeric representation:

Byte	Bit 7 ... Bit 0
0	Bit 7 ... 0: binary measured vale
1	Bit 6 ... 0: binary measured vale Bit 7: sign 0 positive 1 negative

+/- 10V

Voltage	Decimal	Hex
-10V	-27648	9400
-5V	-13824	CA00
0V	0	0
5V	13824	3600
10V	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{U}{10}, \quad U = Value \cdot \frac{10}{27648}$$

U: voltage, Value: decimal value

0...10V

Voltage	Decimal	Hex
0V	0	0000
5V	13824	3600
10V	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{U}{10}, \quad U = Value \cdot \frac{10}{27648}$$

U: voltage, Value: decimal value

1...5V

Voltage	Decimal	Hex
1V	0	0
3V	13824	3600
5V	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{U - 1}{4}, \quad U = Value \cdot \frac{4}{27648} + 1$$

U: voltage, Value: decimal value

4....20mA

Current	Decimal	Hex
4mA	0	0
12mA	13824	3600
20mA	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{I - 4}{16}, \quad I = Value \cdot \frac{16}{27648} + 4$$

I: current, Value: decimal value

+/- 20mA

Current	Decimal	Hex
-20mA	-27648	9400
-10mA	-13824	CA00
0mA	0	0
10mA	13824	3600
20mA	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{I}{20}, \quad I = Value \cdot \frac{20}{27648}$$

I: current, Value: decimal value

0...20mA

Current	Decimal	Hex
0mA	0	0
10mA	13824	3600
20mA	27648	6C00

Formulas for the calculation:

$$Value = 27648 \cdot \frac{I}{20}, \quad I = Value \cdot \frac{20}{27648}$$

I: current, Value: decimal value

232-1BD30 - AO 4x12Bit $\pm 10V$, 0 ... 10V - ECO

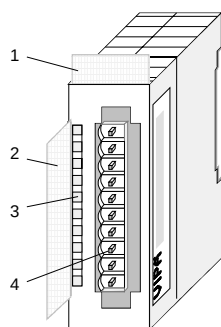
Order data AO 4x12Bit, $\pm 10V$, 0 ... 10V VIPA 232-1BD30

Description This module provides 4 outputs that can be configured individually. The module occupies a total of 8Byte of output data (2Byte per channel) in the process image. These values have to be defined as left justified two's complement entries.

Galvanic isolation between the channels on the module and the backplane bus is provided by means of DC/DC optocouplers. The module requires an external supply of DC 24V.

- Properties**
- 4 outputs with common ground
 - Outputs with individually configurable functions
 - Suitable for connection to actuators requiring $\pm 10V$ or 0 ... 10V inputs

Construction



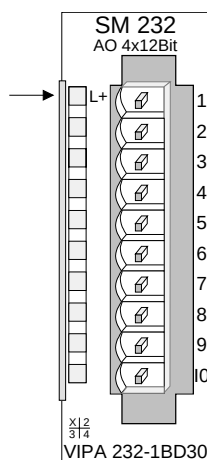
- [1] Label for the name of the module
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator pin assignment

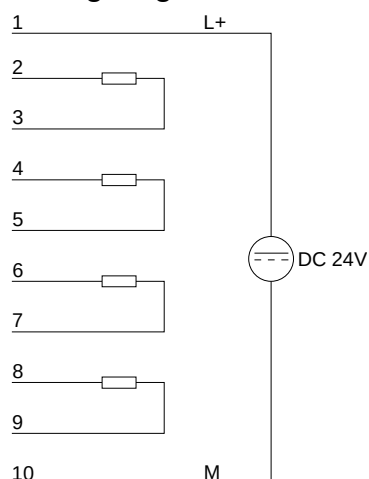
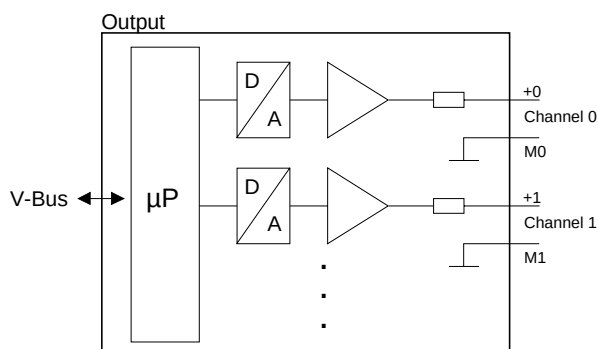
LED Description

L+ LED (green)
supply voltage is on

Pin Assignment



- 1 DC 24V supply voltage
- 2 + Channel 0
- 3 Channel 0 common
- 4 + Channel 1
- 5 Channel 1 common
- 6 + Channel 2
- 7 Channel 2 common
- 8 + Channel 3
- 9 Channel 3 common
- 10 Supply voltage common

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Data output**

The value of the output data is entered into the data output area. For every channel you may configure the relationship between the output value and the respective voltage value by means of a function-no.

The following table shows the structure of the data output area:

Data output area:

Byte	Bit 7 ... Bit 0
0	High-Byte channel 0
1	Low-Byte channel 0
2	High-Byte channel 1
3	Low-Byte channel 1
4	High-Byte channel 2
5	Low-Byte channel 2
6	High-Byte channel 3
7	Low-Byte channel 3

**Note!**

When new values are transferred from the CPU to the module, the module needs one cycle to update all outputs abbr. if the analog values change within this cycle, these are at least available at the concerning outputs at the end of the next following cycle.

Parameter data

6Byte of parameter data are available for the configuration data. These parameters are stored in non-volatile memory and are available after the unit has been powered off.

The following table shows the structure of the parameter data:

Parameter area:

Byte	Bit 7 ... Bit 0	Default
0, 1	reserved	00h
2	Function-no. channel 0	09h
3	Function-no. channel 1	09h
4	Function-no. channel 2	09h
5	Function-no. channel 3	09h

Function-no.
allocation

The assignment of a function-no. to a certain channel happens during parameterization. The function-no. 00h does not influence the function-no. stored in the permanent parameterization data.

Assigning FFh deactivates the according channel.

No.	Function	Output range
00h	Does not affect permanently stored configuration data	
01h	Voltage $\pm 10V$ Siemens S5 format	$\pm 12.5V$ 12.5V = max. value before over range (20480) -10...10V = rated range (-16384...16384) -12.5V = min. value before under range (-20480) two's complement
05h	Voltage 0...10V Siemens S5 format	0...12.5V 12.5V = max. value before over range (20480) 0...10V = rated range (0...16384) no under range available two's complement
09h	Voltage $\pm 10V$ Siemens S7 format	$\pm 11.76V$ 11.76V = max. value before over range (32511) -10V...10V = rated range (-27648...27648) -11.76 = min. value before under range (-32512) two's complement
0Dh	Voltage 0...10V Siemens S7 format	0...11.76V 11.76V = max. value before over range (32511) 0...10V = rated range (0...27648) no under range available two's complement
FFh	Channel not active (turned off)	

**Note!**

- The module is preset to the range " $\pm 10V$ voltage" in S7-format from Siemens.
- When cross over or underdrive range all modes return the value 0.

Technical data

Electrical data		VIPA 232-1BD30
Number of output channels	4	
Length of cable: shielded	200m	
Supply voltage	DC 24V	
- Inverse polarity protection	yes	
Potential separation		
- between channels / backplane bus	yes	
- between channel / power supply of the electronic	yes	
- between the channels	no	
- channels/load voltage L+	yes	
Permitted potential difference		
- between the inputs and $M_{INTERNAL} (U_{ISO})$	DC 75V / AC 60V	
Isolation proofed with	DC 500V	
Current consumption		
- via backplane bus	60mA	
- from load voltage L+ (without load)	100mA	
Power dissipation of the module	2.7W	
Analog value calculation output channels		
Resolution (incl. Overdrive region)	11Bit + sign	
±10V	11Bit	
0...10V	700µs	
Cycle time (all channels)		
Settling time		
- impedance load	1.5ms	
- capacitive load	3.0ms	
- inductive load	-	
Suppression of interference, limits of error output channels		
Crosstalk between the outputs	> 40dB	
Operational limit (in the entire temperature range, referring to input range)		
Voltage output	Measuring range	Tolerance
	±10V	±0.2%
	0...10V	±0.4%
Basic error limit (during temperature is 25°C, referring to input range)		
Voltage output	Measuring range	Tolerance
	±10V	±0.1%
	0...10V	±0.2%
Temperature error (with reference to the output range)	±0.01%/K	
Linearity error (with reference to the output range)	±0.05%	
Repeatability (in steady state at 25°C referred to the output range)	±0.05%	
Output ripple; range 0 to 50kHz (referred to output range)	±0.05%	

continued ...

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Data for choosing an actuator	
Output ranges (rated values) Voltage	$\pm 10V$ 0...10V
Burden resistance (in nominal range of the output)	
at voltage outputs - capacitive load	min. 5k Ω max. 1 μF
Voltage outputs Short-circuit protection Short-circuit current	yes max. 6mA
Destruction limit against voltages/currents applied from outside Voltage at outputs to M _{ANA} Current	max. 15V max. 30mA
Connection of actuators for voltage output	2conductor connection
States, Alarms, Diagnosis	
Diagnosis alarm	-
Diagnosis functions	-
Sum error monitor	-
Diagnostic information readable	-
Substitute value can be applied	-
Programming specifications	
Input data	-
Output data	8Byte (1 word per channel)
Parameter data	6Byte
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD)	25.4x76x88mm
Weight	100g

232-1BD40 - AO 4x12Bit, 0/4...20mA - ECO

Order data

AO 4x12Bit, 0...20mA, 4 ... 20mA

VIPA 232-1BD40

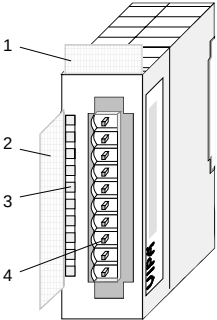
Description

This module provides 4 outputs that can be configured individually. The module occupies a total of 8Byte of output data (2Byte per channel) in the process image. These values have to be defined as left justified two's complement entries.

Galvanic isolation between the channels on the module and the backplane bus is provided by means of DC/DC optocouplers. The module requires an external supply of DC 24V.

- Properties
- 4 outputs with common ground
 - Outputs with individually configurable functions
 - Suitable for actuators with 0 ... 20mA or 4 ... 20mA input

Construction



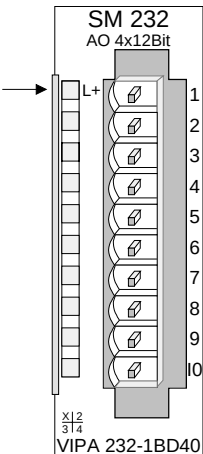
- [1] Label for the name of the module
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator
pin assignment

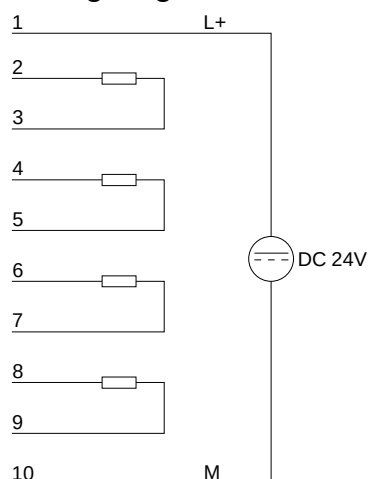
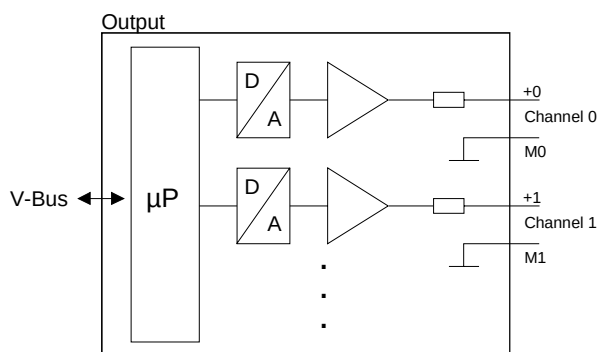
LED Description

L+ LED (green)
supply voltage is on

Pin Assignment



- 1 DC 24V supply voltage
- 2 + Channel 0
- 3 Channel 0 common
- 4 + Channel 1
- 5 Channel 1 common
- 6 + Channel 2
- 7 Channel 2 common
- 8 + Channel 3
- 9 Channel 3 common
- 10 Supply voltage common

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Data output**

The value of the output data is entered into the data output area. For every channel you may configure the relationship between the output value and the respective current value by means of a function-no.

The following table shows the structure of the data output area:

Data output area:

Byte	Bit 7 ... Bit 0
0	High-Byte channel 0
1	Low-Byte channel 0
2	High-Byte channel 1
3	Low-Byte channel 1
4	High-Byte channel 2
5	Low-Byte channel 2
6	High-Byte channel 3
7	Low-Byte channel 3

**Note!**

When new values are transferred from the CPU to the module, the module needs one cycle to update all outputs abbr. if the analog values change within this cycle, these are at least available at the concerning outputs at the end of the next following cycle.

Parameter data

6Byte of parameter data are available for the configuration data. These parameters are stored in non-volatile memory and are available after the unit has been powered off.

The following table shows the structure of the parameter data:

Parameter area:

Byte	Bit 7 ... Bit 0	Default
0, 1	reserved	00h
2	Function-no. channel 0	0Eh
3	Function-no. channel 1	0Eh
4	Function-no. channel 2	0Eh
5	Function-no. channel 3	0Eh

Function-no. allocation

The assignment of a function-no. to a certain channel happens during parameterization. The function-no. 00h does not influence the function-no. stored in the permanent parameterization data.

Assigning FFh deactivates the according channel.

No.	Function	Output range
00h	Does not affect permanently stored configuration data	
04h	Current 4...20mA Siemens S5 format	0...24mA 24mA = max. value before over range (20480) 4...20mA = rated range (0...16384) 0mA = min. value before under range (-4096) two's complement
06h	Current 0...20mA Siemens S5 format	0...25mA 25mA = max. value before over range (20480) 0...20mA = rated range (0...16384) no under range available two's complement
0Ch	Current 4...20mA Siemens S7 format	0...22.81mA 22.81mA = max. value before over range (32511) 4...20mA = rated range (0...27648) 0mA = min. value before under range (-6912) two's complement
0Eh	Current 0...20mA Siemens S7 format	0...23.52mA 23.52mA = max. value before over range (32511) 0...20mA = rated range (0...27648) no under range available two's complement
FFh	Channel not active (turned off)	

**Note!**

- The module is preset to the range "0...20mA" in S7-format from Siemens.
- When cross over or underdrive range all modes return the value 0.

Technical data

Electrical data		VIPA 232-1BD40
Number of output channels	4	
Length of cable: shielded	200m	
Supply voltage	DC 24V	
- Inverse polarity protection	yes	
Potential separation		
- between channels / backplane bus	yes	
- between channel / power supply of the electronic	yes	
- between the channels	no	
- between channels/load voltage L+	yes	
Permitted potential difference		
- between the inputs and $M_{INTERNAL}(U_{ISO})$	DC 75V / AC 60V	
Isolation proofed with	DC 500V	
Current consumption		
- via backplane bus	60mA	
- from load voltage L+ (without load)	50mA	
Power dissipation of the module	1.5W	
Analog value calculation output channels		
Resolution (incl. Overdrive region)		
0...20mA	12Bit	
4...20mA	11Bit	
Cycle time	700µs	
Settling time		
- impedance load	0.03ms	
- capacitive load	-	
- inductive load	1.5ms	
Suppression of interference, limits of error output channels		
Crosstalk between the outputs	> 40dB	
Operational limit (in the entire temperature range, referring to input range)		
Current output	Measuring range	Tolerance
	0...20mA	±0.4%
	4...20mA	±0.5%
Basic error limit (during temperature is 25°C, referring to input range)		
Current output	Measuring range	Tolerance
	0...20mA	±0.2%
	4...20mA	±0.3%
Temperature error (with reference to the output range)	±0.01%/K	
Linearity error (with reference to the output range)	±0.05%	
Repeatability (in steady state at 25°C referred to the output range)	±0.05%	
Output ripple; range 0 to 50kHz (referred to output range)	±0.05%	

continued ...

... continue

Data for choosing an actuator	
Output ranges (rated values) Current	0...20mA 4...20mA
Burden resistance (in nominal range of the output)	
at current outputs inductive load	max. 350Ω max. 10mH
Current outputs No-load voltage	12V
Destruction limit against voltages/currents applied from outside Voltage at outputs to M _{ANA} Current	max. 12V max. 30mA
Connection of actuators for current output	2conductor connection
States, Alarms, Diagnosis	
Diagnosis alarm	-
Diagnosis functions	-
Sum error monitor	-
Diagnostic information readable	-
Substitute value can be applied	-
Programming specifications	
Input data	-
Output data	8Byte (1 word per channel)
Parameter data	6Byte
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD)	25.4x76x88mm
Weight	100g

232-1BD51 - AO 4x12Bit, Multi-output

Order data

AO 4x12Bit Multi-output

VIPA 232-1BD51

Please be aware that this Module cannot be operated on a Profibus DP slave with revision level 4 or less. In this case please use our (spare-part) Module with order-no.: VIPA 232-1BD50 which has the identical function.

Description

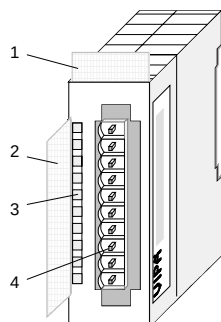
This module provides 4 outputs that can be configured individually. The module occupies a total of 8Byte of output data (2Byte per channel) in the process image. These values have to be defined as left justified two's complement entries.

Galvanic isolation between the channels on the module and the backplane bus is provided by means of DC/DC converters and optocouplers. The module requires an external supply of DC 24V.

Properties

- 4 outputs with common ground
- Outputs with individually configurable functions
- Suitable for connection to actuators requiring $\pm 10V$, 1 ... 5V, 0 ... 10V, $\pm 20mA$, 4 ... 20mA or 0 ... 20mA inputs
- Diagnostic LED and diagnostic function

Construction

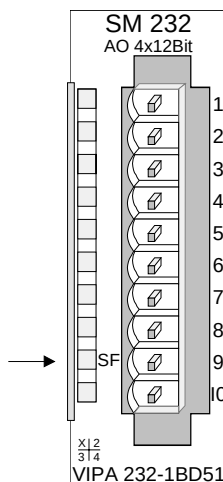


- [1] Label for the name of the module
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator pin assignment

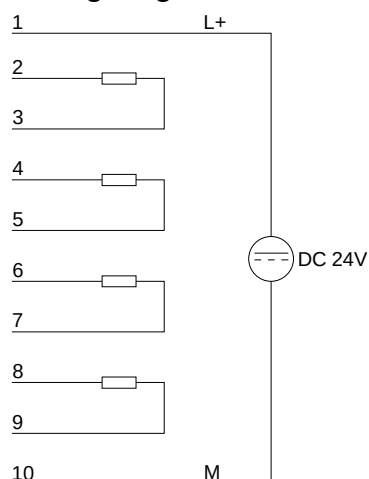
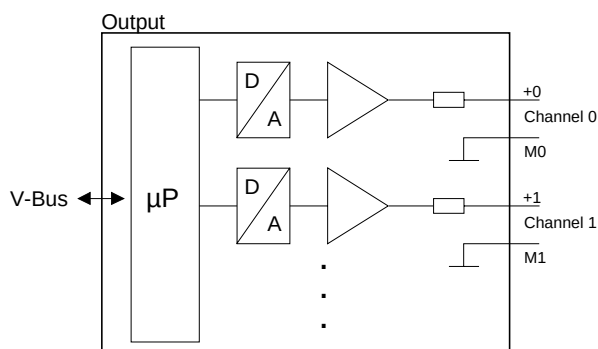
LED Description

- SF Diagnostic LED (red) turned on by:
- a short circuit is detected at the control voltage output
 - an open circuit is detected on the current output line
 - wrong parameter at module
 - the module does not receive supply voltage



Pin Assignment

- | | |
|----|-----------------------|
| 1 | DC 24V supply voltage |
| 2 | + Channel 0 |
| 3 | Channel 0 common |
| 4 | + Channel 1 |
| 5 | Channel 1 common |
| 6 | + Channel 2 |
| 7 | Channel 2 common |
| 8 | + Channel 3 |
| 9 | Channel 3 common |
| 10 | Supply voltage common |

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Data output**

The value of the output data is entered into the data output area. For every channel you may configure the relationship between the output value and the respective current or voltage by means of a function-no..

The following table shows the structure of the data output area:

Data output area:

Byte	Bit 7 ... Bit 0
0	High-Byte channel 0
1	Low-Byte channel 0
2	High-Byte channel 1
3	Low-Byte channel 1
4	High-Byte channel 2
5	Low-Byte channel 2
6	High-Byte channel 3
7	Low-Byte channel 3

**Note!**

When new values are transferred from the CPU to the module, the module needs one cycle to update all outputs abbr. if the analog values change within this cycle, these are at least available at the concerning outputs at the end of the next following cycle.

Parameter data

6Byte of parameter data are available for the configuration data. These parameters are stored in non-volatile memory and are available after the unit has been powered off.

The following table shows the structure of the parameter data:

Parameter area:

Byte	Bit 7 ... Bit 0
0	Diagnostic alarm byte: Bit 5 ... 0: reserved Bit 6: 0: diagnostic alarm inhibited 1: diagnostic alarm enabled Bit 7: reserved
1	reserved
2	Function-no. channel 0
3	Function-no. channel 1
4	Function-no. channel 2
5	Function-no. channel 3

Parameter*Diagnostic alarm*

You can enable diagnostic alarms by means of Bit 6 of Byte 0. When an error occurs 4 diagnostic bytes are transmitted to the master system.

Function-no.

Here you enter the function-no. of the output function for every channel. The relationship between the function number and the output functions is available from the function-no. allocation table.

Diagnostic data

When you enable alarms in Byte 0 of the parameter area, modules will transfer 4 diagnostic bytes with pre-defined contents to your master in case of an error. Please note that analog modules only use the first two bytes for diagnostic purposes. The remaining bytes are not used.

The structure of the diagnostic bytes is as follows:

Diagnostic data:

Byte	Bit 7 ... Bit 0
0	Bit 0: Module malfunction Bit 1: reserved Bit 2: External error Bit 3: Channel error present (wire break/short circuit) Bit 6 ... 4: reserved Bit 7: Wrong parameter at module
1	Bit 3 ... 0: class of module 0101 analog module Bit 4: channel information available Bit 7 ... 5: reserved
2	not assigned
3	not assigned

Function-no. allocation The assignment of a function-no. to a certain channel happens during parameterization.

No.	Function	Output range
00h	Does not affect permanently	stored configuration data
01h	Voltage $\pm 10V$ Siemens S5 format (two's complement)	$\pm 12.5V$ 12.5V = max. value before over range (20480) -10...10V = rated range (-16384...16384) -12.5V = min. value before under range (-20480)
02h	Voltage 1...5V Siemens S5 format (two's complement)	0...6V 6V = max. value before over range (20480) 1...5V = rated range (0...16384) 0V = min. value before under range (-4096)
05h	Voltage 0...10V Siemens S5 format (two's complement)	0...12.5V 12.5V = max. value before over range (20480) 0...10V = rated range (0...16384) no under range available
09h	Voltage $\pm 10V$ Siemens S7 format (two's complement)	$\pm 11.76V$ 11.76V = max. value before over range (32511) -10V...10V = rated range (-27648...27648) -11.76 = min. value before under range (-32512)
0Ah	Voltage 1...5V Siemens S7 format (two's complement)	0...5.704V 5.704V = max. value before over range (32511) 1...5V = rated range (0...27648) 0V = min. value before under range (-6912)
0Dh	Voltage 0...10V Siemens S7 format (two's complement)	0...11.76V 11.76V = max. value before over range (32511) 0...10V = rated range (0...27648) no under range available
03h	Current $\pm 20mA$ Siemens S5 format (two's complement)	$\pm 25mA$ 25mA = max. value before over range (20480) -20...20mA = rated range (-16384...16384) -25mA = min. value before under range (-20480)
04h	Current 4...20mA Siemens S5 format (two's complement)	0...24mA 24mA = max. value before over range (20480) 4...20mA = rated range (0...16384) 0mA = min. value before under range (-4096)
06h	Current 0...20mA Siemens S5 format (two's complement)	0...25mA 25mA = max. value before over range (20480) 0...20mA = rated range (0...16384) no under range available
0Bh	Current $\pm 20mA$ Siemens S7 format (two's complement)	$\pm 23.52mA$ 23.52mA = max. value before over range (32511) -20...20mA = rated range (-27648...27648) -23.52mA = min. value before under range (-32512)
0Ch	Current 4...20mA Siemens S7 format (two's complement)	0...22.81mA 22.81mA = max. value before over range (32511) 4...20mA = rated range (0...27648) 0mA = min. value before under range (-6912)
0Eh	Current 0...20mA Siemens S7 format (two's complement)	0...23.52mA 23.52mA = max. value before over range (32511) 0...20mA = rated range (0...27648) no under range available
FFh	Channel not active (turned off)	

**Note!**

The module is preset to the range " $\pm 10V$ voltage" in Siemens S7-format. When cross over or underdrive range all modes return the value 0.

Technical data

Electrical data		VIPA 232-1BD51
Number of output channels	4	
Length of cable: shielded	200m	
Supply voltage	DC 24V	
- Inverse polarity protection	yes	
Potential separation		
- between channels / backplane bus	yes	
- between channel / power supply of the electronic	yes	
- between the channels	no	
- between channels/load voltage L+	yes	
Isolation proofed with	DC 500V	
Current consumption		
- via backplane bus	75mA	
- from load voltage L+ (without load)	60mA	
Power dissipation of the module	1.8W	
Analog value calculation output channels		
Resolution (incl. Overdrive region)		
±10V, ±20mA	11Bit + sign	
4 ... 20mA, 1 ... 5V	10Bit	
0 ... 10V, 0 ... 20mA	11Bit	
Conversion time (per channel)	450µs	
Settling time		
- impedance load	0.05ms	
- capacitive load	0.5ms	
- inductive load	0.1ms	
Suppression of interference, limits of error output channels		
Crosstalk between the outputs	> 40dB	
Operational limit (in the entire temperature range, referring to input range)		
Voltage output	Measuring range	Tolerance
	1 ... 5V	±0.8% ¹⁾
	0 ... 10V	±0.6% ¹⁾
Current output	±10V	±0.4% ¹⁾
	4 ... 20mA	±0.8% ²⁾
	0 ... 20mA	±0.6% ²⁾
	±20mA	±0.3% ²⁾
Basic error limit (during temperature is 25°C, referring to input range)		
Voltage output	Measuring range	Tolerance
	1 ... 5V	±0.4% ¹⁾
	0 ... 10V	±0.3% ¹⁾
Current output	±10V	±0.2% ¹⁾
	4 ... 20mA	±0.5% ²⁾
	0 ... 20mA	±0.4% ²⁾
	±20mA	±0.2% ²⁾
Temperature error (with reference to the output range)	±0.01%/K	

continued ...

... continue

Linearity error (with reference to the output range)	±0.05%
Repeatability (in steady state at 25°C referred to the output range)	±0.05%
Output ripple; range 0 to 50kHz (referred to output range)	±0.05%
Data for choosing an actuator	
Output ranges (rated values) Voltage Current	1 ... 5V, 0 ... 10V, ±10V 4 ... 20mA, 0 ... 20mA, ±20mA
Burden resistance (in nominal range of the output)	
at voltage outputs - capacitive load at current outputs - inductive load	min. 1kΩ max. 1μF max. 500Ω max. 10mH
Voltage outputs Short-circuit protection Short-circuit current	yes max. 31mA
Current outputs No-load voltage	max. 13V
Destruction limit against voltages/currents applied from outside Voltage at outputs to M _{ANA} Current	max. 15V max. 30mA
Connection of actuators for voltage output for current output	2conductor connection 2conductor connection
States, Alarms, Diagnosis	
Diagnosis alarm Diagnosis functions Sum error monitor Diagnostic information readable	parameterizable parameterizable red LED SF possible
Substitute value can be applied	no
Programming specifications	
Input data Output data Parameter data Diagnostic data	- 8Byte (1 word per channel) 6Byte 4Byte
Dimensions and weight	
Dimensions (WxHxD) Weight	25.4x76x88mm 100g

¹⁾ The error limits are measured with a load of R=1GΩ. For voltage output the output impedance is 30Ω.

²⁾ The error limits are measured with a load of R=10Ω.

