

Chapter 3 Digital input modules

Overview

This chapter contains a description of the construction and the operating of the VIPA digital input modules.

Below follows a description of:

- A system overview of the digital input modules
- Properties
- Constructions
- Interfacing and schematic diagram
- Technical data

Contents

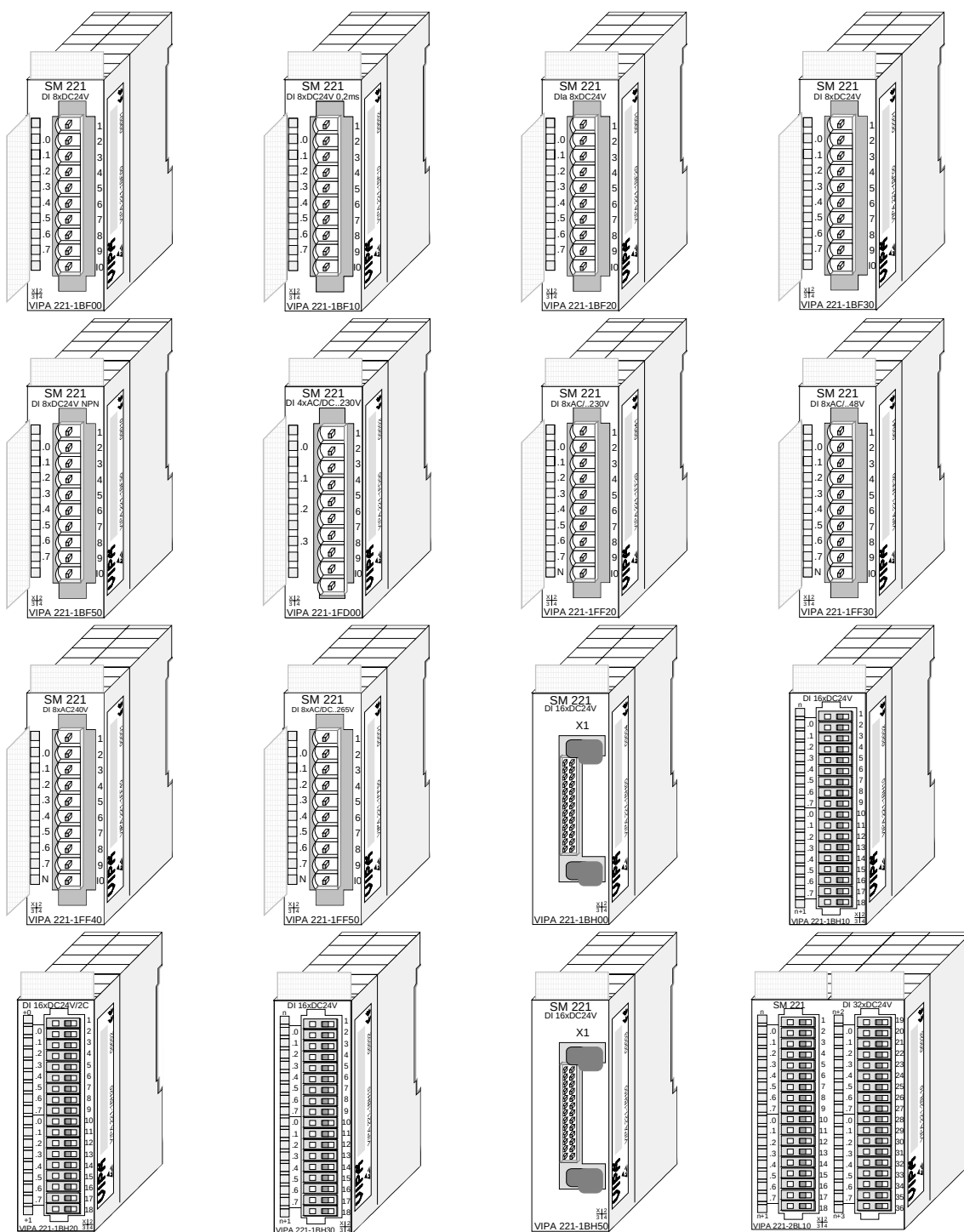
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System overview

Input modules

SM 221

Here follows a summary of the digital input modules that are currently available from VIPA:



**Order data
input modules**

Type	Order number	Page
DI 8xDC 24V	VIPA 221-1BF00	3-4
DI 8xDC 24V 0.2ms	VIPA 221-1BF10	3-6
DIa 8xDC 24V	VIPA 221-1BF20	3-8
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DI 8xAC 240V	VIPA 221-1FF40	3-20
DI 8xAC/DC 180...265V	VIPA 221-1FF50	3-22
DI 16xDC 24V with UB4x	VIPA 221-1BH00	3-24
DI 16xDC 24V	VIPA 221-1BH10	3-26
DI 16xDC 24V/1C	VIPA 221-1BH20	3-28
DI 16xDC 24V - ECO	VIPA 221-1BH30	3-38
DI 16xDC 24V NPN with UB4x	VIPA 221-1BH50	3-40
DI 32xDC 24V	VIPA 221-2BL10	3-42

221-1BF00 - DI 8xDC 24V

Order data

DI 8xDC 24V

VIPA 221-1BF00

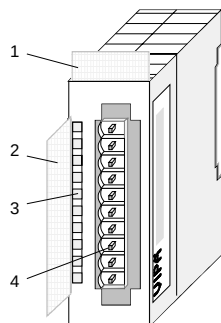
Description

The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.

Properties

- 8 floating inputs, isolated from the backplane bus
- DC 24V nominal input voltage
- Suitable for standard switches and proximity switches
- Status indicator for each channel by means of an LED

Construction



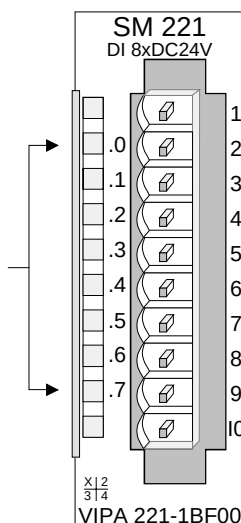
- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Connector edge

Status indicator pin assignment

LED Description

.0... .7 LEDs (green)
I+0.0 to I+0.7
A "1" signal level is recognized as of app. 15V and the respective LED is turned on

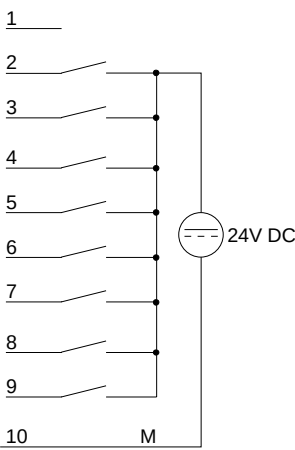
Pin Assignment



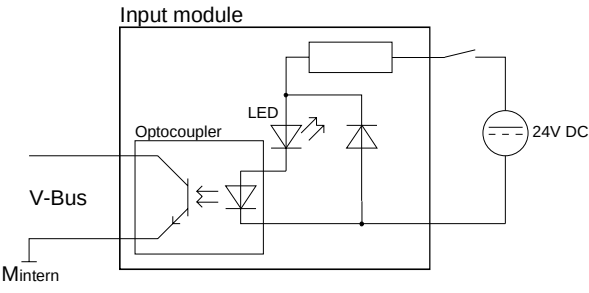
- 1 not connected
- 2 Input I+0.0
- 3 Input I+0.1
- 4 Input I+0.2
- 5 Input I+0.3
- 6 Input I+0.4
- 7 Input I+0.5
- 8 Input I+0.6
- 9 Input I+0.7
- 10 Ground

Wiring and schematic diagram

Wiring diagram



Schematic diagram



Technical data

Electrical data	VIPA 221-1BF00
Number of inputs	8
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	25mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

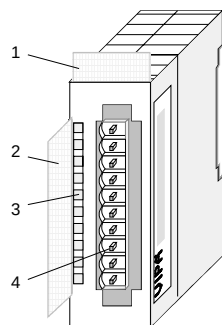
221-1BF10 - DI 8xDC 24V 0.2ms

Order data DI 8xDC 24V 0.2ms VIPA 221-1BF10

Description The digital input accepts binary control signals from the process level and provides an electrically isolated interface to the central bus system. The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.

- Properties**
- 8 floating inputs, isolated from the backplane bus
 - Delay time 0.2ms
 - DC 24V nominal input voltage
 - Suitable for standard switches and proximity switches
 - Status indicator for each channel by means of an LED

Construction

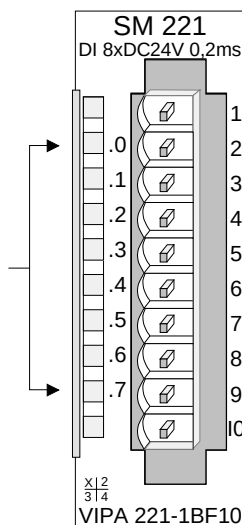


- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator pin assignment

LED Description

.0... .7 LEDs (green)
I+0.0 to I+0.7
A "1" signal level is recognized as of app. 15V and the respective LED is turned on

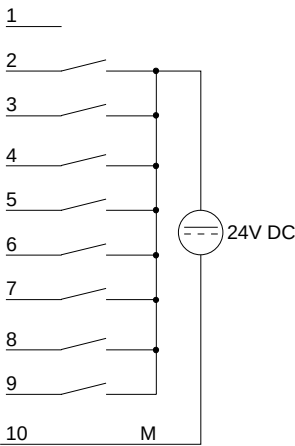


Pin Assignment

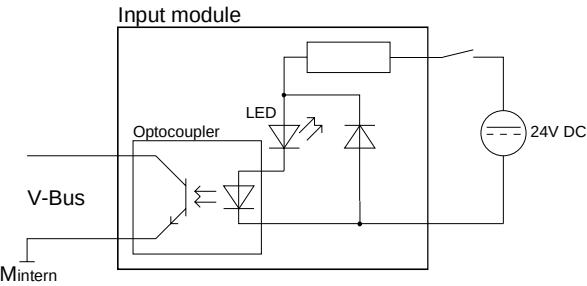
1	not connected
2	Input I+0.0
3	Input I+0.1
4	Input I+0.2
5	Input I+0.3
6	Input I+0.4
7	Input I+0.5
8	Input I+0.6
9	Input I+0.7
10	Ground

Wiring and schematic diagram

Wiring diagram



Schematic diagram



Technical data

Electrical data	VIPA 221-1BF10
Number of inputs	8
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	0.2ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	25mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BF20 - DIa 8xDC 24V

Order data

DIa 8xDC 24V

VIPA 221-1BF20

Description

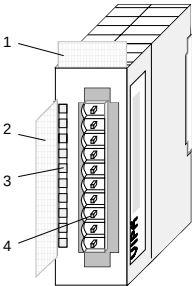
The digital alarm input module accepts the binary control signals from the process level and provides an electrically isolated interface to the central bus system.

All inputs are configurable as alarms. With the rising edge of the input, the alarm is activated. The alarm calls the OB 40 in the CPU. If this OB isn't available, the OB 85 is called. If this OB is also not programmed, the CPU switches to STOP.

The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.

- Properties
- 8 alarm inputs, isolated from the backplane bus
 - nominal input voltage DC 24V
 - suited for urgent signals (switches and proximity switches)
 - Status indicator for each channel by means of an LED

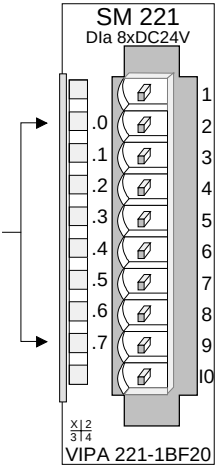
Construction



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

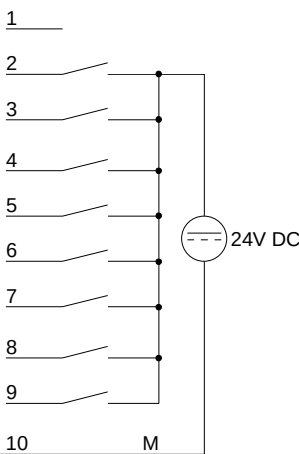
Status indicator
pin assignment

LED	Description	Pin	Assignment
.0... .7	LEDs (green) I+0.0 to I+0.7 A "1" signal level is recognized as of app. 15V and the respective LED is turned on	1	not connected
		2	Input I+0.0
		3	Input I+0.1
		4	Input I+0.2
		5	Input I+0.3
		6	Input I+0.4
		7	Input I+0.5
		8	Input I+0.6
		9	Input I+0.7
		10	Ground

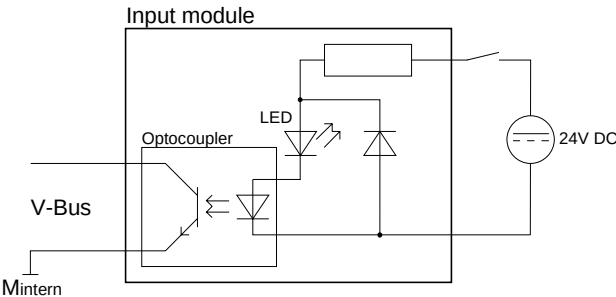


Wiring and schematic diagram

Wiring diagram



Schematic diagram



Note!

The module may be deployed in the System 200V starting from CPU firmware versions:

- CPU 21x: Version 2.2.1
- CPU 24x: Version 3.0.6

The deployment with lower firmware versions causes error messages and a CPU switch to STOP!

Technical data

Electrical data	VIPA 221-1BF20
Number of alarm inputs	8
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	25mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BF30 - DI 8xDC 24V - ECO

Order data

DI 8xDC 24V

VIPA 221-1BF30

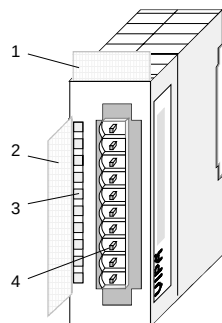
Description

The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.

Properties

- 8 floating inputs, isolated from the backplane bus
- DC 24V nominal input voltage
- Suitable for standard switches and proximity switches
- Status indicator for each channel by means of an LED

Construction



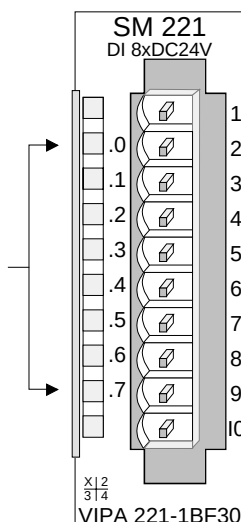
- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Connector edge

Status indicator pin assignment

LED Description

.0... .7 LEDs (green)
I+0.0 to I+0.7
A "1" signal level is recognized as of app. 15V and the respective LED is turned on

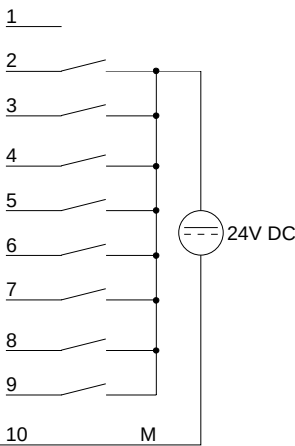
Pin Assignment



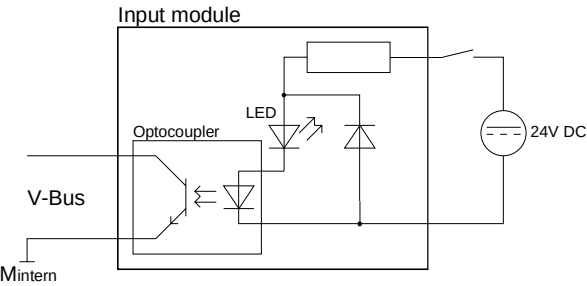
1	not connected
2	Input I+0.0
3	Input I+0.1
4	Input I+0.2
5	Input I+0.3
6	Input I+0.4
7	Input I+0.5
8	Input I+0.6
9	Input I+0.7
10	Ground

Wiring and schematic diagram

Wiring diagram



Schematic diagram



Technical data

Electrical data	VIPA 221-1BF30
Number of inputs	8
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	25mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BF50 - DI 8xDC 24V NPN

Order data

DI 8xDC 24V NPN

VIPA 221-1BF50

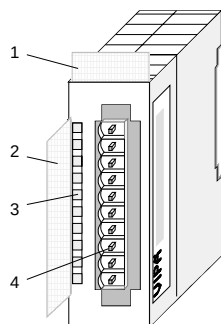
Description

The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The module has 8 channels, each one with a light emitting diode to indicate the status of the channel. The input becomes active when it is connected to ground.

Properties

- 8 floating inputs, isolated from the backplane bus
- Active low input (signal level "1" when input is at ground)
- DC 24V nominal input voltage
- Suitable for standard switches and proximity switches
- Status indicator for each channel by means of an LED

Construction



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

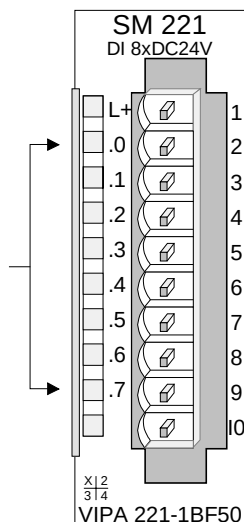
Status indicator pin assignment

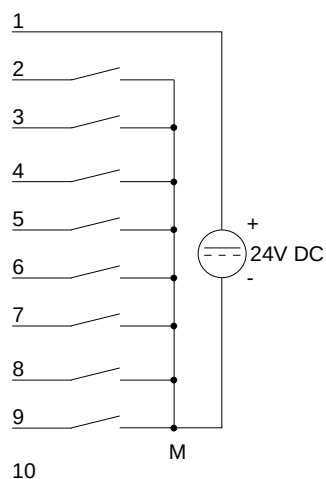
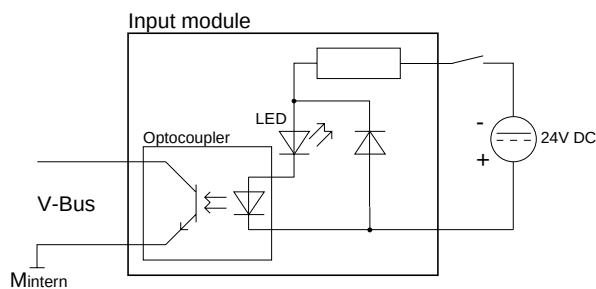
LED Description

.0... .7 LEDs (green)
I+0.0 to I+0.7
when an input is at ground
a "1" is detected and the
respective LED is turned
on

Pin Assignment

1	+DC 24V
2	Input I+0.0
3	Input I+0.1
4	Input I+0.2
5	Input I+0.3
6	Input I+0.4
7	Input I+0.5
8	Input I+0.6
9	Input I+0.7 / Ground
10	reserved



Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-1BF50
Number of inputs	8
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	15 ... 28.8V
Signal voltage "1"	0 ... 5V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	25mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1FD00 - DI 4xAC/DC 90...230V

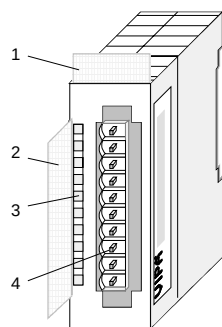
Order data DI 4xAC/DC 90...230V VIPA 221-1FD00

Description The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The module has 4 channels and the respective status is displayed by means of LEDs.

Properties

- 4 floating inputs, isolated from the backplane bus and from each other
- Status indicator for each channel by means of an LED
- Nominal input voltage 90 ... 230V AC/DC

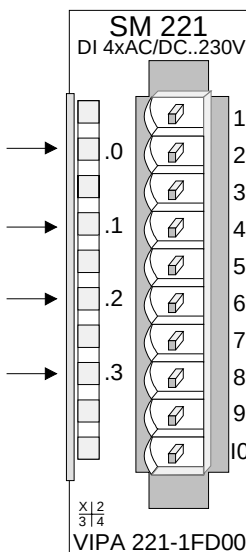
Construction

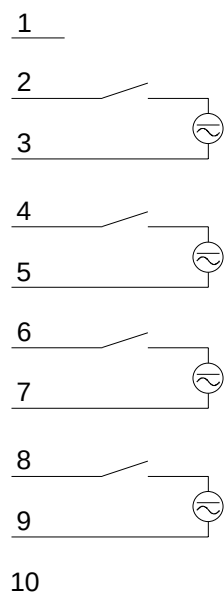
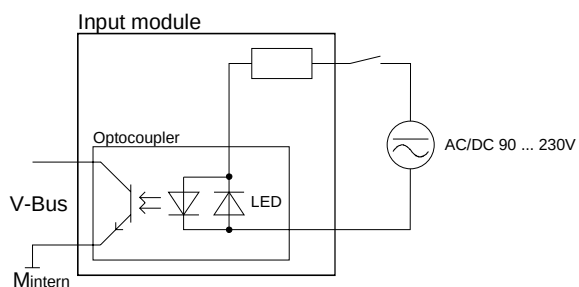


- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator pin assignment

LED	Description	Pin	Assignment
.0	LEDs (green)	1	not connected
.1	I+0.0 to I+0.3	2	I+0.0
.2	from app. DC 80V or AC 65V (50Hz) a signal "1" is detected and the respective LED is turned on	3	Neutral conductor I+0.0
.3		4	I+0.1
		5	Neutral conductor I+0.1
		6	I+0.2
		7	Neutral conductor I+0.2
		8	I+0.3
		9	Neutral conductor I+0.3
		10	not connected



Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-1FD00
Number of inputs	4
Nominal input voltage	AC/DC 90 ... 230V
Signal voltage "0"	AC/DC 0 ... 35V
Signal voltage "1"	AC/DC 90 ... 230V
Input filter time delay	25ms
Frequency of input voltage	50 ... 60Hz
Input resistance	136kΩ
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	40mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte (Bit 0 ... Bit 3)
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

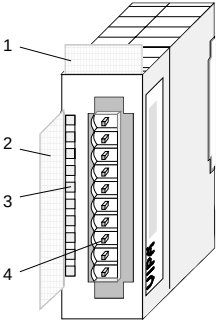
221-1FF20 - DI 8xAC/DC 60...230V

Order data DI 8xAC/DC 60...230V VIPA 221-1FF20

Description The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system.
The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.

- Properties**
- 8 inputs, isolated from the backplane bus
 - Nominal input voltage 60 ... 230V AC/DC
 - Status indicator for each channel by means of an LED

Construction

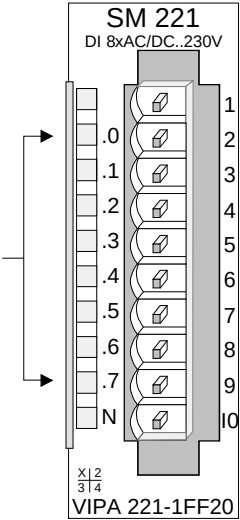


- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

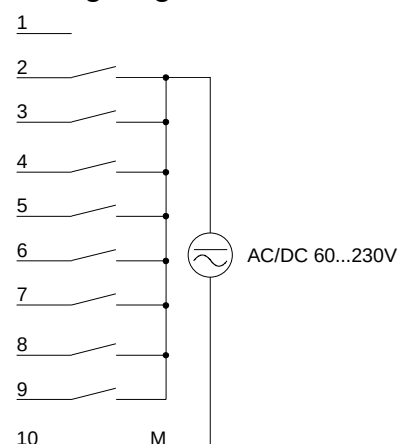
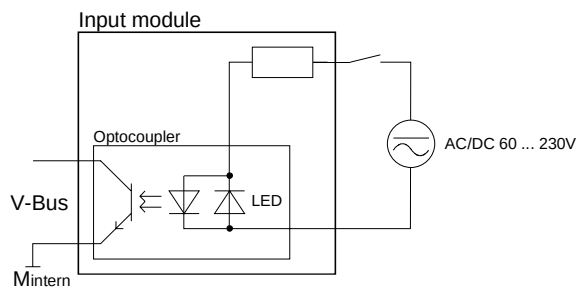
Status indicator pin assignment

LED	Description	Pin	Assignment
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.0... .7	LEDs (green) I+0.0 to I+0.7 from app. DC 55V or AC 45V (50Hz) a signal "1" is detected and the respective LED is turned on
----------	--



- | | |
|----|-------------------|
| 1 | not connected |
| 2 | Input I+0.0 |
| 3 | Input I+0.1 |
| 4 | Input I+0.2 |
| 5 | Input I+0.3 |
| 6 | Input I+0.4 |
| 7 | Input I+0.5 |
| 8 | Input I+0.6 |
| 9 | Input I+0.7 |
| 10 | Neutral conductor |

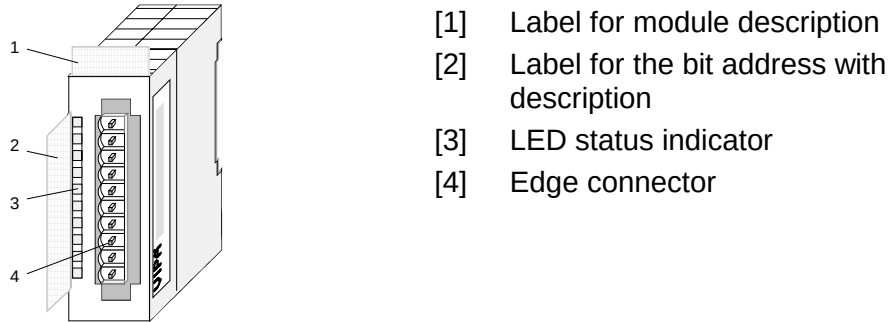
Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-1FF20
Number of inputs	8
Nominal input voltage	AC/DC 60 ... 230V
Signal voltage "0"	AC/DC 0 ... 35V
Signal voltage "1"	AC/DC 60 ... 230V
Input filter time delay	25ms
Frequency of input voltage	50 ... 60Hz
Input resistance	136kΩ
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	60mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1FF30 - DI 8xAC/DC 24...48V

Order data	DI 8xAC/DC 24...48V	VIPA 221-1FF30
Description	The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.	
Properties	• 8 floating inputs, isolated from the backplane bus • Nominal input voltage AC/DC 24 ... 48V • Status indicator for each channel by means of an LED	

Construction

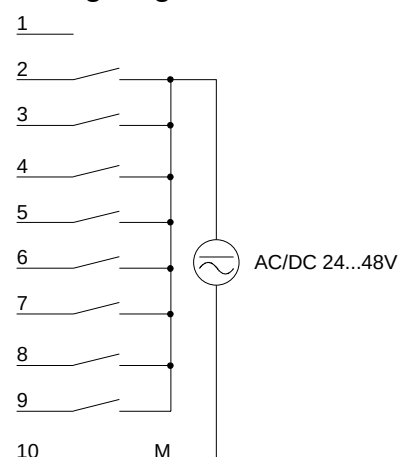
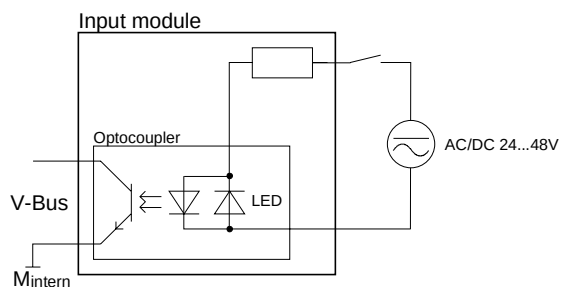


Status indicator pin assignment

LED	Description	Pin	Assignment
.0... .7	LEDs (green) I+0.0 to I+0.7 from app. DC 14V or AC 12V (50Hz) a signal "1" is detected and the respective LED is turned on	1	not connected
		2	Input I+0.0
		3	Input I+0.1
		4	Input I+0.2
		5	Input I+0.3
		6	Input I+0.4
		7	Input I+0.5
		8	Input I+0.6
		9	Input I+0.7
		10	Neutral conductor

SM 221
DI 8xAC/DC...48V

X12
3/4
VIPA 221-1FF30

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-1FF30
Number of inputs	8
Nominal input voltage	AC/DC 24 ... 48V
Signal voltage "0"	AC/DC 0 ... 8V
Signal voltage "1"	AC/DC 18 ... 48V
Input filter time delay	25ms
Frequency of input voltage	50 ... 60Hz
Input resistance	16.4kΩ
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	60mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1FF40 - DI 8xAC 240V

Order data DI 8xAC 240V VIPA 221-1FF40

Description

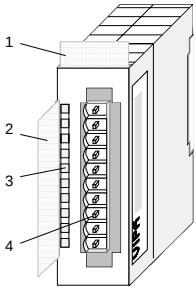
The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system.

The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.

In a defined voltage range, the signal state of the respective input is not modified (Hysteresis).

- Properties**
- 8 floating inputs, isolated from the backplane bus
 - Nominal input voltage AC 240V
 - Status indicator for each channel by means of an LED
 - Hysteresis
 - Current consumption 20mA per channel

Construction

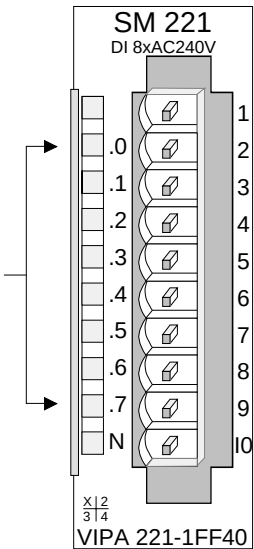


- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator pin assignment

LED Description

.0... .7 LEDs (green)
 I+0.0 to I+0.7
 from app. AC 190 V
 (50Hz) the signal "1" is
 detected and the
 respective LED is turned
 on

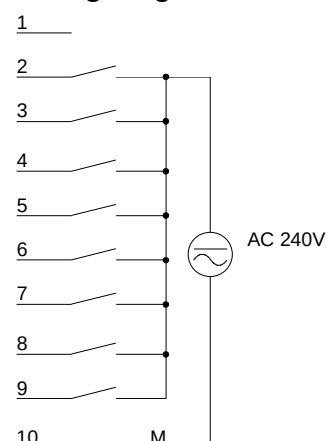


Pin Assignment

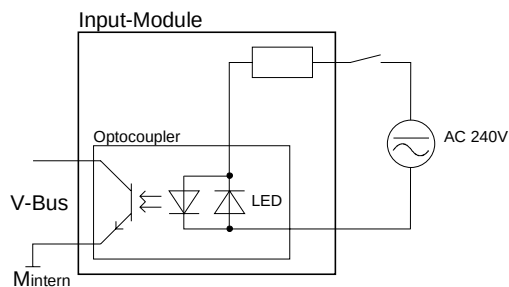
- 1 not connected
- 2 Input I+0.0
- 3 Input I+0.1
- 4 Input I+0.2
- 5 Input I+0.3
- 6 Input I+0.4
- 7 Input I+0.5
- 8 Input I+0.6
- 9 Input I+0.7
- 10 Neutral conductor

Wiring and schematic diagram

Wiring diagram



Schematic diagram



Note!

This module is specified for voltages of max. AC 260V.

If inductive loads occur on the network, this load has to be filtered either directly at the module or at the according device, for example by using a snubber network.

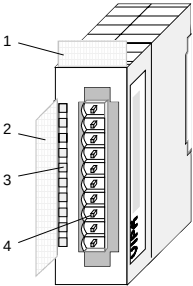
Technical data

Electrical data	VIPA 221-1FF40
Number of inputs	8
Nominal input voltage	AC 240V
Current consumption per channel	20mA
Signal voltage "0"	AC 0 ... 70V
Hysteresis	AC 90 ... 160V
Signal voltage "1"	AC 190 ... 260V
Input filter time delay	25ms
Frequency of input voltage	50Hz
Input resistance	136kΩ
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	60mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	ca. 50g

221-1FF50 - DI 8xAC/DC 180...265V

Order data	DI 8xAC/DC 180...265V VIPA 221-1FF50
Description	The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The module has 8 channels, each one with a light emitting diode to indicate the status of the channel.
Properties	• 8 floating inputs, isolated from the backplane bus • Nominal input voltage AC/DC 180...265V • Status indicator for each channel by means of an LED

Construction

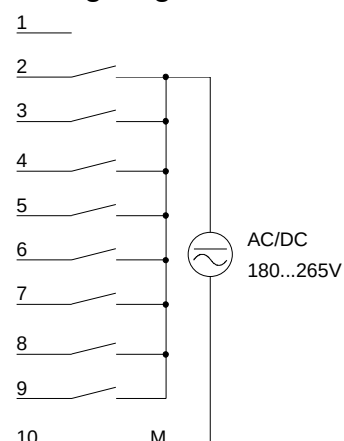
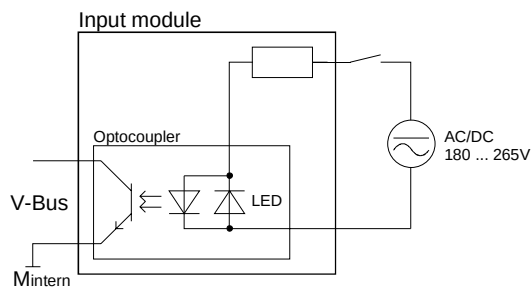


- [1] Label for module description
- [2] Label for the bit address with description
- [3] LED status indicator
- [4] Edge connector

Status indicator
pin assignment

LED	Description	Pin	Assignment
.0... .7	LEDs (green) I+0.0 to I+0.7 from app. DC 150V resp. AC 170V (50Hz) the signal "1" is detected and the respective LED is turned on	1	not connected
		2	Input I+0.0
		3	Input I+0.1
		4	Input I+0.2
		5	Input I+0.3
		6	Input I+0.4
		7	Input I+0.5
		8	Input I+0.6
		9	Input I+0.7
		10	Neutral conductor

A detailed diagram of the terminal block. It shows two rows of terminals. The top row is labeled 'SM 221 DI 8xAC/DC...265V' and contains 10 terminals numbered 1 to 10. The bottom row is labeled 'VIPA 221-1FF50' and contains 12 terminals numbered 1 to 12. The first 8 terminals of the bottom row are labeled .0 to .7. The 9th terminal is labeled 'N'. The 10th terminal is labeled 'X12'. The 11th and 12th terminals are labeled '3' and '4' respectively. Arrows indicate the connection between the top and bottom rows: terminal 1 to .0, 2 to .1, 3 to .2, 4 to .3, 5 to .4, 6 to .5, 7 to .6, 8 to .7, and 9 to N.

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-1FF50
Number of inputs	8
Nominal input voltage	AC/DC 180...265V
Signal voltage "0"	AC/DC 0 ...150V
Signal voltage "1"	AC/DC 180 ... 265V
Input filter time delay	25ms
Frequency of input voltage	50 ... 60Hz
Input resistance	136kΩ
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	80mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	1Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BH00 - DI 16xDC 24V with UB4x

Order data

DI 16xDC 24V

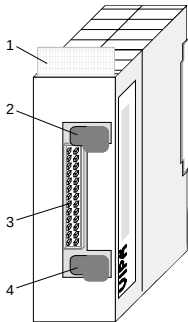
VIPA 221-1BH00

Description

The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. This module requires a UB4x-converter. It has 16 channels that indicate the respective status via LEDs on the UB4x. The module has to be connected to the converter module (DEA-UB4x) by means of a flattened round cable (DEA-KB91C).

- Properties
- 16 inputs, isolated from the backplane bus
 - DC 24V nominal input voltage
 - Suitable for standard switches and proximity switches
 - Status indicator for each channel by means of a LED located on the conversion module UB4x

Construction



- [1] Label for module description
- [2] Clip
- [3] Recessed connector for the interface to a conversion module UB4x via the flattened round cable
- [4] Clip

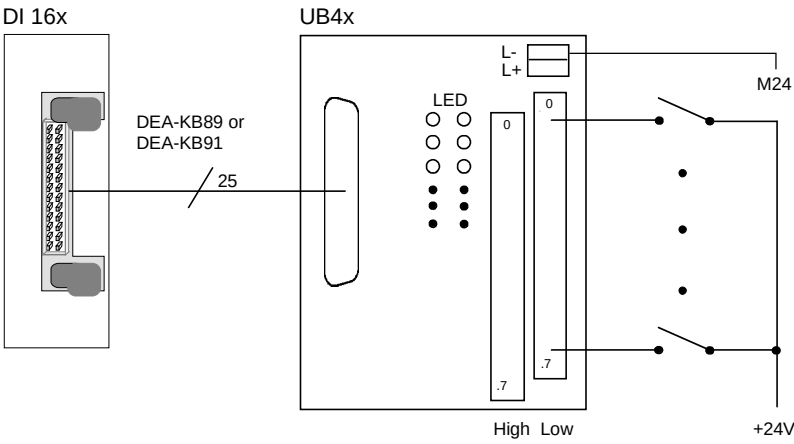
Status indicator on UB4x

LED	Description
0... .15	LEDs (yellow) I+0.0 to I+0.7 High I+0.0 to I+0.7 Low A "1" signal level is recognized as of app. 15V and the respective LED is turned on
L+ L-	LED (green) Supply voltage available

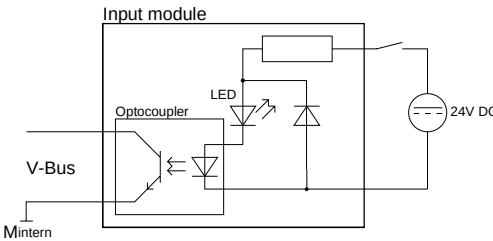
Pin assignment module

Connector	Pin	Assignment
A diagram of a 26-pin connector. The pins are arranged in two columns. The left column is numbered 26, 25, 24, 23, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 from top to bottom. The right column is numbered 23...26, 22, 21, 20, 19, 18, 17, 16, 15, 14, 13, 12, 11, 10, 9, 8, 7, 6, 5, 4, 3, 2, 1 from top to bottom.	23...26	Supply voltage +DC 24V
	22	Input I+0.0
	21	.
	20	.
	19	.
	18	.
	17	Input I+0.7
	16	Input I+1.0
	15	.
	14	.
	13	.
	12	.
	11	.
	10	.
	7	Input I+1.7
	1...6	Supply voltage Ground

Interface to UB4x



Schematic diagram module



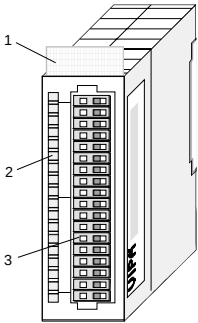
Technical data

Electrical data	VIPA 221-1BH00
Number of inputs	16
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	35mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the UB4x
Programming specifications	
Input data	2Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BH10 - DI 16xDC 24V

Order data	DI 16xDC 24V	VIPA 221-1BH10
Description	The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. It has 16 channels that indicate the respective status by means of LEDs.	
Properties	• 16 inputs, isolated from the backplane bus • DC 24V nominal input voltage • Suitable for standard switches and proximity switches • Status indicator for each channel by means of an LED	

Construction



- [1] Label for module description
- [2] LED status indicator
- [3] Edge connector

Status indicator
connector
assignment

LED	Description	Pin	Assignment
.07	LEDs (green) I+0.0 to I+0.7 A "1" signal level is recognized as of app. 15V and the respective LED is turned on	1	not connected
		2	Input I+0.0
		3	Input I+0.1
		.	.
		.	.
		.	.
		9	Input I+0.7
		10	Input I+1.0
		.	.
		.	.
		.	.
		16	Input I+1.6
		17	Input I+1.7
		18	Ground

DI 16xDC24V

n

.0

.1

.2

.3

.4

.5

.6

.7

.0

.1

.2

.3

.4

.5

.6

.7

n+1

1

2

3

4

5

6

7

8

9

10

11

12

13

14

15

16

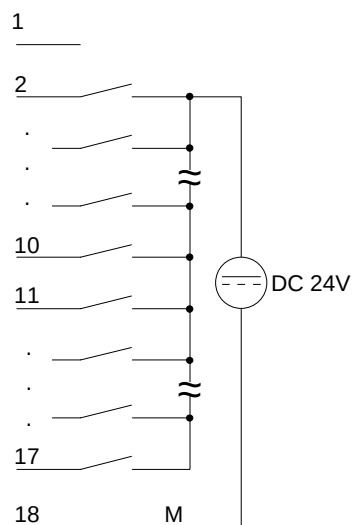
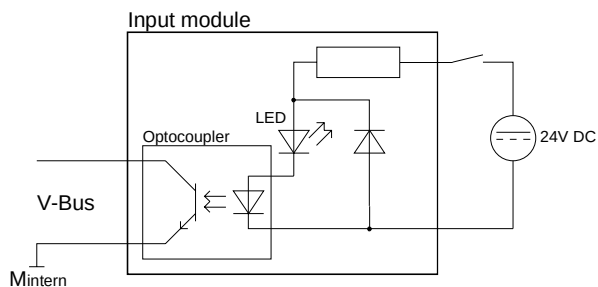
17

18

VIPA 221-1BH10

X12

3 4

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-1BH10
Number of inputs	16
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	40mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	2Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

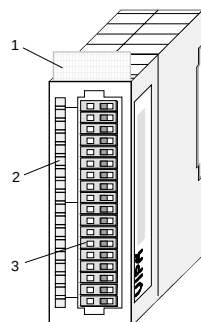
221-1BH20 - DI 16xDC24V/1C

Order data DI 16xDC24V/1C VIPA 221-1BH20

Description The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. It has 16 channels that indicate the respective status by means of LEDs. Additionally, the first two channels may head for counters.

- Properties**
- 16 inputs, isolated from the backplane bus
 - 2 inputs of this configurable as one counter, frequency or period measurement
 - Pull up abbr. pull down resistors are inside, so sensors with positive and negative logic can be connected.
 - Suitable for standard switches and proximity switches
 - Status indicator for each channel by means of an LED

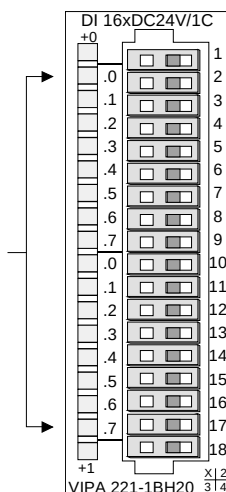
Construction



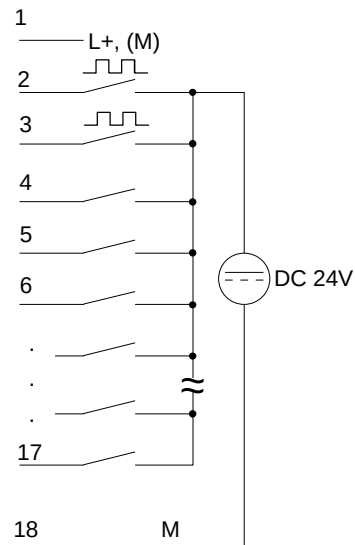
- [1] Label for module name
[2] LED status indicator
[3] Edge connector

Status indicator connector assignment

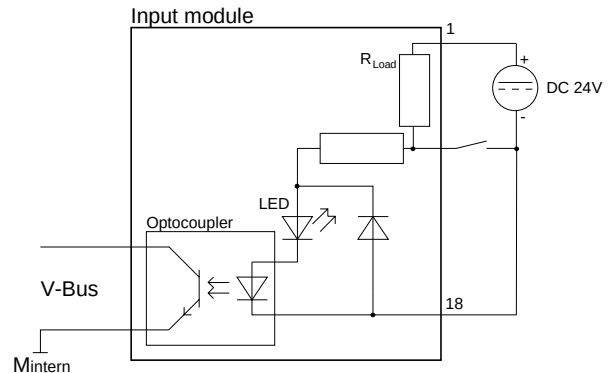
LED	Description	Pin	Assignment
.07	LEDs (green) I+0.0 to I+1.7 A "1" signal level is recognized as of app. 15V and the respective LED is turned on	1	L+ DC 24V or Ground ^{*)}
		2	Input I+0.0 / Counter (A)
		3	Input I+0.1 / Counter (B)
		4	Input I+0.2
		.	.
		.	.
		.	.
		9	Input I+0.7
		10	Input I+1.0
		.	.
		.	.
		.	.
		17	Input I+1.7
		18	Ground



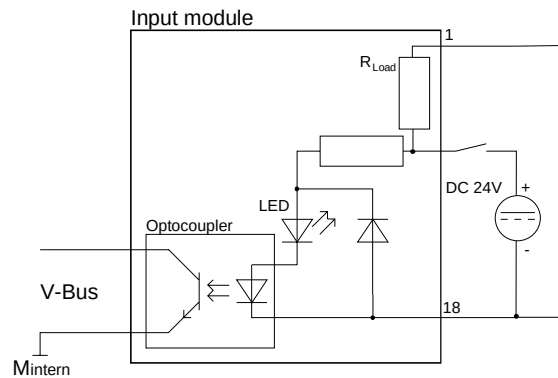
^{*)} DC 24V or Ground to connect sensors with positive or negative logic at I+0.0 or I+0.1

Circuit and schematic diagram**Wiring diagram****Schematic diagram**

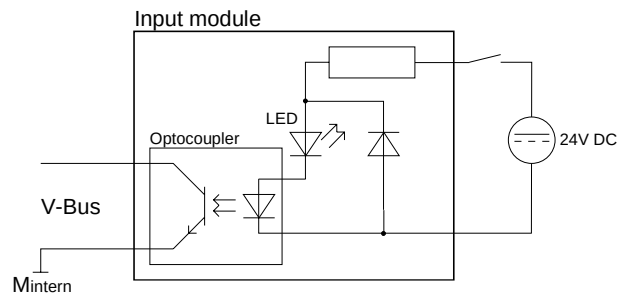
Input I+0.0, I+0.1 (negative logic)



Input I+0.0, I+0.1 (positive logic)



Input I+0.2 ... I+1.5

**Note!**

The inputs I+0.0 and I+0.1 have also internal pull up (-down) resistors, which lead to pin 1 of the connector strip.

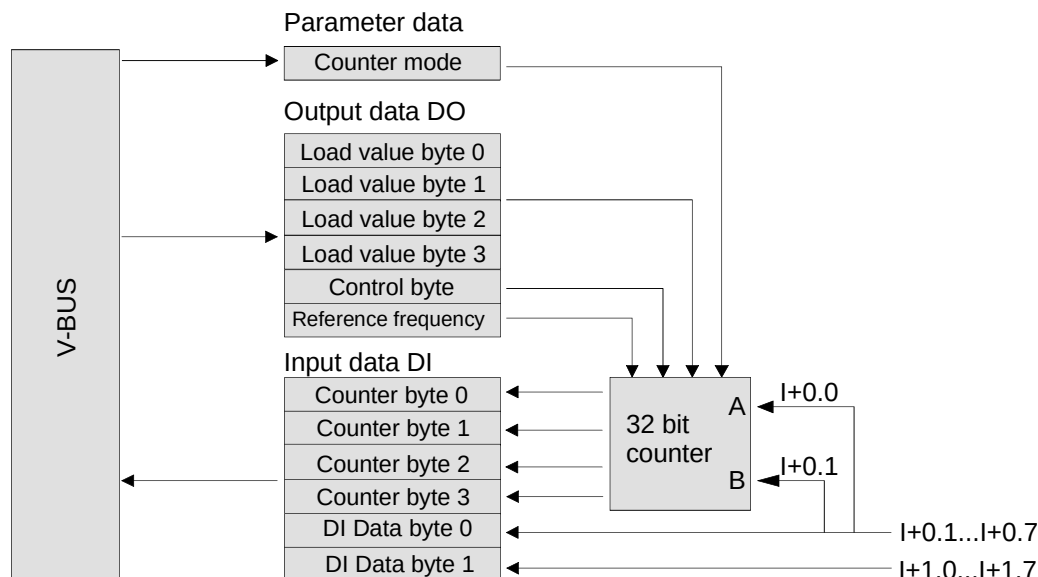
You can connect the sensors with negative logic output directly to the inputs I+0.0 and I+0.1. Here you have to supply pin 1 with DC 24V.

Connect pin 1 to Ground (bridge to pin 18) when I+0.0 and I+0.1 are used as "normal" inputs with positive logic.

Overview

The module is a 16Bit digital input module for System 200V combined with a one-channel 32Bit counter.

Inputs I+0.0 and I+0.1 are used as 'normal' process inputs and as counter inputs (signal A and signal B) simultaneously.



By writing *output data DO* to the module, you may preset a counter value with a *load value* as well as a *reference frequency*. The activation of this values takes place by means of the *control byte*.

With a read access on the *input data DI* you obtain the current counter value.

The counting is started res. stopped via the *control byte* (software gate).

There are 5 counter functions supported. The appropriate counter function is set by parameterization.

Counter activation via software gate

Many applications require that the count can be started or stopped at a defined time depending on other events. This starting and stopping of the count process is done via a software gate function. If the gate is opened, count pulses can reach the counter and the count is started. If the gate is closed, count pulses can no longer reach the counter and the count is stopped.

The software gate is controlled via the bits START and STOP in the Control Byte. Setting the bit START will open the software gate whereas setting the bit STOP will close the software gate.

Count range / Limit values

The counter module can count up and down. The count value is 32Bit wide and is to be interpreted as of type unsigned integer. Therefore the count limits are given as:

Lower count limit	Upper count limit
0	+ 4.294.967.295 ($2^{32} - 1$)

Load value

It is possible to specify a load value for the counter. After loading the counter starts counting up res. down from this new value to the upper res. lower limit value. After receiving a new counting pulse, the counter jumps to the lower (counting up) res. upper limit (counting down) and starts the counting again.

In the operation mode "Frequency Measurement" the load value is used to define the time window of the measurement.

The load mechanism is controlled via the bit LOAD in the control byte.

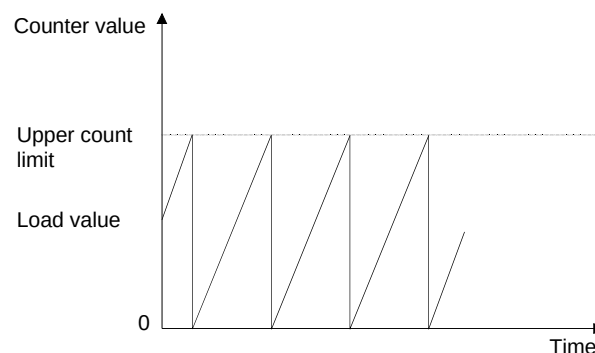
Continuous counting

In all counter modes, a continuous counter function is used as described in the following paragraphs and as shown in figure.

If the counter reaches the upper count limit when counting up and a further count pulse is received, the counter jumps to the lower count limit and starts to add the count pulses again, meaning it counts continuously.

If the counter reaches the lower count limit when counting down and a further count pulse is received, the counter jumps to the upper count limit and continues to count down from there.

The count range in all modes is 0 to +4.294.967.295 and cannot be changed. The counter starts to count at 0 when a complete restart (Power-On Reset or VBUS-Reset) is executed on the module or the counter is cleared by setting bit CLEAR in the control byte.

**Maximum counter frequency**

At the designation of maximum counter frequency, two types of indication are distinguished:

- *Maximum impulse frequency*
The maximum impulse frequency is the maximum frequency the adjacent signal may have, i.e. the maximum frequency at which the impulses arrive at the module. At this module the maximum impulse frequency is 100Hz.
- *Maximum counter frequency*
The maximum counter frequency is the frequency at which can be internally counted to the maximum. At this module the maximum impulse frequency is 400Hz.

Module access

For input and output data, the module occupies each 6Byte in the address area. For setting the counter mode there are 1Byte parameter data at disposal.

Loading the counter res. presetting of a reference frequency is via a control byte by typing the wanted value into the output address area and setting the Bit 2 of the control byte to activate the counter.

You may see the counter value and the state of the inputs in the input address area. Also during count operation you may call all input channels.

**Input data
DI data bytes**

Input bytes 0 to 3 are assigned to the 32Bit counter value whereas bytes 4 and 5 are assigned to the 16Bit digital inputs.

Byte	Bit 7 ... 0
0	Counter Value Byte 0
1	Counter Value Byte 1
2	Counter Value Byte 2
3	Counter Value Byte 3
4	DI Data Byte 0 (I+0.7 ... I+0.0)
5	DI Data Byte 1 (I+1.7 ... I+1.0)

**Output data
DO data bytes**

Byte 0 to 3 are assigned to a load value according to the selected counter mode. Byte 4 is used as control byte for the counter. Byte 5 selects a reference frequency for the counter modes "Frequency Measurement" and "Period Measurement".

Byte	Bit 7 ... 0
0	Load Value Byte 0
1	Load Value Byte 1
2	Load Value Byte 2
3	Load Value Byte 3
4	Control Byte
5	Reference Frequency

Control byte

Bit	Function
0	1 = START counter (the software gate is open)
1	1 = STOP counter (the software gate is closed)
2	1 = LOAD counter
3	1 = CLEAR counter
7 ... 4	reserved

**Reference
frequency**

Value	Reference frequency
00h	16 MHz
01h	8 MHz
02h	4 MHz
03h	1 MHz
04h	100 kHz
05h	10 kHz
06h	1 kHz
07h	100 Hz
others	not allowed

Parameter data

The module has 3Byte parameter data for selecting the counter mode and configuring the digital input filters.

Byte	Bit 7 ... 0
0	Counter function 00h: Quadruple Pulse Evaluation 01h: Pulse and Direction Evaluation 02h: Clock Up / Clock Down Evaluation 03h: Frequency Measurement 04h: Period Measurement others: not allowed
1	Filter (Divider 0) value: 0 ... 255
2	Filter (Divider 1) value: 0 ... 255

Counter function

A description of the counter functions can be found at the next page.

Filter

The counter inputs are debounced by means of digital filters which can be adjusted via parameter Filter (Divider 0 and Divider 1).

So that an pulse can be evaluated as a counting pulse, this must be present longer than the parameterized filter value. Shorter pulses are not evaluated.

For calculation of the pulse time the following formula is to be used:

$$T_{\text{Pulse}} \geq (\text{Divider } 0 + 1) * (\text{Divider } 1 + 1) * 2.5\mu\text{s}$$

Example:

$$\text{Divider } 0 = 3, \text{ Divider } 1 = 0$$

$$T_{\text{Pulse}} \geq (3+1) * 1 * 2.5\mu\text{s} = 10\mu\text{s}$$

In this way filter for a pulse time of 2.5 ... 163840μs can be parameterized.

Example (default:)

$$\text{Divider } 0 = 0, \text{ Divider } 1 = 0$$

$$T_{\text{Pulse}} \geq 1 * 1 * 2.5\mu\text{s} = 2.5\mu\text{s}$$

By default (after Reset) a filter width of 2.5μs is used.

Counter functions

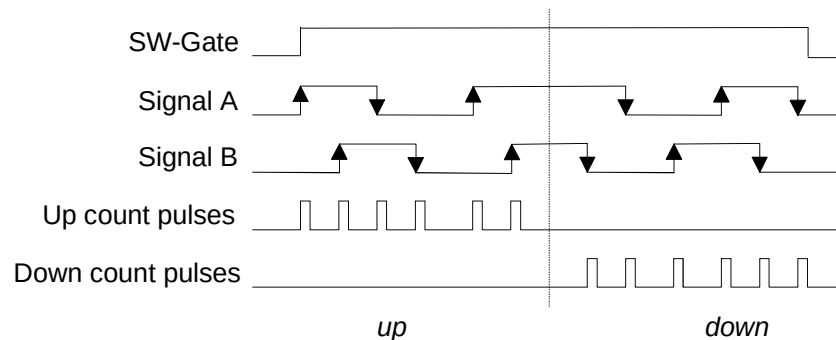
Quadruple Pulse Evaluation (00h)

Quadruple evaluation means that the rising and falling edges of A and B are evaluated; whether up or down count pulses are generated depends on which channel hurries first.

In this counting mode I+0.0 and I+0.1 have the following function:

I+0.0 as channel A: If channel A hurries in front, the counter counts up.

I+0.1 as channel B: If channel B hurries in front, the counter counts down.



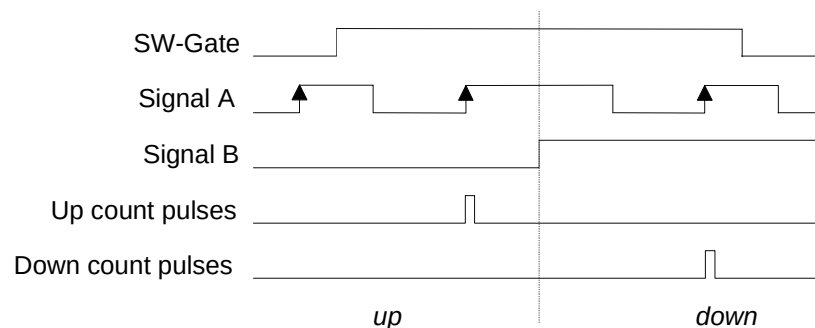
Pulse and Direction Evaluation (01h)

Every rising edge of A is evaluated. Channel B defines the counter direction.

In this counting mode I+0.0 and I+0.1 have the following function:

I+0.0 as channel A: Clock pulse for the counter at rising edge.

I+0.1 as channel B: Defines the counter direction (0 = up, 1 = down)



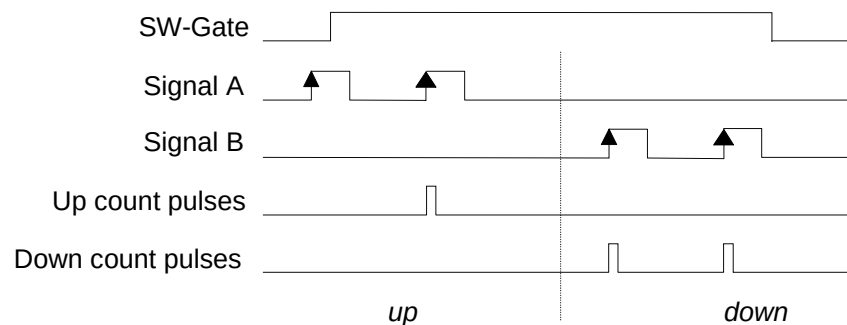
Clock Up / Clock Down Evaluation (02h)

The rising edges of channel A and B are evaluated. The counter is incremented with every rising edge of A and decremented with every rising edge of B.

In this counting mode I+0.0 and I+0.1 have the following function:

I+0.0 as channel A: Clock up pulse for the counter at rising edge.

I+0.1 as channel B: Clock down pulse for the counter at rising edge.



Frequency measurement (03h)

In frequency measurement mode, the module counts the number of rising edges of channel A received within a specified time window.

Channel B is not used in this mode.

The time window T_w is specified indirectly by selecting a *reference frequency* with DO byte 5 and defining a *load value* in DO bytes 0 to 3:

$$T_w = \frac{1}{\text{Reference Frequency}} * \text{Load Value}$$

By setting the Bit 2 of the *control byte*, the time window is transferred. When the counter is enabled (software gate is open), the reference counter is started with the first rising edge of channel A and is incremented with every rising edge of the reference clock.

When the reference counter reaches the load value (time T_w has expired), the current counter value is copied to DI byte 0 to 3 and can be read.

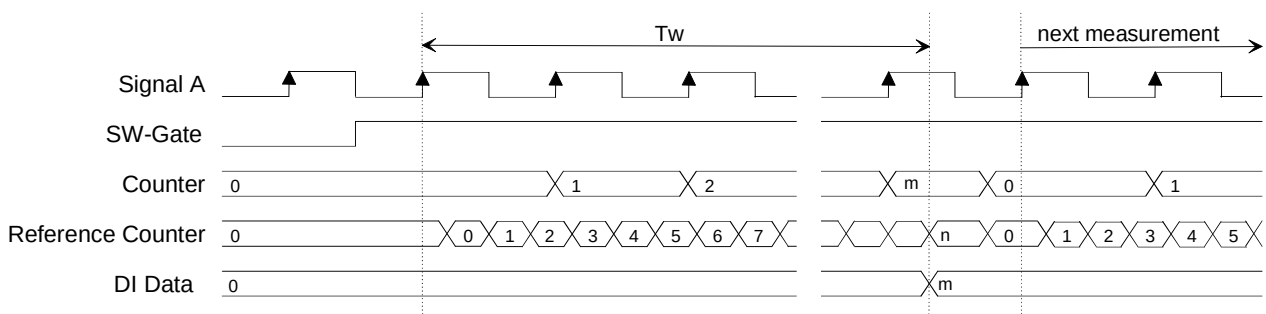
Then the counter and the reference counter is cleared automatically and the next frequency measurement is started with the next rising edge of channel A. If there aren't at least two rising edges of channel A within the time window T_w , the counter value will be read as 0 for this measurement.

Frequency measurement is started and ended by using the software gate, that is as long as the software gate is open, the frequency of channel A is measured.

The counter can be cleared at any time by CLEAR='1' in the *control byte* while the *load value* stays valid until a new value is loaded or a Reset is detected.

The recent frequency can be computed by using the following formula:

$$\text{Frequency} = \text{Reference Frequency} * \frac{\text{Counter Value}}{\text{Load Value}}$$

**Example:**

Reference Frequency : 1 MHz
 Load Value (n) : 1.000.000
 Counter Value (m) : 10.000

$$\text{Frequency} = 1 \text{ MHz} * \frac{10.000}{1.000.000} = 10 \text{ kHz}$$

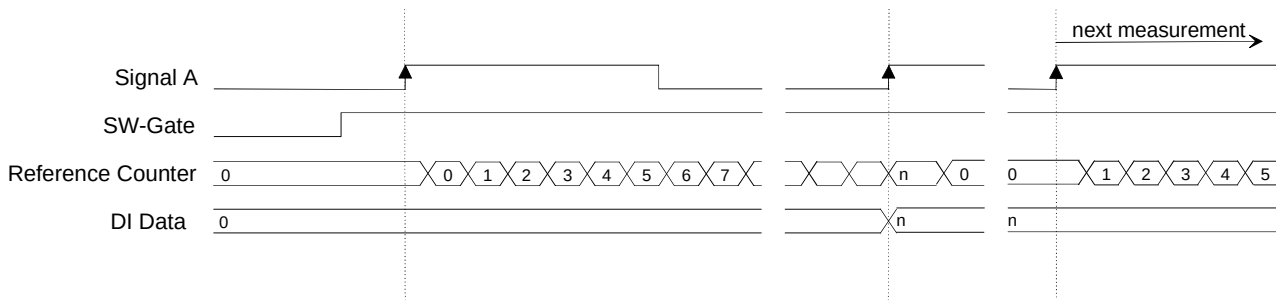
Period measurement (04h)

With very small frequencies, it is convenient to measure the period instead of the frequency. In the operating mode "Period Measurement", the time between two rising edges of channel A is measured by counting the number of rising edges of the selected reference clock occurring between two rising edges of channel A. Channel B is not used in this mode.

Period measurement is started and ended by using the software gate, that is: as long as the software gate is open the period of channel A is measured continuously. The counter can be cleared at any time by CLEAR='1' in the *control byte*. The period measurement will then start again with the next rising edge of channel A.

The recent signal period can be computed by using the following formula:

$$Period = \frac{1}{\text{Reference Frequency}} * \text{Counter Value}$$



Example:

Reference Frequency : 1 MHz
Counter Value (n) : 10.000

$$Period = \frac{1}{1\text{MHz}} * 10.000 = 10\text{ ms}$$



Note!

The counter value stays valid until the next measurement is completed or the counter is cleared.

If the next measurement is never completed (e.g. because the second rising edge of channel A never occurs), you will always see the 'old' counter value and not the current value of the Reference Counter.

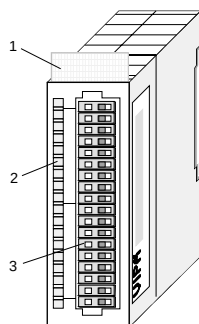
Technical data

Electrical data	VIPA 221-1BH20
Number of inputs	16
Counter	1 (2 inputs A, B)
Rated input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input filter counter	100µs
Max. impulse frequency	100kHz
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	85mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	6 Byte
Output data	6 Byte
Parameter data	3 Byte
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BH30 - DI 16xDC 24V - ECO

Order data	DI 16xDC 24V	VIPA 221-1BH30
Description	The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. It has 16 channels that indicate the respective status by means of LEDs.	
Properties	• 16 inputs, isolated from the backplane bus • DC 24V nominal input voltage • Suitable for standard switches and proximity switches • Status indicator for each channel by means of an LED	

Construction



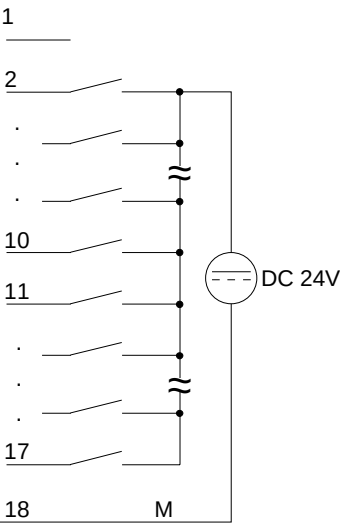
- [1] Label for module description
- [2] LED status indicator
- [3] Edge connector

Status indicator connector assignment

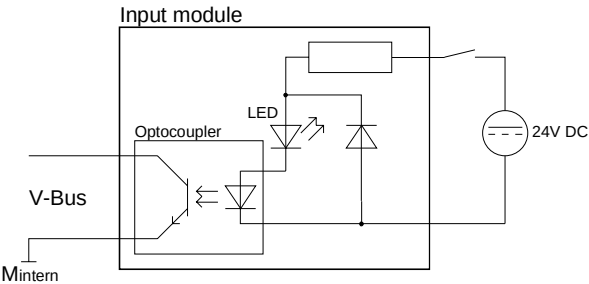
LED	Description	Pin	Assignment
.07	LEDs (green) I+0.0 to I+1.7 A "1" signal level is recognized as of app. 15V and the respective LED is turned on	1	Not connected
		2	Input I+0.0
		3	Input I+0.1
		.	.
		.	.
		.	.
		9	Input I+0.7
		10	Input I+1.0
		.	.
		.	.
		.	.
		17	Input I+1.7
		18	Ground

Wiring and schematic diagram

Wiring diagram



Schematic diagram



Technical data

Electrical data	VIPA 221-1BH30
Number of inputs	16
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	45mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	2Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-1BH50 - DI 16xDC 24V NPN mit UB4x

Order data

DI 16xDC 24V NPN

VIPA 221-1BH50

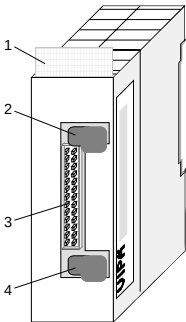
Description

The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system. The input becomes active when it is connected to ground.

This module requires a UB4x-converter. It has 16 channels that indicate the respective status via LEDs on the UB4x. The module has to be connected to the converter module (DEA-UB4x) by means of a flattened round cable (DEA-KB91C).

- Properties
- 16 inputs, isolated from the backplane bus
 - Active low input (signal level "1" when input is at ground)
 - DC 24V nominal input voltage
 - Suitable for standard switches and proximity switches
 - Status indicator for each channel by means of a LED located on the conversion module UB4x

Construction



- [1] Label for module description
- [2] Clip
- [3] Recessed connector for the interface to a conversion module UB4x via the flattened round cable
- [4] Clip

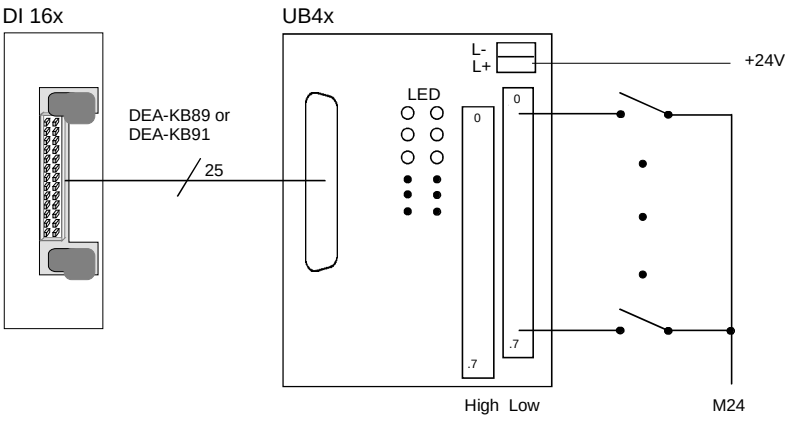
Status indicator on UB4x

LED	Description
0... .15	LEDs (yellow) I+0.0 to I+0.7 High I+0.0 to I+0.7 Low A "1" signal level is recognized as of app. 15V and the respective LED is turned on
L+ L-	LED (green) Supply voltage available

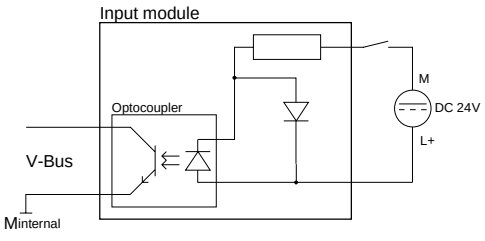
Pin assignment module

Connector	Pin	Assignment
26	25	23...26 Supply voltage +DC 24V
	22	Input I+0.0
	.	.
	.	.
	15	Input I+0.7
	14	Input I+1.0
	.	.
	.	.
	7	Input I+1.7
	1...6	Supply voltage Ground
4	3	
2	1	

Interface to UB4x



Schematic diagram module



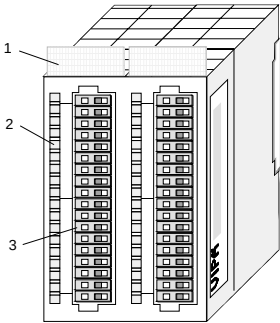
Technical data

Electrical data	VIPA 221-1BH50
Number of inputs	16
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	15 ... 28.8V
Signal voltage "1"	0 ... 5V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	40mA
Isolation	500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the UB4x
Programming specifications	
Input data	2Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	25.4x76x88
Weight	50g

221-2BL10 - DI 32xDC 24V

Order data	DI 32xDC 24V	VIPA 221-2BL10
Description	The digital input accepts binary control signals from the process and provides an electrically isolated interface to the central bus system It has 32 channels that indicate the respective status by means of LEDs.	
Properties	• 32 inputs, isolated from the backplane bus • DC 24V nominal input voltage • Suitable for standard switches and proximity switches • Status indicator for each channel by means of an LED	

Construction

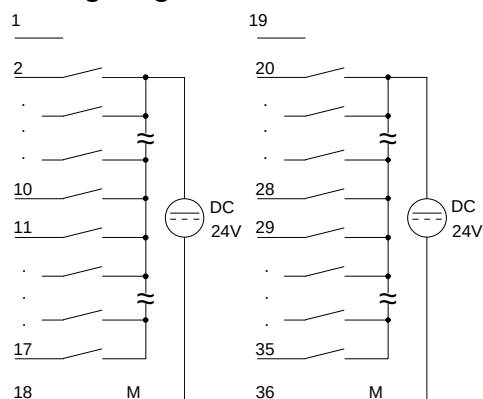
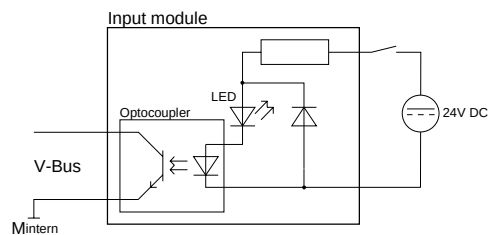


- [1] Label for module description
- [2] LED status indicator
- [3] Edge connector

Status indicator pin assignment

LED	Description	Pin	Assignment
.07	LEDs (green) I+0.0 to I+3.7 A "1" signal level is recognized as of app. 15V and the respective LED is turned on	1	Not connected
		2 ... 17	Input I+0.0...I+1.7
		.	.
		.	.
		.	.
		18	Ground
		19	Not connected
		.	.
		.	.
		.	.
		20 ... 35	Input I+2.0...I+3.7
		36	Ground

VIPA 221-2BL10

Wiring and schematic diagram**Wiring diagram****Schematic diagram****Technical data**

Electrical data	VIPA 221-2BL10
Number of inputs	32
Nominal input voltage	DC 24V (20.4 ... 28.8V)
Signal voltage "0"	0 ... 5V
Signal voltage "1"	15 ... 28.8V
Input filter time delay	3ms
Input current	typ. 7mA
Power supply	DC 5V via backplane bus
Current consumption via backplane bus	40mA
Isolation	in 2 groups of 16 inputs each 500Vrms (field voltage to the bus)
Status indicator	via LEDs located on the front
Programming specifications	
Input data	4Byte
Output data	-
Parameter data	-
Diagnostic data	-
Dimensions and weight	
Dimensions (WxHxD) in mm	50.8x76x88
Weight	50g

