# 6DL1131-6BH00-0PH1

## SIMATIC ET 200SP HA DI 16x24VDC HA Digital Input Module

Siemens 6DL1131-6BH00-0PH1 is an ET 200SP HA 16-channel 24 V DC digital input module with per-channel parameterization, diagnostics, value status, and I/O redundancy support.

### PRODUCT ENQUIRY

Email: **info@apterpower.com**
Phone / WhatsApp: **+86 18106909650**
Website: **www.apter.com**

## Product overview

Siemens 6DL1131-6BH00-0PH1 is the SIMATIC ET 200SP HA DI 16x24VDC HA digital input module. It provides 16 individually parameterizable 24 V DC inputs for P-reading sensors and supports IEC 61131-2 Type 1 and Type 3 input characteristics.

The module supports value status, channel diagnostics, hardware interrupts, I&M; data, parameter reassignment in RUN, and I/O redundancy. Time stamping is available with 1 ms resolution, while the high-precision time-stamp operating mode uses the documented expanded address space.

Use H1 or M1 terminal blocks according to the station design, and use M1 for redundant operation. Sensor supply loading, installation orientation, cable shielding, input delay, and the supported PCS 7 engineering environment must be checked before commissioning or replacement.

# Technical specifications

| Parameter | Value |
|---|---|
| Model Number | 6DL1131-6BH00-0PH1 |
| Product Family | SIMATIC ET 200SP HA |
| Product Type | DI 16x24VDC HA digital input module |
| Digital Inputs | 16 |
| Input Principle | P-reading |
| Sensor Standards | IEC 61131-2 Type 1 and Type 3 |
| Rated Supply Voltage | 24 V DC |
| Permissible Supply Range | 19.2 to 28.8 V DC |
| Rated Current Consumption | 60 mA |
| Maximum Current Without Sensor Supply | 120 mA |
| Sensor Supply Outputs | 16 |
| Minimum Sensor Supply Output | 18.2 V |
| Sensor Supply Protection | Electronic short-circuit protection |
| Backplane Power Consumption | 80 mW |
| Typical Power Loss | 3.6 W |
| Standard Address Space | 2 input bytes plus 2 QI bytes |
| High-Precision Time-Stamp Address Space | 18 bytes |
| Zero-Signal Input Range | -30 to +5 V |
| One-Signal Input Range | +11 to +30 V |
| Typical Input Current | 2.5 mA |
| Shielded Cable Length | Up to 1000 m |
| Unshielded Cable Length | Up to 600 m |
| Maximum 2-Wire Sensor Quiescent Current | 1.5 mA |
| Terminal Blocks | H1 or M1; M1 for redundancy |
| Supported PCS 7 Version | V9.0 or higher |
| Horizontal Operating Temperature | -40 to 70 °C |
| Vertical Operating Temperature | -40 to 60 °C |
| Width | 22.5 mm |
| Height | 115 mm |
| Depth | 138 mm |
| Approximate Weight | 135 g |
| Module Cycle Time | 1 ms |
| Redundancy Failover Time | 55 ms maximum |

Source: Siemens SIMATIC ET 200SP HA manual for 6DL1131-6BH00-0PH1

SIEMENS

SIMATIC

# ET 200SP HA
# Digital Input Module DI 16x24VDC HA (6DL1131-6BH00-0PH1)

Manual


Security information 1

Product overview 2

Wiring 3

Parameters 4

Displays and interrupts 5

Technical specifications 6

Drivers, parameters, diagnostics messages and address space A



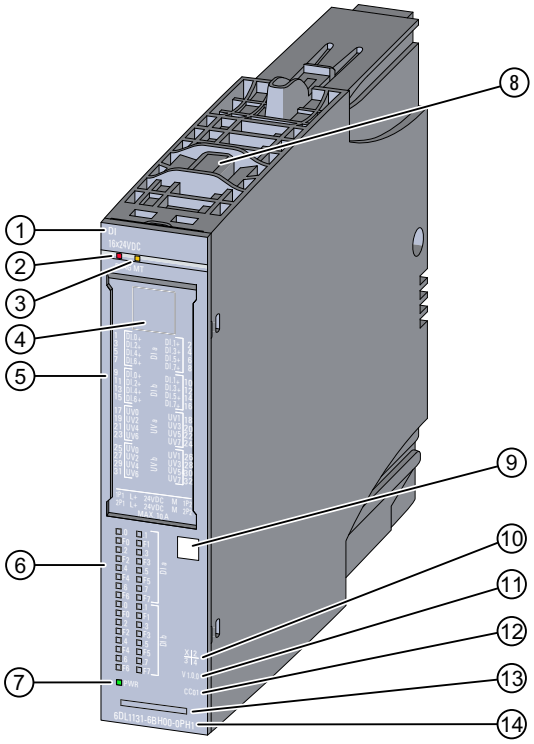
11/2017
A5E39265608-AB

# Product overview

2

## 2.1 Properties of the I/O module DI 16x24VDC HA

### View of the module




① Module type and designation
② LED for diagnostics
③ LED for maintenance
④ 2D matrix code
⑤ Wiring diagram
⑥ LEDs for channel status/channel fault
⑦ LED for supply voltage
⑧ Output disable switch
⑨ Module type color coding
⑩ Product version
⑪ Function status and firmware version
⑫ Color code for selection of the color-coded labels
⑬ Serial number
⑭ Article number

Figure 2-1 View of the DI 16×24VDC HA

## Properties

The I/O module has the following technical properties:

- 16 digital inputs with the following properties that can be individually configured for each channel
  - Pulse stretching
  - Diagnostics
  - Input delay
  - Hardware interrupts for positive and negative edges
- Sink input (PNP, active high)
- Module-specific configurable diagnostics for missing supply voltage L+
- Suitable for connecting switches and 2-wire sensors according to IEC 61131-2, types 1 and 3

The I/O module supports the following functions:

- Firmware update
- I&M identification data
- Parameter reassignment in RUN
- Value status QI
- IO redundancy
- Time stamping with 1 ms accuracy
- Output disable switch

You can configure the I/O module with HW Config and integrate it into your system.

## Output disable switch

If you want to pull the I/O module in runtime, you have to press the output disable switch for 3 seconds for the I/O module to be deenergized.

When the output disable switch has been pressed for 3 seconds, the LED DIAG flashes red, the LED MT lights up yellow and the I/O module generates a diagnostics message. See section Status and error displays of the I/O module DI 16x24VDC HA (Page 21).

**Note**

Pressing the output disable switch interrupts any ongoing firmware update. A firmware update cannot be performed when the device is deenergized.

## Accessories

The following accessories must be ordered separately:

- Labeling strips
- Color-coded labels

# Wiring

# 3

## 3.1 Terminal assignment of the I/O module DI 16x24VDC HA

### Terminal blocks

You can operate the I/O module with the following terminal blocks:

- 6DL1193-6TP00-0DH1, light
- 6DL1193-6TP00-0BH1, dark
- 6DL1193-6TP00-0DM1, light, for redundant configuration
- 6DL1193-6TP00-0BM1, dark, for redundant configuration

The terminal block is not included in the scope of delivery of the I/O module and must be ordered separately.

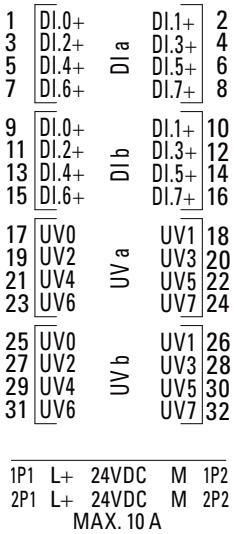
**Note**

You can find additional information on the configuration in the system manual.

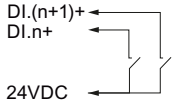
## General pin assignment

Table 3-1 Pin assignment of the DI 16×24VDC HA

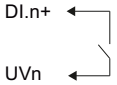
| Terminal | Assignment | Terminal | Assignment | Explanations |
|---|---|---|---|---|
| 1 | DI a /DI.0+ | 2 | DI a /DI.1+ | DI a /DI.n+: Input signal, channel n (0…7)<br>DI b /DI.n+: Input signal, channel n+8 (8…15)<br>UV a /UV.n: Sensor supply, channel n (0...7)<br>UV b /UV.n: Sensor supply, channel n+8 (8…15)<br>1P1: Supply voltage L+ of the voltage bus 1P<br>2P1: Supply voltage L+ of the voltage bus 2P<br>1P2: Ground reference of the voltage bus 1P<br>2P2: Ground reference of the voltage bus 2P |
| 3 | DI a /DI.2+ | 4 | DI a /DI.3+ | |
| 5 | DI a /DI.4+ | 6 | DI a /DI.5+ | |
| 7 | DI a /DI.6+ | 8 | DI a /DI.7+ | |
| 9 | DI b /DI.0+ | 10 | DI b /DI.1+ | |
| 11 | DI b /DI.2+ | 12 | DI b /DI.3+ | |
| 13 | DI b /DI.4+ | 14 | DI b /DI.5+ | |
| 15 | DI b /DI.6+ | 16 | DI b /DI.7+ | |
| 17 | UV a/UV0 | 18 | UV a/UV1 | |
| 19 | UV a/UV2 | 20 | UV a/UV3 | |
| 21 | UV a/UV4 | 22 | UV a/UV5 | |
| 23 | UV a/UV6 | 24 | UV a/UV7 | |
| 25 | UV b/UV0 | 26 | UV b/UV1 | |
| 27 | UV b/UV2 | 28 | UV b/UV3 | |
| 29 | UV b/UV4 | 30 | UV b/UV5 | |
| 31 | UV b/UV6 | 32 | UV b/UV7 | |
| 1P1 | L+ | 1P2 | M | |
| 2P1[1] | L+ | 2P2 | M | |



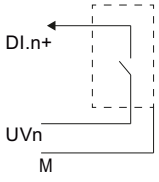

1-wire




2-wire




3-wire




[1] If the module is plugged into a TB45R-P32 terminal block suitable for IO redundancy, the potential at this terminal is 1P3.

## 3.2 Schematic circuit diagram

The following figure shows the block diagram of the DI 16×24VDC HA.

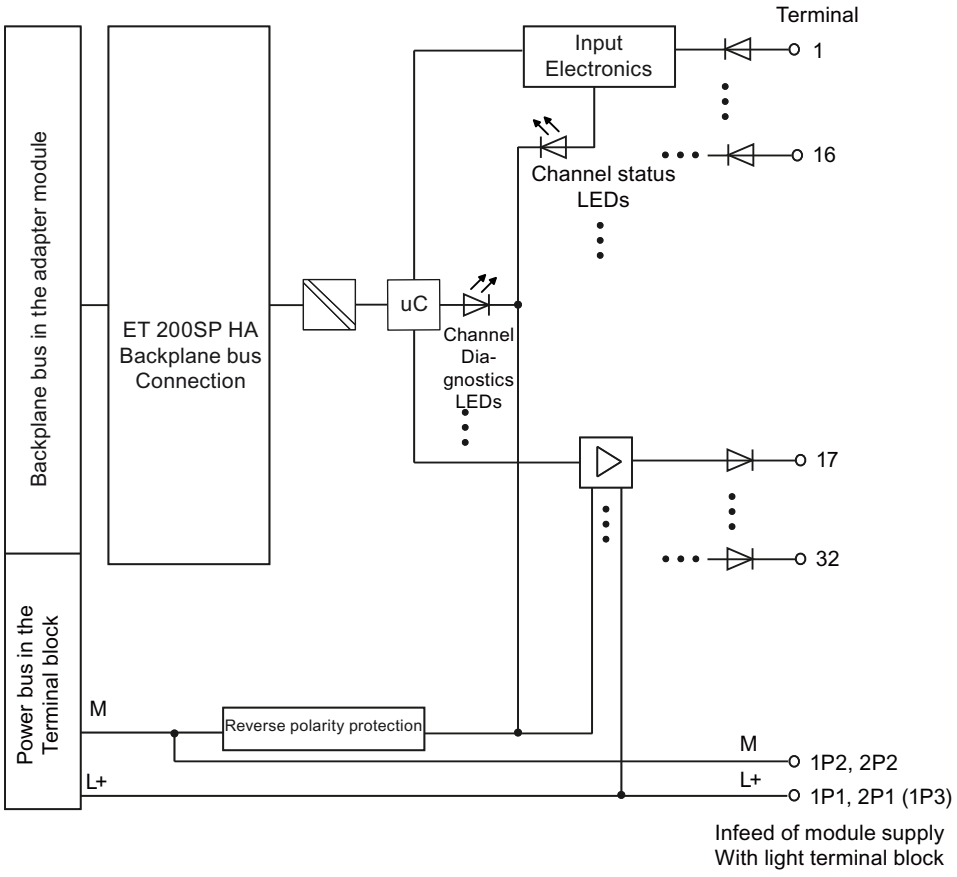



Figure 3-1 Block diagram DI 16X24VDC HA

# Parameters

4

## 4.1 Parameters of the I/O module DI 16x24VDC HA

### Configuration

You configure the I/O module with PCS 7 V9.0 or higher.

### Parameters

You define the functioning of the I/O module via parameters.

### See also

Parameter assignment and structure of the module/channel parameters (Page 35)

# 4.2 Module/channel parameters

## Parameters of the DI 16X24VDC HA

You have the following setting options:

Table 4-1 Parameters and their defaults

| Parameter | Value range | Default | Parameter re-assignment in RUN | Efficiency range |
|---|---|---|---|---|
| Diagnostics,<br>Missing supply voltage L+ | • Enabled<br>• Disabled | Enabled | Yes | Module |
| IO redundancy | • None<br>• 2 modules | None | No | Module |
| Diagnostics<br>Short-circuit to ground | • Enabled<br>• Disabled | Enabled | Yes | Channel |
| Diagnostics,<br>Wire break [1] | • Enabled<br>• Disabled | Enabled | Yes | Channel |
| Check for wire break | • Enabled<br>• Disabled | Enabled | Yes | Channel |
| Channel activated | • Enabled<br>• Disabled | Enabled | Yes | Channel |
| Input delay [2] | • None<br>• 0.05 ms<br>• 0.1 ms<br>• 0.4 ms<br>• 0.8 ms<br>• 1.6 ms<br>• 3.2 ms<br>• 12.8 ms<br>• 20 ms | 3.2 ms | Yes | Channel |
| Pulse stretching [2] | • None<br>• 0.05 s<br>• 0.1 s<br>• 0.2 s<br>• 0.5 s<br>• 1 s<br>• 2 s | None | Yes | Channel |
| Hardware interrupts rising edge [2] | • Enabled<br>• Disabled | Disabled | Yes | Channel |

| Parameter | Value range | Default | Parameter re-assignment in RUN | Efficiency range |
|---|---|---|---|---|
| Hardware interrupts falling edge [2] | • Enabled<br>• Disabled | Disabled | Yes | Channel |
| Potential group | • Use potential group of the left module<br>• Allow new potential group | Use potential group of the left module | No | Module |

[1] The wire break diagnostics can only be enabled when the "Check for wire break" parameter is enabled. If you use a simple encoder contact, you need to connect a parallel resistor to enable wire break diagnostics in the open state (sensor resistance for wire break diagnostics: 15 kΩ to 18 kΩ).

[2] The input delay is switched off on all channels when high precision time stamping is activated. When high precision time stamping is activated, pulse stretching and the rising/falling edge hardware interrupt are deactivated on all channels (not adjustable).

## Parameter reassignment

Each configuration change resets the corresponding reaction. Changing the configuration of a function does not affect other functions.

## 4.3 Explanation of the module/channel parameters

### Diagnostics, Missing supply voltage L+

Enabling of the diagnostics for missing or insufficient supply voltage L+.

### IO redundancy

You can configure two identical modules redundantly. To do so, plug both modules into a redundant terminal block side by side. You can find additional information on mounting modules in an IO redundancy configuration in the ET 200SP HA System Manual, section "Installing", "Installing terminal block".

In IO redundancy mode, the left-hand module is the master and the right-hand module is the slave.

Both redundant modules measure simultaneously and independently in the process. Both redundant modules generate diagnostics, alarms and process values.

### Diagnostics, Short-circuit to ground

Enabling of the diagnostics if a short-circuit of the actuator supply to ground occurs.

### Diagnostics, Wire break

When wire-break check is activated, you can enable wire-break diagnostics via the Diagnostics, Wire break parameter for insufficient current flow on the input.

### Check for wire break

Enable for wire break check. The module can only detect a wire break when the wire-break check is activated.

### Channel activated

Specifies whether a channel is activated or deactivated.

### Input delay

This parameter can be used to avoid signal faults. Changes to the signal are only detected if they are constantly pending longer than the set input delay time.

For input channels with longer input delays, the read-in time is moved accordingly. This means individual channels can be assigned input delays, if necessary, without having a negative impact on the possible cycle time.

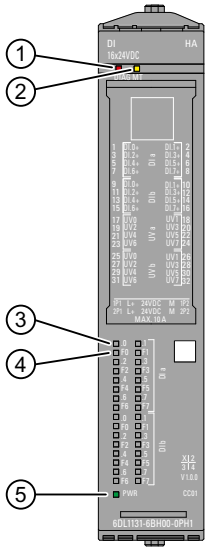
# Displays and interrupts

# 5

## 5.1 Status and error displays of the I/O module DI 16x24VDC HA

### LED displays

The following figure shows the LED displays of the I/O module:




① DIAG LED (green/red)
② MT LED (yellow)
③ Channel status LED (green)
④ Channel fault LED (red)
⑤ PWR LED (green)

Figure 5-1 LED displays

### Meaning of the LED displays

The tables below explain the meaning of the status and error displays. Remedial measures for diagnostics alarms can be found in section Diagnostics messages and maintenance events (Page 38).

## DIAG LED

Table 5-1 Diagnostics display of the DIAG LED

| DIAG LED | Meaning |
|---|---|
| Off | The power supply of the ET 200SP HA is disrupted or switched off. |
| Flashes | Module is not configured. |
| On | Module is configured, a diagnostics message is not pending. |
| Flashes | Module is configured, at least one diagnostic message is pending. |

## MT LED

Table 5-2 Status display of the LED MT

| MT LED | Meaning |
|---|---|
| Off | No maintenance required. |
| On | Maintenance is required, i.e. at least one maintenance event has occurred. |

## Channel status/channel error LED

Regardless of the parameter assignment, the green LED channel status shows the signal level at the input terminal. It lights up starting at approximately 10 V of terminal current.

The red channel fault LED lights up when a channel diagnostics is active for an enabled channel.

Table 5-3 Status and error display of the LEDs channel status and channel error

| LED channel status | LED channel error | Meaning |
|---|---|---|
| Off | Off | Process signal = 0 and<br>• Channel disabled or module switched off<br>• Channel enabled and no channel diagnostics pending<br>• Module diagnostics pending |
| On | Off | Process signal = 1 and<br>• Channel disabled or module switched off<br>• Channel enabled and no channel diagnostics pending<br>• Module diagnostics pending |

| LED channel status | LED channel error | Meaning |
|---|---|---|
| □ Off | ■ On | Process signal = 0 and<br>• Channel enabled and channel diagnostics pending |
| ■ On | ■ On | Process signal = 1 and<br>• Channel enabled and channel diagnostics pending |

## PWR LED

Table 5-4 Status display of the PWR LED

| PWR LED | Meaning |
|---|---|
| □ Off | Supply voltage L+ missing. |
| ■ On | Supply voltage L+ present. |

## 5.2 Interrupts

The I/O module supports diagnostics interrupts, maintenance messages and hardware interrupts. You can find additional information on hardware interrupts in the appendix Hardware interrupts (Page 40)

### Diagnostics interrupts

The I/O module generates a diagnostics interrupt at the following events:

- Supply voltage missing
- Short-circuit to ground
- Wire break
- Parameter assignment error
- Hardware interrupt lost
- Channel/component temporarily unavailable
- Retentive memory in carrier module defective
- Retentive memory in the terminal block defective
- Shutdown on button activation
- IO redundancy parameter assignment inconsistent

### Maintenance messages

The I/O module generates a maintenance message for the following events:

- Redundancy partner has different hardware/firmware
- IO redundancy warning
- Retentive memory in carrier module defective
- Retentive memory in the terminal block defective

# Technical specifications

# 6

## Technical specifications of the DI 16X24VDC HA

| Article number | 6DL1131-6BH00-0PH1 |
|---|---|
| **General information** | |
| Product type designation | DI 16x24VDC HA |
| HW functional status | FS01 |
| Firmware version | V1.0 |
| • FW update possible | Yes |
| Usable terminal block | TB type H1 and M1 |
| Color code for module-specific color identification plate | CC01 |
| **Product function** | |
| • I&M data | Yes; I&M0 to I&M3 |
| **Engineering with** | |
| • PCS 7 configurable/integrated as of version | V9.0 |
| **Operating mode** | |
| • DI | Yes |
| • Counter | No |
| • Oversampling | No |
| • MSI | No |
| **Redundancy** | |
| • Redundancy capability | Yes; With TB type M1 |
| **Supply voltage** | |
| Rated value (DC) | 24 V |
| permissible range, lower limit (DC) | 19.2 V |
| permissible range, upper limit (DC) | 28.8 V |
| Reverse polarity protection | Yes |
| **Input current** | |
| Current consumption (rated value) | 60 mA; without sensor supply |
| Current consumption, max. | 120 mA; without sensor supply |
| **Encoder supply** | |
| Number of outputs | 16 |
| Output voltage encoder supply, min. | 18.2 V; L+ (-1 V) |
| Short-circuit protection | Yes; Electronic (response threshold 0.7 A to 1.3 A; for IO redundancy up to 2.6 A) Ensure sufficient low-resistance cable routing to the sensor/actuator in order to attain the response threshold. Depending on the cable cross-section used, there may be constraints regarding the usable length of cable. |
| **Output current** | |

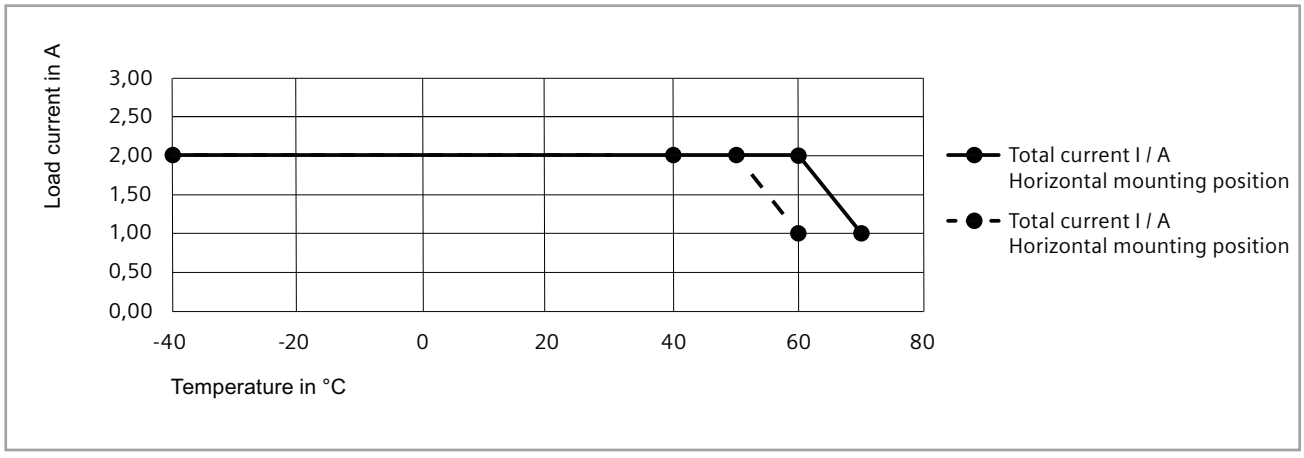
| Article number | 6DL1131-6BH00-0PH1 |
|---|---|
| • up to 60 °C, max. | 2 A; 1 A when mounted vertically; see derating information in Equipment Manual |
| • up to 70 °C, max. | 1 A; See derating information in Equipment Manual |
| **24 V encoder supply** | |
| • 24 V | Yes |
| • Short-circuit protection | Yes; Electronic (response threshold 0.7 A to 1.3 A; for IO redundancy up to 2.6 A) Ensure sufficient low-resistance cable routing to the sensor/actuator in order to attain the response threshold. Depending on the cable cross-section used, there may be constraints regarding the usable length of cable. |
| **Power** | |
| Power available from the backplane bus | 80 mW |
| **Power loss** | |
| Power loss, typ. | 3.6 W; Maximum value (taking the max. encoder current and the max. operating voltage into account) |
| **Address area** | |
| **Address space per module** | |
| • Address space per module, max. | 2 byte; + 2 bytes for QI information (additional 18 bytes when using high-precision time stamping) |
| **Hardware configuration** | |
| Automatic encoding | |
| • Mechanical coding element | Yes |
| **Digital inputs** | |
| Number of digital inputs | 16 |
| Digital inputs, parameterizable | Yes |
| Source/sink input | Yes; P-reading |
| Input characteristic curve in accordance with IEC 61131, type 1 | Yes |
| Input characteristic curve in accordance with IEC 61131, type 2 | No |
| Input characteristic curve in accordance with IEC 61131, type 3 | Yes |
| Pulse extension | Yes |
| • Length | Off, 50 ms, 100 ms, 200 ms, 500 ms, 1 s, 2 s |
| Time stamping | Yes; Resolution 10 ms |
| Time stamp (with precision of 1 ms) | Yes; Resolution 1ms |
| Edge evaluation | Yes; rising edge, falling edge, edge change |
| **Input voltage** | |
| • Type of input voltage | DC |
| • Rated value (DC) | 24 V |
| • for signal "0" | -30 to +5V |
| • for signal "1" | +11 to +30V |
| **Input current** | |
| • for signal "1", typ. | 2.5 mA |

| Article number | 6DL1131-6BH00-0PH1 |
|---|---|
| **Input delay (for rated value of input voltage)** | |
| **for standard inputs** | |
| – parameterizable | Yes; none / 0.05 / 0.1 / 0.4 / 0.8 / 1.6 / 3.2 / 12.8 / 20 ms |
| **Cable length** | |
| • shielded, max. | 1 000 m |
| • unshielded, max. | 600 m |
| **Encoder** | |
| **Connectable encoders** | |
| • 2-wire sensor | Yes |
| – permissible quiescent current (2-wire sensor), max. | 1.5 mA |
| **Interrupts/diagnostics/status information** | |
| Diagnostics function | Yes |
| **Alarms** | |
| • Diagnostic alarm | Yes; channel by channel |
| • Hardware interrupt | Yes; channel by channel |
| **Diagnostic messages** | |
| • Diagnostic information readable | Yes |
| • Monitoring the supply voltage | Yes; Module-wise |
| – parameterizable | Yes |
| • Monitoring of encoder power supply | Yes |
| • Wire-break | Yes; Channel-by-channel, optional protective circuit for preventing wire-break diagnostics in the case of simple encoder contacts: 15 kOhm to 18 kOhm |
| • Short-circuit to M | Yes; Encoder supply to M, channel by channel |
| **Diagnostics indication LED** | |
| • MAINT LED | Yes; yellow LED |
| • Monitoring of the supply voltage (PWR-LED) | Yes; green PWR LED |
| • Channel status display | Yes; Green LED |
| • for channel diagnostics | Yes; Red LED |
| • for module diagnostics | Yes; Green/red LED |
| **Potential separation** | |
| **Potential separation channels** | |
| • between the channels | No |
| • between the channels and backplane bus | Yes |
| • between the channels and the power supply of the electronics | No |
| **Isolation** | |
| Isolation tested with | 1 500 V DC/1 min, type test |
| **Ambient conditions** | |
| **Ambient temperature during operation** | |
| • horizontal installation, min. | -40 °C |

| Article number | 6DL1131-6BH00-0PH1 |
|---|---|
| • horizontal installation, max. | 70 °C |
| • vertical installation, min. | -40 °C |
| • vertical installation, max. | 60 °C |
| **Dimensions** | |
| Width | 22.5 mm |
| Height | 115 mm |
| Depth | 138 mm |
| **Weights** | |
| Weight, approx. | 135 g |

## Derating curve

The following figure shows the load current derating with horizontal and vertical mounting positions.




## Cycle time

The cycle time describes the time slice in which signals from the inputs are acquired and processed. The cycle time of the I/O module is 1 ms (250 µs for time stamping).

## Minimum pulse length

In order for a pulse or an edge transition to be reliably detected by the I/O module, the signal status must be active for at least the duration of the minimum pulse length.

In non-redundant mode, the minimum pulse length is greater than the input delay and greater than the cycle time.

In IO redundancy mode, the minimum pulse length is greater than the input delay and greater than the cycle time + 50 ms.

## Redundancy failover time

At an I/O redundancy failover, the update time of the process values or the detection of an edge transition is delayed once by no longer than this time.
The maximum redundancy failover time of the I/O module is 55 ms.