

MANUAL

**FREQUENCY CONVERTER
HID2891**



With regard to the supply of products, the current issue of the following document is applicable:
The general terms of delivery for products and services of the electrical industry, as published by
the central association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V.",
including the supplementary clause "Extended reservation of title".

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1 Introduction

1.1 General

This manual describes the installation, initial operation and handling of the device. It renders information on the safe operation of the device, fault elimination, maintenance and disposal.

The corresponding data sheets, declarations of conformity and/or EC-Type Examination Certificates are part of this instruction manual. The instruction manual shall be valid only if all applicable documents are taken into consideration. These documents can be downloaded at www.pepperl-fuchs.com. For additional information, please refer to the contact addresses on the last page of this instruction manual.

This instruction manual requires technical know-how and experience with plant installations and explosion protection.

The devices are intended only for correct and intended use (see section 2). In case of any violation, all guarantee and manufacturer's liability shall become void. Please observe the applicable laws and guidelines for the use and intended purpose.

The device has been developed and manufactured under observation of all applicable European standards and directives.

1.2 Symbols used in this document

In order to highlight safety-related and informative notes, we have defined the following categories. Every note is marked by a symbol.



Danger!

This symbol indicates a warning about a possible danger.

In the event the warning is ignored, the consequences may range from personal injury to death.



Warning!

This symbol indicates a warning about a possible fault or danger.

In case of non-observation injuries or severe material damage may result.



Caution!

This symbol warns of a possible fault.

In the event the warning is ignored, the consequences may course personal injury or heaviest property damage.



This symbol brings important information to your attention.



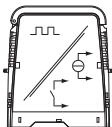
This symbol marks an acting paragraph.

2 Intended use

This device is used to transmit and convert signals between field devices and the process control system/the control unit.



The HiD2891 frequency converter is a 1-channel, bus-powered device. It transfers and converts the input frequency of a large number of signals (mechanical contact, proximity switches, magnetic encoders, current or voltage signal) from the potentially explosive area into signals for the safe area.



The input signal is transferred to an insulated transistor output with an open collector and is converted into an analog output signal proportional to the input frequency.

The frequency alarm and error detection are reported via the relay output or error bus output.

The parameters of the analog output can be set to create a current sink or current source or as voltage with two different voltage ranges. The device can be adjusted with the DIP switches or by control program **FACT^{ware}**TM.

The device is suitable for connecting field devices used in potentially explosive areas. In this device, the field circuits are intrinsically safe and galvanically separated from the non-intrinsically safe circuits. The device constitutes the electrical separation between the potentially explosive (field side) and the safe area (process side) of a plant. The intrinsically safe input (field side) is securely separated in conformity with EN 50020 from the output, programming input, and the supply (process side).

For more information (on certificates, data sheets and the instruction manual), please refer to our website at www.pepperl-fuchs.com/pa (entry in product search: HiD2891).

3 Safety

3.1 General safety instructions

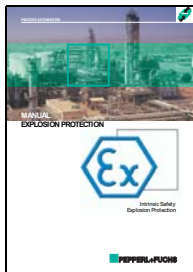
The device may be mounted, connected and operated only **outside of the potentially explosive area**. Have the work carried out only by a trained expert in electric engineering.

Use the device for its intended use only (see section 2). Please observe the information rendered in the instruction manual on installation, initial operation and handling of the device.

If faults can not be remedied, shut down the device. Secure the device against accidental operation. Return the device to Pepperl+Fuchs for repair. Own interventions and modifications are potentially hazardous, and any guarantee and manufacturer's liability shall become void.

Responsibility for adhering to local safety regulations and directives is held by the operator

3.2 Explosion protection



For matters concerning primary explosion protection, i.e. measures to prevent or restrict formation of a potentially explosive atmosphere, please refer to Directive 1999/92/EU (ATEX 137) and the corresponding national regulations.

For matters concerning secondary explosion protection, i.e. measures to prevent ignition by electrical apparatus of a potentially explosive atmosphere, Pepperl+Fuchs are happy to provide their "Explosion protection manual" for a nominal fee.

In particular, please observe DIN EN 60079-10, DIN EN 60079-14, DIN EN 50014 and DIN EN 50020 as well as the corresponding national regulations.

Pepperl+Fuchs also offer a seminar on the subject of explosion protection.

4 Delivery, transport and storage

4.1 Scope of delivery

The scope of delivery comprises:

- The device
- The instruction manual (this document)

4.2 Acceptance

Please check the packaging and contents for any damage. Please check the delivery in order to ensure that all parts are available and the delivery conforms to your order. Compare the data on the nameplate with the ordering data.

Data on the nameplate:

- Order designation and part number
- Supply voltage
- Input and/or output data
- Data on explosion protection and intrinsic safety (if applicable)

4.3 Transport

Pack the device for transport to protect it against damage. The original packaging offers perfect protection for the device.

4.4 Storage

Pack the device for storage to protect it against impact and soiling. The original packaging offers perfect protection for the device. Store the device in a dry environment protecting it against humidity and aggressive media. The permissible storage temperature ranges from -20 °C to 70 °C (253 ... 343 K).

5 Installation and mounting

5.1 Mounting the device



Warning!

Fault or damage of the device caused by wrong mounting location.

In case of non-observation, the safety and function of the device as well as other devices or plants are not ensured.

- ▶ Select the mounting location according to the type of protection of the device (IP30).
 - ▶ Protect the device against foreign bodies of 2.5 mm or larger and against spraying water.
 - ▶ Please observe the notes on the types of housing protection (IEC 60529).
-

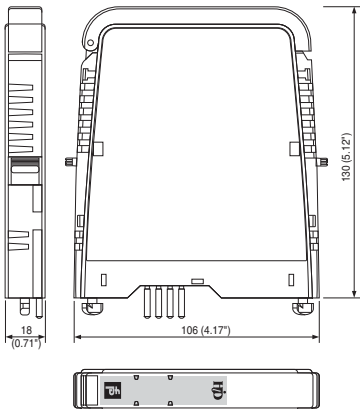
The device can be mounted on the termination boards of the H-system:

All HiD2000 devices can be connected to every mounting station and can be mixed on the termination board.



For additional information on the termination boards, please refer to the instruction manual HiD2000 and the "HiD2000 Termination Boards" manual on our website at www.pepperl-fuchs.com/pa (entry in product search: HiD2891).

If you want to use a customised termination board, please contact your Pepperl+Fuchs assistant.



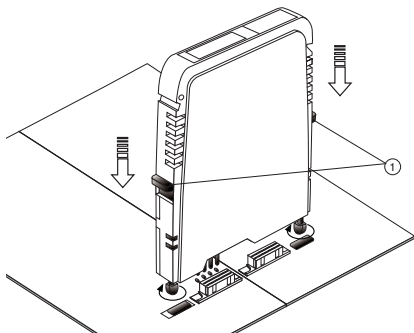
Dimensions of the device in mm



Mounting the device on the termination board:

- ▶ Please ensure that the red Quick Lok Bar (1) is in the upper position.
 - ▶ Center the pins over the contacts on the termination board. Observe the plug orientation of the device.
 - ▶ Carefully press the device into the contacts.
 - ▶ Press the red Quick Lok Bar (1) down on either side of the device (see figure)
- The device is mounted.

(1) Quick Lok Bar



5.2 Connecting the device

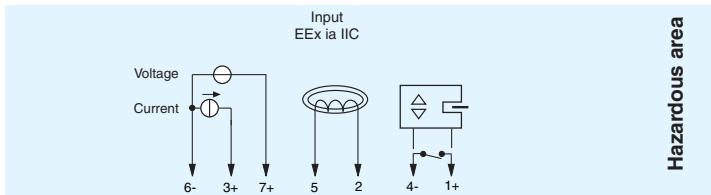
The device is connected by means of the terminals of the termination board, which permits a fast and faultfree exchange in case of failure.

The terminals are self-opening and have a spacious connecting area for a core cross-section of up to 2.5 mm².

Intrinsically safe field circuits are connected to the **blue** terminals 1 to 8, which in keeping with DIN EN 60079-14 by means of connecting cables can be passed into the potentially explosive area.

You can connect one of the following sensors (see illustration):

- Terminal 1 and 4: sensor according to EN 60947-5-6 (NAMUR)
- Terminal 2 and 5: magnetic encoder
- Terminals 3, 6, 7: 3-wire sensor (current or voltage signal)

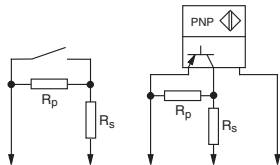


For sensors that do not have any corresponding internal resistors, the resistors can be added externally (as close to the sensor as possible):

- A parallel resistor for lead breakage monitoring (not possible for NPN sensors and push-pull power amplifiers)
- One series resistor for lead breakage monitoring

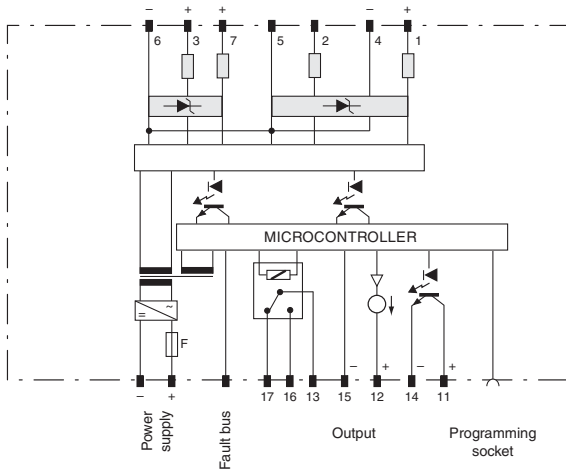
	R_p	R_s
Ex	10 k Ω	400 Ω < R_s < 2 k Ω
Non-Ex	20 k Ω < R_p < 100 k Ω	100 k Ω

NPN: 2,2 k Ω < R_p < 100 k Ω , can also be added externally



Non-intrinsically safe current circuit can be connected to the **gray** terminals, which have the following function:

- Terminal 12 and 15: analog output proportional to input frequency
- Terminal 11 and 14: digital output optocoupler transistor
- Terminals 13, 16, 17: SPDT relay output
- Fault bus
- Power supply



Safe area

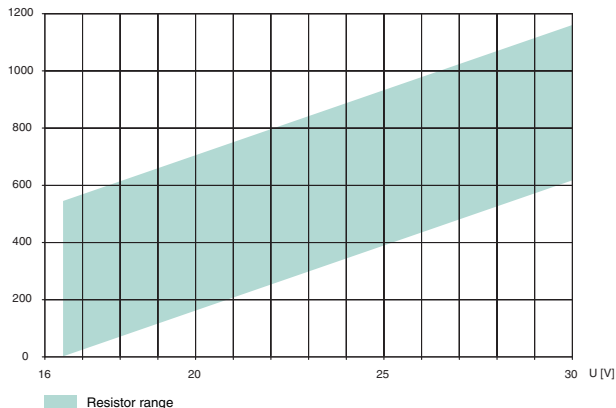
If a **current output** is operated **as a sink**, the voltage of the terminals has to be between 5 V and 30 V. An additional resistance is required only, if the voltage is over 16.5 V. The resistance has to be between $(U - 16.5 \text{ V})/0.0215 \text{ A}$ and $(U - 5 \text{ V}) / 0.0215 \text{ A}$ (see diagram).

Example: $U = 24 \text{ V}$

$$(24 \text{ V} - 16.5 \text{ V})/0.0215 \text{ A} = 350 \ \Omega$$

$$(24 \text{ V} - 5 \text{ V})/0.0215 \text{ A} = 880 \ \Omega$$

R [Ω]



If a **current output** operated **as a source**, the load resistance has to be between 0 Ω and 550 Ω (535 Ω if the output current is between 4 mA and 20 mA).

For more information on connections (on terminal assignment and current supply, for example), please refer to our website at www.pepperl-fuchs.com/pa (entry in product search: HiD2891).

5.3 Operating and display elements

The following operating and display elements are located on the front side of the device:

- LED FAULT (red) for display
 - a line failure at the input (terminals 1 to 7; flashes red)
 - of the simulation mode (flashes red)
 - a device failure (continuously red)
- LED STATUS (yellow) to indicate the output status
- LED RELAY (yellow) to indicate the relay status
- LED PWR ON (green) to indicate the presence of the supply voltage
- Serial RS 232 interface for connection to a PC for programming and diagnosis of the device using **PACTware™**

You will find the following control elements on the device side (see also section 6.1):

- DIP switch SW1 for setting the input type
- DIP switch SW2 for setting the output type



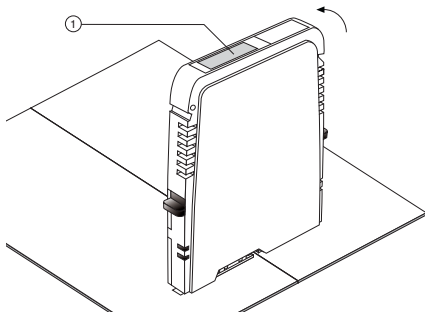
5.4 Marking

It is possible to mark the device, the signals and the device function of each individual device. For this purpose, please use the labels offered by Pepperl+Fuchs.



Marking the device:

- ▶ Open the transparent housing cover.
- ▶ Push the label into the receptacle (1).
- ▶ Close the housing cover.



(1) Position the label receptacle

6 Operation

The configuration of the device includes 2 steps:

- Setting the input type and output type with the DIP switches on the device
- Configuration and setting of diagnostic functions with PC control program

6.1 Configuration on the device

Set the input type with DIP switch SW1 on the device side.

- Select the input type (potential-free contact, proximity switch, magnetic encoder, current signal or voltage signal)
- Select the base threshold for a magnetic encoder (50 mV or 500 mV)

Set the output type with DIP switch SW2 on the device side.

- Select the output type (current sink, current source, voltage),
- Select the voltage output range (0 V ... 5 V or 0 V ... 10 V).

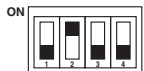


Configuring the device:

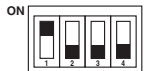
- ▶ Dismount the device (see section 9.1).
- ▶ Select the input type from the table (see figure).
- ▶ Adjust the input type using DIP switch SW1.
- ▶ If necessary, select the base threshold for magnetic encoders.
- ▶ Select the output type from the table (see figure).
- ▶ Adjust the output type using DIP switch SW2.
- ▶ If necessary, select the voltage output range.
- ▶ Mount the device (see section 5.1).

The device is configured.

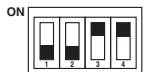
Positions switch 2



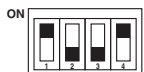
Sink mA 0/4 ... 20 mA



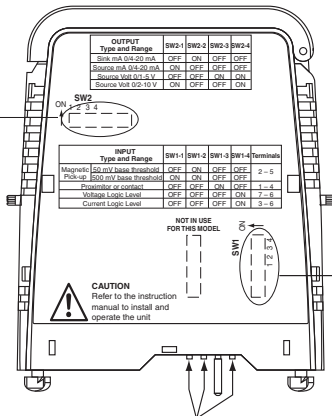
Source mA 0/4 ... 20 mA



Source Volt 0/1 ... 5 V



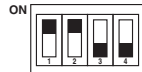
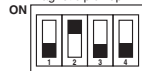
Source Volt 0/2 ... 10 V



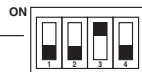
Pins factory trimmed

Positions switch 1

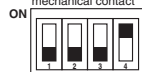
50 mV base threshold magnetic pick-up



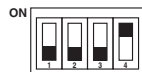
500 mV base threshold magnetic pick-up



Proximity sensor or mechanical contact



Voltage logic level



Current logic level

6.2 Configuration using a PC operating program

6.2.1 Installing the software components

In order to be able to configure the device by means of a PC operating program, the following software components are required:

1. **Microsoft® .NET Framework 1.1** or later
2. **PACT^{ware}™ 2.4** (Process Automation Configuration Tool) or later.
PACT^{ware}™ is used according to FDT Specification 1.2 (Field Device Tool Specification) as a framework program for the DTM (Device Type Manager), which is supplied by manufacturers of field devices as configuration software.
3. **DTM Collection** Conventional Interface Technology. The DTM Collection comprises all device and communication DTM required to parameterise devices of conventional interface technique.
 The DTM are used to establish the communication with field devices using protocols, such as the HART or PROFIBUS protocol.

The software components are rendered available on CD or on the Internet at www.pepperl-fuchs.com in the product selector under **Software > PACTware**.



For the **latest** software component, please access the product selector for **Software > PACTware**.



Installing the software components:

The installation of the software components is described in the "PACT^{ware}™ Installation Instructions" manual. Please observe the sequence of the installation steps and the instructions in the installation instructions.

- ▶ Install **Microsoft® .NET Framework**.
- ▶ Install **PACT^{ware}™**.
- ▶ Use the **DTM Collection** Conventional Interface Technology to install the communication DTM of your device.

The cross-device properties of the software are described in the "**PACTware™** Process Automation Configuration Tool" manual. For the free manual written in several languages, please access our website at www.pepperl-fuchs.com/pa under **Software > PACTware**.

Below please find the device-specific settings for frequency converter HiD2891 only.

6.2.2 Connecting the device



Connect the PC to the device

- ▶ Mount the device on the termination board (see section 5.1).
- ▶ Connect the device to the power supply.
- ▶ Use the adapter cable K-ADP1 to connect the PC to the device.

This cable can be ordered as an accessory.

Please use the adapter cable version with a plug length of 18 mm (part number 071923).



- ▶ Insert the cable jack into the RS 232 interface on the front of the device and the 9-pin or 25-pin connector to a free serial interface on the PC.
- ▶ Start the **PACTware™** as described in the "**PACTware™** Process Automation Configuration Tool" manual.

6.2.3 Adjustment of the communication DTM

In a **PACT^{ware}**™ project the frequency converter HiD2891 can be addressed by communication DTM P2P RS232 FDT only. Please refer to the "**PACT^{ware}**™ Process Automation Configuration Tool" manual to read how to create and edit a project.

If such a driver is not available in your project yet, use the device catalog to add it to the project (see "**PACT^{ware}**™ Process Automation Configuration Tool" manual).

The only parameters of the communication DTM are the PC interfaces used and the number of repeat attempts.

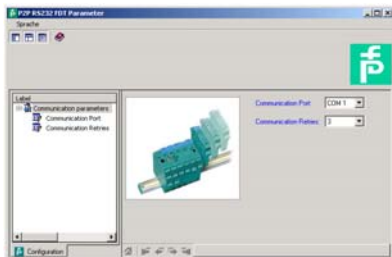


Setting the parameters

- ▶ Use the mouse to double-click on communication DTM **P2P RS232 FDT** in the project window.

The **Parameter** window is opened.

- ▶ Select the requested communication port from the list of **communication ports**.
- ▶ Select the number of attempts from the list of repeat attempts.
Here the number of attempts is selected which the communication DTM carries out to establish a connection to the connected device.
- ▶ Close the **Parameter** window using the button



In order to add a device to a project, please chose communication DTM P2P RS232 FDT of the project. Add the device to the device catalog. For more details on these working steps, please refer to the "**PACT_{ware}**TM Process Automation Configuration Tool" manual.

The description in the following chapters proceeds on the assumption that a device has been chosen in the project.

The following submenus can be run in the **Device Menu**:

- Device**
 - > **Connect**
 - > **Disconnect**
 - > **Load from device**
 - > **Store to device**
 - > **Parameter (section 6.3)**
 - > **Measured value (section 6.2.4)**
 - > **Simulation (section 6.2.5)**
 - > **Diagnostics (section 6.2.6)**
 - > **Additional functions**
 - > **Service (section 6.2.7)**



Starting and stopping communication

- ▶ Start the communication between **PACT_{ware}**TM and the device by running **Device > Connect**.
- ▶ Stop the communication between **PACT_{ware}**TM and the device by running **Device > Disconnect**.

6.2.4 Measured value

The **Measured value** window displays the current values measured for the inputs and the current output values.

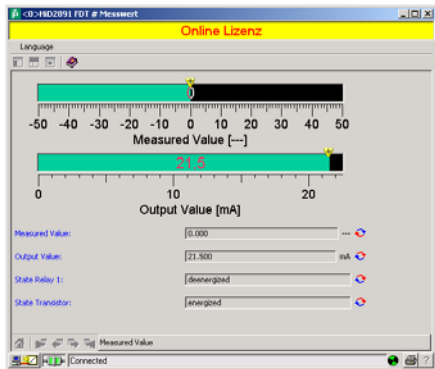


Open the Measured value window.

- ▶ Open the **Measured value** window by accessing **Device data > Measured value**.
- ▶ Close the **Measured value** window using the button

The **Measured value** window shows the following device information:

- Value of the input in the selected unit as a bar diagram and numerically.
- Output value in the selected unit as a bar diagram and numerically.



6.2.5 Simulation

Simulation operation is activated or deactivated in the **Simulation** window.



Open the Simulation window.

- ▶ Open the **Simulation** window by accessing **Device data > Simulation**.



Warning!

The simulation operation may disturb or damage the device and the plant.

The simulation interrupts the normal function of the device! The safety and functionality of the device, other devices, or the system are not ensured.

- ▶ Do not start the simulation unless you are sure that no hazardous condition will occur in the plant.

**Activating and deactivating simulation:**


- ▶ Activate simulation with **Active**.
- ▶ Change the output current and/or output voltage data for test purposes.
- ▶ Press the **Enter** button to permit the numerical input to become effective.
- ▶ Deactivate simulation with **Active**. The device will resume its normal function immediately again.
- ▶ An interruption of the power supply will also shutdown the simulation.
- ▶ Close the **Simulation** window by clicking on the button . The device will operate in simulation mode until simulation is deactivated by **Active**.

6.2.6 Diagnostics

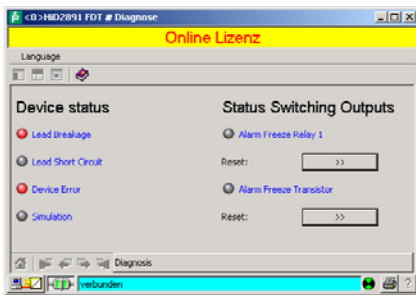
The device status and the status of the switch outputs is shown in the **Diagnose** window.



Open the **Diagnose** window.

- ▶ Open the **Diagnose** window by accessing **Device data > Diagnose**.
- ▶ If necessary, reset the status of the switch outputs with **Reset**.
- ▶ Close the **Diagnose** window using the button .

If a diagnosis is available, it will be marked in red. The **Diagnose** window contains the following information:



Explanation:


- **Lead Breakage:** page 33
- **Short Circuit:** page 33
- **Device Error:** Please contact Pepperl+Fuchs.
- **Simulation:** see section 6.2.5
- **Status Switching Outputs:** Indicates whether the alarm freeze is holding the switch output in the current state. This status can be reset.

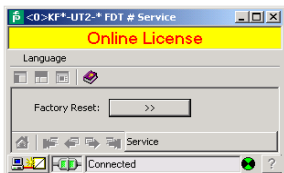
6.2.7 Service

The device can be reset to the factory settings in the **Service** window. Section 10 lists all preset parameters.



Open the Service window.

- ▶ Open the **Service** window by accessing **Device data > Other functions > Service**.
- ▶ Reset the device to factory setting with **Load factory settings**.
- ▶ Close the **Service** window using the button .



6.3 Defining the device data

Define all device parameters in the **Parameter** window.



Warning!

Faults or damage may occur due to modifications of the device functions.

In case of non-observation, the safety and function of the device as well as other devices or plants are not ensured.

- ▶ Before transmitting new data, please make sure that no danger is caused for the device and the plant by these new data.



Open the Parameter window.

- ▶ Open the **Parameter** window by accessing **Device > Parameter** open (see "PACT^{ware}™ Process Automation Configuration Tool" manual).

The **Parameter** window contains dialog windows, which can be called via the structure in the left part of the window. These dialog windows are described in the following chapters.

- | | |
|---|---|
| <ul style="list-style-type: none"> Parameter > Information (section 6.3.1) > Description (section 6.3.2) > Input (section 6.3.3) > Output (section 6.3.4) | <ul style="list-style-type: none"> > Relay output 1 > Transistor output > Analog output |
|---|---|

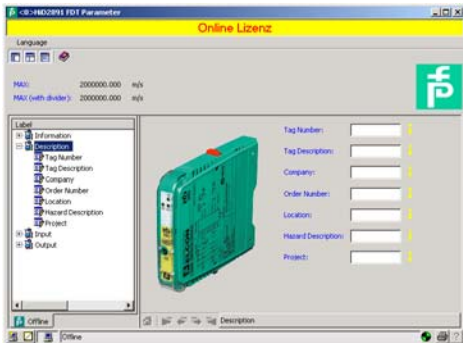
6.3.2 Description

Enter the freely selectable descriptions in the **Description** dialog window.



Open the Description dialog window.

- ▶ Open the **Parameters** window by accessing **Device data > Parameters**.
- ▶ Open the **Description** dialog window in the directory tree.



Enter the description.

- ▶ Enter the data in the description fields.
These data can be defined and edited as you require.

6.3.3 Input

Use the **Input** dialog window to enter the input parameter.



Open the **Input** dialog window.

- ▶ Open the **Parameters** window by accessing **Device data > Parameters**.
- ▶ Open the **Input** dialog window in the directory tree.

Input Type and Range	Dir13	Dir12	Dir11	Dir10	Dir9	Dir8
Magnetic Start/stop threshold	On	On	On	On	On	2-5
Preload Start/stop threshold	On	On	On	On	On	1-4
Proximity or Contact	On	On	On	On	On	1-4
Infrage/light Level	On	On	On	On	On	7-8
Contact Logic Level	On	On	On	On	On	1-4

Input Type:
 Unit:
 Smoothing:
 Divider: pulse/unit
 Detect Lead Breakage: Active
 Detect Short Circuit: Active
 Debounce Filter (Max. 10 Hz): Active



Enter parameters.

- ▶ Open the **Input** dialog window.
- ▶ Set the desired parameters.

The following parameters can be set:

- **Input Type:**

You can select from among the following sensor types:

- Sensor according to DIN EN 60947-5-6 (NAMUR)
- Mechanical contact
- Magnetic encoder
- Logical current or voltage signal



The actual selection of the input type is made by DIP switches on the device itself (see section 6.1). In communication DTM, the setting has to be made manual so that the display corresponds to the real device setting.

- **Unit:**



The unit selected at this point is used for **all** corresponding settings and displays in **PACTware™**.

The HiD2891 frequency converter always measures internally in Hz (actually in mHz = 0.001 Hz). If the value should be displayed in rpm or revolutions per second (rps), the number of input pulses per revolution must be entered (see **Divider** parameter). Then the units are converted as follows:

$$\text{rpm} = \frac{\text{Hz} \times 60}{\text{Pulses per revolution}}$$

$$\text{rps} = \frac{\text{Hz}}{\text{Pulses per revolution}}$$

If the value should be displayed in l/min, l/h or m³/h, m/s or km/h, the number of input pulses per liter, per m³, km or m must be entered (see **Divider** parameter). Then the units are converted as follows:

$$l/min = \frac{Hz \times 60}{Pulses \text{ per liter}}$$

$$l/h = \frac{Hz \times 3600}{Pulses \text{ per liter}} \quad (\text{measuring range restricted to } 0.001 \text{ Hz ... } 550 \text{ Hz})$$

$$m^3/h = \frac{Hz \times 3600}{Pulses \text{ per m}^3} \quad (\text{measuring range restricted to } 0.001 \text{ Hz ... } 550 \text{ Hz})$$

$$m/s = \frac{Hz \times 1000}{Pulses \text{ per km}} \quad (\text{measuring range restricted to } 0.001 \text{ Hz ... } 2 \text{ kHz})$$

$$km/h = \frac{Hz \times 3600}{Pulses \text{ per km}} \quad (\text{measuring range restricted to } 0.001 \text{ Hz ... } 550 \text{ Hz})$$

- **Smoothing:**

If values deviate sharply, smoothing can affect how quickly an output responds to a change in an input value:

- 0 s = no smoothing
- 255 s = maximum smoothing

- **Divider:**

The **Pulse/unit** menu item only appears if you have selected a unit other than Hz for the value display (see **Unit** parameter).

Enter the number of pulses per revolution, per liter, per m³ or per km, depending on the selected unit. The conversion is performed as described in the **Unit** parameter.

Examples

- The speed of an agitator will be indicated in rpm (or rps). The agitator consists of 8 stirring blades that are recorded by the sensor. You should therefore enter 8 pulses per unit (revolution).
- The flow rate recorded by a water meter will be indicated in l/min (or l/h). The meter returns 20 pulses per liter. Enter this value. For a display in m³/h, enter 20,000 pulses per unit (m³).
- The speed of a conveyor belt will be entered in m/s (or km/h). The sensor records 8 pulses per revolution on the drive wheel. The drive wheel has a diameter of 0.4 m and thus a circumference of 1.256 m. You should therefore enter $8 \times 1000 / 1.256 = 6369$ pulses per unit (m).

- **Detect Lead Breakage:**

Lead breakage monitoring tests whether there is no current flowing for terminal 3 (LB = lead breakage).

A suitable parallel resistor must be present in the sensor or externally for lead breakage monitoring (see page 11).

Lead breakage monitoring is not possible for NPN sensors and push-pull power amplifiers. If a sensor of this type is used, LB must always be deactivated with **Active**

- **Detect Short Circuit:**

Short circuit monitoring tests whether the input current is too high for terminal 3 (SC = short circuit). A suitable series resistor must be present in the sensor or externally for short circuit monitoring (see page 11).

- **Debounce Filter:**

A bounce filter is required when a mechanical contact is used. You can use the bounce filter if the frequencies that will be processed are always below 10 Hz.



Activating and deactivating line monitoring and debounce filter.

- ▶ Activate the monitoring system with **Active**.
- ▶ Deactivate the monitoring system with **Active**.

6.3.4 Output

Use the **Output** dialog window to enter the output parameter.



Opening the Output dialog window:

- ▶ Open the **Parameters** window by accessing **Device data > Parameters**.
- ▶ Open the **Output** dialog window in the directory tree.

There are three additional dialog windows in the **Output** dialog window: **Relay Output 1**, **Transistor Output** and **Analog Output**.

Relay Output 1 and Transistor Output

The **Relay Output 1** and **Transistor Output** dialog windows are identical in structure and are described here together.



Entering parameters:

- ▶ In the **Output** dialog window, open **Relay Output 1** or **Transistor Output**.
- ▶ Set the parameters for the selected output.

Relay output 1 and Transistor output together make 3 different functions available:

- **Trip mode:**

The following parameters can be set:

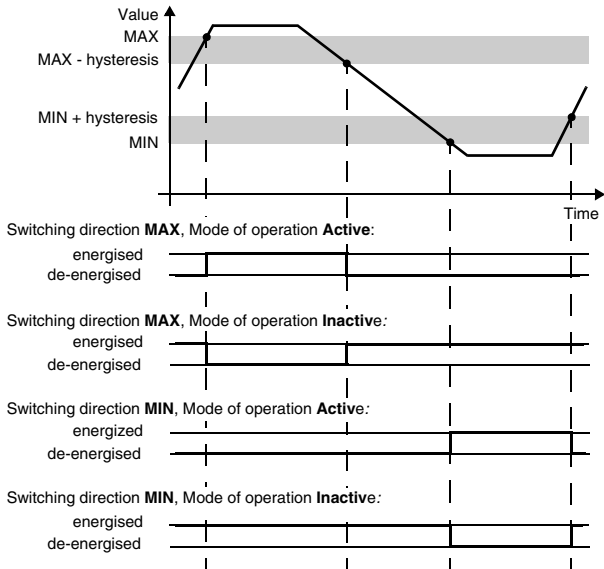
- Switching point and hysteresis for the relay. The unit is indicated according to the selection made for the **Input** parameter (see section 6.3.3). The hysteresis should be selected > 1% of the measuring range to prevent the relay from fluttering.
- Switching direction (MAX or MIN) and mode of operation (active or inactive) for the relay
- Alarm freeze: If alarm freeze is deselected, the relay state remains intact after a limit is exceeded or an error message is generated. It can only be reset by restarting the device.

Switching behavior of the relays

- MIN or MAX can be set as the switching direction. The mode of operation can be energized (active) or de-energized (inactive).

Application ranges (see illustration on page 36):

- Switching direction MAX, mode of operation energized (active):
 - Alarm when limit value is exceeded, for example horn on
 - Protection against excess speed, for example brake on
- Switching direction MAX, mode of operation de-energized (inactive):
 - Protection against excess speed, for example motor off
 - MIN-MAX operation with large hysteresis, for example motor on/off
- Switching direction MIN, mode of operation energized (active):
 - Alarm for trip underrange, for example horn on
 - Protection against speed too low, for example motor on
- Switching direction MIN, mode of operation de-energized (inactive):
 - Protection against speed too low, for example brake off
 - MIN-MAX operation with large hysteresis, for example motor off/on



- **Alarm Output:**

A switch output with the alarm output function is energized in normal operation. If the device detects a fault (see section 6), the switch output is de-energised.

- **Pulse Repeater:**

With pulse repeater, input pulses are switched 1 : 1 to the switch output. Then pulses can be evaluated in the process control system/controller. With this function, the HiD2891 thus acts only as a separator between the intrinsically safe and non-intrinsically safe current.

The maximum switching frequency for the transistor output is 5 kHz, for the relays < 2 Hz. Thus the relay is only suitable as a pulse repeater output in exceptional cases.

Analog Output

The screenshot shows the configuration window for the HiD2891 FDI Parameters. The title bar indicates 'Online Lizenz'. The left sidebar shows a tree view with 'Analog Output' selected. The main area displays three analog output channels:

- (1) 0 ... 20mA: Range 0 to 20.0 mA, scale (3).
- (1) 4 ... 20mA NE43: Range 0 to 21.5 mA, scale (3).
- (1) 4 ... 20mA unbegrenzt / unlimited: Range 0 to 21.5 mA, scale (3).

On the right, there is a table for 'Output Type and Range' and several configuration options:

Output Type and Range	SV1-1	SV2-1	SV2-2	SV2-3	SV2-4
Sink 0/4 ... 20mA	Off	On	Off	Off	Off
Source 0/4 ... 20mA	On	Off	Off	Off	Off
Source 0/1 ... 5V	Off	Off	On	On	On
Source 0/2 ... 5V	On	Off	Off	Off	Off

Configuration options on the right:

- Characteristic (1): 4...20mA NE43
- Start Value (2): 0.000 m/s
- End Value (3): 10000000 m/s
- Error Indication: Upscale
- Invert Characteristic: Active

- **Characteristic curve:** The following current output characteristic curves are available:
 - 4 mA ... 20 mA **unlimited**
 - 4 mA ... 20 mA (NE 43)
 - 4 mA ... 20 mA **limited**
 - 0 mA ... 20 mA

For the behavior of the current output in various settings, see section 6. 4.

- **Characteristic**, if the voltage output has been selected for the type of **current output**.
 - 1 mA ... 5 mA **unlimited**
 - 1 mA ... 5 mA (NE 43)
 - 1 mA ... 5 mA **limited**
 - 0 mA ... 5 mA

or

- 2 V ... 10 V **unlimited**
- 2 V ... 10 V (NE 43)
- 2 V ... 10 V **limited**
- 0 V ... 10 V

For the behavior of the voltage output in various settings, see section 6. 4.

- **Start and End Values:** When entering the start and end values, please note:
 - Enter the values in the selected unit (see section 6.3.3).
 - Values between 0.001 Hz and 5000 Hz can be entered (for non-Ex devices: 12 kHz). You can determine the input limits for an input unit other than Hz from these values by converting them. Conversions are indicated in section 6.3.3.
 - Since frequency converter HiD2891 converts all values internally into whole-number mHz values (= 0.001 Hz), rounding errors may occur in values that you enter as rpm, rps, l/min, l/h, m³/h, km/h or m/s. If your application cannot tolerate these minor deviations in exceptional cases, please select Hz as the unit.
 - The difference between the start and end values should be greater than 1% of the end value.
- **Error Indication:** see section 7
 - **Upscale**
 - **Downscale**
 - **Maintain**
 - **Upscale/downscale** (to be used for resistance temperature detectors only)

- **Invert Characteristic:** see section 6. 4



Activating and deactivating the characteristic.

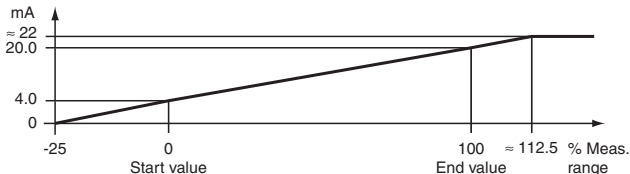
- ▶ Activate the inverted characteristic with **Active**.
- ▶ Deactivate the inverted characteristic with **Active**.

6. 4 Behaviour of the current output

The linear behaviour outside of the measuring range described in the following chapter occurs only, if the current values correspond to the temperature values which are between the minimum and the maximum value of the sensor selected. If this is not the case, the output current skips to the minimum or maximum value rendered.

If **Invert Characteristic** is selected, the start value and the end value are replaced by each other.

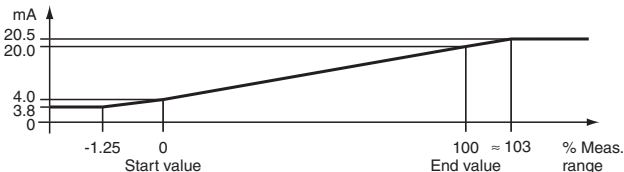
6.4.1 Setting 4 mA ... 20 mA unlimited



At this setting, the start value of the measurement range is converted to 4 mA and the end value to 20 mA. Intermediate values are converted proportionately.

If the value falls below the start value, the output current decreases linearly to a minimum of 0 mA (-25 % of the measurement range). Further decreases cannot be evaluated (output 0 mA). If the value exceeds the end value, the output current increases linearly to a maximum of 22 mA (approx. 112.5 % of the measurement range). Further increases cannot be evaluated (output approx. 22 mA).

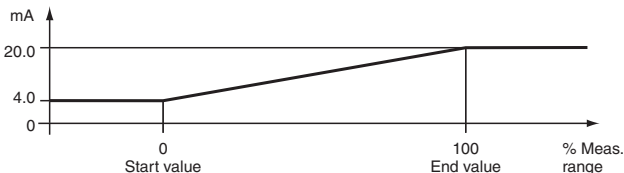
6.4.2 Setting 4 mA ... 20 mA (NE 43)



At this setting, the start value of the measurement range is converted to 4 mA and the end value to 20 mA. Intermediate values are converted proportionately.

If the value falls below the start value, the output current decreases linearly to a minimum of 3.8 mA (-1.25 % of the measurement range). Further decreases cannot be evaluated (output 3.8 mA). If the value exceeds the end value, the output current increases linearly to a maximum of 20.5 mA (approx. 103 % of the measurement range). Further increases cannot be evaluated (output 20.5 mA).

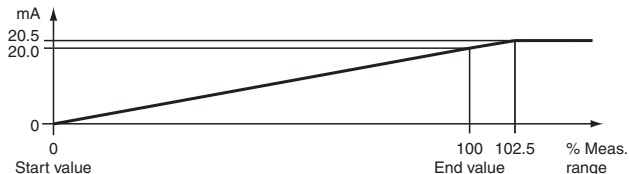
6.4.3 Setting 4 mA ... 20 mA limited



At this setting, the start value of the measurement range is converted to 4 mA and the end value to 20 mA. Intermediate values are converted proportionately.

Values below the start value cannot be evaluated (output 4 mA). Values above the end value cannot be evaluated either (output 20 mA).

6.4.4 Setting 0 mA ... 20 mA



At this setting, the start value of the measurement range is converted to 0 mA and the end value to 20 mA. Intermediate values are converted proportionately.

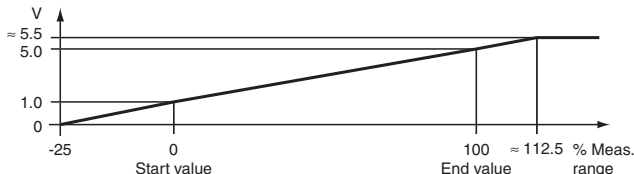
Values less than the start value cannot be evaluated (output 0 mA). If the value exceeds the end value, the output current increases linearly to a maximum of 20.5 mA (102.5 % of the measuring range). Further increases cannot be evaluated (output 20.5 mA).

6.5 Behaviour of the voltage output

The linear behaviour outside of the measuring range described in the following chapter occurs only, if the voltage values correspond to the temperature values which are between the minimum and the maximum value of the sensor selected. If this is not the case, the output voltage skips to the minimum or maximum value rendered.

If **Invert Characteristic** is selected, the start value and the end value are replaced by each other.

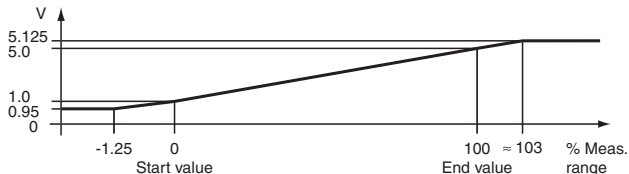
6.5.1 Setting 1 V ... 5 V unlimited



At this setting, the start value of the measurement range is converted to 1 V and the end value to 5 V. Intermediate values are converted proportionately.

If the value falls below the start value, the output voltage decreases linearly to a minimum of 0 V (-25 % of the measurement range). Further decreases cannot be evaluated (output 0 V). If the value exceeds the end value, the output voltage increases linearly to a maximum of 5.5 V (approx. 112.5 % of the measurement range). Further increases cannot be evaluated (output approx. 5.5 V).

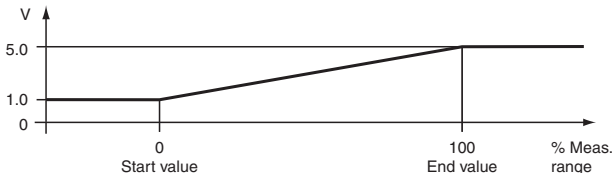
6.5.2 Setting 1 V... 5 V (NE 43)



At this setting, the start value of the measurement range is converted to 1 V and the end value to 5 V. Intermediate values are converted proportionately.

If the value falls below the start value, the output voltage decreases linearly to a minimum of 0.95 V (-1.25 % of the measurement range). Further decreases cannot be evaluated (output 0.95 V). If the value exceeds the end value, the output voltage increases linearly to a maximum of 5.125 V (approx. 103 % of the measurement range). Further increases cannot be evaluated (output 5.125 V).

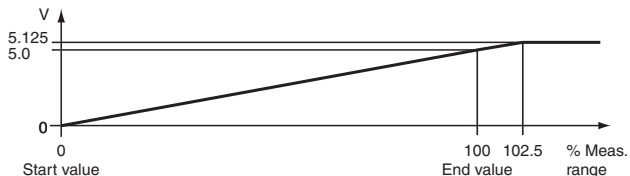
6.5.3 Setting 1 V... 5 V limited



At this setting, the start value of the measurement range is converted to 1 V and the end value to 5 V. Intermediate values are converted proportionately.

Values below the start value cannot be evaluated (output 1 V). Values above the end value cannot be evaluated either (output 5 V).

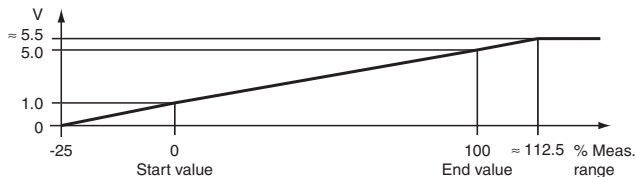
6.5.4 Setting 0 V ... 5 V



At this setting, the start value of the measurement range is converted to 0 V and the end value to 5 V. Intermediate values are converted proportionately.

Values below the start value cannot be evaluated (output 0 V). If the value exceeds the end value, the output voltage increases linearly to a maximum of 5.125 V (approx. 102.5 % of the measurement range). Further increases cannot be evaluated (output 5.125 V).

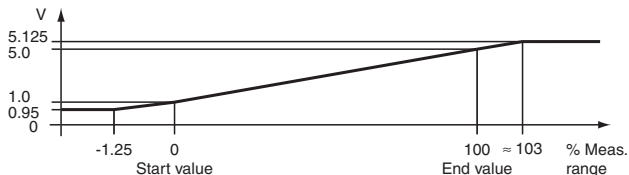
6.5.5 Setting 2 V ... 10 V unlimited



At this setting, the start value of the measurement range is converted to 2 V and the end value to 10 V. Intermediate values are converted proportionately.

If the value falls below the start value, the output voltage decreases linearly to a minimum of 0 V (-25 % of the measurement range). Further decreases cannot be evaluated (output 0 V). If the value exceeds the end value, the output voltage increases linearly to a maximum of 11 V (approx. 112.5 % of the measurement range). Further increases cannot be evaluated (output approx. 11 V).

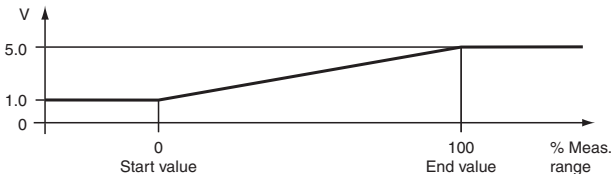
6.5.6 Setting 2 V... 10 V (NE 43)



At this setting, the start value of the measurement range is converted to 2 V and the end value to 10 V. Intermediate values are converted proportionately.

If the value falls below the start value, the output voltage decreases linearly to a minimum of 1.9 V (-1.25 % of the measurement range). Further decreases cannot be evaluated (output 1.9 V). If the value exceeds the end value, the output voltage increases linearly to a maximum of 10.25 V (approx. 103 % of the measurement range). Further increases cannot be evaluated (output 10.25 V).

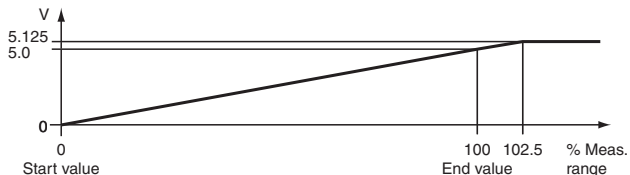
6.5.7 Setting 1 V... 5 V limited



At this setting, the start value of the measurement range is converted to 2 V and the end value to 10 V. Intermediate values are converted proportionately.

Values below the start value cannot be evaluated (output 2 V). Values above the end value cannot be evaluated either (output 10 V).

6.5.8 Setting 0 V ... 10 V



At this setting, the start value of the measurement range is converted to 0 V and the end value to 10 V. Intermediate values are converted proportionately.

Values below the start value cannot be evaluated (output 0 V). If the value exceeds the end value, the output voltage increases linearly to a maximum of 10.25 V (approx. 102.5 % of the measurement range). Further increases cannot be evaluated (output 10.25 V).

7 Trouble shooting

7.1 Fault current

The following table shows the values of the current output during a fault, depending on the settings.

Setting	Characteristic 4 mA ... 20 mA unlimited	Characteristics 4 mA ... 20 mA (NE 43) 4 mA ... 20 mA limited	Characteristic 0 mA ... 20 mA
Upscale	approx. 22 mA (cannot be distinguished from value exceeding end value)	approx. 21.5 mA	approx. 21.5 mA
Downscale	0 mA (cannot be distinguished from value below start value)	2.0 mA	0 mA (cannot be distinguished from measurement of the start value)
Hold	last measured value before the fault		
Upscale/ downscale sensible only for RTD	approx. 22 mA in the case of lead short- circuit (cannot be distinguished from value exceeding end value)	approx. 21.5 mA in the case of lead short-circuit	approx. 21.5 mA in the case of lead short- circuit
	0 mA in the case of lead breakage (cannot be distinguished from value below start value)	2.0 mA in the case of lead breakage	0 mA in the case of lead breakage (cannot be distinguished from measurement of the start value)

7.2 Fault voltage

The following table shows the values of the voltage output during a fault, depending on the settings.

Setting	Characteristic 1 V ... 5 V unlimited	Characteristics 1 V ... 5 V (NE 43) 1 V ... 5 V limited	Characteristic 0 V ... 5 V
Upscale	approx. 5.5 V (cannot be distinguished from value exceeding end value)	approx. 5.375 V	approx. 5.375 V
Downscale	0 V (cannot be distinguished from value below start value)	0.5 V	0 V (cannot be distinguished from measurement of the start value)
Hold	last measured value before the fault		
Upscale/ downscale sensible only for RTD	approx. 5.5 V in the case of lead short- circuit (cannot be distinguished from value exceeding end value)	approx. 5.375 V in the case of lead short-circuit	approx. 5.375 V in the case of lead short- circuit
	0 V in the case of lead breakage (cannot be distinguished from value below start value)	0.5 V in the case of lead breakage	0 V in the case of lead breakage (cannot be distinguished from measurement of the start value)

Setting	Characteristic 2 V ... 10 V unlimited	Characteristics 2 V ... 10 V (NE 43) 2 V ... 10 V limited	Characteristic 0 V ... 10 V
Upscale	approx. 11 V (cannot be distinguished from value exceeding end value)	approx. 10.75 V	approx. 10.75 V
Downscale	0 V (cannot be distinguished from value below start value)	1 V	0 V (cannot be distinguished from measurement of the start value)
Hold	last measured value before the fault		
Upscale/ downscale sensible only for RTD	approx. 11 V in the case of lead short- circuit (cannot be distinguished from value exceeding end value)	approx. 10.75 V in the case of lead short-circuit	approx. 10.75 V in the case of lead short- circuit
	0 V in the case of lead breakage (cannot be distinguished from value below start value)	1 V in the case of lead breakage	0 V in the case of lead breakage (cannot be distinguished from measurement of the start value)

8 Maintenance and repair

The device is maintenance-free. If the device is defective,

- dismantle the device (see section 9.1), and
- return it to Pepperl+Fuchs for repair or
- replace the device.

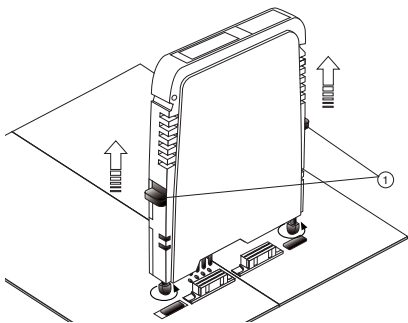
Own interventions and modifications are potentially hazardous, and any guarantee and manufacturer's liability shall become void.

9 Dismounting, storage and disposal

9.1 Dismounting

- ✂ ▶ Pull the red Quick Lok Bar (1) up on either side of the device (see figure).
- ▶ Carefully pull the device out of the contact receptacle.

(1) Quick Lok Bar



9.2 Storage

Pack the device for storage to protect it against impact and soiling. The original packaging offers perfect protection for the device. Store the device in a dry environment protecting it against humidity and aggressive media. The permissible storage temperature ranges from -20 °C to 70 °C (253 ... 343 K).

9.3 Disposal

Separate the device components according to their materials. Recycle any recyclable components.



Caution!

The material of the device components may be a hazard to the environment.

Electronic waste is hazardous waste.

- ▶ Please observe the legal and local regulations applicable at the point of disposal of clapped-out devices.
-

10 Factory settings

The device is supplied with preset factory parameters. The following table lists all parameters.

Parameter	Factory settings	Own settings
Input		
Input Type	Contact	
Unit	rpm	
Smoothing	2 s	
Divider	1 pulse/unit	
Detect Lead Breakage	active	
Detect Short Circuit	active	
Debounce Filter	inactive	
Relay Output 1		
Function	Trip	
Trip Value	6000 m/s	
Hysteresis	3000 m/s	
Switching Direction	Min	
Operation Mode	inactive	
Alarm Freeze	inactive	
Transistor Output		
Function	Pulse Repeater	
Trip Value	6000 m/s	
Hysteresis	3000 m/s	
Switching Direction	Min	
Operation Mode	inactive	
Alarm Freeze	inactive	
Analog Output		
Characteristic	4 mA ... 20 mA NE 43	
Start Value	0.000 m/s	
End Value	30000 m/s	
Error Indication	Upscale	
Invert Characteristic	inactive	

With regard to the supply of products, the current issue of the following document is applicable:
The general terms of delivery for products and services of the electrical industry, as published
by the central association of the "Elektrotechnik und Elektroindustrie (ZVEI) e.V.",
including the supplementary clause "Extended reservation of title".

PROCESS AUTOMATION – PROTECTING YOUR PROCESS



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