VibroLine® 3.0

2020

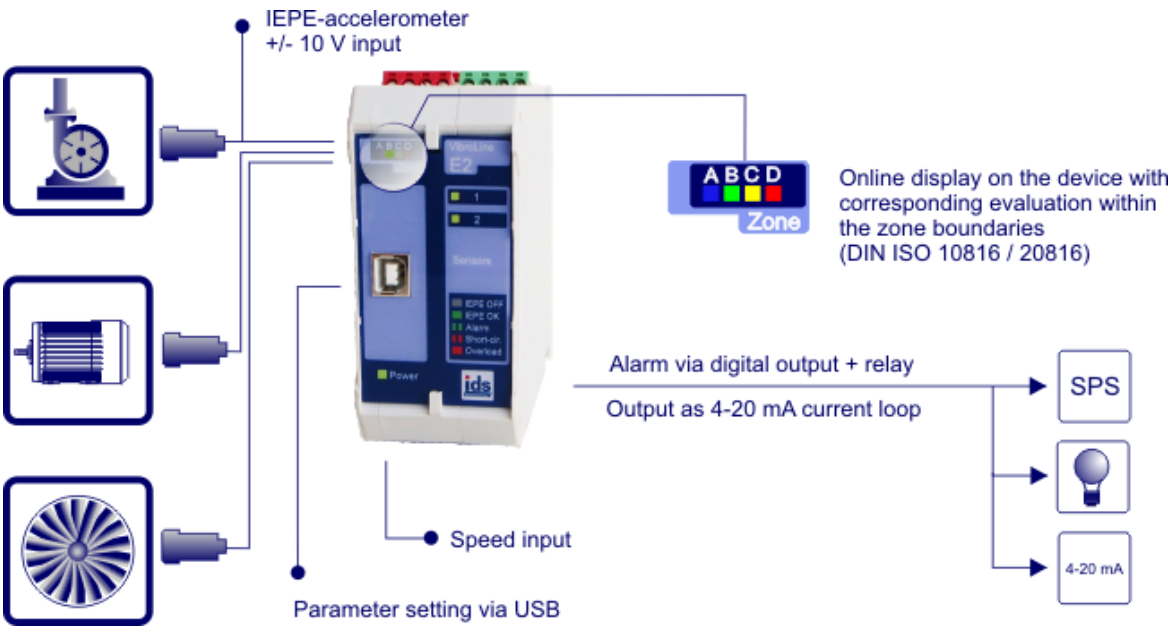
Table of contents

IDS Innomic Schwingungsmesstechnik GmbH
Zum Buchhorst 35
D-29410 Hansestadt Salzwedel

VibroLine® - Intended use

The devices of the VibroLine VLE series are designed for continuous vibration monitoring of machines and systems. Vibration sensors are mounted on the measuring object and supplied and processed by VibroLine. Vibration acceleration, velocity or displacement can be monitored with adjustable frequency filtering for different applications.

Setup



Possible applications are for instance:

- Monitoring of vibration characteristics acc. to DIN ISO 10816 / DIN ISO 20816
- Condition monitoring
- Imbalance monitoring
- Tool breakage/crash detection (when using impact characteristics)
- Continous bearing monitoring (4 bearing characteristics available)
- Vibration measurement for quality assurance

With predefined parameter sets or user-defined specifications, the devices can be set up quickly and easily for the respective measuring tasks. The devices are addressed by configuration software via the USB interface.
The VLE devices indicate the operating status of machines in four zones according to DIN ISO 10816/20816. The corresponding events are transmitted via the changeover relay or signalled via three digital outputs. Switch-on and switch-off delays (hold time) can be set. In addition to vibration characteristics monitoring, it is also possible to monitor order and impact characteristics (switching times < 0.66 ms).
The units are available with 1,2,4,6 or 8 measuring channels. A process variable output (4-20 mA current loop) can be configured for each measuring channel in order to transmit the measured vibration characteristic values to subsequent evaluation electronics. In addition, the outputs can also be used for error signalling.

Safety information

- This manual must be read and understood in full before installation and operation.

- This device may only be installed and adjusted by skilled and competent personnel. This includes in particular persons who have sufficient knowledge of the EMC and low-voltage directives.
- Changes to the electrical connections may only be made to the de-energized device. This also includes output load circuits.
- The protection against accidental contact according to IP20 only exists after all terminals have been completely plugged in.

- The device may only be operated under the conditions specified in the data sheet.
- All peripheral devices (sensors, devices at the interfaces to digital and relay outputs) must be designed for operation with VibroLine devices. The responsibility for this lies with the operator.
- Any unauthorized modification of the VLE devices (e. g. opening of the housing, repair or replacement of components or PCBs) will void the warranty.
- The manufacturer accepts no liability for damage caused by non-observance of this manual.
- If there are any uncertainties or malfunctions, please contact the manufacturer.

Installation, connection and start-up

Installation and start-up may only be carried out by qualified personnel.

All VibroLine devices are designed for mounting on DIN-rail systems. For mounting, the VLE devices are placed on top of the DIN rail and locked in place with a rotary movement and light pressure downwards. The upper and lower sides of the unit must be left at least 5 cm free space to ensure the necessary air circulation. For disassembly, pull the metal tab on the underside of the device downwards and turn the device upwards. It can then be detached from the DIN rail.

After installation, the following steps should be carried out according to the connection diagram:

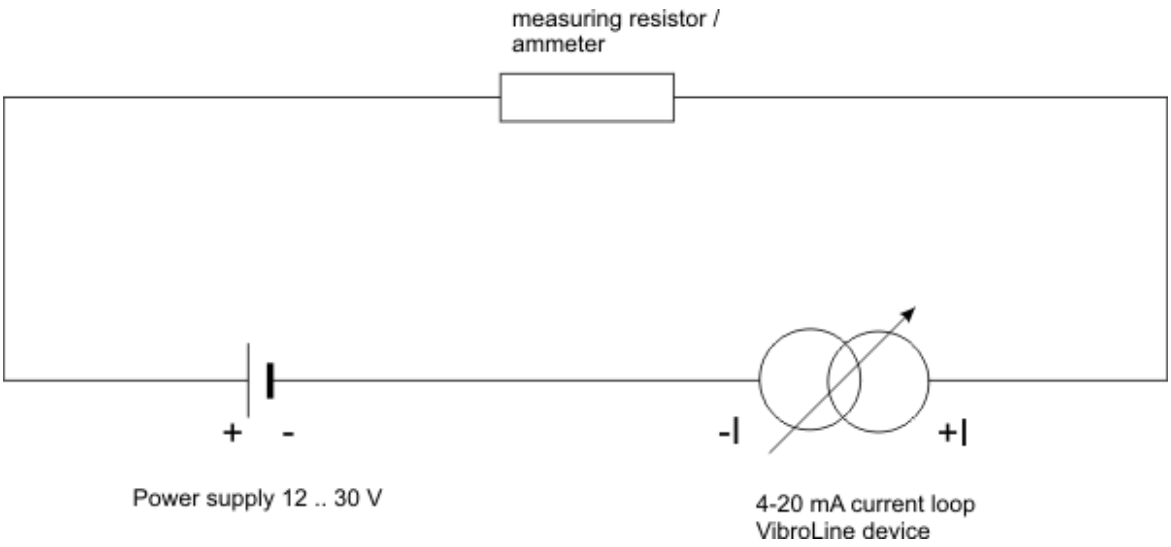
- Connection of the sensors (green connectors, max. cable length 250 m)
- Connection of the speed input (grey connector)
- Connection of the current loop outputs (orange connector, 12..30 V voltage source required to supply the current sink, max. cable length 1000 m)
- Connection of digital outputs 1+2 (red connector) and change-over relay (grey connector)
- Connection of the 24 V power supply and digital output 3 (red plug connector)

The individual inputs and outputs are protected against polarity reversal. In addition, the connectors are mechanically coded (except for sensor and current loop outputs). The device can be destroyed if the connectors are interchanged.

Before switching on the power supply, the correct cabling must be checked.

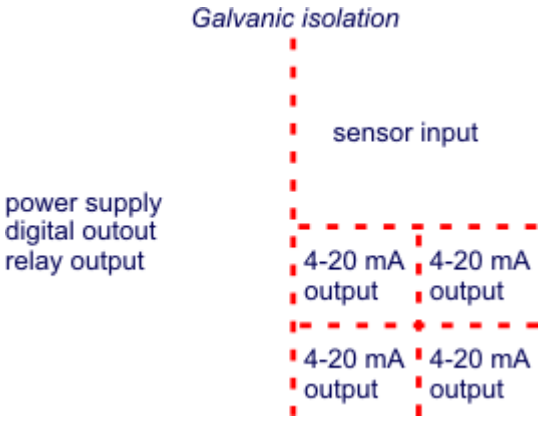
Connection of the 4-20 mA current loop

The 4-20 mA current loop is passive, i.e. operates as a current sink. An external supply with 12 ... 30 V DC voltage is required. The 4-20 mA output terminals of the VibroLine devices must be supplied with > 12 V (consider voltage drop via measuring resistors!).
The following scheme illustrates the correct connection of peripherals to the current loop outputs of the VibroLine devices:



Galvanic concept

In order to prevent earth loops, all VibroLine devices have a galvanic isolation between the *voltage supply / digital outputs / relays* and the s*ensor inputs*. Furthermore, each *current output* is electrically isolated from the rest of the circuitry. The following figure illustrates the mass concept of the VibroLine devices:



The following also applies to VLE6 and VLE8 devices: The sensors 6, 7 and 8 are also galvanically isolated from the rest of the circuitry.

Start-up

After installation and connection, the device is first started up. For this purpose, the device must be connected to a computer via the enclosed USB cable. The computer is equipped with the supplied

software VibroLine Configurator and the device driver for the VibroLine devices. After starting the software, the device can be parameterized accordingly. Parameterization is described in the Configuration section. Once all configuration parameters have been defined, the device operates autonomously and reports the current machine status.

Electrical and mechanical data

Electrical data:

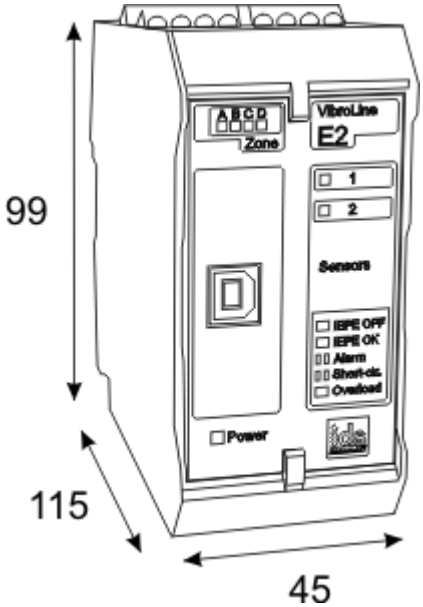
devices VLE, n=number of measuring channels	VLE*n*
Measuring input	
measuring range	± 10 V AC, IEPE supply selectable
frequency range	0,1 .. 40.000 Hz
A/D conversion	24 Bit, 96.000 Hz
cycle time	8 ms (0.333 ms)*
number of measuring channels	1, 2, 4, 6, 8
gain (switchable)	1, 25
noise (0,1 .. 40000 Hz), eff.	< 250 µV (gain 1), < 15 µV (gain 25)
noise (10 .. 1000 Hz), eff	< 60 µV (gain 1), < 5 µV (gain 25)
measuring error	< 4 %
Digital trigger input	
standard configuration	input for speed signals
level	0 .. 24 V
number	1
switching threshold High-Low	0.5 .. 24 V selectable
minimum pulse length	12 µs
Digital output (configurable)	
outout High	24 V, 100 mA
output Low	high-impedance
number	3
response time (min, max)	8 ms, 16 ms (0,333 ms, 0,666 ms)*
Analog output	
currend loop (isolated)	4-20 mA
number	1, 2, 4, 6, 8
Relay output	
type	changeover contact
max. switching voltage	60 V
max. switching current	2 A
number	1
response time (min, max)	12 ms, 20 ms
Connections	
USB 2.0	yes
Power supply	
voltage	24 V DC ± 20 %
current	max. 500 mA

* for measurement of impact characteristic values and a max. response time of 0.666 ms.

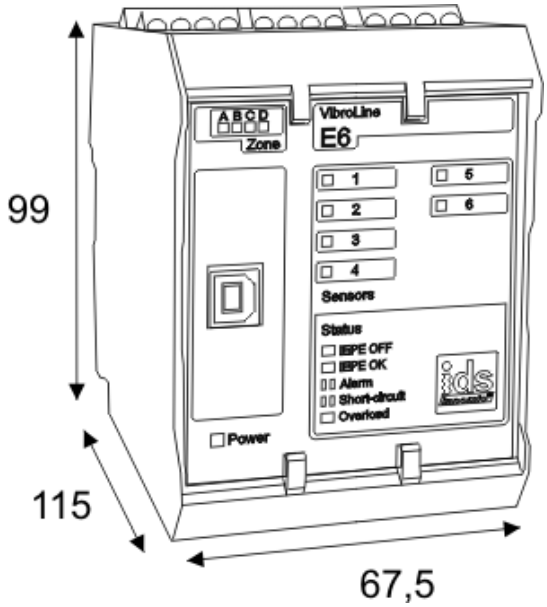
Mechanical data:

devices VLE, n=number of measuring channels	VLE*n*
Mechanical Data	
enclosure material	polyamide
color	grey
Flammability class according to UL94	V0
dimensions (W x D x H, in mm)	45 x 114,5 x 99 (till VLE4) 67,5 x 114,5 x 99 (from VLE6)
mass	250 g (till VLE4) 380 g (from VLE6)
mounting	DIN rail
Environmental conditions / standards	
protection grade	IP20
Ambient temperature during operation	-20 ..60 ºC
relative humidity, no condensation	5..95 %
certification	CE

enclosure dimensions (in mm):



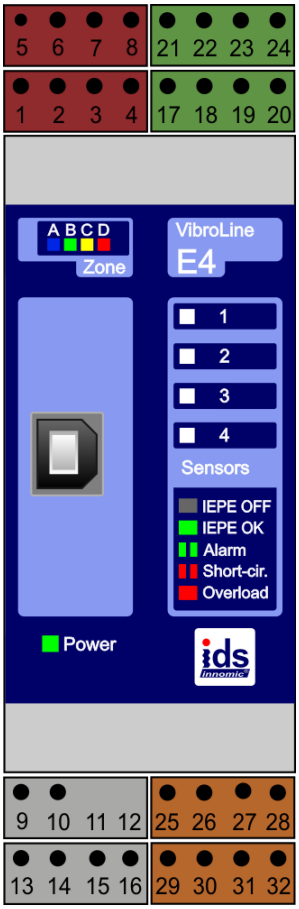
VLE1 .. VLE4



VLE6 .. VLE8

Connection diagram

The electrical connections of the VibroLine devices are located on the upper and lower side of the housing. The individual terminals can be removed from the VibroLine devices for easy connection.



The numbering indicates the following connections:

1	Digital output 1	25	Positive 4-20 mA current loop S1
2	GND	26	Negative 4-20 mA current loop S1
3	Digital output 2	27	Positive 4-20 mA current loop S2
4	GND	28	Negative 4-20 mA current loop S2
5	Digital output 3	29	Positive 4-20 mA current loop S3
6	GND	30	Negative 4-20 mA current loop S3
7	Voltage supply (24 V)	31	Positive 4-20 mA current loop S4
8	GND	32	Negative 4-20 mA current loop S4
9	Changeover contact NC (Normally closed)	33	Measuring input Sensor 5 (IEPE / ±10 V)
10	GND	34	GND
11	not used	35	Measuring input Sensor 6 (IEPE / ±10 V)
12	not used	36	GND
13	Changeover contact NO (Normally open)	37	Measuring input Sensor 7 (IEPE / ±10 V)

14	GND
15	Trigger input
16	GND
17	Measuring input Sensor 1 (IEPE / ±10 V)
18	GND
19	Measuring input Sensor 2 (IEPE / ±10 V)
20	GND
21	Measuring input Sensor 3 (IEPE / ±10 V)
22	GND
23	Measuring input Sensor 4 (IEPE / ±10 V)
24	GND
38	GND
39	Measuring input Sensor 8 (IEPE / ±10 V)
40	GND
41	Positive 4-20 mA current loop S5
42	Negative 4-20 mA current loop S5
43	Positive 4-20 mA current loop S6
44	Negativer 4-20 mA current loop S6
45	Positive 4-20 mA current loop S7
46	Negative 4-20 mA current loop S7
47	Positive 4-20 mA current loop S8
48	Negative 4-20 mA current loop S8

Configuration

The VibroLine devices are parameterized by means of the configuration software. All parameters required for operation can be set. In addition, it is possible to display the current vibration signal in order to define input amplifications, alarms and process variable outputs (4-20 mA) appropriately (test measurement). All settings can be collected and saved individually as templates for further parameterization. In addition to these user-defined templates, there are also templates created by the manufacturer to simplify parameterization in accordance with DIN ISO 10816.

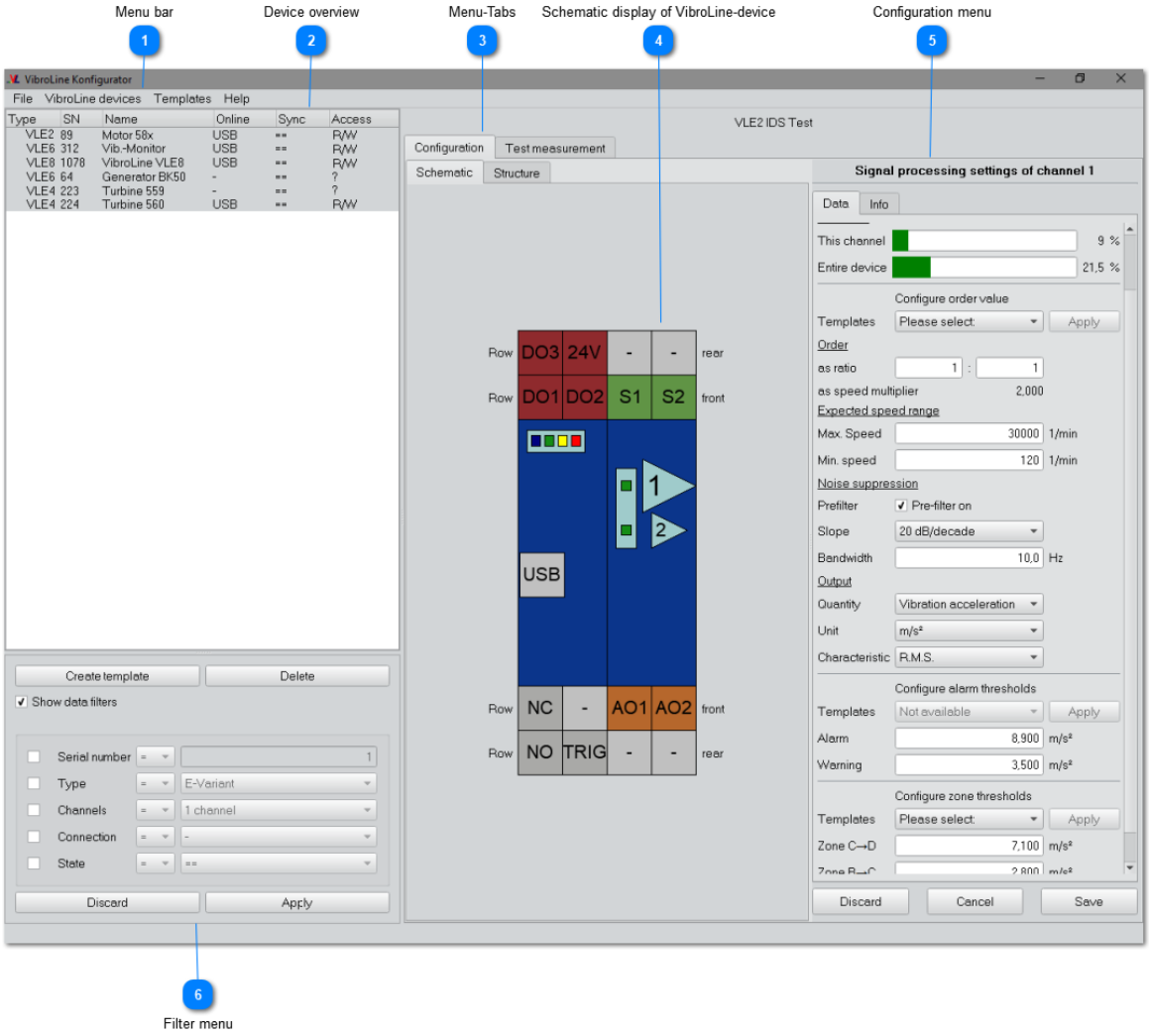
The configuration software is described in detail below:

- Overview
- Device overwiew and status
- Device configuration
- Test measurement
- Template creation and management

Overview

After starting the program, the VibroLine Configurator opens as shown below. The program window is divided into three areas:

- VibroLine device overview with data filter function (left)
- Schematic display of the VibroLine device (central)
- Configuration menu for all device properties (right).



1 Menu bar

File VibroLine devices Templates Help

All program menus can be selected in the menu bar. The following submenus can be selected by clicking on the individual items:

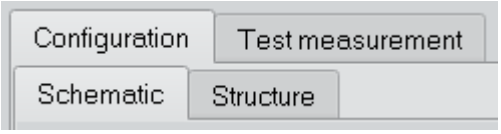
File	
Settings	• Open Settings
Close	• End software
VibroLine devices	
Configuration	• VibroLine configuratio
Templates	
Complete devices	• Template management
Sensor inputs	
Trigger input	
Analog outputs	
Analog error output	
Digital outputs	
Relay	
Bandpass filter (general)	
Bandpass filter (impact)	
Order filter	
Overall values	
Order characteristics	
Impact characteristics	
Alarm thresholds	
Zone thresholds	
Help	
Show Help F1	• Show software manual
About ...	• Show software information

2 Device overview

Type	SN	Name	Online	Sync	Access
VLE2	89	Motor 58x	USB	==	R/W
VLE6	312	Vib.-Monitor	USB	==	R/W
VLE8	1078	VibroLine VLE8	USB	==	R/W
VLE6	64	Generator BK50	-	==	?
VLE4	223	Turbine 559	-	==	?
VLE4	224	Turbine 560	USB	==	R/W

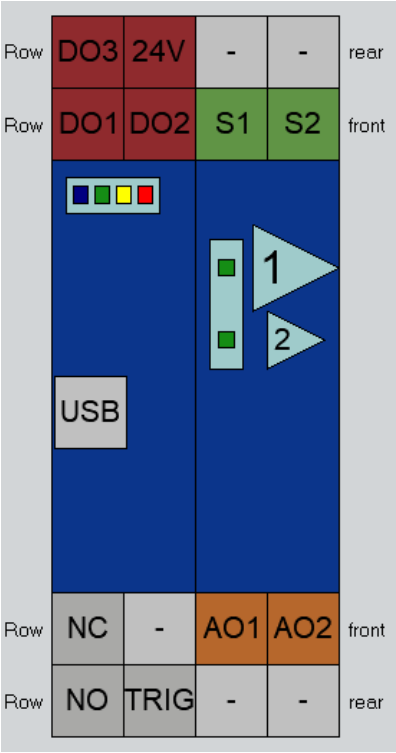
The device overview on the left side of the window lists all VibroLine devices in the program database and their communication status.

3 Menu-Tabs



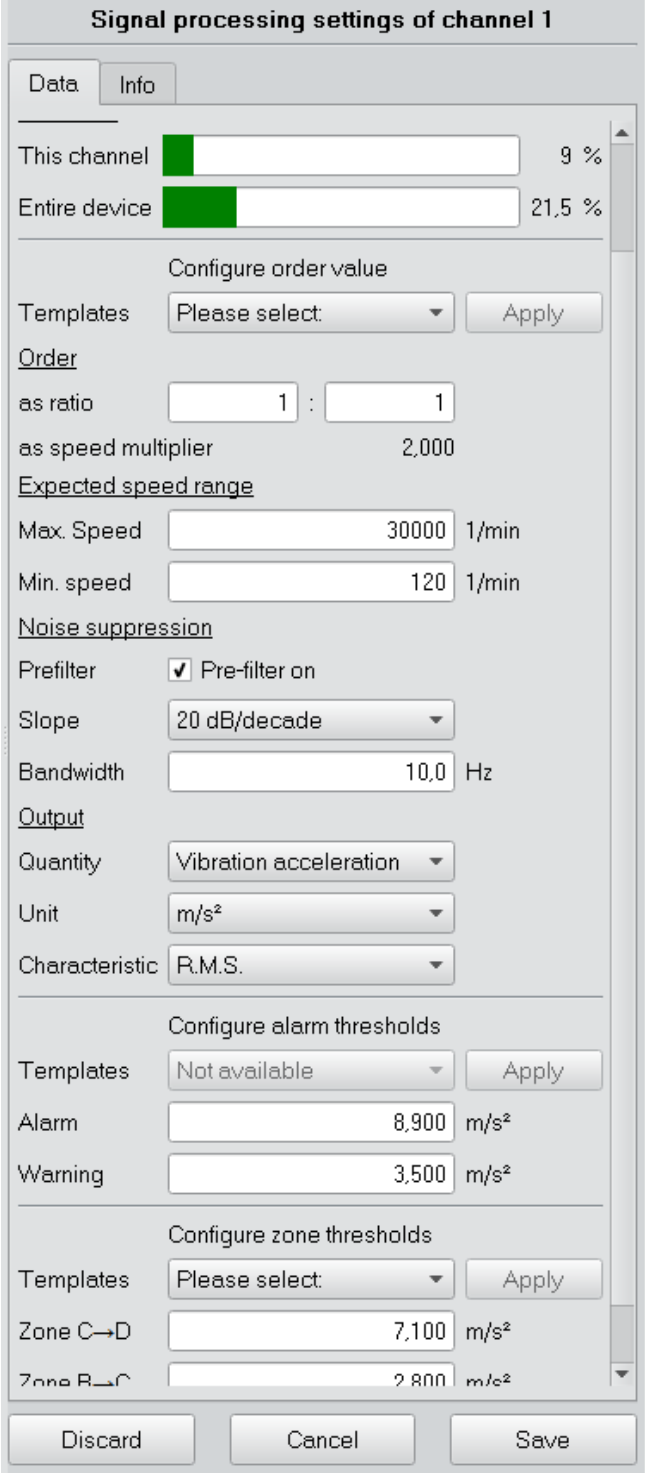
The configuration can be done by means of the schematic display of the VibroLine device or in the structure view. A live measurement function can also be selected (test measurement).

4 Schematic display of VibroLine-device



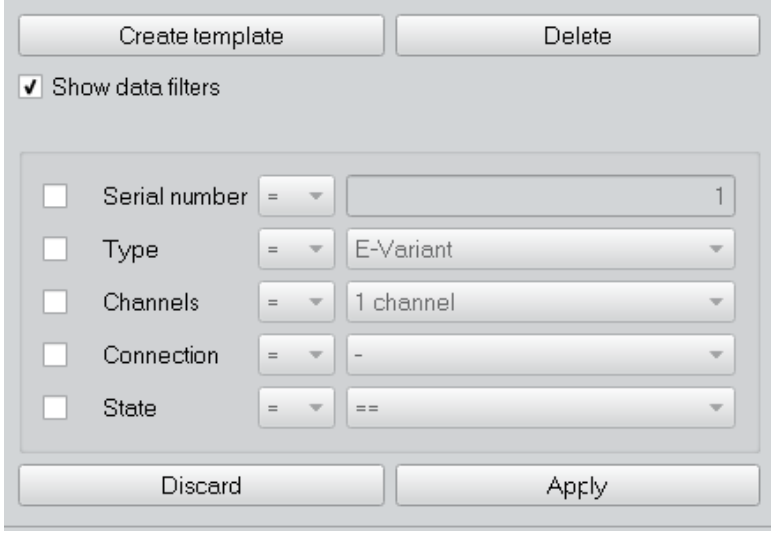
A schematic display of the VibroLine device selected from the device overview is shown centrally. For configuration, click on the respective input/output (or device property) in the display. The corresponding properties menu opens. At the same time, the positioning of the inputs and outputs on the VibroLine device can be taken from the illustration.

5 Configuration menu



Setting options related to the content are arranged in separate configuration menus. These are oriented to the right edge of the window. The menu content change depending on the selected device properties. All configuration menus are explained in the section "Device Configuration".

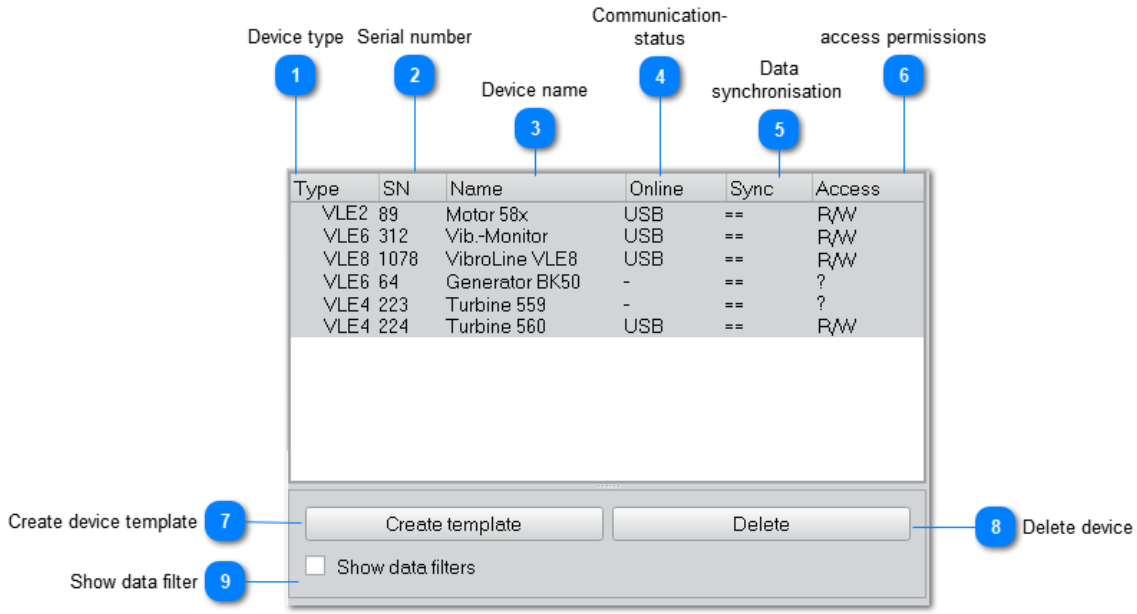
6 Filter menu



A selection of all listed VibroLine devices can be reached with the filter menu. The desired filter category is activated by checking the box and the desired criterion and a comparison operator are selected. Clicking on **Apply** sets the filter, **Discard** resets the filter selection.

Device overview and status

The device overview shows all VibroLine devices in the program database. This includes currently connected devices as well as previously connected devices. Important device and status information is displayed for the VibroLine devices.



1 Device type

Type
VLE2

The device type is displayed. The name is given according to the pattern:

VLE2 = VibroLine E-version + 2 measuring channels.

Depending on the number of channels, VLE1, VLE2, VLE4, VLE6 or VLE8 is displayed.

2 Serial number

SN
89

Serial number of the VibroLine device assigned by the manufacturer.

3 Device name

Name
Motor 58x

User selectable description of the VibroLine device.

4 Communication-status

Online
USB

Depending on the communication status,"**USB**" (connected via USB) or "**-**" (not connected) is displayed here.

5 Data synchronisation

Sync
==

The status of the data synchronisation between the device and the program database is displayed:

PW	The parameter set in the device is password-protected (not readable).
Def!	The parameter set in the device is faulty.
Ver!	The version of the parameter set in the device is newer than it can be processed by the software. Configuration cannot be read out.
==	The parameter set in the database and device is the same.
<>	The parameter set in the database and device is different.
0	Empty parameter set in database (e. g. if there are no reading rights due to password protection).

Note: The data synchronization between database and device includes all settings made. The following applies to passwords: The selected status (password use or not) is compared, but for security reasons the assigned passwords are excluded from the comparison.

6 access permissions

Access
R/W

The access permission level is displayed:

-	no access permissions, password invalid
?	Device not connected, rights status unknown
R	Read-only rights
R/W	read and write permissions

7 Create device template

Create template

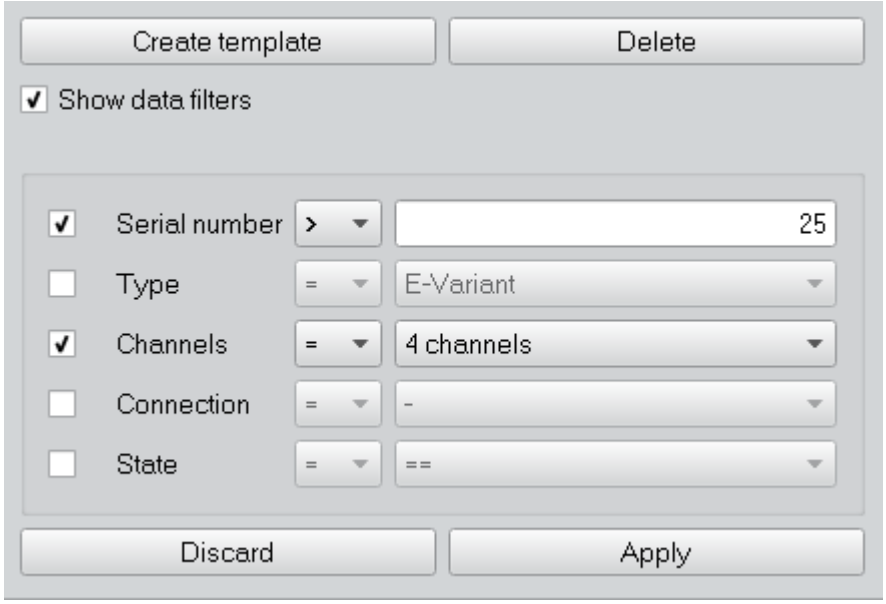
The entire configuration of the selected VibroLine device can be saved as a template by clicking on "**Create template**". The template creation and management section describes the subject of templates in more detail.

8 Delete device

The selected device can be deleted from the program database. If it is reconnected at a later time, all set parameters are reconstructed from the VibroLine device. (=, >, <, >=, <=, <>)

9 Show data filter

A data filter can be set to obtain a selection of the displayed VibroLine devices. To do this, check the box **Show data filter**. The filter criteria (see picture) can be provided with comparison operators (=, >, <, >=, <=, <>). To perform filtering, select **Apply**. Reset the filter by clicking **Discard**.

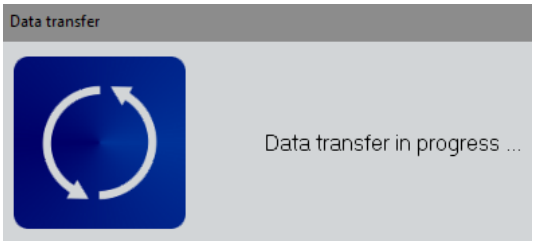


Device configuration

The VibroLine devices can be comprehensively configured. The configuration is possible in the following ways:

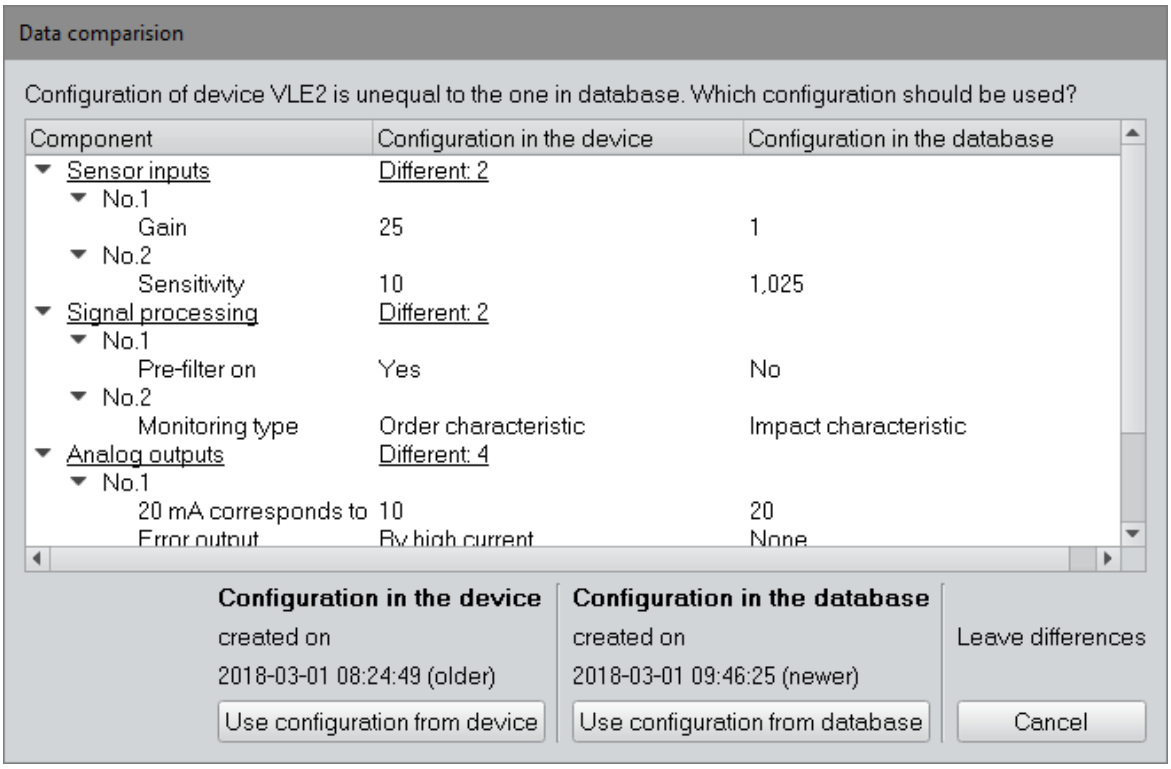
Configuration of connected devices

Here, changed parameters are written directly to the connected device. The writing process is indicated by a corresponding window.

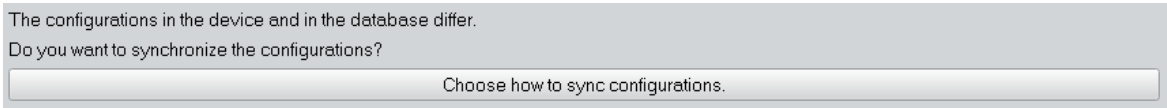


Configuration of disconnected devices

Here, the changed parameters are first saved in the software database. If the corresponding device is connected, a dialog box appears in order to select between the configuration from the *device* and the configuration from *database*. All differences are clearly listed.



If Cancel is selected, the differences remain. The data synchronization dialog can be reopened by using the button under Information text at the bottom of the window:

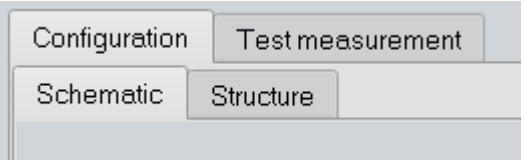


Executing the configuration

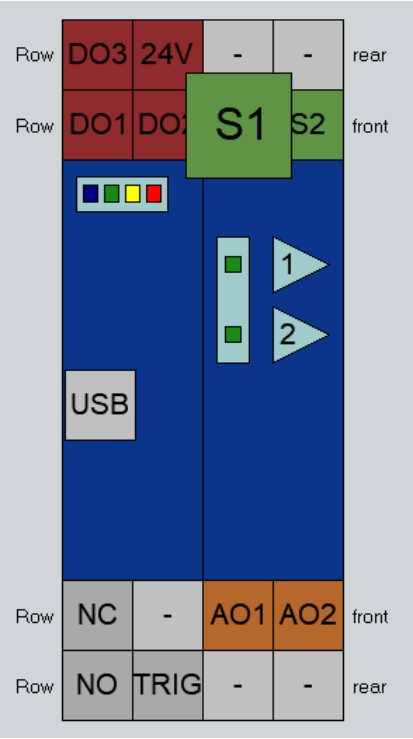
Parameters of the VibroLine device can be changed in three different ways:

1. Schematic display of the VibroLine device

To do this, select the "Configuration" tab and then the "Schema" tab:

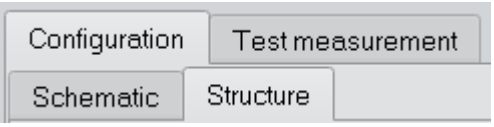


The device properties and parameters of the individual inputs and outputs can be selected by clicking on the schematic representation of the VibroLine devices. The property currently being edited is highlighted:



2. Structure view of the VibroLine device

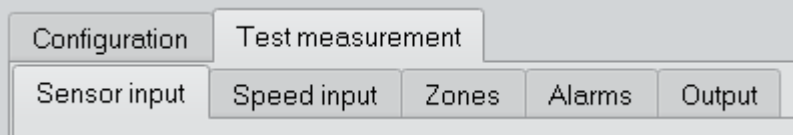
To do this, select the "Configuration" tab and then the "Structure" tab:



All device parameters can be modified from the structure view.

3. Test measurement

To do this, select the "Test measurement" tab:



The test measurement can be used to change the measurement gain, zone and alarm limits, and the 4-20 mA scaling of the analog output.

The following describes the parameterization options of the device using the schematic display of the VibroLine device:

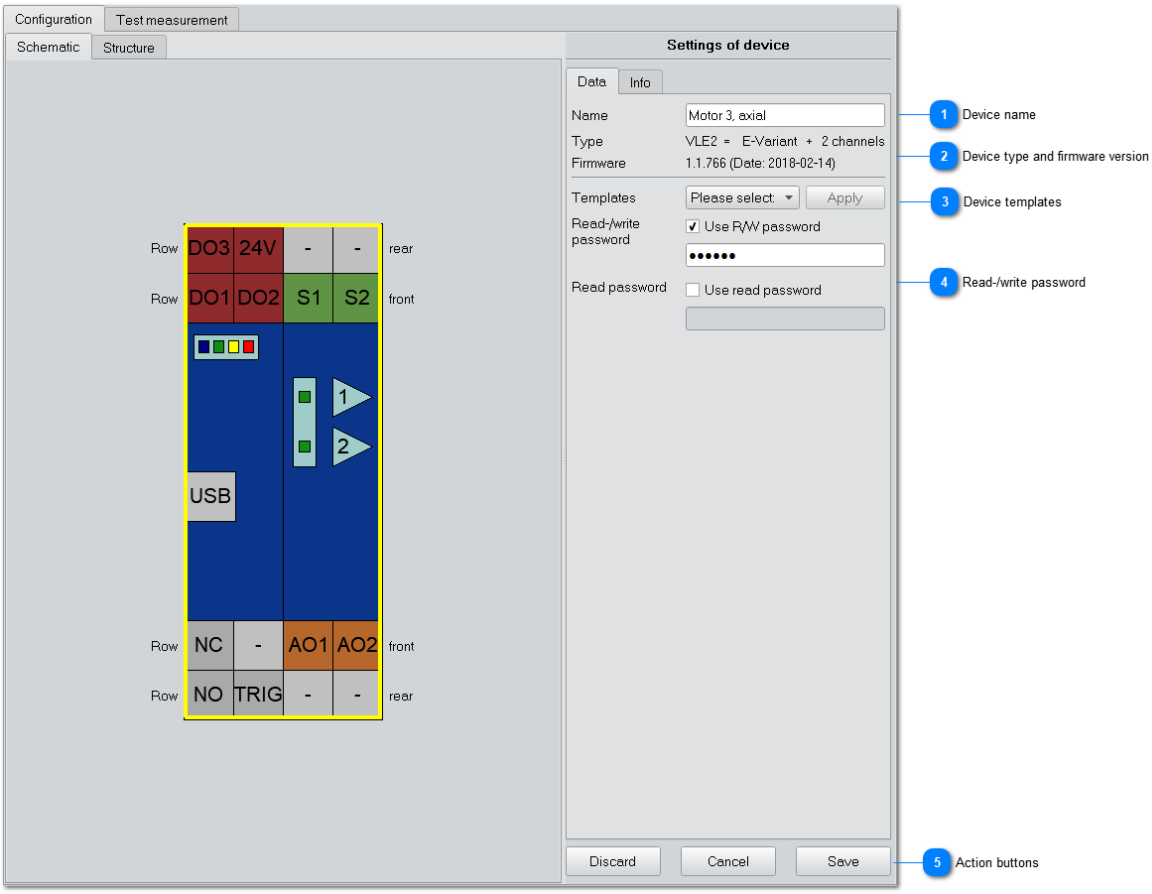
- Device properties
- Measurement input
- Signalprocessing
- Analog output properties
- Digital output
- Relay output
- Trigger input
- Sensor-Status-LED
- Zone-Status-LED

Each dataset is provided with information on the creation/change date and access level. For details, refer to the section dataset information.

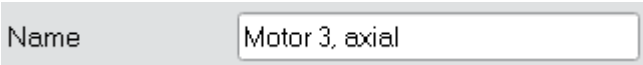
Device properties

The device properties can be edited by clicking on the blue area of the displayed VibroLine device. The active editing option is indicated by the yellow frame.

All device settings are also listed in the structure view and can be edited from there.

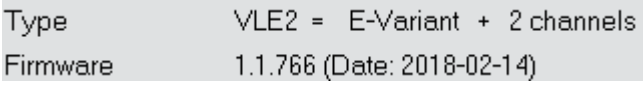


1 Device name



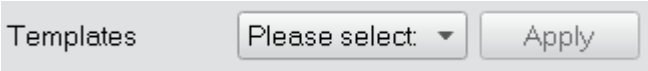
The device name can be entered here. Up to 40 characters are available.

2 Device type and firmware version



Display of the device type and the currently used firmware version.

3 Device templates



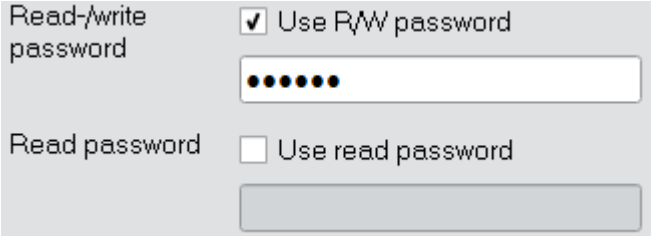
Entire device configurations can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a device template is confirmed by clicking **Apply**. A corresponding note appears, for example:

When saving, all device parts are configured as in template Config. radial meas..

If the selected template shall be written to the device, the action button **Save** must be clicked.

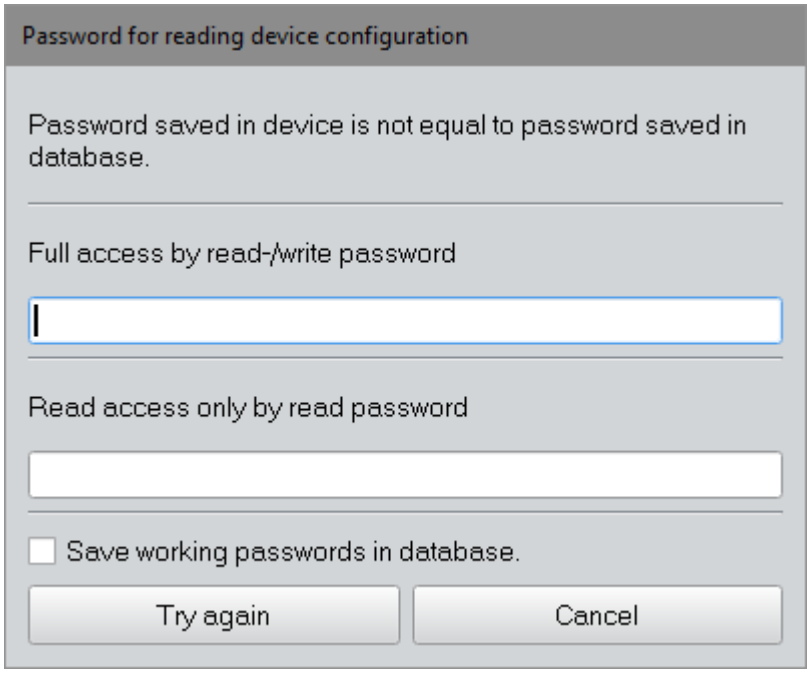
If no template exists, "Not available" is displayed in the selection field.

4 **Read-/write password**



The devices can be equipped with a read/write or read password to prevent unauthorized access an manipulation. To use the respective password you have to set the corresponding check mark and enter a password.

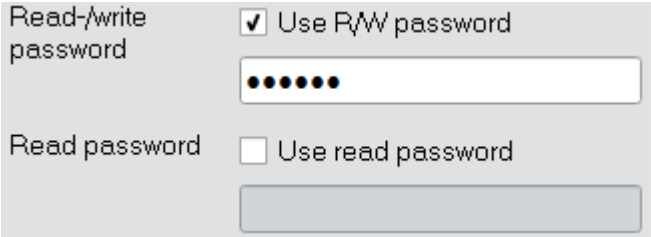
When using the password, the following dialog box appears when you connect the device to your computer:



After entering a read/write or read password, all device parameters can be either edited or only read. For easier handling, the passwords can be saved in the (encrypted) software database. Authentication is then performed automatically. If the device is used on an empty database (other computer, empty database), the password must be re-entered.

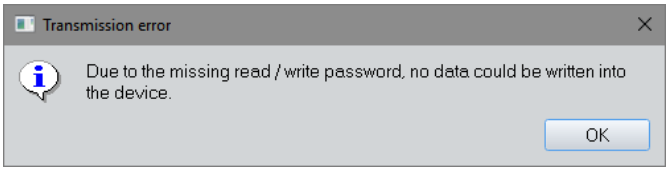
You can change the access level in the following ways:

- New registration of the device (disconnect and reconnect USB connection or delete device).
- Enter and save the corresponding password when the device is connected.

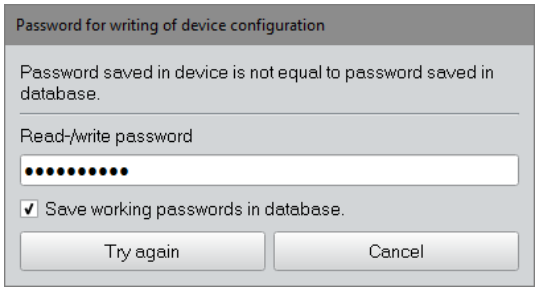


As long as the device is connected, there is authorized access. After disconnecting the device, the respective password must be re-entered.

- If only a read password has been entered and data in the device is to be changed, a message appears indicating that the access rights are insufficient:

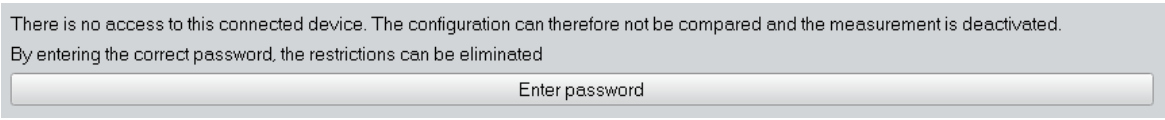


Clicking on **OK** opens a password dialog to enter the corresponding read/write password:



- If **Cancel** is selected, the previous access level (read only) is retained.

- If no password was entered when connecting the device (**Cancel** button), an entry can be made using the **Enter Password** button underneath the schematic display. It also informs you of the current access status:



5 **Action buttons**

The action buttons can be used to change the configuration:

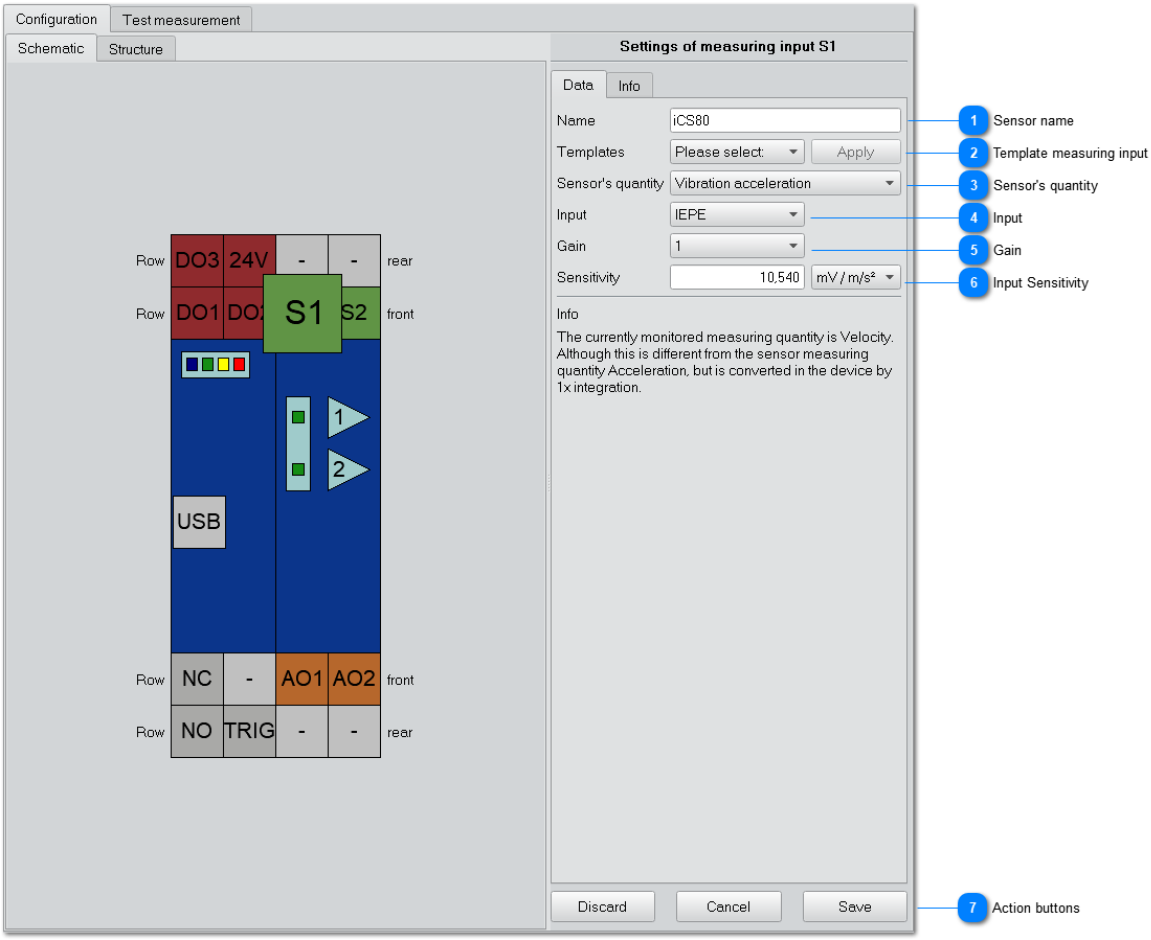
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Measurement input

The properties of the sensor and the measuring input can be changed by clicking on a measuring input (S1 .. S8, green). The displayed configuration is carried out for each measuring channel individually.

All measurement input settings are also listed in the structure view and can be edited from there.



1 Sensor name

The name of the sensor and, if necessary, its serial number can be entered here. For triaxial transducers, the measuring direction can be made clear by adding -X, -Y, -Z. Up to 40 characters are available.

2 Template measuring input

Sensor configurations can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a sensor template is confirmed by clicking **Apply**. If the selected template is to be transferred to the device,

the button **Save** must be pressed. If no template exists, "Not available" is displayed in the selection field.

3 Sensor's quantity

Sensor's quantity | Vibration acceleration

Here the actual (physical) measurement quantity of the sensor can be selected. Vibration acceleration, velocity and displacement are available.

Note: The desired monitoring measurement type is selected during configuration of the signal processing. If, for example, an accelerometer is connected and the vibration velocity is to be monitored, the sensor data are integrated once. A message summarizes the respective situation between sensor and monitoring measurement type:

Info

The currently monitored measuring quantity is Velocity. Although this is different from the sensor measuring quantity Acceleration, but is converted in the device by 1x integration.

Only integrated or directly used monitoring quantities can be used. Differentiation (e. g. vibration displacement to vibration velocity) is currently not supported. In order to keep the data consistent, the monitoring measurement type is then adjusted. A message appears:

Attention!

The currently monitored measuring quantity is Velocity. The device can not convert into this quantity from the sensor measuring quantity Displacement. Therefore, also the monitored measuring quantity will be set to Displacement when this data is saved.

4 Input

Input | IEPE

The VibroLine devices support IEPE (also called ICP® or Deltatron®) and a +/- 10 V AC input. The current status of the sensors is indicated by the sensor status LED.

5 Gain

Gain | 1

For each measuring channel the internal gain can be increased from 1 to 25. This increases the digitizing quality for permanently small signals. By increasing the gain, naturally the dynamic range of the measuring channel decreases, also by a factor of 25. The Test measurement of the input can also be used to determine the appropriate gain factor.

6 Input Sensitivity

The sensor sensitivity indicates which electrical voltage corresponds to an acceleration value of 1 m/s² (or 1 g) and is thus the conversion between mechanical and electrical quantities. The sensitivity value is usually given in the sensor data sheet.
Note: Please note the correct unit (mV/m/s² or mV/g). The following applies: 1 mV/m/s² = 9.81 mV/g.

The sensitivity value should be checked at regular intervals (calibration). Please contact the sensor manufacturer or IDS Innomic Schwingungsmesstechnik GmbH.

7 Action buttons

The action buttons can be used to change the configuration:

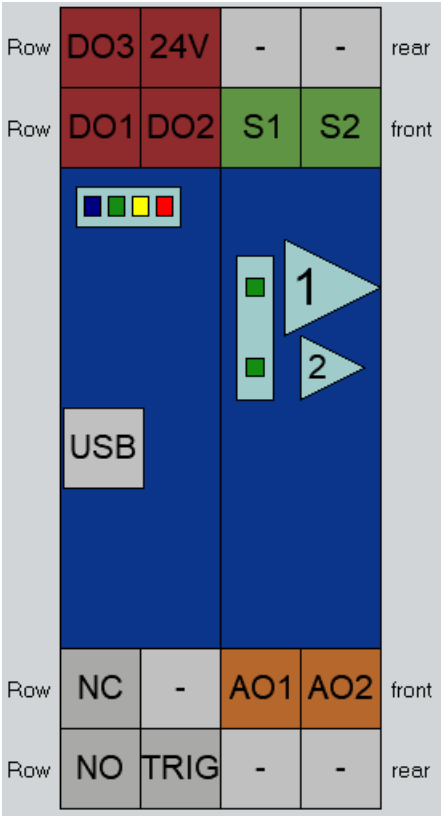
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Signal processing

By clicking on signal processing (1... 8, triangles) the properties of the signal processing can be specified. The displayed configuration is carried out for each measuring channel individually.

All signal processing settings are also listed in the structure view and can be edited from there.

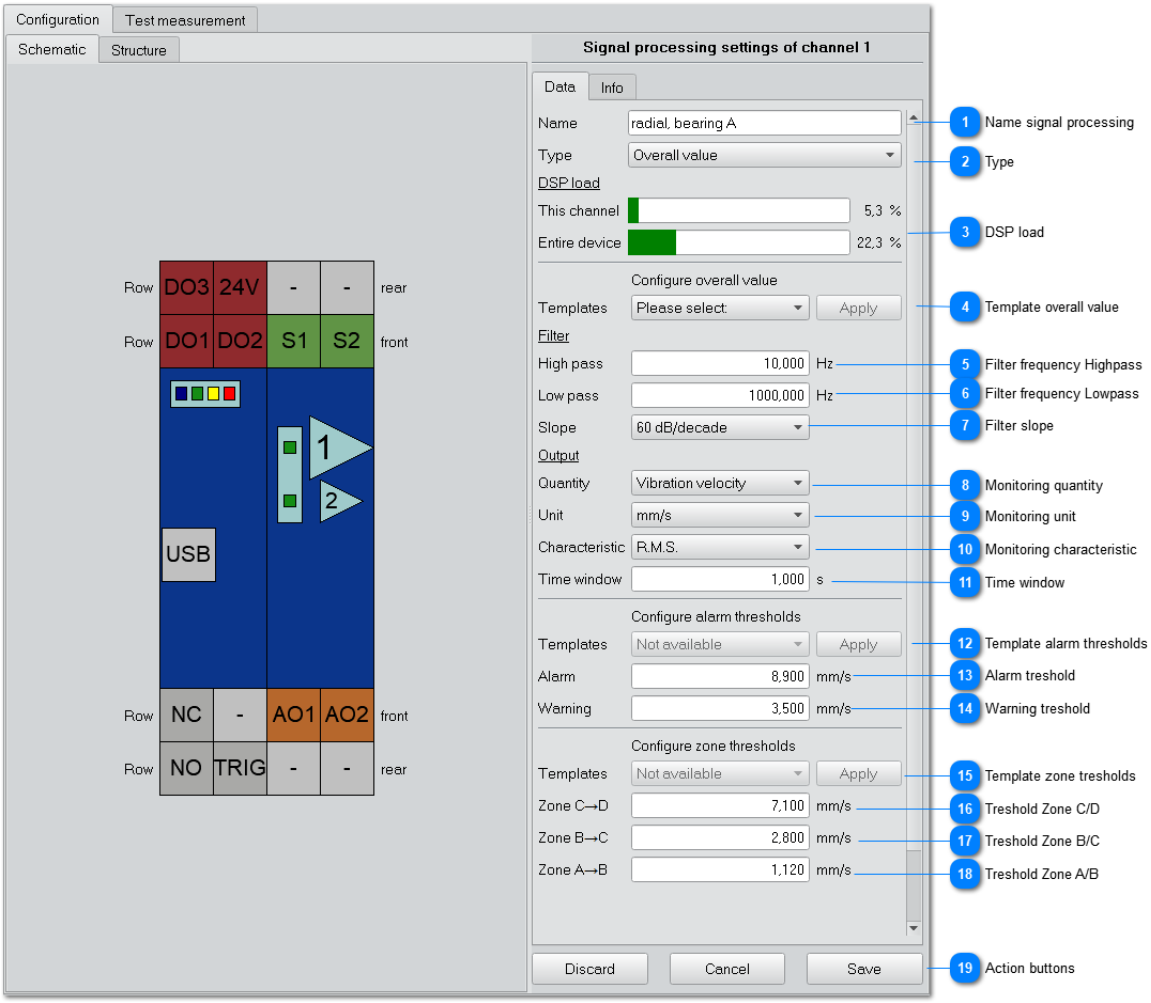


The configuration options for the currently available parameters are explained in the following subsections:

- Overall value
- Order characteristic
- Impact characteristic
- Bearing characteristics

Overall value

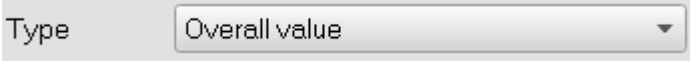
Overall values enable monitoring of vibrations over a wide frequency range. This may allow different machine errors to be detected at the same time. Monitoring in accordance with ISO 10816/20816 includes the monitoring of unbalance, misalignments, coupling errors, and much more. . If free monitoring is configured, high-frequency shocks, such as those occurring in the case of rolling bearing faults, can be detected (frequency range e. g. 10 - 20 kHz).



1 Name signal processing

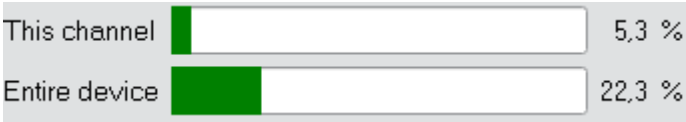
The signal processing configured here can be named accordingly. Up to 40 characters are available.

2 Type



Selection of the characteristic value to be monitored. Here it is the overall value.

3 **DSP load**



Depending on the vibration characteristic settings, the digital signal processing (DSP) of the ViboLine device is more or less requested. The current load of the selected measurement channel and the total load of the device are displayed. If the load value of the entire device reaches > 100%, different settings must be made in individual channels (e. g. lower filter slope, less fast response time, switch off pre-filtering for order characteristic values,...). If configurations with > 100% load are to be written into the device, a message will appear indicating that no data transfer has been carried out. The occurrence of the message can be suppressed. The message can be reactivated in the settings.

4 **Template overall value**

Overall values can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

For many parts of ISO 10816, the required monitoring measurement variables are already included in the software, so that a fast and convenient selection of the measurement variables conforming to standards can be made.

5 **Filter frequency Highpass**

The vibration signal to be monitored can be limited to a frequency range. The high pass is used to set the lower frequency limit. The minimum value is 0.1 Hz. Butterworth filters are used, so the specified frequency corresponds to a signal drop of -3 dB.

Note: The combination of very small high-pass values (< 1 Hz) with correspondingly integrated measurement variables (vibration velocity, vibration displacement) leads to longer filter transient times, which can be quite a few seconds depending on the setting. The settling process can be observed in the test measurement.

Note: Also note the (physically caused) 1/f noise at very low frequencies and integrated measurands. Particularly when using a low filter slope (e. g. 40 dB/decade) the noise levels can exceed the expected measurement signal. For these applications, the noise levels should be compared with the signal levels actually expected using the test measurement.

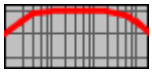
6 **Filter frequency Lowpass**

The vibration signal to be monitored can be limited to a frequency range. The low pass is used to set the higher frequency limit. The minimum value is 40 kHz. Butterworth filters are used, so the specified frequency corresponds to a signal drop of -3 dB.

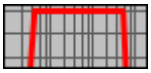
7 **Filter slope**

Slope 60 dB/decade

The filter slope of the specified high and low pass filter can be selected. You can choose between 40 dB/decade and 60 dB/decade (filter order 2 or 3). The steeper the filter is (higher filter order) the fewer contributions apart from the set filter limits are considered:



flat filter



steep filter

Note: If low-frequency vibrations are to be monitored, it is recommended to use the 60 dB/decade filter slope. Thus noise contributions of the 1/f noise are suppressed more efficiently.

8 **Monitoring quantity**

Quantity Vibration velocity

Vibration acceleration, vibration velocity and displacement can be selected as the monitoring measurement variable. Depending on the sensor measurement type used, the signal is integrated accordingly (e. g. double integration of vibration acceleration after displacement).

9 **Monitoring unit**

Unit mm/s

The unit of the monitoring measurement quantity can be defined here. Metric and non-metric units are available.

10 **Monitoring characteristic**

Characteristic R.M.S.

The following characteristics can be selected for the monitoring measured variable:

RMS	Formation by means of squaring, averaging and root extraction (square mean value, True RMS)
Peak	Peak value from the maximum of the amounts of plus and minus peak value
Peak - Peak	Maximum from the values of plus and minus peak values

11 Time window

Time span in seconds over which the characteristic value is formed. A minimum of 0.1 s and a maximum of 100 s can be specified.

12 Template alarm thresholds

Alarm thresholds can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

Note: Only templates of alarm thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

13 Alarm treshold

Setting a limit value for the alarm. This value must be determined individually for each machine. In many parts of ISO 20816 it is suggested that the switch-off value should not be higher than 1.25 x zone C/D limit value.

14 Warning treshold

Setting a limit value for warning. This value must be determined individually for each machine. In many parts of DIN ISO 20816 it is suggested to determine the alarm value according to the following rule:

Alarm = baseline + *p* x threshold Zone B/C.
Note: 0 < p < 1.

The baseline depends on the respective machine, the measuring location and the measuring direction. It must be determined individually for each monitoring channel. A determination can be made conveniently via the level deviation displayed in the alarm test measurement for a "run-in" machine.

In general, the alarm value should not be higher than 1.25 zone limit B/C.

15 Template zone tresholds

Zone thresholds can be saved in a template too. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"None exists" is displayed in the selection field.

For many parts of DIN ISO10816, the corresponding zone limits are included in the software upon delivery and can thus be selected quickly and conveniently.

Note: Only templates of zone thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

16 Treshold Zone C/D

Entering the zone boundary between zones C and D. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

17 Treshold Zone B/C

Entering the zone boundary between zones B and C. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

18 **Treshold Zone A/B**

Entering the zone boundary between zones A and B. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

19 **Action buttons**

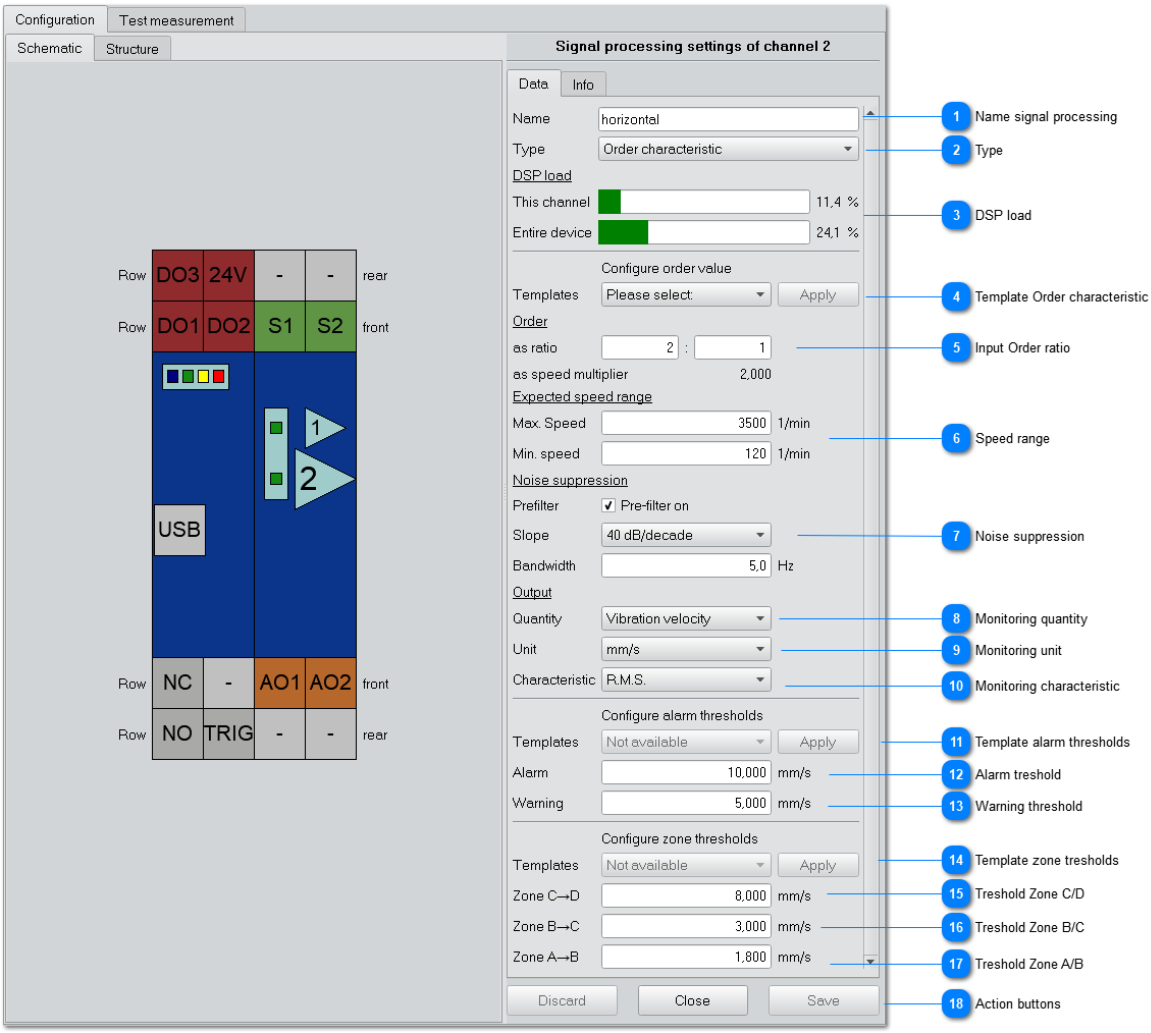
The action buttons can be used to change the configuration:

Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Order characteristic

Ordering characteristic are narrow-band characteristic which measures the vibrations at speed or at multiples of rpm. To measure order characteristic, a speed signal must be present at the trigger input of the VibroLine device. In particular for unbalance monitoring (vibration at speed, order 1:1) or transmission monitoring (vibration at speed multiplied by the number of teeth x of a gear wheel, order[f_n*x]). 1) order characteristics are very helpful.



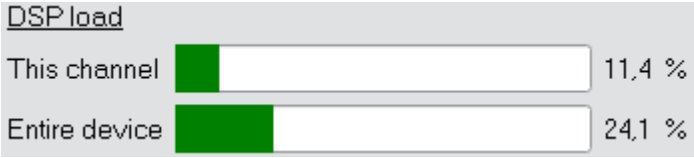
1 Name signal processing

The signal processing configured here can be named accordingly. Up to 40 characters are available.

2 Type

Selection of the characteristic value to be monitored. Here it is the order characteristic.

3 DSP load

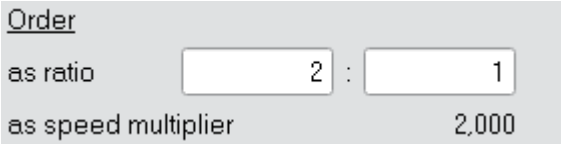


Depending on the vibration characteristic settings, the digital signal processing (DSP) of the ViboLine device is more or less requested. The current load of the selected measurement channel and the total load of the device are displayed. If the load value of the entire device reaches > 100%, different settings must be made in individual channels (e. g. lower filter slope, less fast response time, switch off pre-filtering for order characteristic values,...). If configurations with > 100% load are to be written into the device, a message will appear indicating that no data transfer has been carried out. The occurrence of the message can be suppressed. The message can be reactivated in the settings.

4 Template Order characteristic

Order characteristics can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

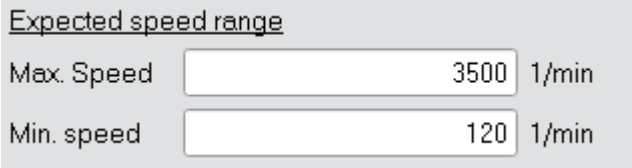
5 Input Order ratio



The VibroLine devices can monitor arbitrary orders. Multiples and broken orders can be defined

First Order	1 : 1
Thrid Order	3 : 1
Half Order	1 : 2
13/5 Order	13 : 5

6 Speed range

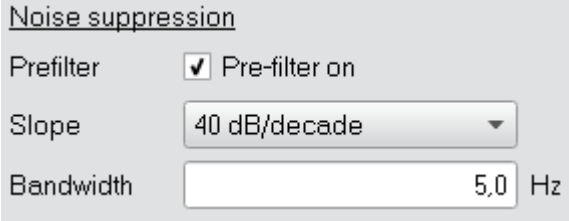


In principle, the VibroLine devices are able to detect speeds from 6 rpm. However, it will then take up to 10 seconds to detect standstill.If faster detection is desired, the minimum speed can be increased. For example, at 30 rpm the detection is given after 2 seconds. However,

speeds below 30 rpm are then not detected. By entering the maximum available speed, the calculation effort for the DSP is reduced because the maximum possible speed (4500 Hz) does not have to be expected.

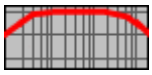
If the valid speed window is left, "0" is output as measured value to signal that no meaningful result can be calculated. In addition, an error can be output when leaving the speed range ("Signal measurement problem").

7 Noise suppression

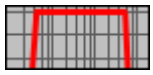


The order signal is filtered in such a way that it indicates the oscillations at speed or the selected speed order. If an even sharper delimitation to adjacent frequency ranges is required, the pre-filter can be activated. This may be necessary, for example, if strong amplitudes occur at nearby frequencies, but the characteristic order value is to be measured with the correct amplitude.

The **slope** of the pre-filter can be defined by means of the selection field. You can choose between 20, 40 and 60 dB/decade.



flat filter



steep filter

The bandwidth determines how wide the pre-filter is applied around the selected speed order. At e. g. 5 Hz bandwidth, the pre-filter extends by 2.5 Hz to lower or higher frequencies around the selected order. The bandwidth can be adjusted from 2 to 100 Hz.

Note: The activated pre-filter (especially with high slope) results in high DSP load for the VibroLine device. For multi-channel applications, the total load of the device should therefore be taken into account when configuring the pre-filters.

8 Monitoring quantity

Vibration acceleration, vibration velocity and displacement can be selected as the monitoring measurement variable. Depending on the sensor measurement type used, the signal is integrated accordingly (e. g. double integration of vibration acceleration after displacement).

9 Monitoring unit

The unit of the monitoring measurement quantity can be defined here. Metric and non-metric units are available.

10 Monitoring characteristic

Characteristic R.M.S.

The following characteristics can be selected for the monitoring measured variable:

RMS	Formation by means of squaring, averaging and root extraction (square mean value, True RMS)
Peak	Peak value from the maximum of the amounts of plus and minus peak value
Peak - Peak	Maximum from the values of plus and minus peak values

11 Template alarm thresholds

Templates Not available Apply

Alarm thresholds can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

Note: Only templates of alarm thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

12 Alarm treshold

Alarm 10,000 mm/s

Setting a limit value for the alarm. This value must be determined individually for each machine..

13 Warning threshold

Warning 5,000 mm/s

Setting a limit value for the warning. This value must be determined individually for each machine.

14 Template zone tresholds

Templates Not available Apply

Zone thresholds can be saved in a template too. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"None exists" is displayed in the selection field.

Note: Only templates of zone thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

15 **Treshold Zone C/D**

Entering the zone boundary between zones C and D. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

16 **Treshold Zone B/C**

Entering the zone boundary between zones B and C. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

17 **Treshold Zone A/B**

Entering the zone boundary between zones A and B. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

18 **Action buttons**

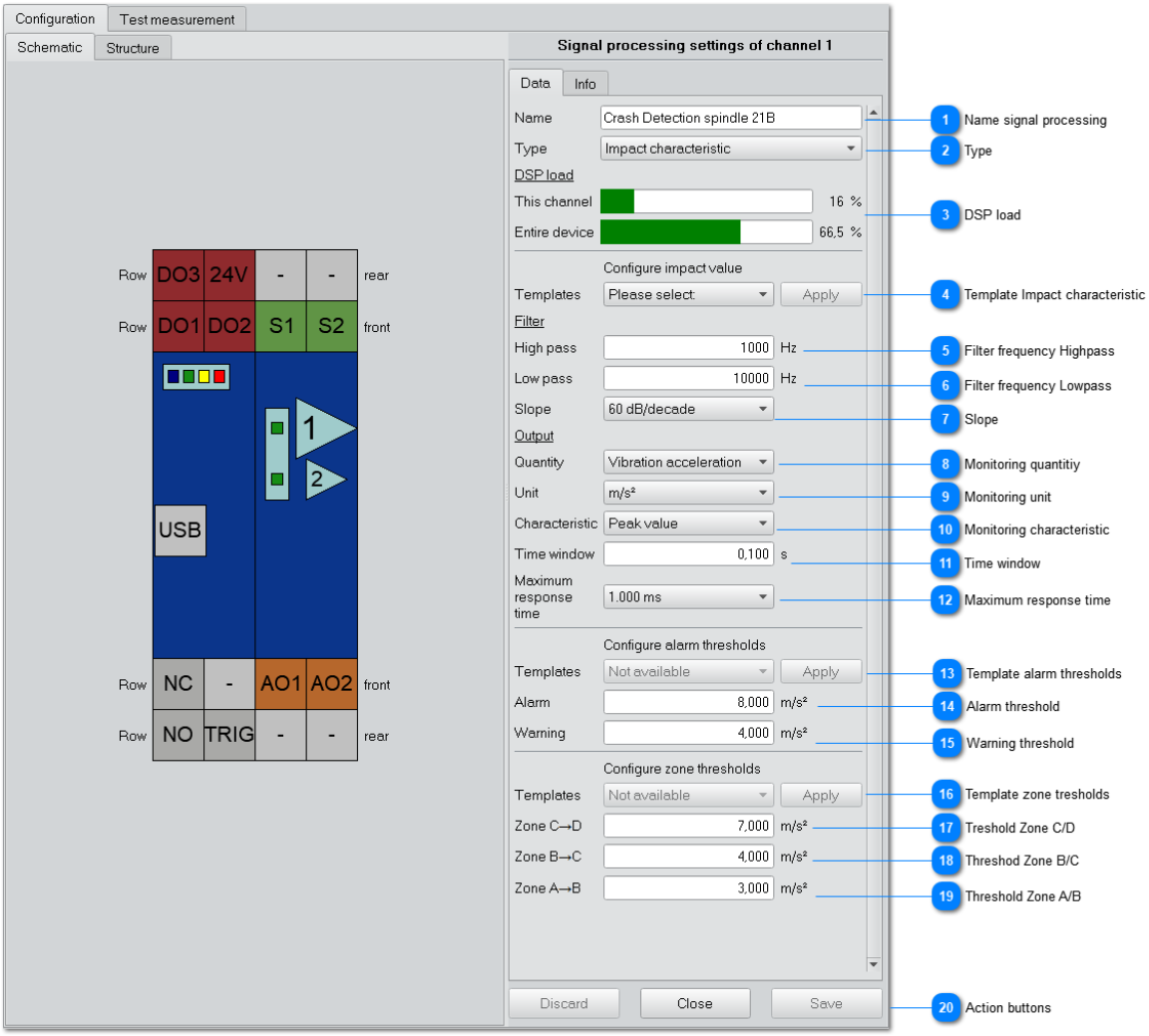
The action buttons can be used to change the configuration:

Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Impact characteristic

Impact characteristic values are overall values with a very fast response time of up to < 0.666 ms of the digital and relay outputs. Especially in applications such as tool breakage or crash detection, shock parameters can be used for very fast shut-off of the machine. Tool breakages, for example, generate a wide frequency signal extending into the kHz range (see Diraq shock). By monitoring this high-frequency range, unwanted machine states can be detected and stopped very quickly.



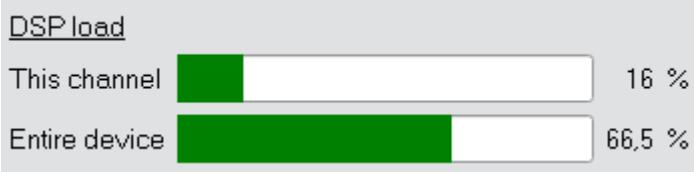
1 Name signal processing

The signal processing configured here can be named accordingly. Up to 40 characters are available.

2 Type

Selection of the characteristic value to be monitored. Here it is the impact characteristic.

3 DSP load



Depending on the vibration characteristic settings, the digital signal processing (DSP) of the ViboLine device is more or less requested. The current load of the selected measurement channel and the total load of the device are displayed. If the load value of the entire device reaches > 100%, different settings must be made in individual channels (e. g. lower filter slope, less fast response time, switch off pre-filtering for order characteristic values,...). If configurations with > 100% load are to be written into the device, a message will appear indicating that no data transfer has been carried out. The occurrence of the message can be suppressed. The message can be reactivated in the settings.

4 Template Impact characteristic

Impact characteristics can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

5 Filter frequency Highpass

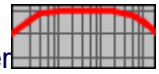
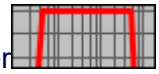
The vibration signal to be monitored can be limited to a frequency range. The high pass is used to set the lower frequency limit. The minimum value is 100 Hz. Butterworth filters are used, so the specified frequency corresponds to a signal drop of -3 dB.

6 Filter frequency Lowpass

The vibration signal to be monitored can be limited to a frequency range. The low pass is used to set the higher frequency limit. The minimum value is 40 kHz. Butterworth filters are used, so the specified frequency corresponds to a signal drop of -3 dB.

7 Slope

The filter slope of the specified high and low pass filter can be selected. You can choose between 40 dB/decade and 60 dB/decade (filter order 2 or 3). The steeper the filter is the fewer contributions apart from the set filter limits are considered:

flat filter  steep filter 

8 **Monitoring quantitiy**

Quantity | Vibration acceleration

Vibration acceleration, vibration velocity and displacement can be selected as the monitoring measurement variable. Depending on the sensor measurement type used, the signal is integrated accordingly (e. g. double integration of vibration acceleration after displacement).

Note: Impact characteristic values can only be measured from 100 Hz. Frequency ranges in the kHz range are required for many applications (e. g. tool breakage detection). Therefore, for such high-frequency measurements it is essential to use vibration acceleration as a monitoring measurement parameter, otherwise the high-frequency components will be underestimated.

9 **Monitoring unit**

Unit | m/s²

The unit of the monitoring measurement quantity can be defined here. Metric and non-metric units are available.

10 **Monitoring characteristic**

Characteristic | Peak value

The peak value (amount peak value from the maximum of the amounts of plus and minus peak value) is defined for the monitoring measurement quantity, since the fast response times of < 0.66 ms can only be achieved by means of peak value detection.

11 **Time window**

Time window | 0,100 | s

Time span in seconds over which the characteristic value is formed. A minimum of 0.1 s and a maximum of 100 s can be specified.

12 **Maximum response time**

Maximum response time | 1.000 ms

The impact characteristics have been developed for very fast detection of peak values. This makes it possible, for example, to detect crash- or breakage of tools. The dropdown box sets the response time of the digital outputs and the relay output. 0.666, 1, 2 or 4 ms can be selected.

13 **Template alarm thresholds**

Templates | Not available | Apply

Alarm thresholds can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

Note: Only templates of alarm thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

14 **Alarm threshold**

Setting a limit value for the alarm. This value must be determined individually for each machine.

15 **Warning threshold**

Setting a limit value for the warning. This value must be determined individually for each machine.

16 **Template zone tresholds**

Zone thresholds can be saved in a template too. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"None exists" is displayed in the selection field.

Note: Only templates of zone thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

17 **Treshold Zone C/D**

Entering the zone boundary between zones C and D. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

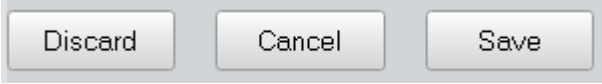
18 **Threshod Zone B/C**

Entering the zone boundary between zones B and C. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

19 **Threshold Zone A/B**

Entering the zone boundary between zones A and B. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

20 **Action buttons**



The action buttons can be used to change the configuration:

Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Bearing characteristic

Rolling bearings can be monitored with wideband characteristic values. If a defect develops in the rolling bearing, e.g. damage to the running surface in the outer ring (pitting), each rolling element experiences an impact as it passes through this defect and generates a wide excitation band in the surrounding area of the bearing (see Diraq impact). Due to this very wide excitation band, e.g. natural frequencies of nearby components are present or the natural frequency of the sensor itself is excited.

Since bearing damage is usually represented in amplitudes in the high frequency range, vibration acceleration is used as the measured variable. Vibration velocity and displacement would be underestimated.

Characteristic values on a wide frequency band measure these excessive values caused by bearing damage. The frequency range from 1000 Hz upwards is considered as a preference in order to remove speed-proportional components.

For the bearing characteristics, higher amplitudes mean a higher extent of damage in the rolling bearing. It can only be determined whether damage has occurred. Which rolling bearing component is exactly affected (outer ring, inner ring, rolling element, retainer) requires in-depth analysis with other measuring tools (e.g. envelope curve analysis with VibroMatrix). Detailed information on rolling bearing diagnosis on machines can be found in VDI 3832 "Measurement of structure-borne sound of rolling element bearings in machines and plants for evaluation of condition.

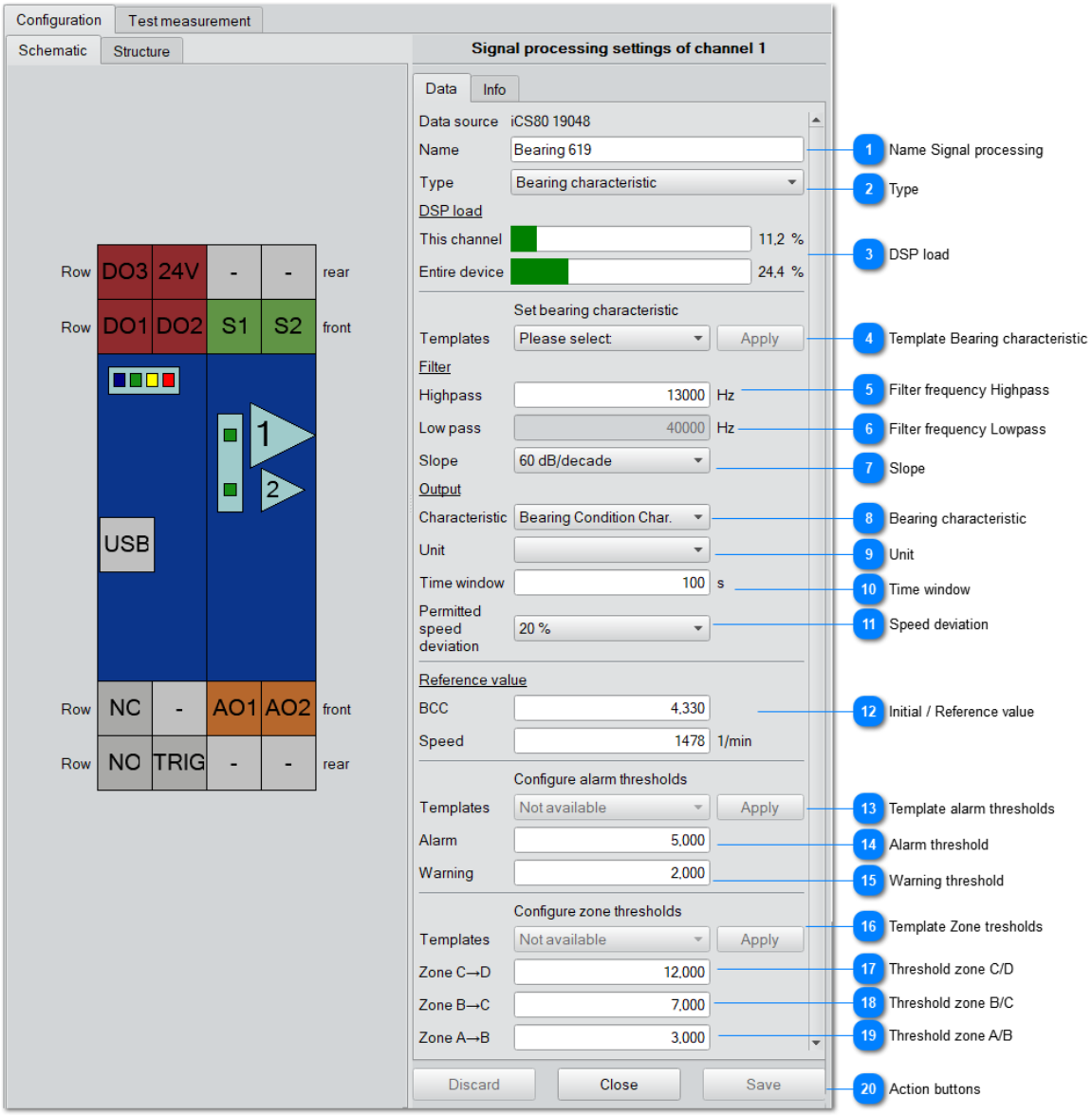
The **bearing characteristics** implemented in VibroLine are regarded as **relative values**. This means that the current measured value is always compared with an initial or reference value. The initial value corresponds to the undamaged condition of the bearing. The actual measured **value** represents a unitless **deviation from the reference value**. This procedure is useful (and suggested by VDI 3832) because the characteristic values of bearings can be very different and therefore the good condition must always be known for the good/bad evaluation (initial value). Furthermore, bearing characteristic values can be strongly dependent on the speed, therefore a speed band can be specified in the VibroLine devices in which the bearing characteristic value is determined.

The following bearing characteristics are available:

- relative r.m.s value
- relative peak value
- 1/k(t)
- Bearing condition characteristic (BCC)

A detailed explanation of the characteristics is given below.

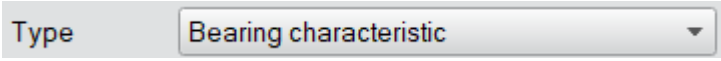
To measure the bearing characteristics , "screw connection" should be used for the accelerometer in order to minimize the disturbing influence of coupling resonances.



1 Name Signal processing

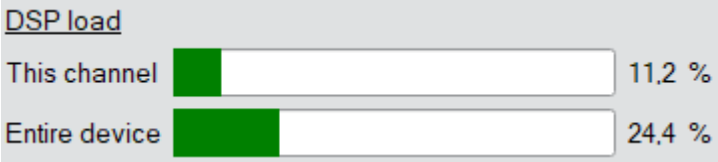
The signal processing configured here can be named accordingly. Up to 40 characters are available.

2 Type



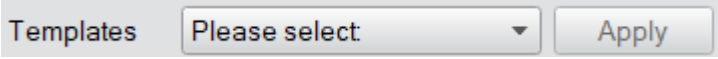
Selection of the characteristic value to be monitored. Here it is the bearing characteristic.

3 DSP load



Depending on the vibration characteristic settings, the digital signal processing (DSP) of the ViboLine device is more or less requested. The current load of the selected measurement channel and the total load of the device are displayed. If the load value of the entire device reaches > 100%, different settings must be made in individual channels (e. g. lower filter slope, less fast response time, switch off pre-filtering for order characteristic values,...). If configurations with > 100% load are to be written into the device, a message will appear indicating that no data transfer has been carried out. The occurrence of the message can be suppressed. The message can be reactivated in the settings.

4 Template Bearing characteristic



Bearing characteristics can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

5 Filter frequency Highpass

The vibration signal to be monitored can be limited to a frequency range. The high pass is used to set the lower frequency limit. The minimum value is 1000 Hz. Butterworth filters are used, so the specified frequency corresponds to a signal drop of -3 dB.

6 Filter frequency Lowpass

The vibration signal to be monitored can be limited to a frequency range. The low pass is used to set the higher frequency limit. The minimum value is 40 kHz. Butterworth filters are used, so the specified frequency corresponds to a signal drop of -3 dB.
For the characteristic value Bearing Condition Characteristic (BCC), the low-pass filter is permanently set to 40 kHz.

7 Slope

The filter slope of the specified high and low pass filter can be selected. You can choose between 40 dB/decade and 60 dB/decade (filter order 2 or 3). The steeper the filter is the fewer contributions apart from the set filter limits are considered.

8 Bearing characteristic

Characteristic | Bearing Condition Char.

The VibroLine devices have 4 characteristic values for rolling bearing monitoring. The selection is made here.
The characteristic values mean in detail:

Characteristic	Formation	Behavior
relative r.m.s value	The relative r.m.s of the vibration acceleration usually measured in the linear frequency range of the sensor. Reference is made to the initial r.m.s value.	If there is bearing damage, the general signal level rises (see above resonance increase) and thus the r.m.s.
relative peak value	Peak value of the vibration acceleration usually measured in the linear frequency range of the sensor. Reference is made to the initial peak value.	In the event of bearing damage, the signal becomes more peak-containing due to the shocks that occur. This peaking quality is determined by the relative peak value.
1/k(t)	The 1/k(t)-Wert is calculated as follows: $\frac{1}{k(t)} = \frac{a_{rms}(t) \cdot a_{peak}(t)}{a_{rms}(0) \cdot a_{peak}(0)}$ So the products of the r.m.s and peak values of the vibration acceleration are used. In each case at the current time t and the reference measurement (t= 0). The r.m.s or peak values are determined in the linear frequency range of the sensor.	The amplitudes for the r.m.s. and peak values increase with bearing damage (see above). This results in increasing values for the product as well.. The 1/k(t) value thus has higher values in the event of damage.
Bearing Condition Characteristic BCC	The bearing condition characteristic BCC is determined in the resonance range of the sensor (typically > 13 kHz). However, the component-related resonances < 13 kHz can also be included in the calculation. The shocks caused by the bearing damage are measured amplified by the resonance(s) present The **Bearing Condition Characteristic BCC** (with 13 kHz high pass) behaves similarly to the **Bearing Condition Unit (BCU)**.	With increasing severity of the damage, the intensity of the shocks increases. The BCC value then shows higher values.

9 **Unit**

Unit

The measured value (deviation of the current value from the reference or initial value) can be specified in absolute quantities or in percent.

Example:

Initial value	Measured value	Actuel value
5 m/s²	15 m/s²	3
5 m/s²	15 m/s²	300 %

The unit set here must be considered in particular for the correct definition of the alarm and zone limit values.

10 **Time window**

Time window 100 s

Time span in seconds over which the characteristic value is formed. A minimum of 1 s and a maximum of 3600 s can be entered. For fluctuating characteristic values (e.g. peak values, 1/k(t)) it is recommended to keep the standard 100s.

11 **Speed deviation**

Permitted speed deviation 20 %

Bearing characteristic values can only be compared with values under the same operating conditions, i.e. at the same speed. Therefore, the deviation by which the current speed may deviate from the speed when the initial values are recorded can be defined here.
If the valid speed window is left, "0" is output as measured value to signal that no meaningful result can be calculated. In addition, an error can be output when leaving the speed range ("Signal measurement problem").

If measured values are also to be calculated at any speed, the selection "ignore" can be made (not recommended).

12 **Initial / Reference value**

Reference value

BCC 4,330

Speed 1478 1/min

The initial/reference values are entered in this input field. Depending on the selected characteristic value, r.m.s., peak values, the product of effective value and peak value or BCC values must be entered.

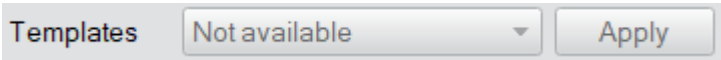
The speed during the acquisition of the initial values should also be logged.
The test measurement function can also be used to simplify the definition of reference values.

Notes on defining the initial values:
The initial values should be obtained in the OK state of the bearing at operating speed. This OK state is usually present after the running-in phase following bearing assembly. In the running-in phase, the vibration behaviour of the bearing can temporarily degrade, but this does not necessarily indicate bearing damage (assuming correct mounting and grease distribution).

If no data on the OK state of the bearing is available, typical values for the bearing characteristic values can be collected for identical machines. It is important to collect several data sets or to examine several other machines.

After defining the reference value, this value is left unchanged for the lifetime of the bearing and current measured values are normalized to the reference value (quotient = bearing characteristic value).

13 Template alarm thresholds



Alarm thresholds can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

Note: Only templates of alarm thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

14 Alarm threshold

Enter a limit value for the alarm. The deviation from the initial value is entered in absolute values (multiples) or in percent, depending on the selection.
Setting a limit value for the alarm. This value must be determined individually for each machine.

15 **Warning threshold**

Warning	2,000

Enter a limit value for the warning. The deviation from the initial value is entered in absolute values (multiples) or in percent, depending on the selection.
Setting a limit value for the alarm. This value must be determined individually for each machine

16 **Template Zone tresholds**

Templates	Not available	Apply

Zone thresholds can be saved in a template too. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the device, the action button **Save** must be pressed. If no template exists,"None exists" is displayed in the selection field.

Note: Only templates of zone thresholds are displayed whose assigned overall value corresponds to the overall value selected above. If this is not the case, the selection field of the alarm limit value templates is greyed out.

17 **Threshold zone C/D**

Zone C→D	12,000

Entering the zone boundary between zones C and D. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

18 **Threshold zone B/C**

Zone B→C	7,000

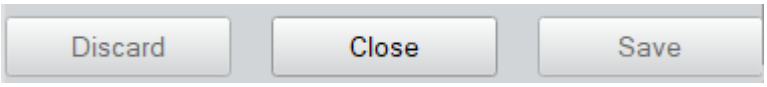
Entering the zone boundary between zones B and C. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

19 **Threshold zone A/B**

Zone A→B	3,000

Entering the zone boundary between zones A and B. The zone system proposed in ISO 20816 is used for this purpose. The zone corresponding to the current machine status is indicated by a coloured LED on the front of the housing.

20 Action buttons



The action buttons can be used to change the configuration:

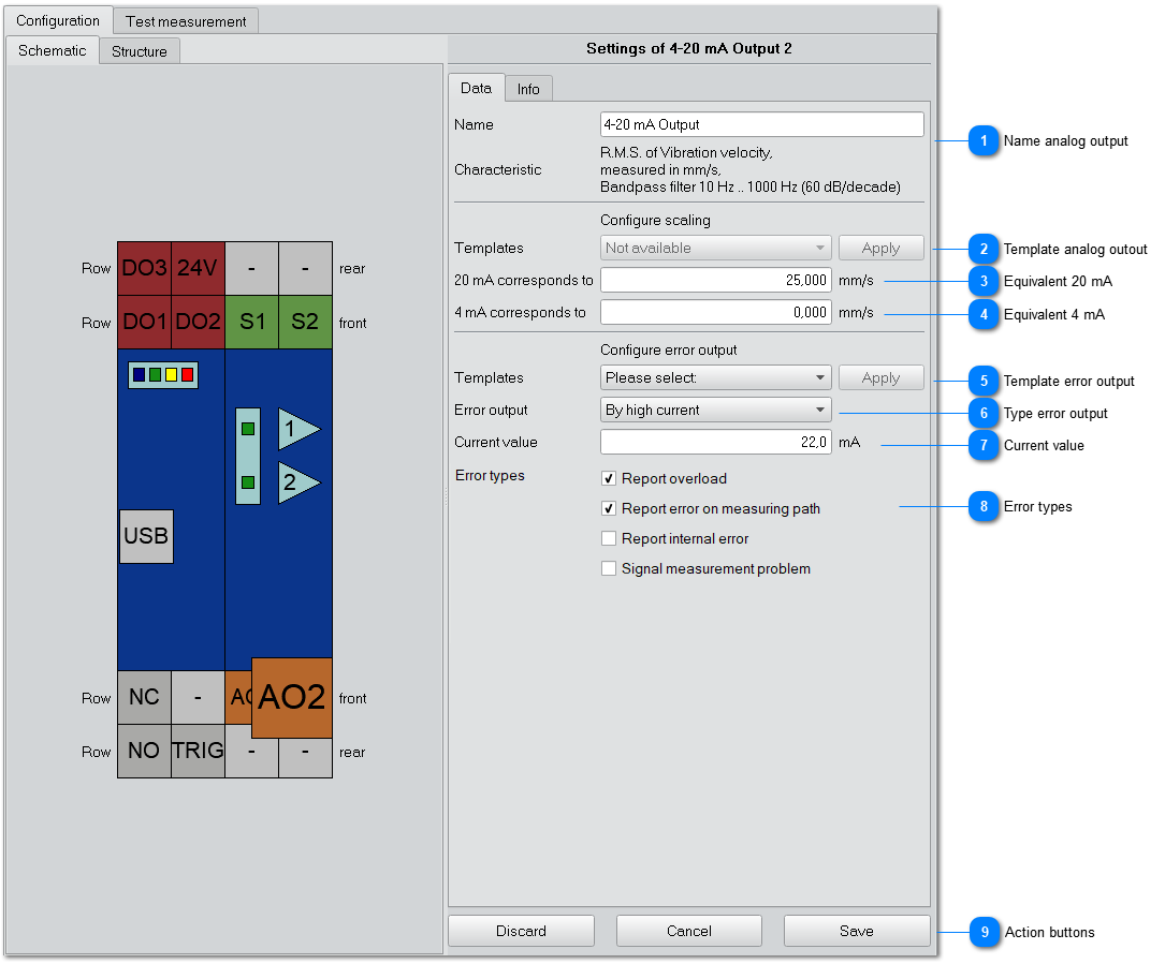
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

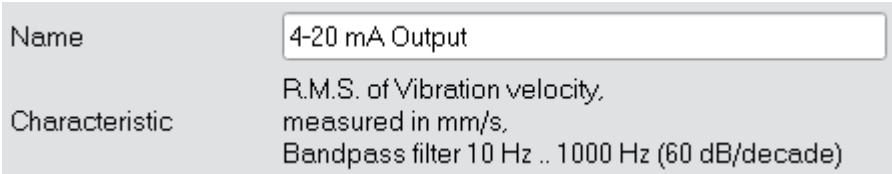
Analog output

To configure the 4-20 mA analog outputs, the orange AO1... AO8 fields are selected. The displayed configuration is performed individually for each analog output channel.
A voltage source is required to operate the 4-20 mA current loops, as the outputs represent a current sink. As a supply voltage, voltages between 12 and 30 V can be used. The analog outputs are updated at the cycle time.

All analog output settings are also listed in the structure view and can be edited from there.



1 Name analog output



Each configuration can be named accordingly. Up to 40 characters are available. The currently used vibration characteristic is displayed.

2 **Template analog outout**

Templates	Not available	Apply

Analog output configurations can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of an analog output template is confirmed by clicking **Apply**. If the selected template is to be transferred to the device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

3 **Equivalent 20 mA**

20 mA corresponds to	25,000	mm/s

The scaling of the analog output can be set. The value of the measured quantity set in signal processing is determined, which corresponds to a current of 20 mA.

4 **Equivalent 4 mA**

4 mA corresponds to	0,000	mm/s

The scaling of the analog output can be set. The value of the measured quantity set in signal processing is determined, which corresponds to a current of 4 mA.

5 **Template error output**

Templates	Please select:	Apply

Error output configurations can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of an error output template is confirmed by clicking **Apply**. If the selected template is to be transferred to the device, the action button **Save** must be pressed. If no template exists,"None exists" is displayed in the selection field.

6 **Type error output**

Error output	By high current

In addition to the 4-20 mA current loop, faults can be reported to the subsequent evaluation electronics by means of low or high current. The selection is made via the selection field.

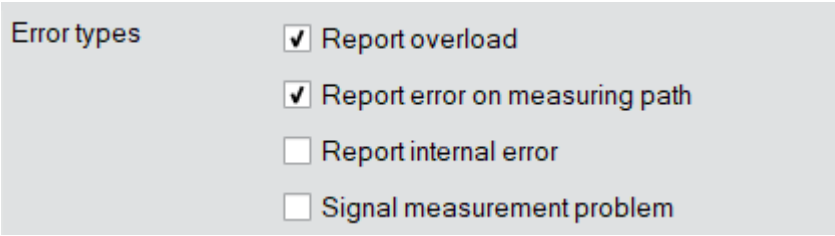
7 **Current value**

Current value	22,0	mA

In the event of an error, the low or high current value specified here is used. The output currents can be freely selected within the following limits:

Low current	2,0 .. 3,5 mA
High current	20,5 .. 24 mA

8 Error types



The following error types can be reported by means of the high or low current output (multiple selection possible):

Overflow	The input level exceeds the specified range. Analog-to-digital conversion cannot be performed with precision. A reduction of the gain must be checked (alternatively: use of a sensor with lower sensitivity).
Error on measuring path	Only for IEPE sensors. Short circuit or cable breakage in the sensor cable is detected.
Internal error	Error of the VibroLine device. An inspection and diagnosis by the manufacturer may be necessary. Note: If an internal error occurs, the zone LEDs all flash simultaneously.
Signal measurement problem	Relevant for order characteristic and bearing characteristic. Error is activated when the valid speed window is left.

9 Action buttons

The action buttons can be used to change the configuration:

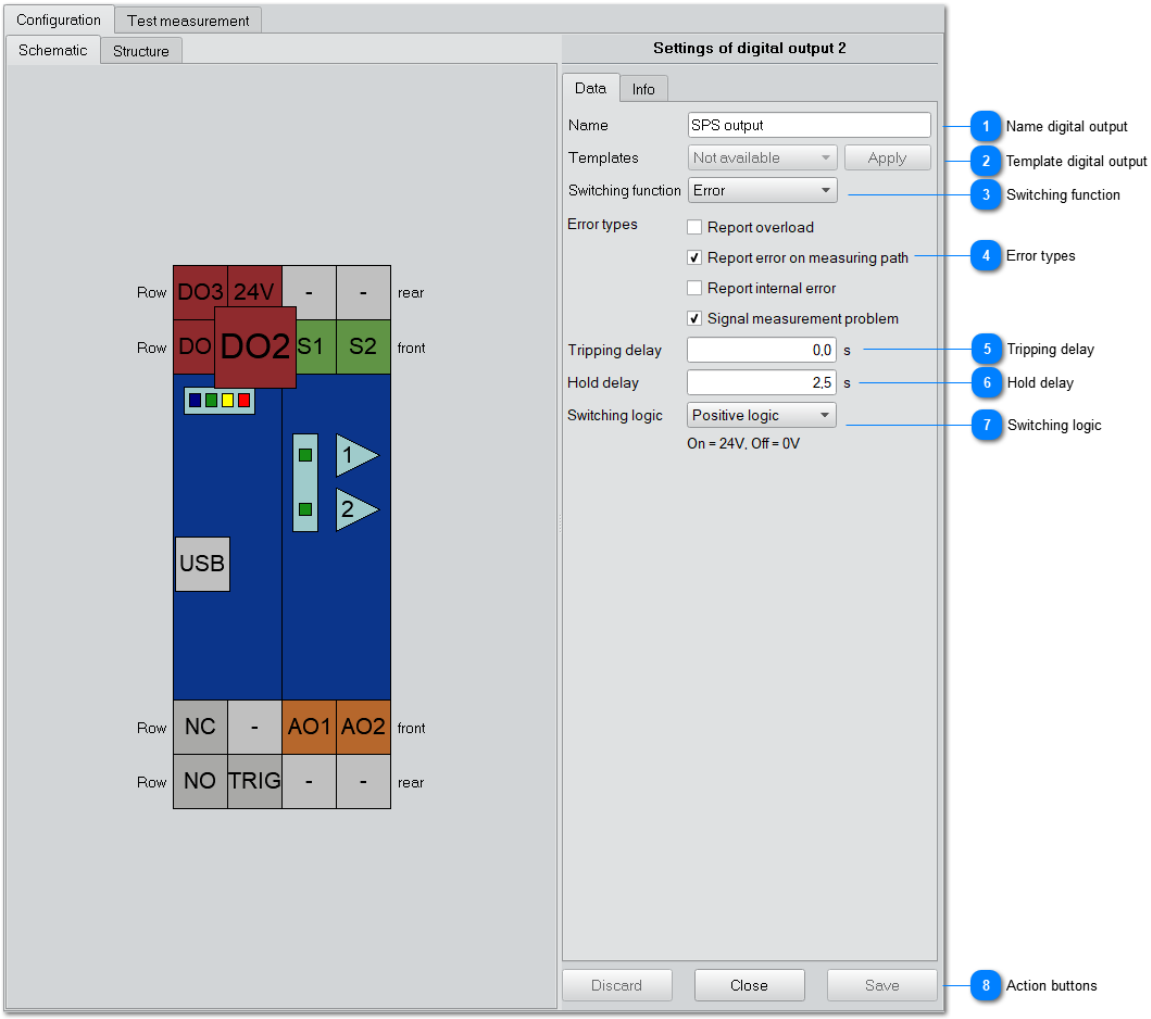
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Digital output

The digital outputs can be accessed by clicking on the red DO1.. DO3 fields. Each digital output is parameterized individually.

All settings are also listed in the structure view and can be edited from there.



1 Name digital output

The digital output configured here can be named accordingly. Up to 40 characters are available.

2 Template digital output

Digital output settings can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the

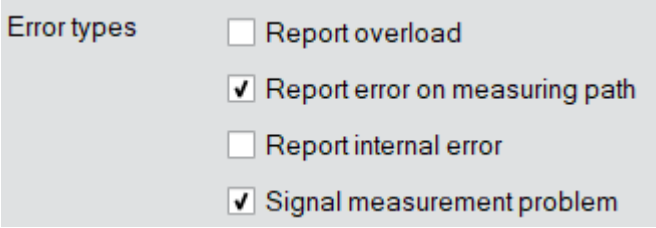
device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

3 Switching function

Each digital output can be used for different switching functions:

Always OFF	The digital output is permanently switched to OFF (can be used as an alive signal depending on the switching logic).
Always ON	The digital output is permanently switched to ON (can be used as an alive signal depending on the switching logic).
Zone A -> B	The transition from zone A to B switches to ON.
Zone B -> C	The transition from zone B to C switches to ON.
Zone C -> D	The transition from zone C to D switches to ON.
Warning	When the warning level is reached, it switches to ON.
Alarm	When the larm level is reached, it switches to ON.
Error	In the event of an error, it switches to ON.

4 Error types



If an error is to be reported via the digital output, the following error types are available (multiple selection possible):

Overflow	The input level exceeds the specified range. Analog-to-digital conversion cannot be performed with precision. A reduction of the gain must be checked (alternatively: use of a sensor with lower sensitivity).
Error on measuring path	Only for IEPE sensors. Short circuit or cable breakage in the sensor cable is detected.
Internal error	Error of the VibroLine device. An inspection and diagnosis by the manufacturer may be necessary. Note: If an internal error occurs, the zone LEDs all flash simultaneously.
Signal measurement problem	Relevant for order characteristic and bearing characteristic. Error is activated when the valid speed window is left.

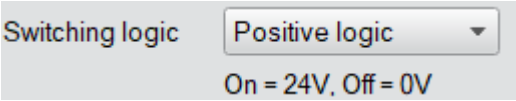
5 Tripping delay

The switching of the digital output can be delayed by a definable period of time after the switching condition has been reached. Values between 0.0 and 60 s can be set. With a delay value of 0.0 s, the switching process depends on the cycle and reaction time. The minimum switch-on delay for overall values and order characteristics is 12 ms and the maximum switch-on delay is 20 ms. If shock parameters are used, the minimum switch-on delay can be reduced to 0.666 ms.

6 **Hold delay**

The switching of the digital output can also be delayed after the switching condition has expired. Values between 0.0 and 60 s can also be set here. With a delay value of 0.0 s, the switch-off process is carried out after the cycle time.

7 **Switching logic**



The switching logic of the digital output can be selected. It can be selected whether HIGH is 24 V or 0 V (for LOW correspondingly inverted).

8 **Action buttons**

The action buttons can be used to change the configuration:

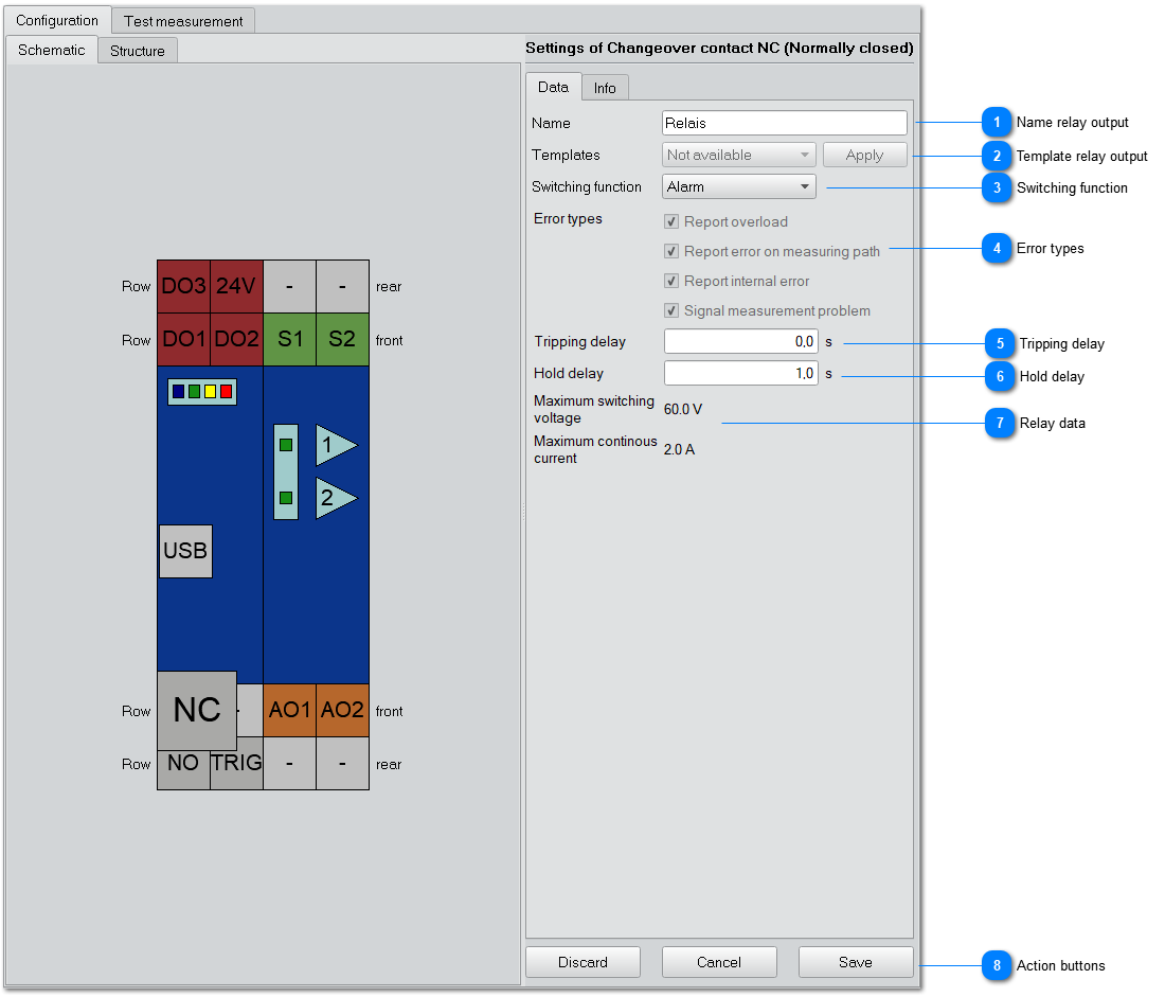
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Relay output

The settings of the changeover relay can be selected via the grey NC or NO fields. Due to the changeover relay character, the settings for the other contact are adopted.

All settings are also listed in the structure view and can be edited from there.



1 Name relay output

The NC- and NO relais output configured here can be named accordingly. Up to 40 characters are available.

2 Template relay output

Relay output settings can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the

device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

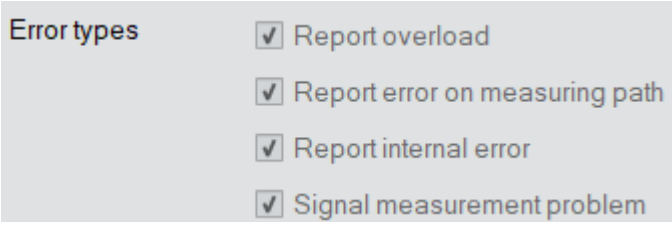
3 Switching function

The NC and NO output of the changeover relay can be used for various switching functions:

Always OFF	The relay output is permanently switched to OFF.
Always ON	The relay output is permanently switched to ON.
Zone A -> B	The transition from zone A to B switches to ON.
Zone B -> C	The transition from zone B to C switches to ON.
Zone C -> D	The transition from zone A to B switches to ON.
Warning	When the warning level is reached, it switches to ON.
Alarm	When the alarm level is reached, it switches to ON.
Error	In the event of an error, it switches to ON.

Note: Due to the change-over relay character, the switching functions are inverted on the other contact.

4 Error types



If an error is to be reported via the digital output, the following error types are available (multiple selection possible):

Overflow	The input level exceeds the specified range. Analog-to-digital conversion cannot be performed with precision. A reduction of the gain must be checked (alternatively: use of a sensor with lower sensitivity).
Error on measuring path	Only for IEPE sensors. Short circuit or cable breakage in the sensor cable is detected.
Internal error	Error of the VibroLine device. An inspection and diagnosis by the manufacturer may be necessary. Note: If an internal error occurs, the zone LEDs all flash simultaneously.
Signal measurement problem	Relevant for order characteristic and bearing characteristic. Error is activated when the valid speed window is left.

5 **Tripping delay**

Tripping delay	0,0	s

The switching of the relay output can be delayed by a definable period of time after the switching condition has been reached. Values between 0.0 and 60 s can be set. With a delay value of 0.0 s, the switching process depends on the cycle and reaction time. The minimum switch-on delay for overall values and order characteristics is 12 ms and the maximum switch-on delay is 20 ms. If shock parameters are used, the minimum switch-on delay can be reduced to 0.666 ms.

6 **Hold delay**

Hold delay	1,0	s

The switching of the relay output can also be delayed after the switching condition has expired. Values between 0.0 and 60 s can also be set here. With a delay value of 0.0 s, the switch-off process is carried out after the cycle time.

7 **Relay data**

Maximum switching voltage	60.0 V
Maximum continous current	2.0 A

The built-in relay is a wear-free and very fast solid-state changeover relay. The NC and NO contacts can be loaded up to 60 V and 2 A.

Note: Due to the SSR character of the changeover relay, both contacts are deenergized open.

8 **Action buttons**

Discard | Cancel | Save

The action buttons can be used to change the configuration:

Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

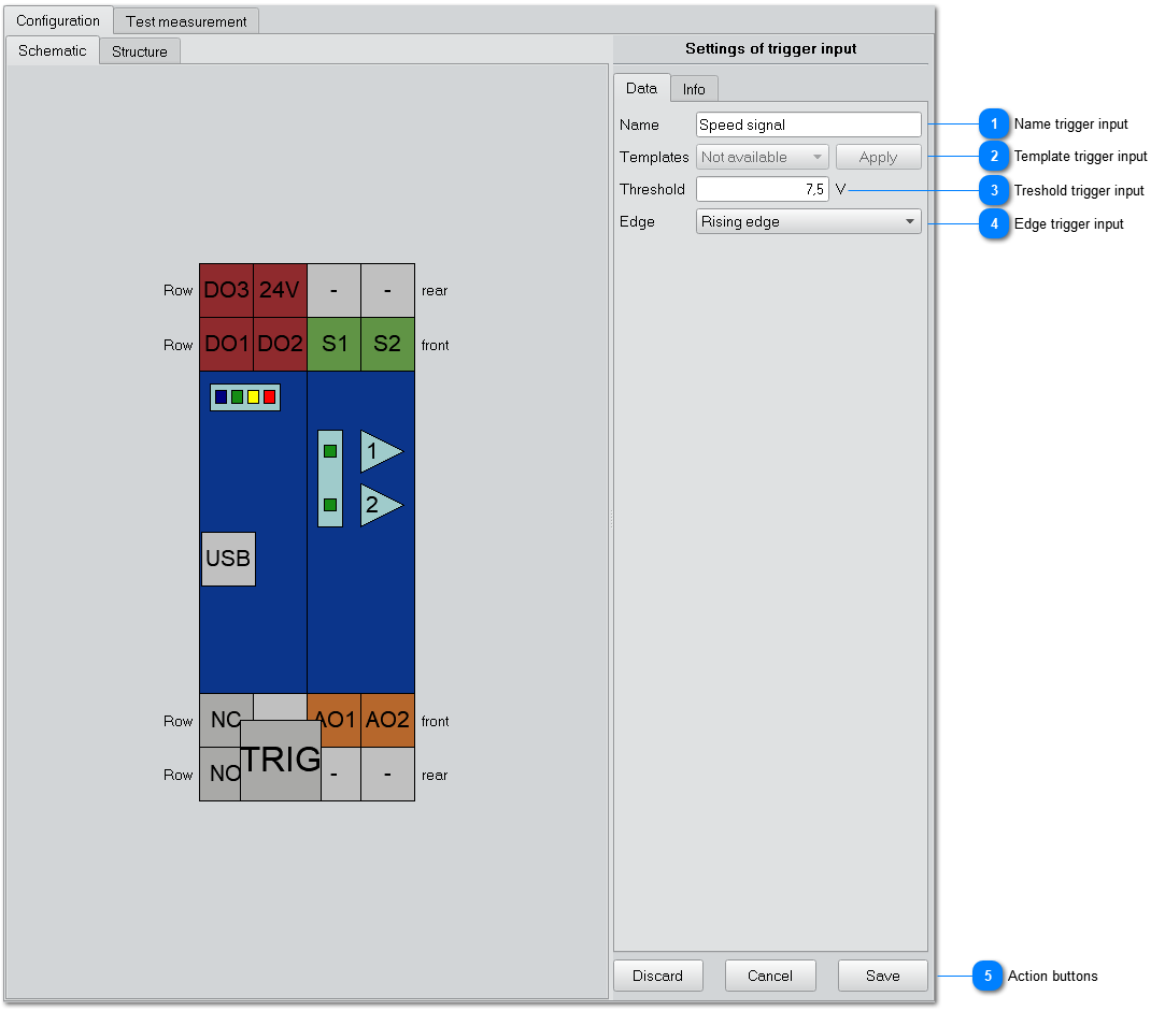
If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Discard | Close | Save

Trigger input

The menu for editing the settings of the trigger input is accessed via the grey TRIG button. A speed signal can be fed in via the trigger input. This is, for example, the basis for the order characteristic.

All settings are also listed in the structure view and can be edited from there.



1 Name trigger input

The trigger input configured here can be named accordingly. Up to 40 characters are available.

2 Template trigger input

Trigger input settings can be saved in a template. If templates are available, they can be selected from the selection box ("Please select"). The selection of a signal processing template is confirmed by clicking **Apply**. If the selected template is to be written into the

device, the action button **Save** must be pressed. If no template exists,"Not available" is displayed in the selection field.

3 **Treshold trigger input**

Input of the trigger input threshold. For the change from *low* to *high*, values of 0.5... 24V can be specified. The hysteresis of the trigger input is approx. 0.5 V.

4 **Edge trigger input**

The trigger input can switch with *rising* or *falling edge*. The selection is made here.

5 **Action buttons**

The action buttons can be used to change the configuration:

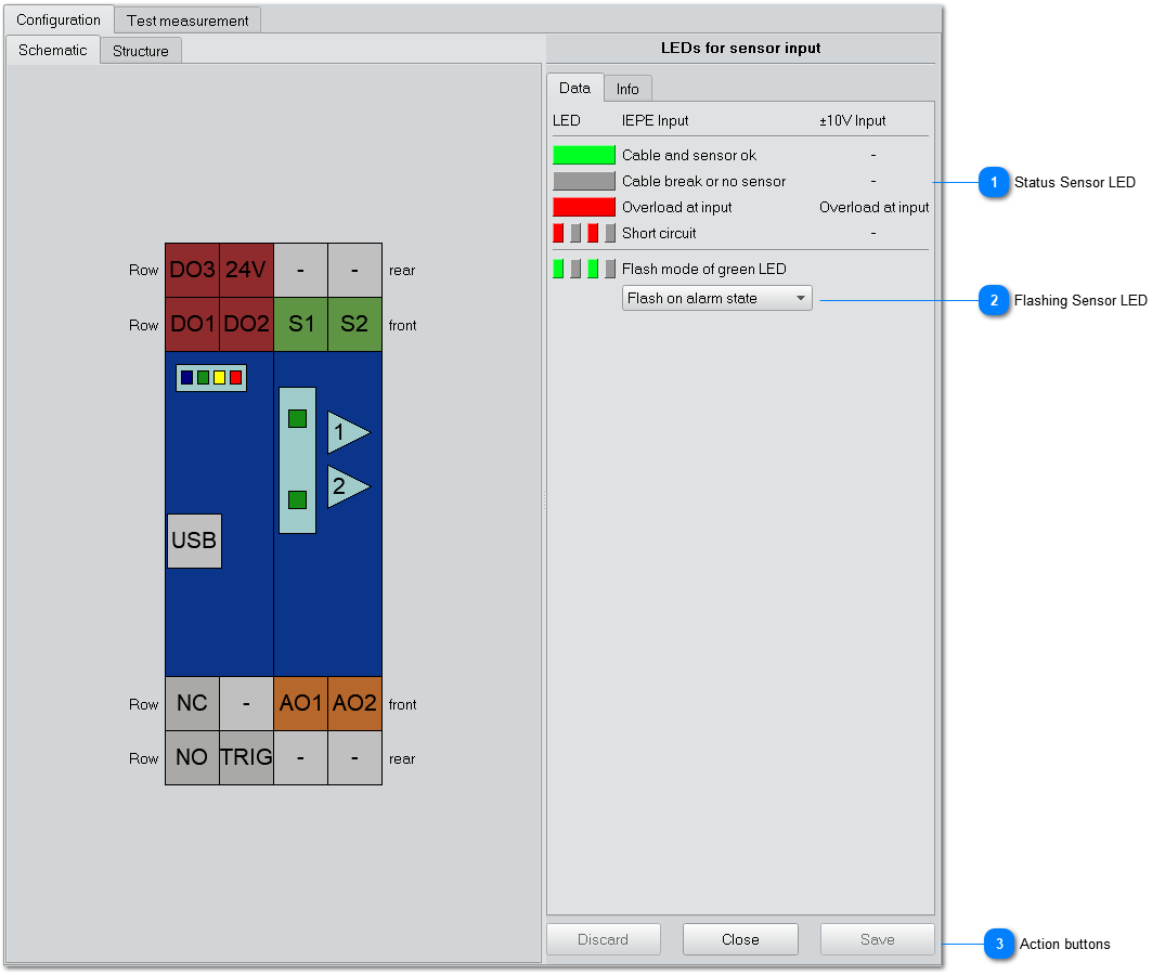
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Status Sensor LED

To call up the information about the status LEDs of the measurement inputs, click on the LEDs shown in the schematic view. In addition to information on colour- and flashing codes, it can be specified whether a pre- or alarm limit is to be signalled as a flashing green sensor LED. The setting is made for all measuring channels at the same time.

All settings are also listed in the structure view and can be edited from there.

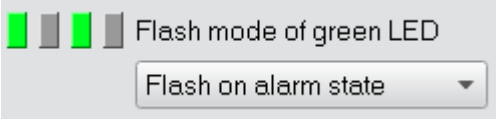


1 Status Sensor LED

LED	IEPE Input	±10V Input
	Cable and sensor ok	-
	Cable break or no sensor	-
	Overload at input	Overload at input
	Short circuit	-

The sensor LED indicates the current status of the sensor. Depending on whether the input is used as an IEPE input or +/- 10 V input, errors on the measuring section can be signalled by the LED.

2 **Flashing Sensor LED**



The sensor LED can also be used to detect the measuring channel with a warning or alarm violation. This setting is made for all measuring channels at the same time. In this way, exceeding a limit value can be immediately assigned to a sensor and thus to a measuring point.
If the flashing mode is not to be used, "No flashing" can be selected.

3 **Action buttons**

The action buttons can be used to change the configuration:

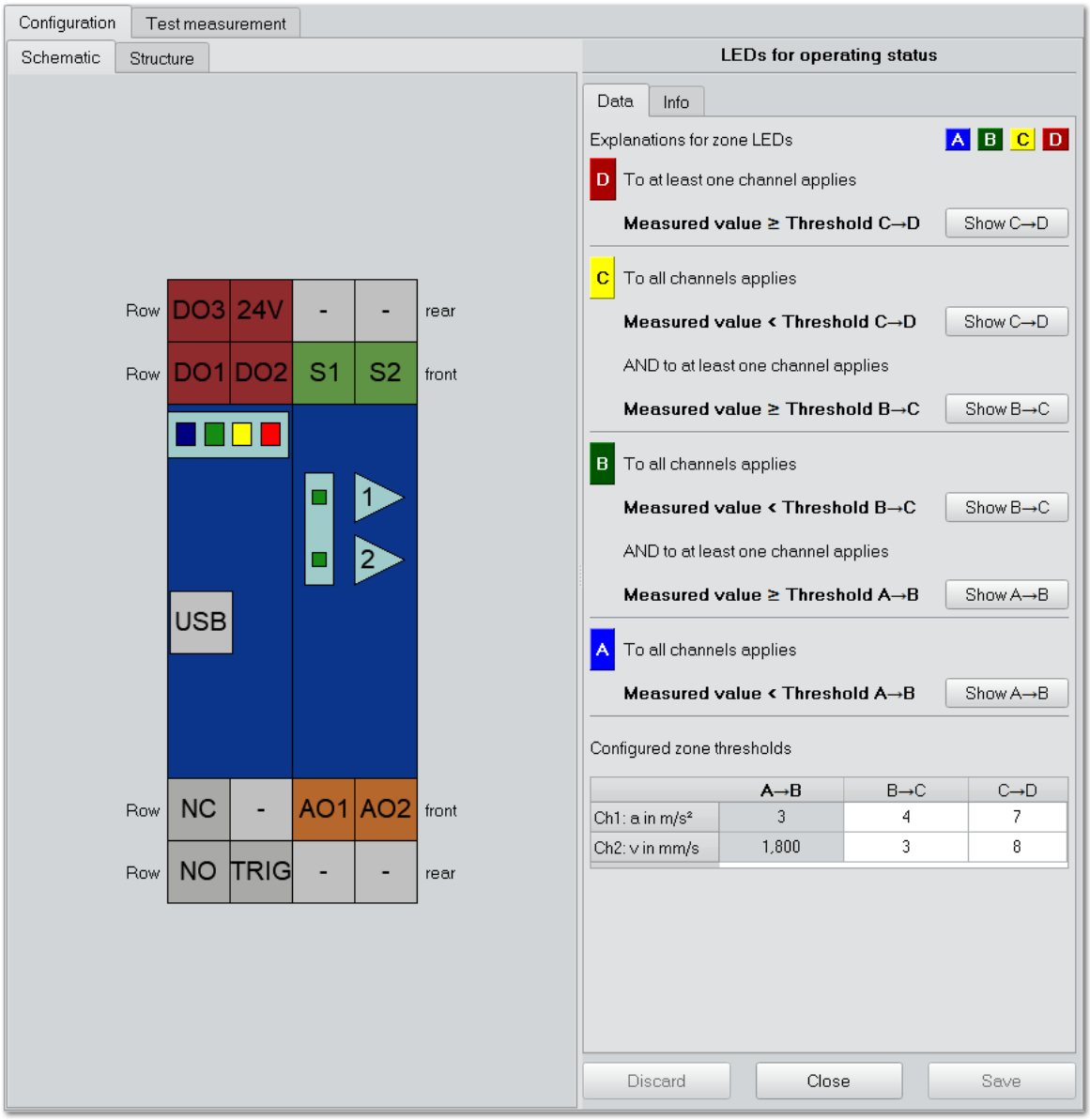
Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database and - if connected - immediately transferred to the device. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Zone-LEDs

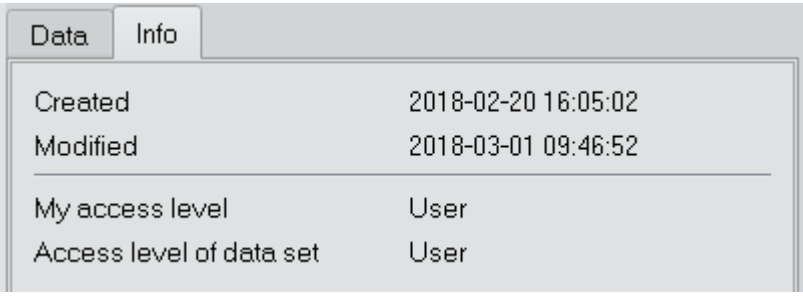
The current settings of the zone LEDs of all channels can be called up by clicking on the coloured LED series. The display is for information purposes only. No changes can be made.
The machine status represented by the zone LEDs represents the maximum value of all channels.
All zone LEDs flash at the same time when

- a data transfer from the configuration program to the device takes place
- a transient process occurs
- an internal error (e. g. overload, faulty DSP configuration).

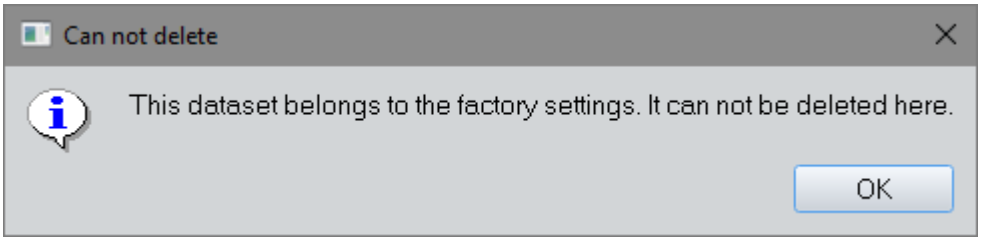


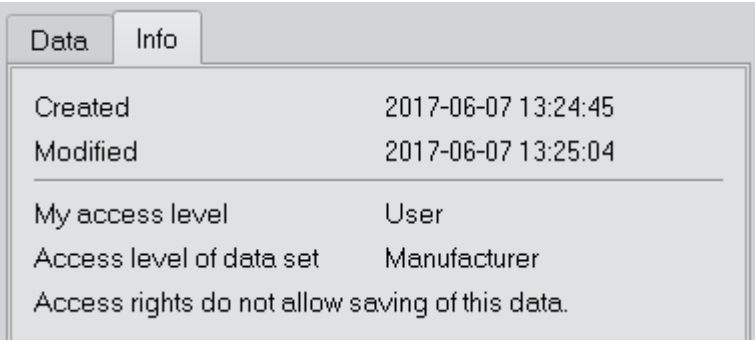
Data set information

Each properties menu contains a tab **Info**. This contains information on the creation date, change date, and the current access level of the user or dataset.



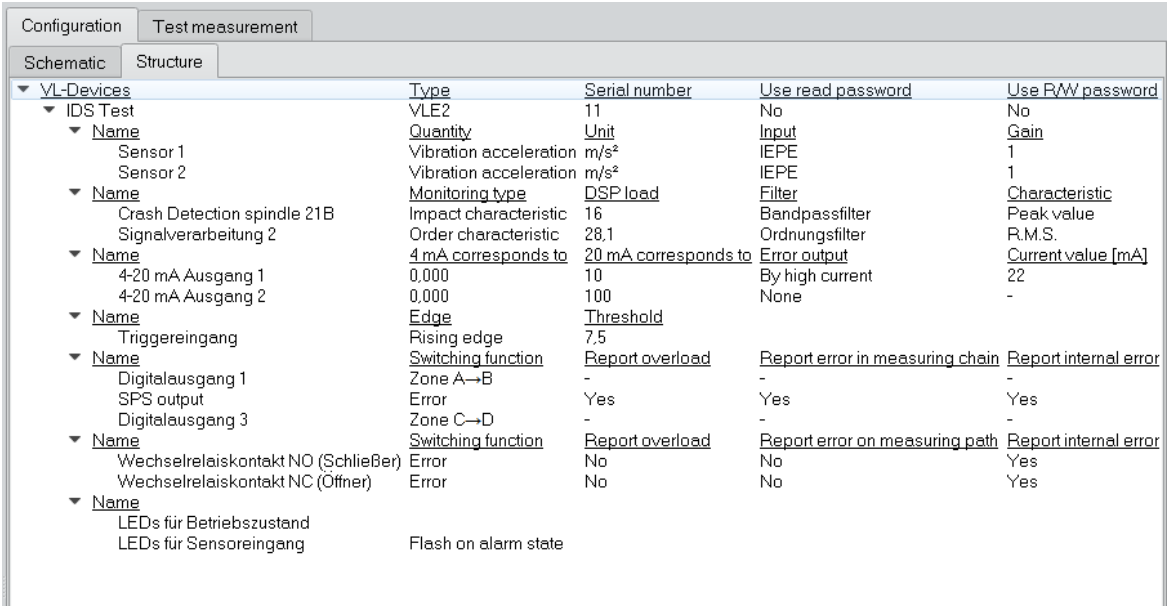
Data records can have the access levels **User** and **Manufacturer**. You cannot change or delete data records of type **Manufacturer** with access level **User**. This applies to the factory settings of the templates for filters, characteristic values and zone limits saved in the program. The program indicates this accordingly:



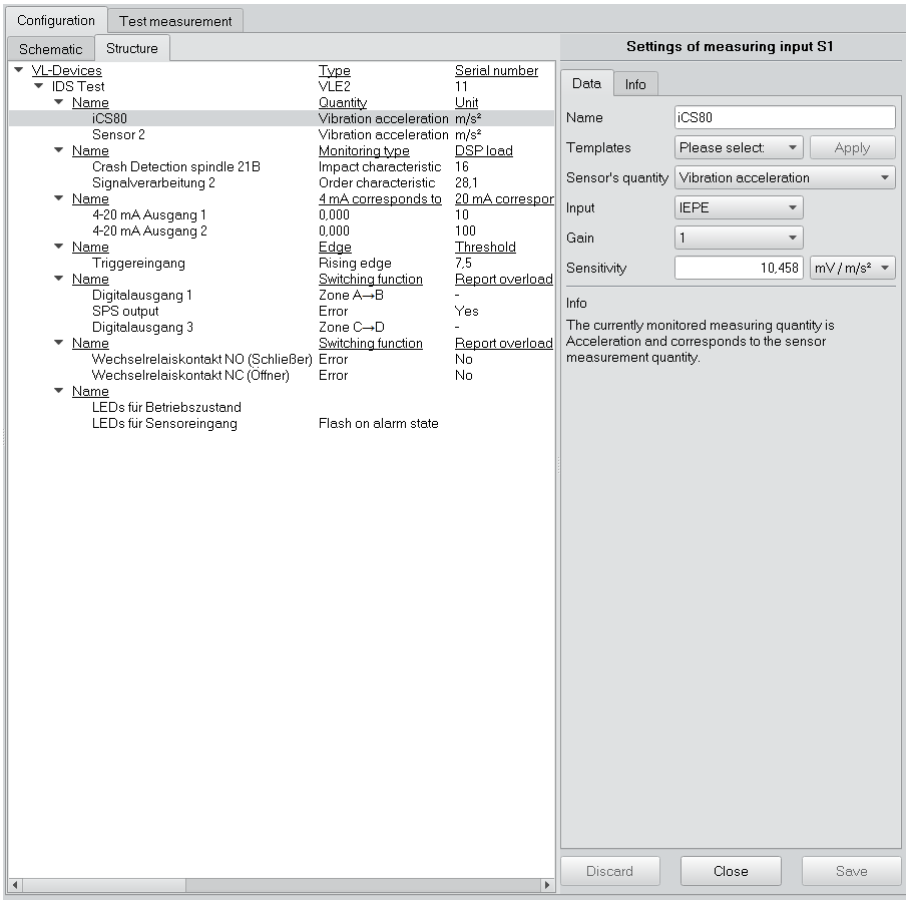


Structure view

All the settings made can are clearly shown in the structure view. The current settings are displayed for each configuration menu (sensor inputs, signal processing, analog outputs, etc.). In this way, the parameterization of many channels can be compared or controlled at a glance.



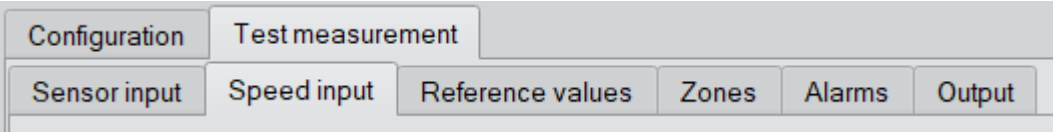
You can also change settings directly from the structure view. The line to be changed is selected and the corresponding configuration menu opens. The individual menus are explained in the sub-sections of the device configuration.



Test measurement

With the help of the VibroLine Konfigurator it is possible to obtain a live display of the currently measured vibration values. Prior to the autonomous operation of the VibroLine devices, the measuring channel amplifications, speeds or trigger states, zone and alarm limits as well as the scaling of the 4-20 mA analog output can be checked and, if necessary, adapted. During operation, the current vibration values can be displayed by means of the test measurement function.

The test measurement function is selected by selecting the "Test measurement" tab:

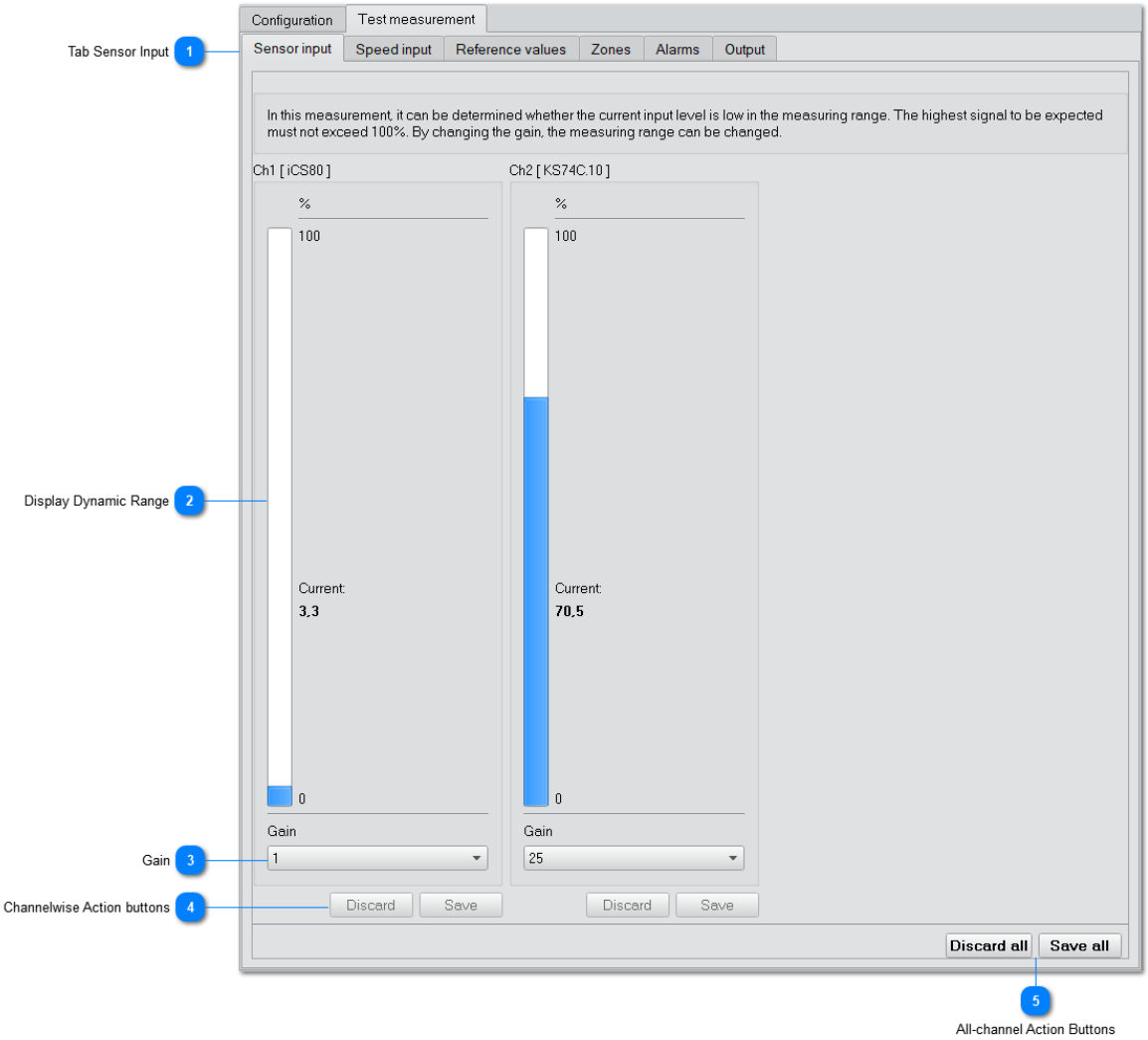


The following options are possible:

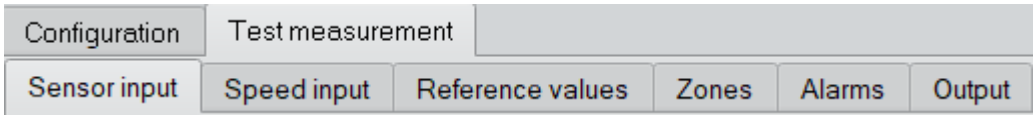
- Sensor input
- Speed input
- Reference values
- Zones
- Alarms
- Output

Sensor input

The suitability of the currently selected gain factor can be checked quickly and easily via the level indicators. The current input level is displayed for all measuring channels. If the level is too low or too high despite a change in gain, a sensor with higher or lower sensitivity should be used.
The amplification can be determined individually for each measuring channel.



1 Tab Sensor Input



The "Sensor Input" tab is selected to display the current level of all measurement channels.

2 **Display Dynamic Range**

The bar graph display shows the current level taking into account the selected gain of each measuring channel. This corresponds to 100% of the maximum voltage level of each input channel. The display sets this to 0.1. 40000 Hz band limited input signal (= maximum frequency range of the VibroLine devices). If very high (> 95%) or very small (< 1%) values are continuously displayed during operation, it is advisable to adjust the gain. If this is not possible, a sensor with lower or higher sensitivity should be used.

3 **Gain**

For each measuring channel the internal gain can be increased from 1 to 25. This increases the digitizing quality for very small signals. By increasing the gain, the dynamic range of the measuring channel decreases naturally, also by a factor of 25.

4 **Channelwise Action buttons**

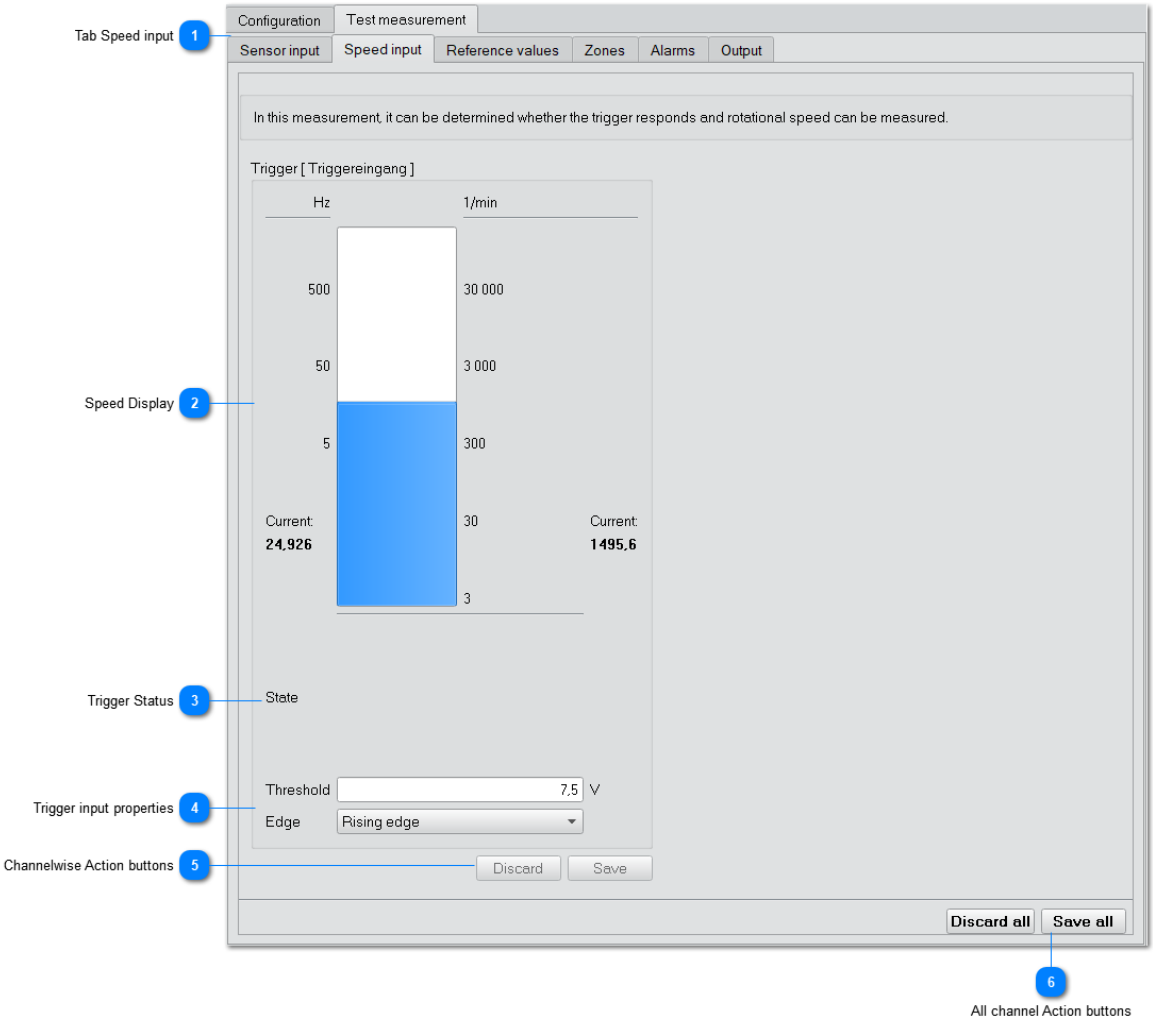
For each measuring channel, the change of the gain can be stored individually. If you want to cancel the change, you can choose Discard.

5 **All-channel Action Buttons**

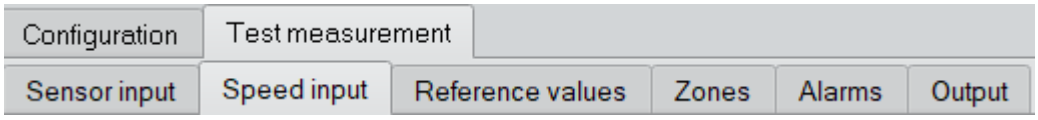
To save or discard the changes for all channels at the same time, the all-channel action buttons are used.

Speed input

The current speed or trigger state is displayed here together with the setting options of the trigger input on the VibroLine device.

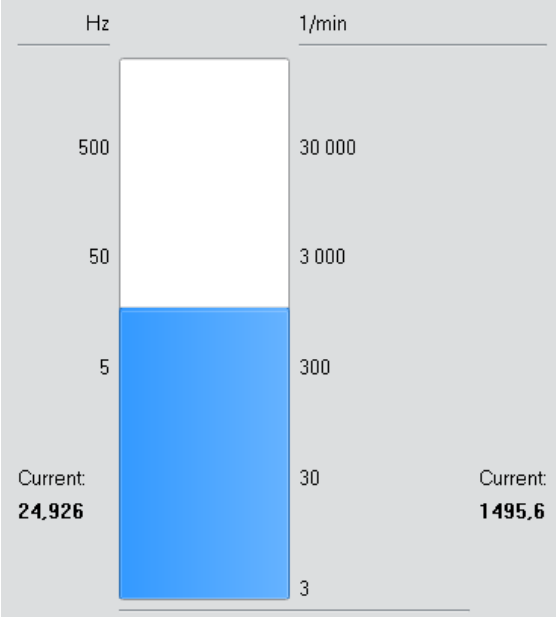


1 Tab Speed input



The "Speed input" tab is selected to display the current speed.

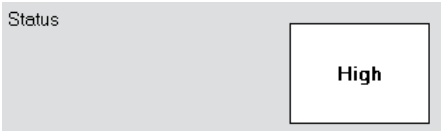
2 **Speed Display**



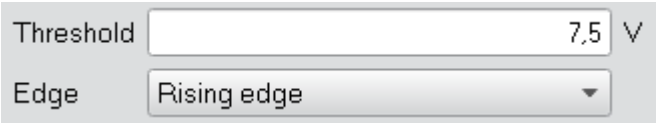
In the bar graph, the current speed is displayed numerically and as level. The speed is output in Hertz (Hz, left) and revolutions per minute (1/min, right). Please note that the bar graph is logarithmically scaled.

3 **Trigger Status**

If RPM are detected, the status field is empty. If no speed is detected, the current status of the trigger input is displayed (High - Low according to switching threshold):



4 **Trigger input properties**



The trigger input can be configured for different digital signals, so that the switching threshold or the switching edge can be easily adjusted in the measuring menu.

5 **Channelwise Action buttons**

Saves the settings. If you want to cancel the change, you can choose Discard.

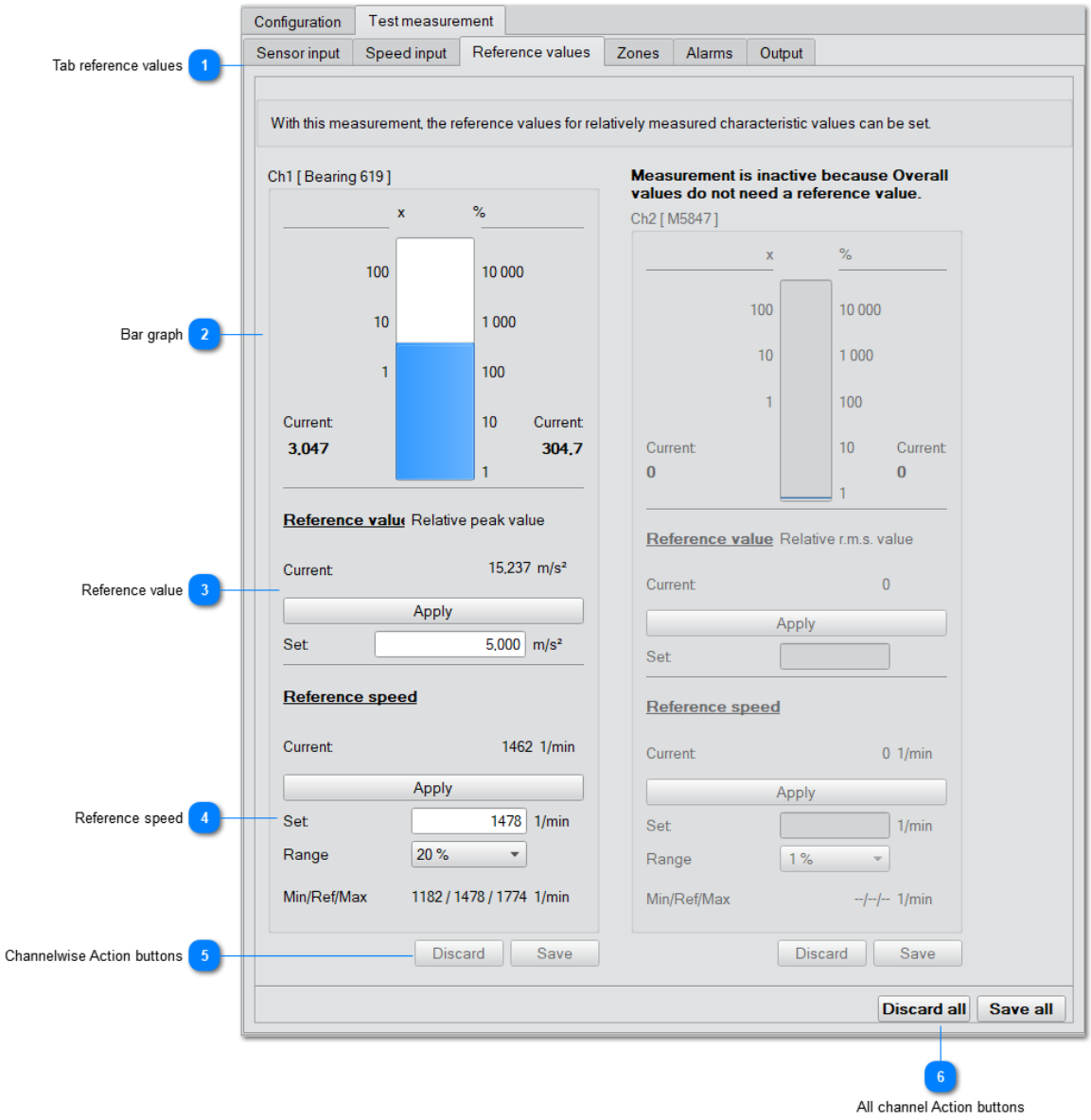
6 **All channel Action buttons**

To save or discard the changes for all channels at the same time, the all-channel action buttons are used.

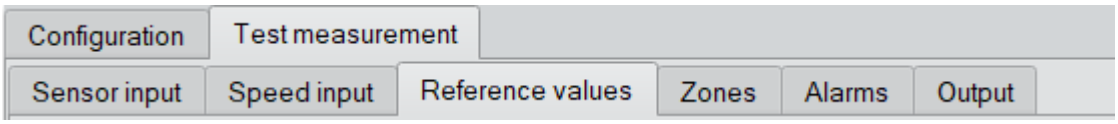
Reference values

Rolling bearing values are set in relation to initially set or measured values. The test measurement function "Reference values" enables the practical measurement of these values. The measurement procedure should be carried out with the bearing run in and undamaged. The reference speed can also be saved at the same time as the reference value is acquired (rolling bearing characteristic values can only be compared under the same operating conditions).

The bar graph also serves to graphically display the current rolling bearing characteristics.

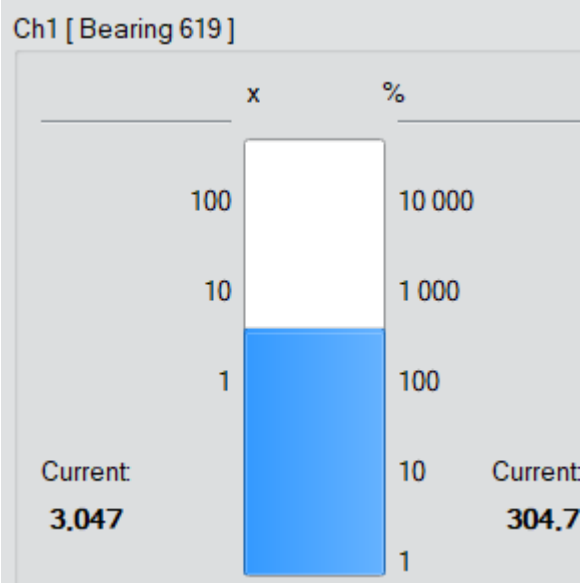


1 Tab reference values



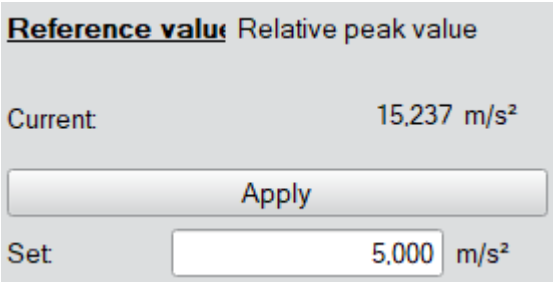
The "Reference value" tab is selected to display the current reference values.

2 **Bar graph**



The bar graph shows the current value of the bearing characteristic. Here a triple increase (304%) of the reference value would be present. The absolute value is shown on the left and the value in % on the right. Note that the axis scaling is logarithmic.

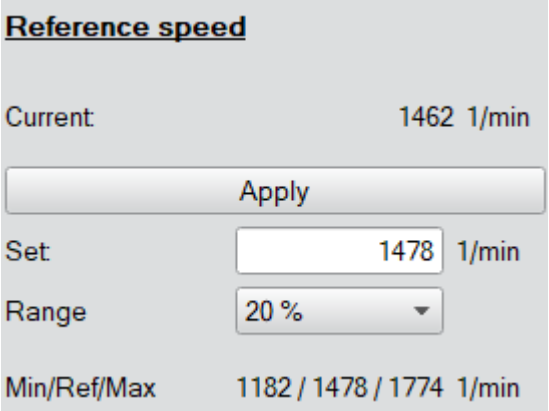
3 **Reference value**



Bearing characteristics are always referred to one value (reference value). The display shows the type of the current bearing characteristic (here relative peak value) and its current measured value (here 15.24 m/s²). If the OK state of the bearing is to be aligned with the current measured value, only click on *Apply*. The input box *Set* then accepts the current measured value. Of course, a reference value can also be entered numerically.

After defining the reference value, this value is left unchanged for the lifetime of the bearing and current measured values are normalized to the reference value (quotient = bearing characteristic value).

4 **Reference speed**



The formation of the bearing characteristic (that is, the comparison of the current values with the reference value) only makes sense if both values were recorded under the same operating conditions (speed, load, ...). For the VibroLine devices the parameter speed is saved. The value is saved either numerically in the input field *Set* or in the signal processing or via the test measurement function shown here. To do this, just click on the *Apply* button after entering the reference value (see above). The current speed is taken.

Since speeds are not arbitrarily constant, a speed range (in percent around the nominal speed) can be defined.

If the valid speed window is left, "0" is output as measured value to signal that no meaningful result can be calculated. In addition, an error can be output when leaving the speed range ("Signal measurement problem").

If measured values are also to be calculated at any speed, the selection "ignore" can be made (not recommended).

5 **Channelwise Action buttons**

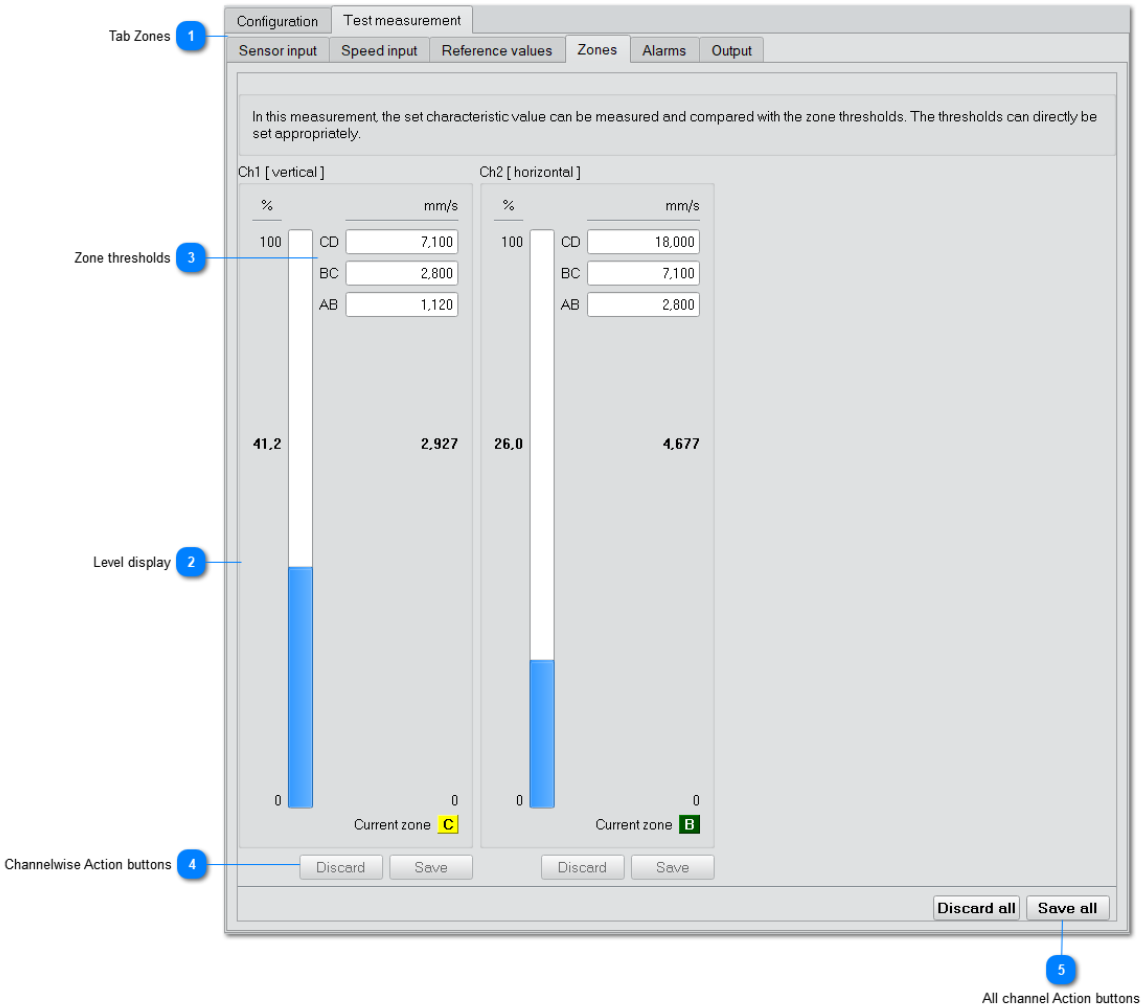
Saves the settings. If you want to cancel the change, you can choose Discard.

6 **All channel Action buttons**

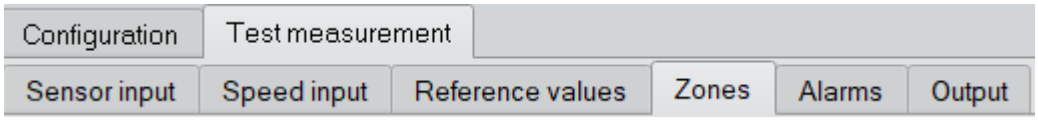
To save or discard the changes for all channels at the same time, the all-channel action buttons are used.

Zones

The zone limits are displayed here together with the current vibration level. In this way, zone classification can be done at a glance. If necessary, the zone limits can be adjusted. Individual zone limits can be defined for each measuring channel.

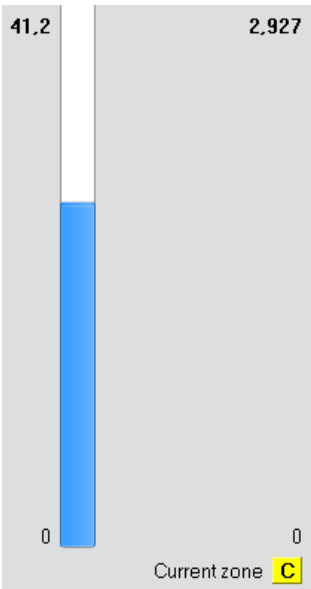


1 Tab Zones



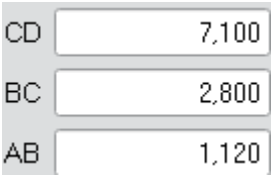
The "Zones" tab is selected to display the current vibration level of all measurement channels.

2 **Level display**



The level display shows the currently measured value of the characteristic value of the configured signal processing. On the left the value is given in %, on the right in the unit of the selected characteristic value. 100% correspond to the zone transition C/D. The evaluation zone corresponding to the current amplitude is displayed at the bottom right.

3 **Zone thresholds**



The currently set zone limits are shown here. For machine classes outside the relevant standards (e. g. ISO 10816 / 20816) or if free zone limits are selected, the values can be adjusted here with regard to the current vibration levels.

4 **Channelwise Action buttons**

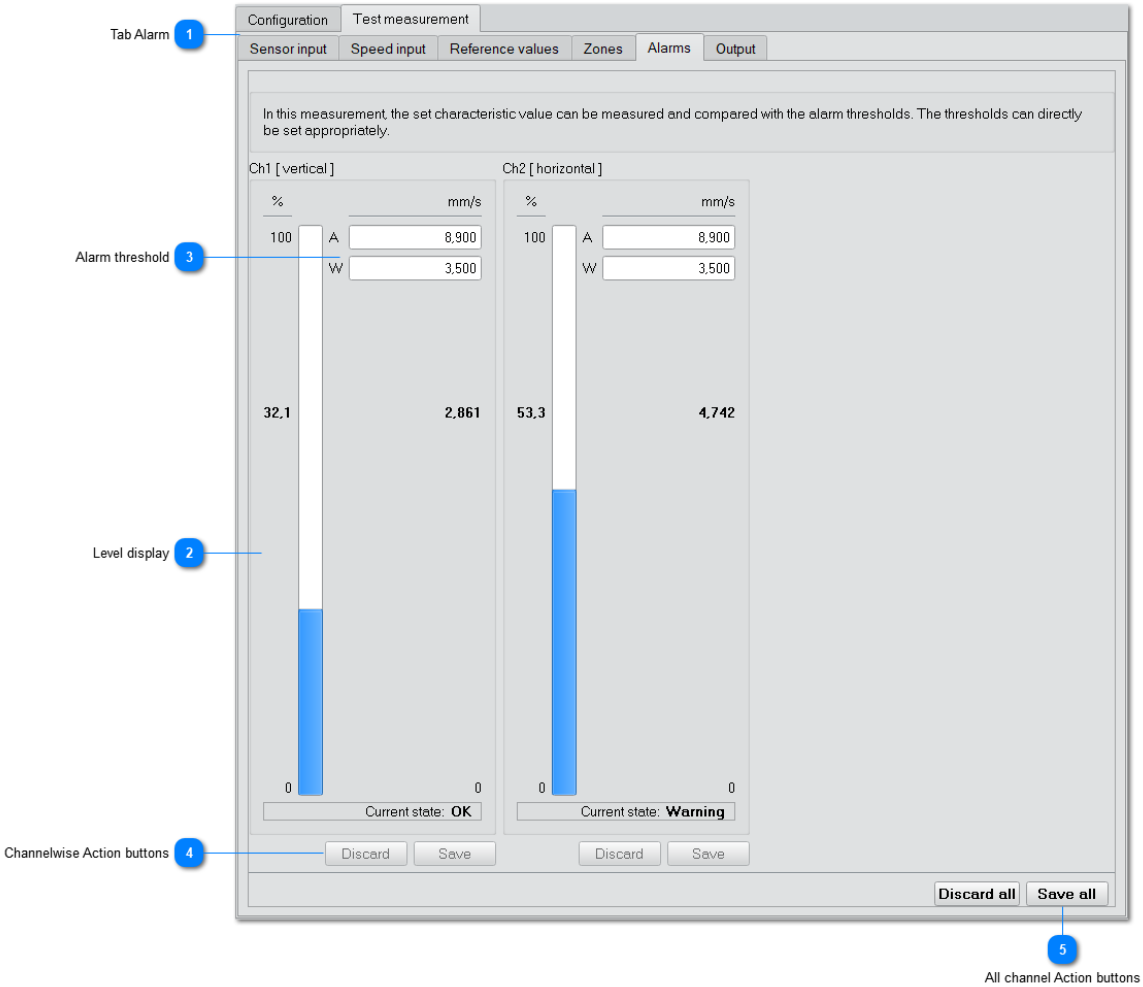
For each measuring channel, the change of the zone limits can be saved individually. If you want to cancel the change, you can choose Discard.

5 **All channel Action buttons**

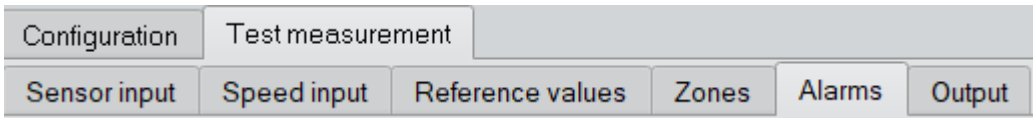
To save or discard the changes for all channels at the same time, the all-channel action buttons are used..

Alarms

The currently occurring vibration level is displayed in the alarm calibration menu together with the defined alarm limits. In this way, the determination of the baseline (see below) which is necessary for determining the alarm can easily take place. Individual alarm limits can be set for each channel.

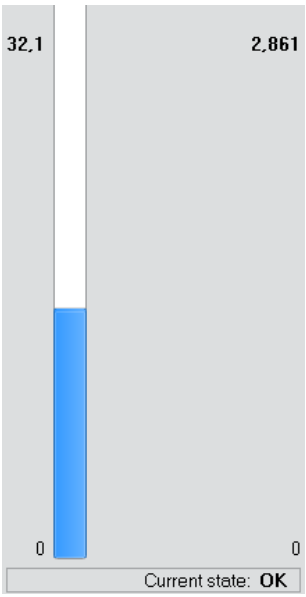


1 Tab Alarm



The "Alarms" tab is selected to display the current vibration levels of all measurement channels.

2 Level display



The level display shows the currently measured value of the characteristic value of the configured signal processing. On the left the vibration level is given in %, on the right in the unit of the selected characteristic value. 100% corresponds to the value of the main alarm (HA). The alarm assignments corresponding to the current amplitude are displayed in the lower area.

3 Alarm threshold

The values for the warning (W) and the alarm (A) can be adjusted here with regard to the current vibration levels.

Alarm:
This value must be determined individually for each machine. In many parts of ISO 10816 it is suggested that the switch-off value should not be higher than 1.25 x zone C/D limit value.

Warning:
This value must be determined individually for each machine. In many parts of DIN ISO 10816 it is suggested to determine the alarm value according to the following rule:

Alarm = baseline + *p* x threshold Zone B/C.
Note: $0 < p < 1$.

The baseline depends on the respective machine, the measuring location and the measuring direction. It must be determined individually for each monitoring channel.

In general, the alarm value should not be higher than 1.25 zone limit B/C.

4 **Channelwise Action buttons**

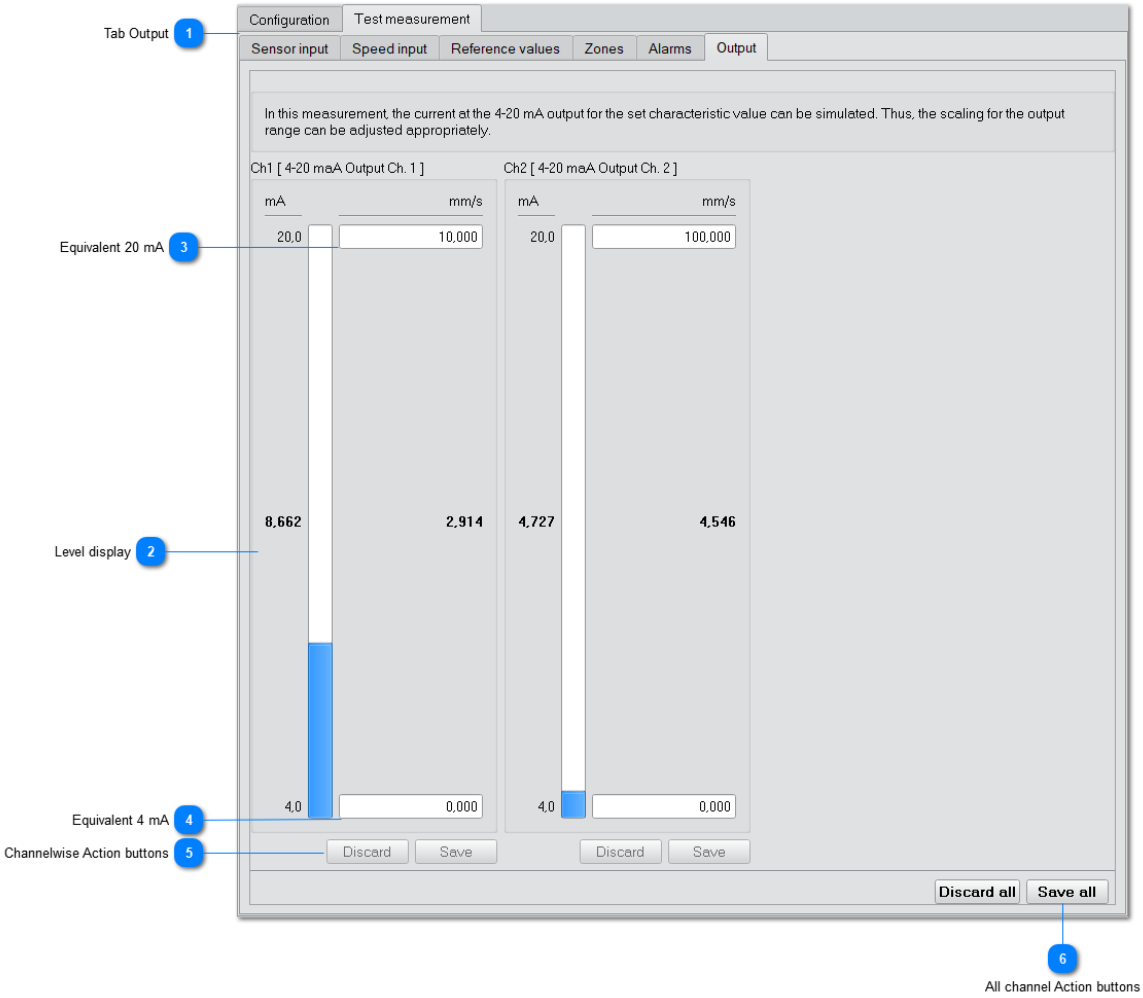
For each measuring channel, the changes of the alarm values can be stored individually. If you want to cancel the change, you can choose Discard.

5 **All channel Action buttons**

To save or discard the changes for all channels at the same time, the all-channel action buttons are used.

Output

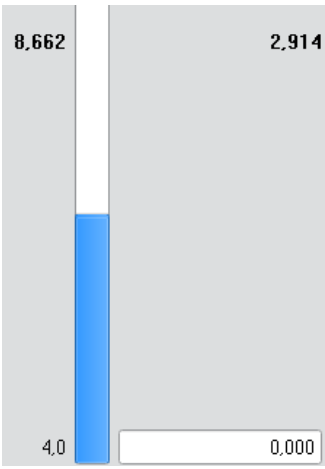
The scaling of the 4-20 mA analog output can be adapted to the available vibration values. The level indicator allows you to quickly and easily determine the 4 or 20 mA equivalents of the vibration signal. The scaling can be carried out individually for each measuring channel.



1 Tab Output

The "Output" tab is selected to display the current vibration levels and the 4-20 mA scaling of all measuring channels.

2 **Level display**



The level display shows the currently measured value of the characteristic value of the configured signal processing. On the left the deflection is given in mA, on the right in the unit of the selected characteristic value.

3 **Equivalent 20 mA**

The scaling of the analog output can be set. The value of the measured variable set in signal processing is defined, which corresponds to a current of 20 mA.

4 **Equivalent 4 mA**

The scaling of the analog output can be set. The value of the measured variable set in signal processing is defined, which corresponds to a current of 4 mA.

5 **Channelwise Action buttons**

The change of the current outputs can be saved individually for each measuring channel. If you want to cancel the change, you can choose Discard.

6 **All channel Action buttons**

To save or discard the changes for all channels at the same time, the all-channel action buttons are used.

Template creation and management

All settings of VibroLine devices can be saved as a template. This allows often used parameter sets to be quickly and easily transferred to new devices. The following parameter sets can be saved in detail:

- Complete devices

- Sensor inputs
- Trigger input
- Analog outputs
- Analog error output
- Digital outputs
- Relay

- Bandpass filter (general)
- Bandpass filter (impact)
- Bandpass filter (Bearings general)
- Bandpass filter (Bearings BCC)
- Order filter

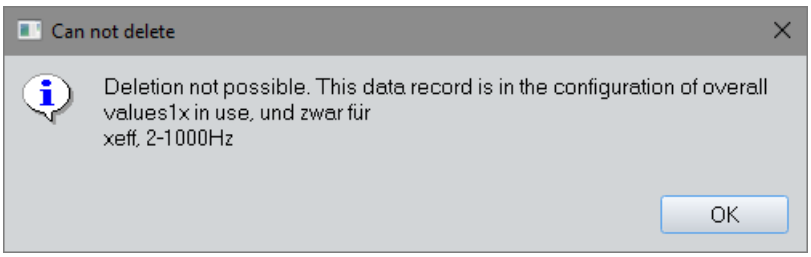
- Overall values
- Order characteristics
- Impact characteristics
- Bearing characteristics

- Alarm thresholds
- Zone thresholds

In addition, complete device templates can also be exported and imported. This means that a compiled data set can be quickly integrated into another program database.
Note: Passwords are not included in the export.

The device templates and examples of the sensor input and zone threshold templates are explained below. All other templates have a very similar processing principle.

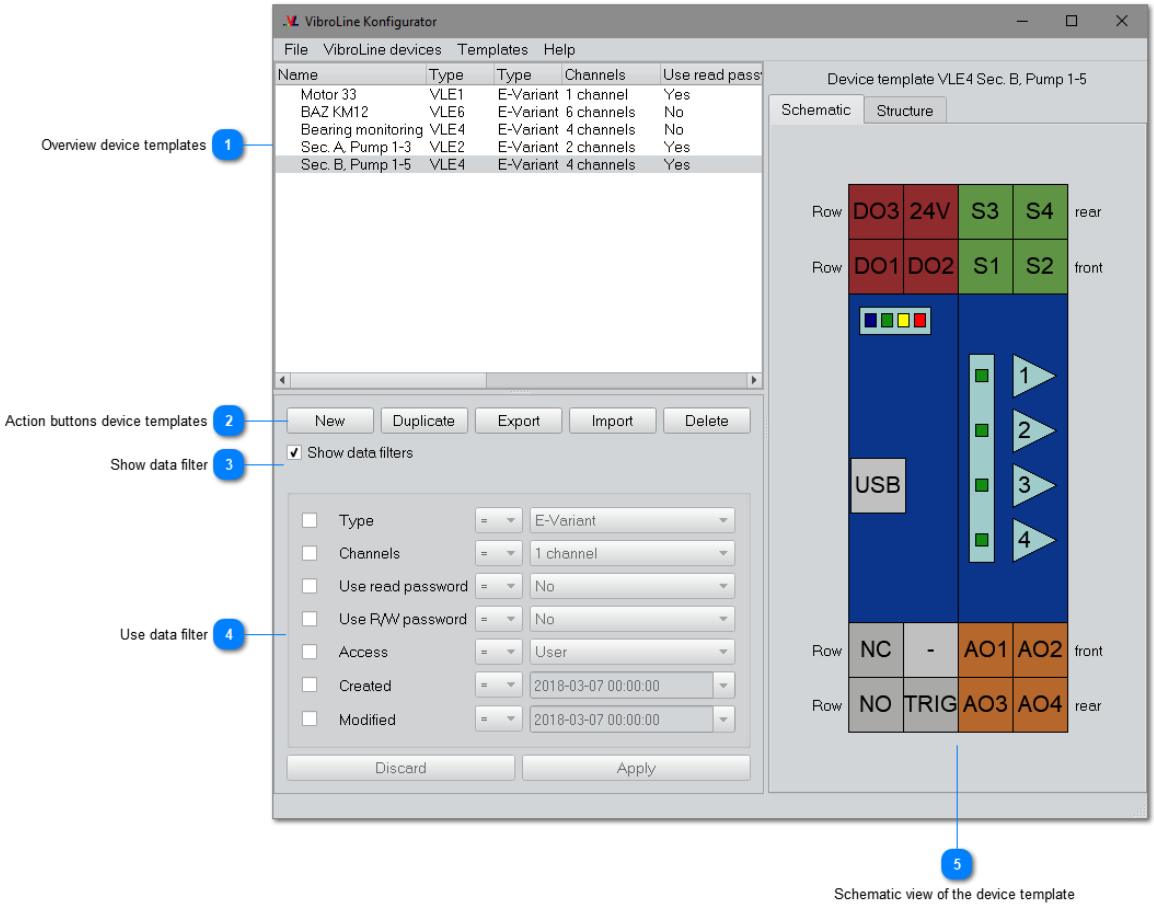
Some templates refer to other templates. For example, overall value templates require the specification of a bandpass filter template. If you want to delete the underlying bandpass filter template, this is prevented by an indication of the actual usage:



The overall value template must first be deleted.

Device Templates

Device templates reflect the complete image of a VibroLine device. For example, a consistent configuration can be quickly transferred to other VibroLine devices. All device parameters can be individually adjusted in the template.



1 Overview device templates

Name	Type	Type	Channels	Use read pass
Motor 33	VLE1	E-Variant	1 channel	Yes
BAZ KM12	VLE6	E-Variant	6 channels	No
Bearing monitoring	VLE4	E-Variant	4 channels	No
Sec. A, Pump 1-3	VLE2	E-Variant	2 channels	Yes
Sec. B, Pump 1-5	VLE4	E-Variant	4 channels	Yes

The overview contains all created device templates. For this purpose, the assigned name, type, number of channels and password protection are listed.

2 **Action buttons device templates**

New device templates can be created as follows:

- Create device template from the device overview
- Create a new (empty) device template using the **NEW** action button
- Multiply an existing device template using the **Duplicate** action button.

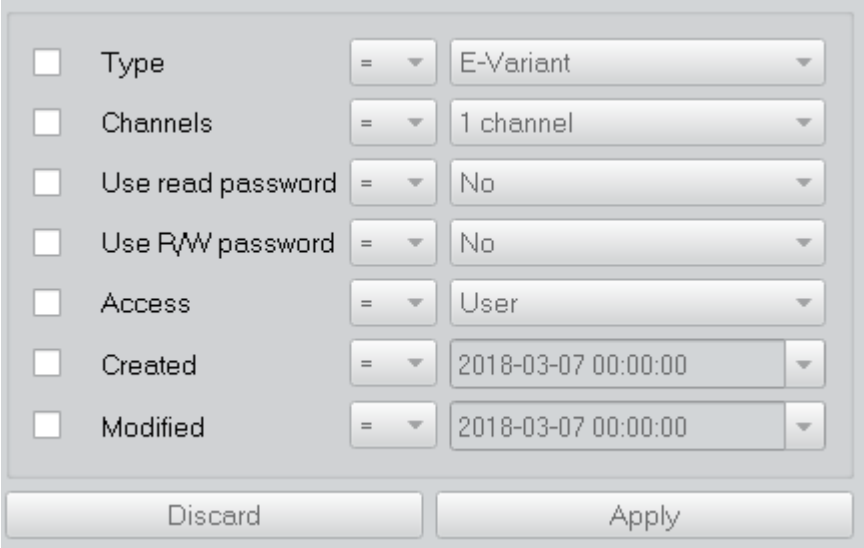
A device template is removed (without confirmation) after clicking on **Delete**.

To export a device template, select the corresponding action button (**Export**). A file dialog appears in which the file name and path of the device template file (*. vldbr) can be defined. For an import (**Import**) with the file dialog a template file is selected and opened.

3 **Show data filter**

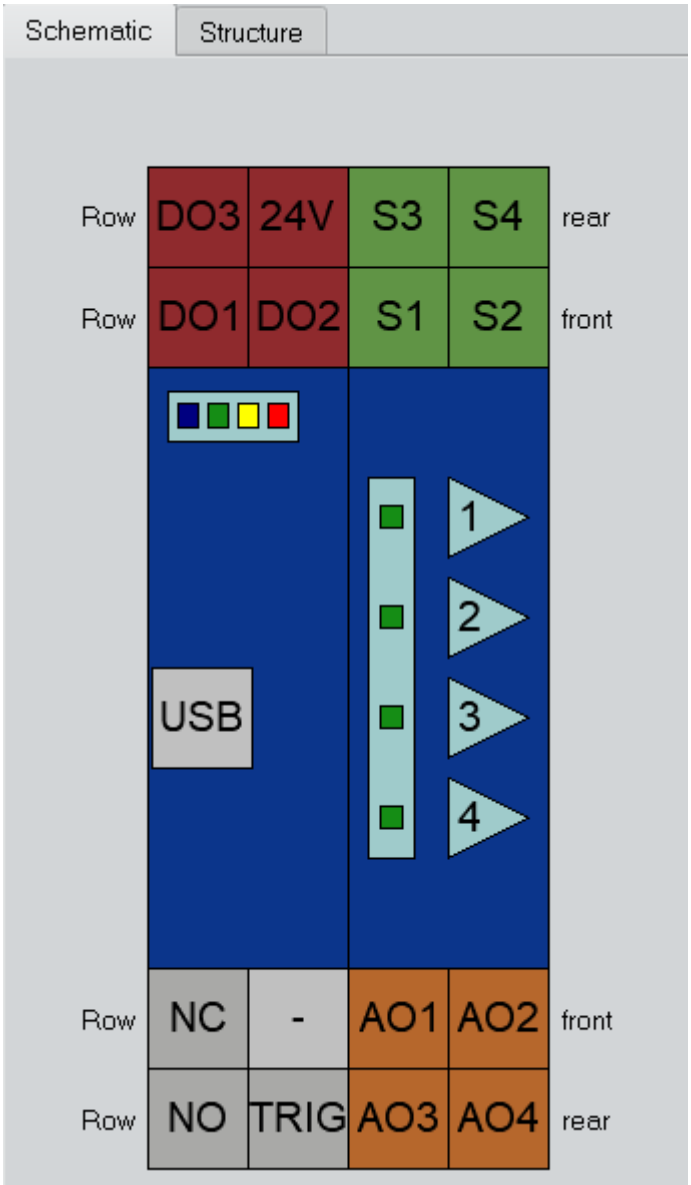
To control the selection of displayed device templates a data filter can be set by activating the check mark.

4 **Use data filter**



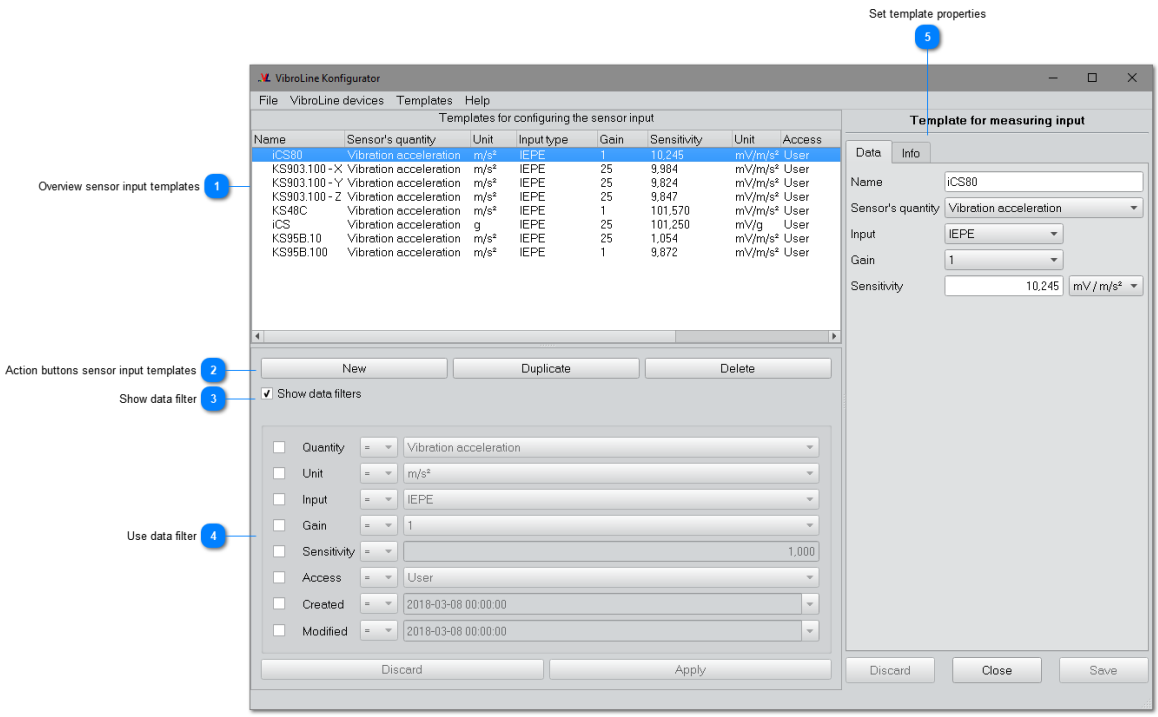
The existing device templates can be filtered according to various criteria (see picture). The desired filter category is activated by checking the box and the desired criterion and a comparison operator are selected (=, >, <, >=, <=, <>). Clicking on **Apply** sets the filter, **Discard** resets the filter selection.

5 **Schematic view of the device template**



The device template can be adapted by the schematic representation of the VibroLine device (similar to the device configuration). The structure view can also be used for viewing and editing parameters.

Example Sensor input



1 Overview sensor input templates

Name	Sensor's quantity	Unit	Input type	Gain	Sensitivity	Unit	Access
iCS80	Vibration acceleration	m/s²	IEPE	1	10,245	mV/m/s²	User
KS903.100 - X	Vibration acceleration	m/s²	IEPE	25	9,984	mV/m/s²	User
KS903.100 - Y	Vibration acceleration	m/s²	IEPE	25	9,824	mV/m/s²	User
KS903.100 - Z	Vibration acceleration	m/s²	IEPE	25	9,847	mV/m/s²	User
KS48C	Vibration acceleration	m/s²	IEPE	1	101,570	mV/m/s²	User
iCS	Vibration acceleration	g	IEPE	25	101,250	mV/g	User
KS95B.10	Vibration acceleration	m/s²	IEPE	25	1,054	mV/m/s²	User
KS95B.100	Vibration acceleration	m/s²	IEPE	1	9,872	mV/m/s²	User

The overview contains all created sensor input templates. For this purpose, the most relevant data (name, measurement type, sensitivity,...) are given.

2 Action buttons sensor input templates

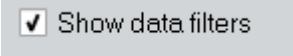
New | Duplicate | Delete

New sensor input templates can be created as follows:

- Create a new (empty) sensor input template using the **NEW** action button
- Multiply an existing sensor input template using the **Duplicate** action button.

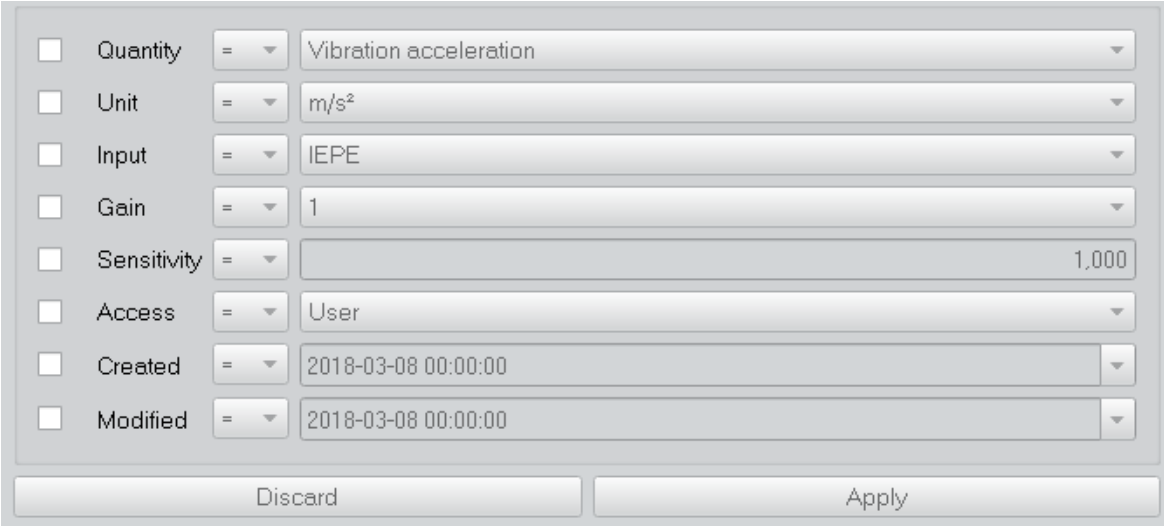
A sensor input template is deleted (without confirmation) after clicking on **Delete**.

3 **Show data filter**



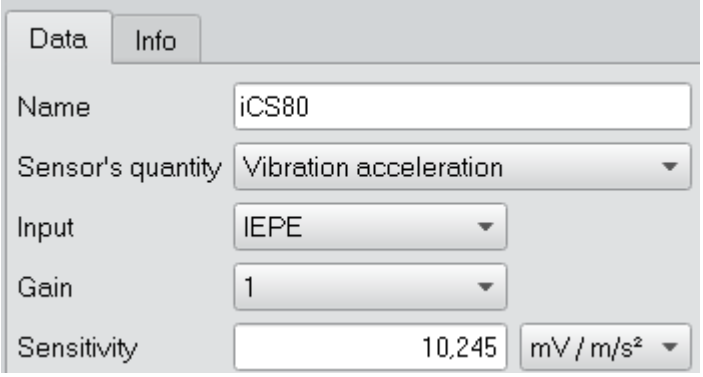
To control the selection of displayed device templates a data filter can be set by activating the check mark.

4 **Use data filter**



The existing templates can be filtered according to various criteria (see picture). The desired filter category is activated by checking the box and the desired criterion and a comparison operator are selected (=, >, <, >=, <=, <>). Clicking on **Apply** sets the filter, **Discard** resets the filter selection.

5 **Set template properties**



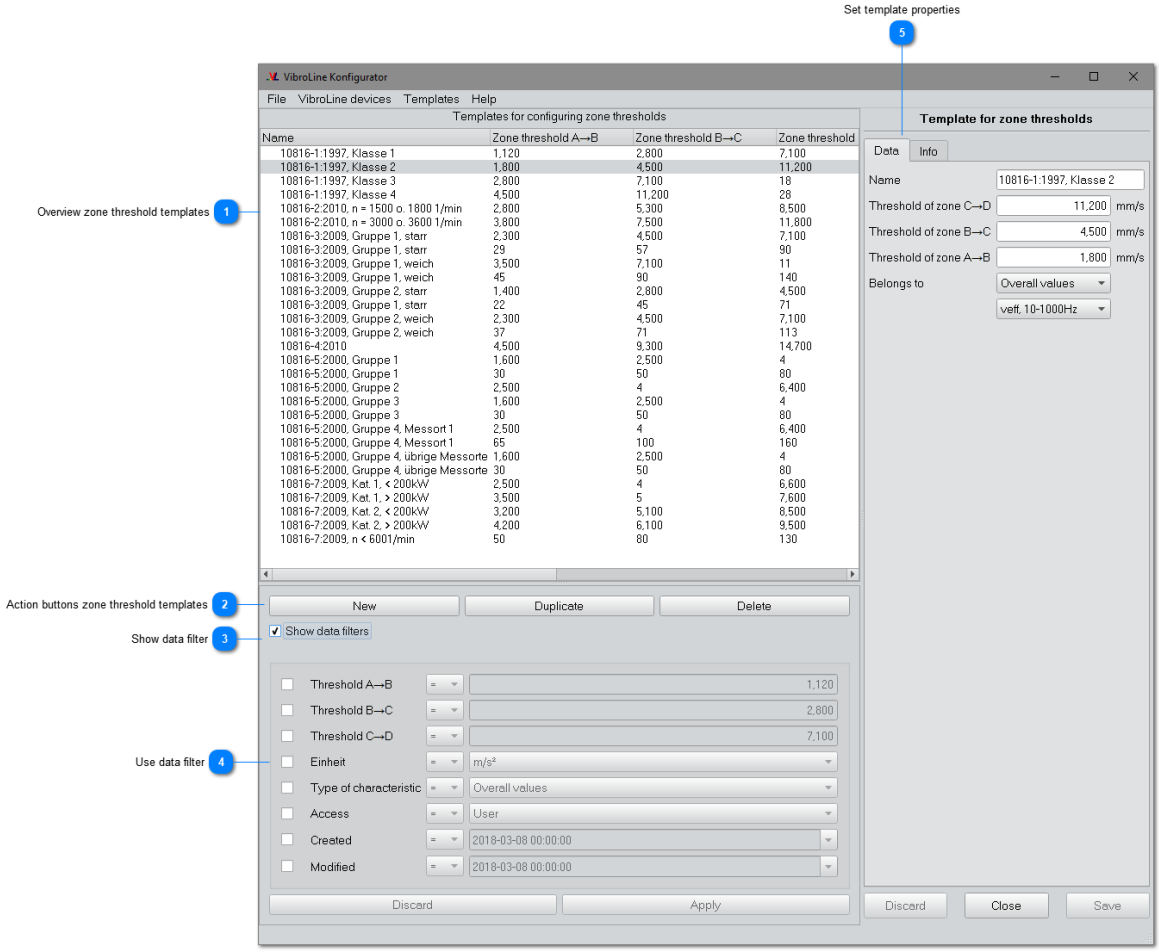
New or existing sensor input templates can be edited using this menu.

The action buttons can be used to change the configuration:

Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Example Zone thresholds



1 Overview zone threshold templates

Name	Zone threshold A→B	Zone threshold B→C	Zone threshold
10816-1:1997, Klasse 1	1,120	2,800	7,100
10816-1:1997, Klasse 2	1,800	4,500	11,200
10816-1:1997, Klasse 3	2,800	7,100	18
10816-1:1997, Klasse 4	4,500	11,200	28
10816-2:2010, n = 1500 o. 1800 1/min	2,800	5,300	8,500
10816-2:2010, n = 3000 o. 3600 1/min	3,800	7,500	11,800
10816-3:2009, Gruppe 1, starr	2,300	4,500	7,100
10816-3:2009, Gruppe 1, starr	29	57	90
10816-3:2009, Gruppe 1, weich	3,500	7,100	11
10816-3:2009, Gruppe 1, weich	45	90	140
10816-3:2009, Gruppe 2, starr	1,400	2,800	4,500
10816-3:2009, Gruppe 1, starr	22	45	71
10816-3:2009, Gruppe 2, weich	2,300	4,500	7,100
10816-3:2009, Gruppe 2, weich	37	71	113

The overview contains all created zone threshold templates. The template name and the zone limits are listed.

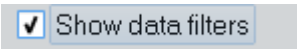
2 **Action buttons zone threshold templates**

New zone threshold templates can be created as follows:

- Create a new (empty) zone threshold template using the **NEW** action button
- Multiply an existing zone threshold template using the **Duplicate** action button.

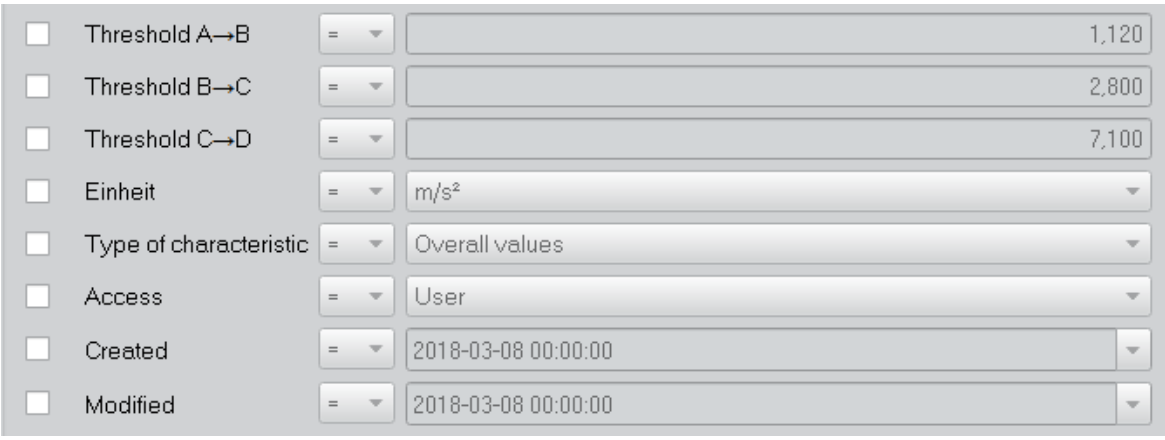
A zone threshold template is deleted (without confirmation) after clicking on **Delete**.

3 **Show data filter**



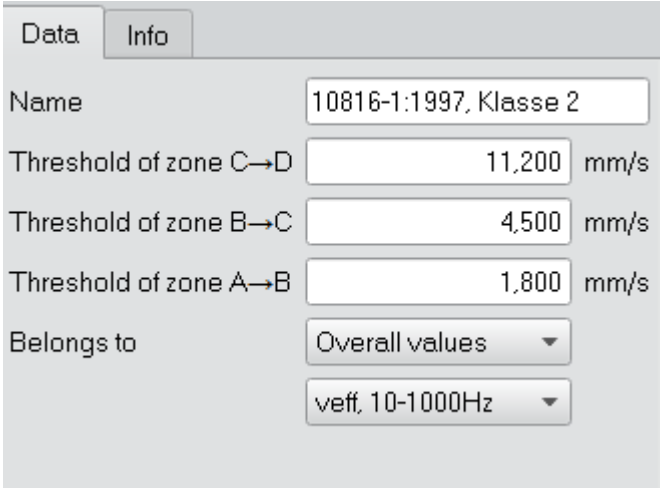
To control the selection of displayed device templates a data filter can be set by activating the check mark.

4 **Use data filter**



The existing templates can be filtered according to various criteria (see picture). The desired filter category is activated by checking the box and the desired criterion and a comparison operator are selected (=, >, <, >=, <=, <>). Clicking on **Apply** sets the filter, **Discard** resets the filter selection.

5 **Set template properties**



New or existing zone threshold templates can be edited using this menu. Since zone thresholds are a unit-linked variable, a reference value template must be assigned (**Belongs to**).

The action buttons can be used to change the configuration:

Discard - Restores the previous state (call up the configuration view).
Cancel / Close - All changes made are ignored and the configuration view is closed.
Save - The changes made are saved in the database. The configuration view closes.

If the entries do not mean a change in the properties stored so far, only the **Close** action is offered.

Program settings

1 Database filepath

Database C:/ProgramData/Innomic/VLConfig 2.0/VL.db

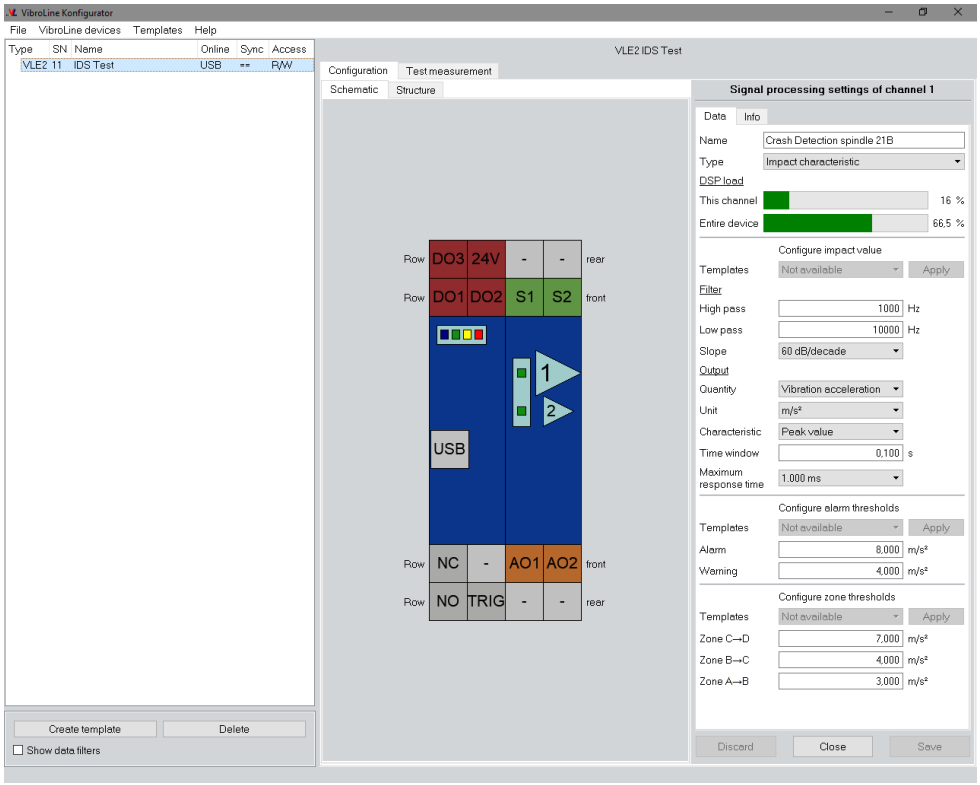
The currently used database and its file path are displayed. Access to the database with third-party programs is not possible due to encryption.

2 Themes

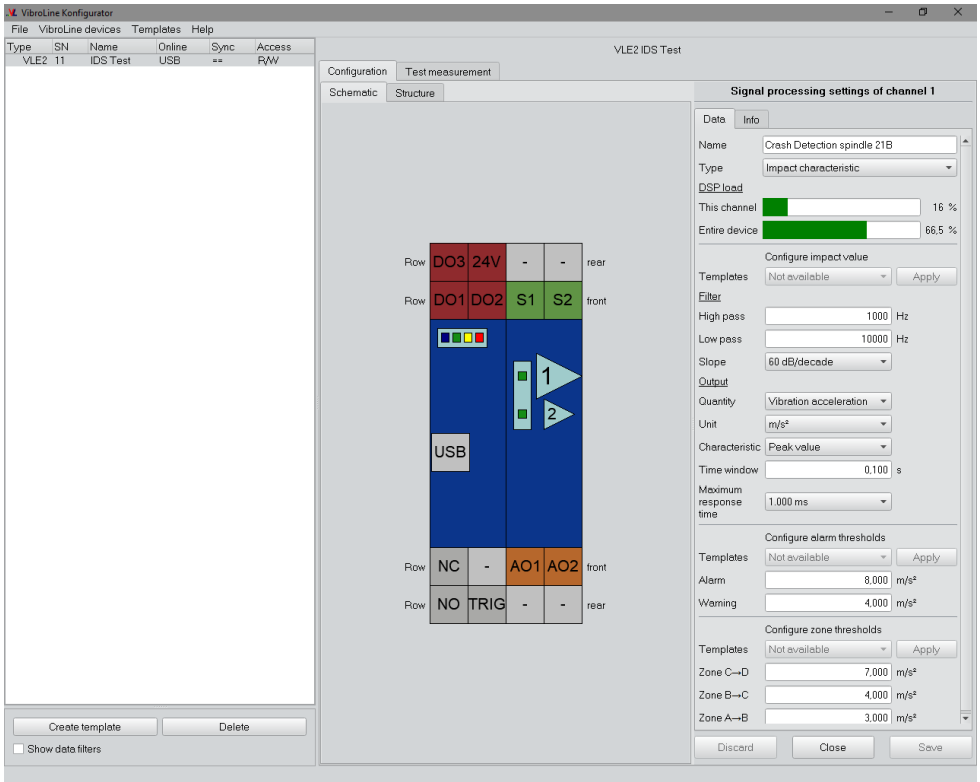
Look Fusion

The appearance of the VibroLine configuration program can be adjusted.
The themes *Classic*, *Fusion* and *Stone* are available. The appearance is changed after pressing the OK button.

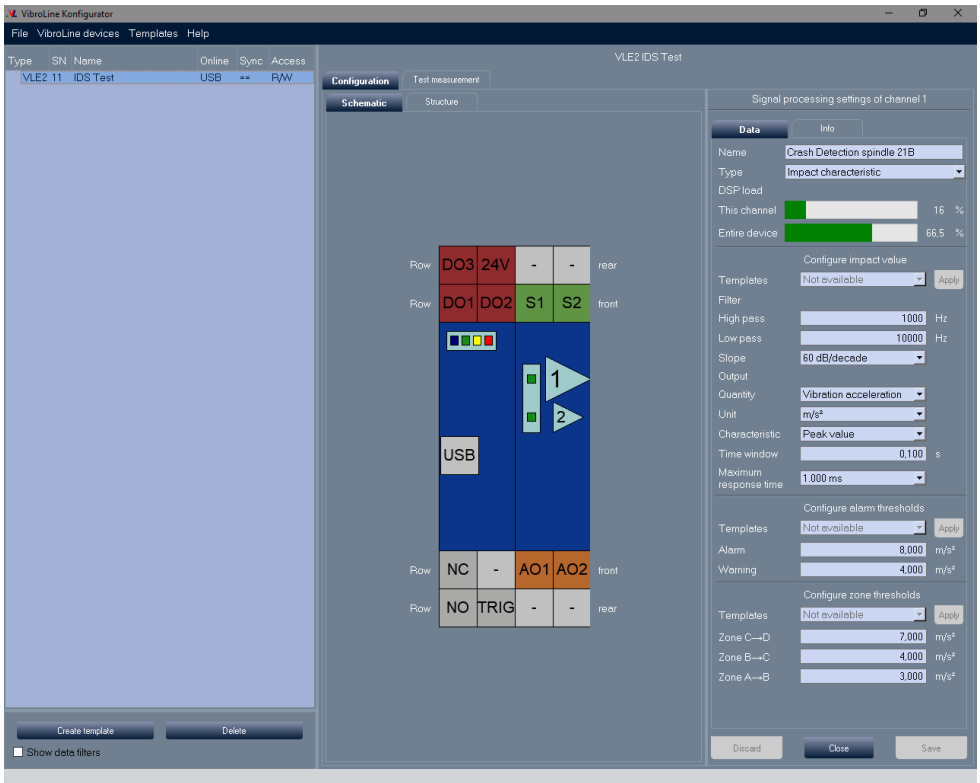
Look Classic:



Look Fusion:



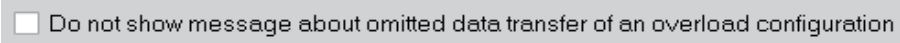
Look Stone:



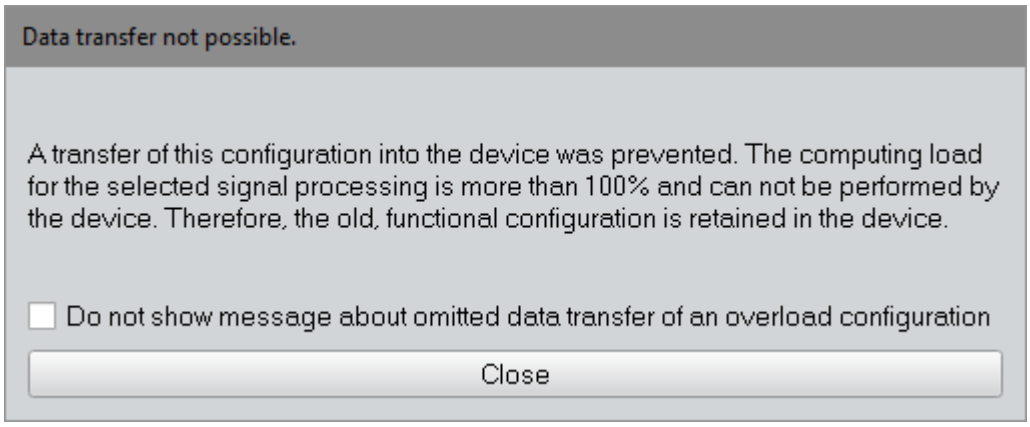
3 **Language**

The VibroLine configurator is initially available in German and English. Switching is done via the dropdown box.

4 **Message omitted data transfer**



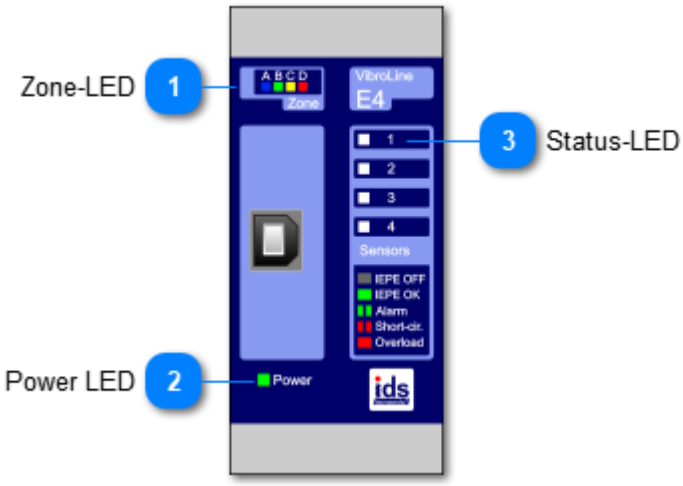
If a signal processing is selected that exceeds the permissible DSP load of the entire device (> 100%), a message appears that the data transfer cannot be carried out. The appearance of this message can be suppressed by setting the check mark.



Operation

When the operating voltage is switched on, the transient response of the digital filters is indicated by a fast flashing of the zone LEDs. The transient response depends on the selected high pass filter frequency value. For this period, all outputs are also deactivated to prevent false alarms (except for internal errors). However, the transient response can be monitored by means of the test measurement. **The ready-to-operate status of the VibroLine device is indicated by a single zone LED.**

During operation, all sensor inputs are analyzed and evaluated in parallel. Alarms are sent to the 3 digital outputs and/or the change-over relay in accordance with the specified limit values. The process variable outputs provide an individually configurable 4-20 mA current loop signal.
The current status of the vibration monitoring is signalled by the VLE device as follows:



1 **Zone-LED**

The zone LEDs indicate the vibration state of the machine according to the set zone limits. The maximum of all connected channels is displayed. If all LEDs flash at the same time, the configuration is transferred to the device, a transient settling process takes place or there is an internal error (e. g. DSP configuration faulty).

2 **Power LED**

Indicates active power supply.

3 Status-LED

The status LED indicates the state of the sensor input:

	IEPE Mode	± 10 V Mode
OFF	No IEPE-sensor connected or cable breakage	-
Green	IEPE-sensor connected	-
Green flashing	Warning or alarm on respective channel (adjustable)	
Red	Input overload	
Red flashing	Short circuit	-

Also for channels 2-8 (VLE2 - VLE8).

Accessories

The VibroLine devices can be upgraded with accessories, e.g. to enhance the comfort of displaying the current vibration level (4-20 mA display) or to be used in hazardous areas by using ATEX accessories.

On the following pages, accessories are presented and their use described:

Displays for 4-20 mA current loop

The VibroLine devices have one 4-20 mA output per measuring channel. This output can be used to forward the process variables to other peripherals (PLC, control room, ...) and/or as an output for displays showing the current vibration level. A 4-20 mA display is required for each measuring channel. The characteristic value set in the VibroLine Configurator is shown.

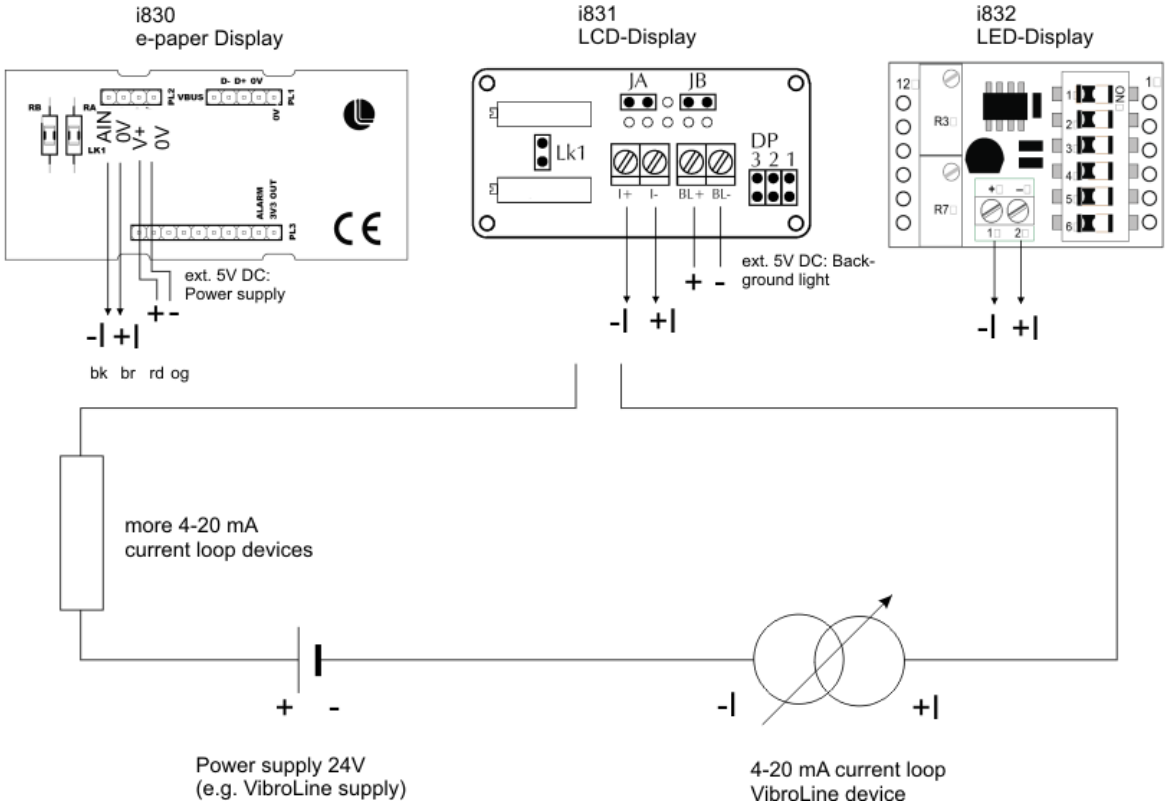
IDS Innomic Schwingungsmesstechnik GmbH offers the following 4-20 mA displays as VibroLine accessories:

i830-10	2.1" E-paper Display	Scaling 0..10
i830-20	2.1" E-paper Display	Scaling 0..20
i830-50	2.1" E-paper Display	Scaling 0..50
i830-100	2.1" E-paper Display	Scaling 0..100
i830-IND	2.1" E-paper Display	individual Scaling
i831-10	12,7 mm LCD Display	Scaling 0..10
i831-20	12,7 mm LCD Display	Scaling 0..20
i831-50	12,7 mm LCD Display	Scaling 0..50
i831-100	12,7 mm LCD Display	Scaling 0..100
i831-IND	12,7 mm LCD Display	individual Scaling
i832-10	9,4 mm LED Display	Scaling 0..10
i832-20	9,4 mm LED Display	Scaling 0..20
i832-50	9,4 mm LED Display	Scaling 0..50
i832-100	9,4 mm LED Display	Scaling 0..100
i832-IND	9,4 mm LED Display	individual Scaling

The displays are designed for front panel mounting/panel mounting. The delivery includes a pre-configured display (scaling see above) and mounting material. After connection, the displays are immediately ready for use. Changes to the scaling may only be made after consultation with IDS Innomic Schwingungsmesstechnik GmbH.

Item	Picture		dimensions (LxHxD in mm)	Power supply
i830		Design 1	housing: 73,8 x 37,5 x 17cut area: 70 x 34	• 5 V DC as power supply
		Design 2		
i831			housing: 64,5 x 34,5 x 20,7 cut area: 62 x 32	• from 4-20 mA current loop • optional 5V DC for backlighting
i832			housing: 35,1 x 24,1 x 22,4 cut area: 33 x 20,3	• from 4-20 mA current loop

Wiring:
The following diagram describes the correct wiring of the 4-20 mA displays to the VibroLine devices:


i830
e-paper Display
i831
LCD-Display
i832
LED-Display
ext. 5V DC:
Power supply
-I +I
bk br rd og
JA
JB
Lk1
DP
3 2 1
I+ I- BL+ BL-
ext. 5V DC: Back-
ground light
+ -
-I +I
-I +I
more 4-20 mA
current loop devices
+ -
-I
+I
Power supply 24V
(e.g. VibroLine supply)
4-20 mA current loop
VibroLine device

LED signalling light

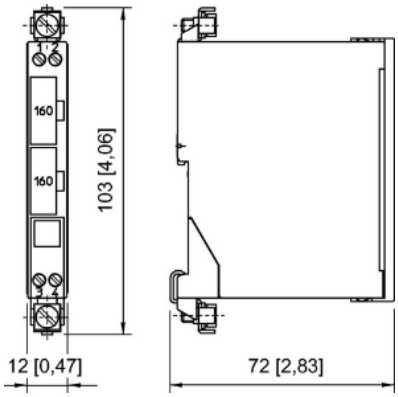
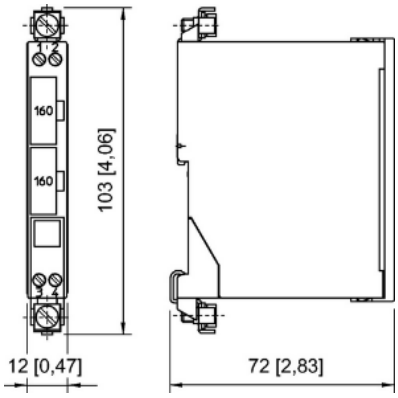
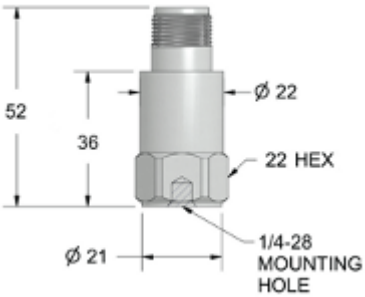
The current machine status can be displayed by means of a signal light. The lamp has several segments which can be individually parameterised in colour and flashing rhythm/continuous light. The connection is made directly to the digital outputs of the VibroLine devices. As an option, the lamp has an 85 dB acoustic alarm signal.
The devices are parameterised according to customer requirements.

Item	Description
i835	5-segment signal lamp, supply from VibroLine device, incl. connection cable and parameterisation.
i836	5-segment signal lamp (+ acoustic alarm), supply from VibroLine device, incl. connection cable and parameterisation.

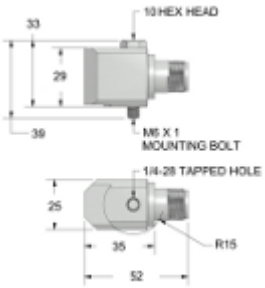
Use in ATEX areas

Accessories are required for monitoring machines in hazardous areas (ATEX zones). A specially protected accelerometer operates in the ATEX zone. Outside this zone, the sensor signal is directed through a safety barrier to intercept voltage peaks. Only then is the sensor signal transmitted to the VibroLine devices. The VibroLine devices themselves must not be operated in ATEX zones.

The following accessories are available for operation in ATEX zones:

Item	Picture	Dimensions	Description
i821			Single-channel safety barrier, 28 V, 100 mA DIN rail mounting (TS35)
i822			Two-channel safety barrier, 28 V, 93 mA DIN rail mounting (TS35)
M/ AC915-1A			• With ATEX approval Zone 0 • Insulated housing to avoid ground loops • Intrinsically safe sensor • IEPE output: Low susceptibility to interference in harsh environments; long cable lengths possible

M/ AC915-1A



- With ATEX approval Zone 0
- Insulated housing to avoid ground loops
- Intrinsically safe sensor
- IEPE output: Low susceptibility to interference in harsh environments; long cable lengths possible

Power supply

The VibroLine devices must be supplied with 24 V (+/- 5%) DC voltage. We offer the following power supplies as accessories:

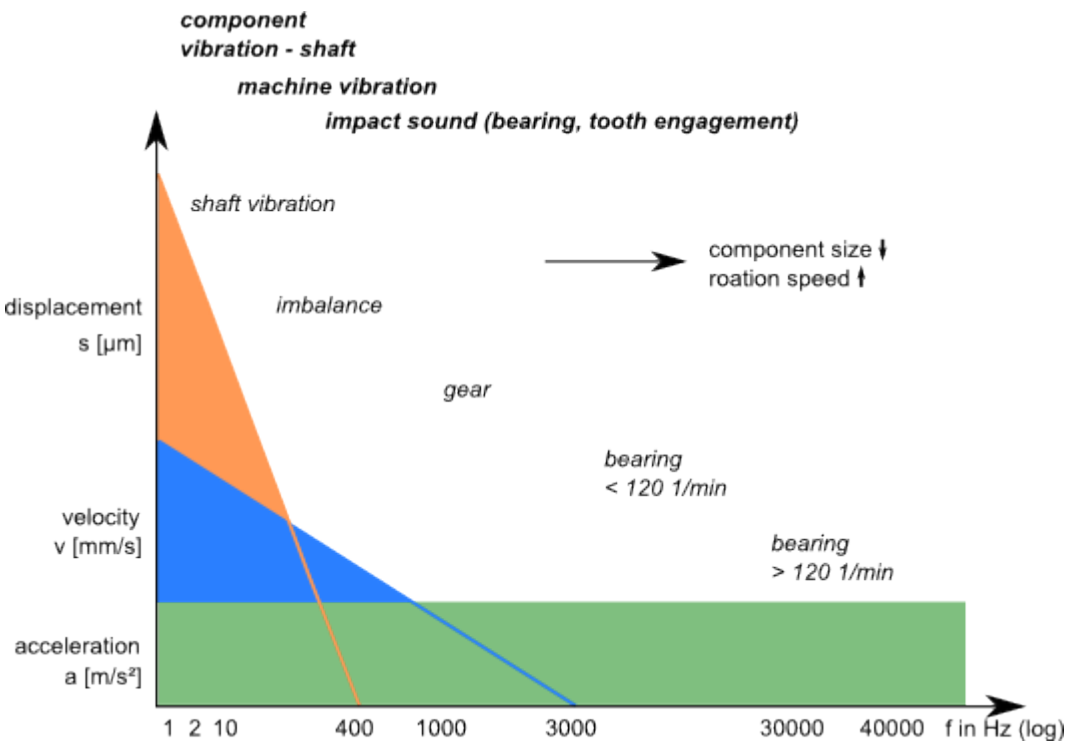
Item	Description
i811	Plug-in power supply 24 V, 1.5 A, for up to 3 VibroLine devices
i812	DIN rail power supply 24 V, 1.25 A, for up to 2 VibroLine devices

Vibration on machines

Machines are devices with moving parts. Movement generates vibrations. Such vibrations can be unintentional or intentional in machines.

- Unwanted vibrations affect the lifetime of machines, generate noise and impair manufacturing quality.
- Vibrations are intended, for example, in vibrating screens or vibratory conveyors.

Machine vibrations extend over a wide frequency range. Vibrations from a few Hertz to 40 kHz and more can occur. The vibrations generated by machines can be roughly divided into different areas: Shaft vibrations and imbalances typically occur at low frequencies (< 1000 Hz). Interference frequencies of gearwheels and shock impulses of slow-speed gears or rolling bearings are usually found in the range up to 20 kHz, faster-speed rotating machines generate impacts at frequencies above 20 kHz.
The selection of the vibration measurement variable also depends on the frequency range to be investigated: vibration displacement of up to several hundred hertz and vibration velocities of up to approx. 2000 Hz can only be measured meaningfully; vibrations at higher frequencies must be measured as vibration acceleration. The following figure illustrates the frequency ranges.



Various characteristic values have become established for the detection of machine vibrations. In addition to vibration characteristic values (oscillation on a wide frequency band) it is also possible to measure order characteristic values (oscillations at speed or multiples thereof).
It is established to use the ISO 10816 and ISO 20816 series of standards for the measurement of vibration characteristic values for machine monitoring.