Operating Instructions

VEGAMET 391

4 … 20 mA/HART signal conditioning instrument
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Supplementary documentation

Information:
Supplementary documents appropriate to the ordered version come with the delivery. You can find them listed in chapter "Product description".
1 About this document

1.1 Function

This operating instructions manual provides all the information you need for mounting, connection and setup as well as important instructions for maintenance and fault rectification. Please read this information before putting the instrument into operation and keep this manual accessible in the immediate vicinity of the device.

1.2 Target group

This operating instructions manual is directed to trained qualified personnel. The contents of this manual should be made available to these personnel and put into practice by them.

1.3 Symbolism used

Information, tip, note

This symbol indicates helpful additional information.

Caution: If this warning is ignored, faults or malfunctions can result.

Warning: If this warning is ignored, injury to persons and/or serious damage to the instrument can result.

Danger: If this warning is ignored, serious injury to persons and/or destruction of the instrument can result.

Ex applications

This symbol indicates special instructions for Ex applications.

List

The dot set in front indicates a list with no implied sequence.

Action

This arrow indicates a single action.

1 Sequence

Numbers set in front indicate successive steps in a procedure.
2 For your safety

2.1 Authorised personnel

All operations described in this operating instructions manual must be
carried out only by trained specialist personnel authorised by the plant
operator.

During work on and with the device the required personal protective
equipment must always be worn.

2.2 Appropriate use

VEGAMET 391 is a universal signal conditioning instrument and power
supply unit for connection of a 4 … 20 mA/HART sensor.

You can find detailed information on the application range in chapter
"Product description".

Operational reliability is ensured only if the instrument is properly used
according to the specifications in the operating instructions manual as
well as possible supplementary instructions.

For safety and warranty reasons, any invasive work on the device
beyond that described in the operating instructions manual may be
carried out only by personnel authorised by the manufacturer. Arbitrary
conversions or modifications are explicitly forbidden.

2.3 Warning about misuse

Inappropriate or incorrect use of the instrument can give rise to
application-specific hazards, e.g. vessel overfill or damage to system
components through incorrect mounting or adjustment.

2.4 General safety instructions

This is a high-tech instrument requiring the strict observance of
standard regulations and guidelines. The user must take note of the
safety instructions in this operating instructions manual, the country-
specific installation standards as well as all prevailing safety
regulations and accident prevention rules.

The instrument must only be operated in a technically flawless and
reliable condition. The operator is responsible for trouble-free
operation of the instrument.

During the entire duration of use, the user is obliged to determine the
compliance of the required occupational safety measures with the
current valid rules and regulations and also take note of new
regulations.
2.5 Safety label on the instrument
The safety approval markings and safety tips on the device must be observed.

2.6 CE conformity
This device fulfills the legal requirements of the applicable EC guidelines. By attaching the CE mark, VEGA provides a confirmation of successful testing. You can find the CE conformity declaration in the download area of www.vega.com.

2.7 Safety instructions for Ex areas
Please note the Ex-specific safety information for installation and operation in Ex areas. These safety instructions are part of the operating instructions manual and come with the Ex-approved instruments.

2.8 Overfill protection according to WHG
In Germany the WHG (Water Resource Act) stipulates an overfill protection for systems that deal with substances hazardous to water. An appropriately certified sensor is the prerequisite for such protection. The VEGAMET 391 fulfills the construction and testing principles for overfill protection systems. This is certified by the TÜV (Technical Control Board) statement "PP 5003/09". You can download this document from our homepage under "Downloads - Approvals - Signal conditioning instruments - Overfill protection".

2.9 Environmental instructions
Protection of the environment is one of our most important duties. That is why we have introduced an environment management system with the goal of continuously improving company environmental protection. The environment management system is certified according to DIN EN ISO 14001.

Please help us fulfil this obligation by observing the environmental instructions in this manual:

- Chapter "Packaging, transport and storage"
- Chapter "Disposal"
3 Product description

3.1 Structure

Scope of delivery

The scope of delivery encompasses:

- VEGAMET 391 signal conditioning instrument
- Two clamping elements for panel mounting
- Ex separating wall
- Mini-USB cable
- Carrier rail adapter (optional)
- RS232 modem connection cable (optional)
- Documentation
  - this operating instructions manual
  - Supplementary instruction 30325 "RS232/Ethernet connection" (optional)
  - Supplementary instructions manual 30768 "Modbus-TCP, ASCII protocol" (optional)
  - Ex-specific "Safety instructions" (with Ex-version)
  - if necessary, further certificates

Constituent parts

![Diagram of VEGAMET 391]

Fig. 1: VEGAMET 391
1 Ex separating wall
2 Clamping element for panel mounting
3 Indicating and adjustment unit
4 RS232 or Ethernet interface (optional)
5 USB interface

Type label

The type label contains the most important data for identification and use of the instrument:

- Article number
- Serial number
- Technical data
- Article numbers, documentation
The serial number allows you to access the delivery data of the instrument via www.vega.com, "VEGA Tools" and "serial number search".

### 3.2 Principle of operation

**Application area**

VEGAMET 391 is a universal signal conditioning instrument for a number of applications such as level, gauge and process pressure measurement. At the same time, it can serve as power supply unit for connected sensors. VEGAMET 391 is designed for connection of any 4 … 20 mA/HART sensor.

On instruments with one of the optional interfaces (RS232/Ethernet), the measured values can be retrieved via modem or network and displayed by means of a web browser or WEB-VV. It is also possible to send measured values and messages via e-mail/SMS. The use of VEGAMET 391 is particularly suitable for stocktaking, VMI (Vendor Managed Inventory) and remote enquiry.

**Functional principle**

The VEGAMET 391 signal conditioning instrument can power the connected sensor and process its measurement signals. The requested parameter is shown on the display and also outputted to the integrated current output for further processing. The measurement signal can thus be transferred to a remote indication or a superordinate control system. Six operating relays for control of pumps or other devices are also integrated.

**Voltage supply**

Wide-range power supply unit with 20 … 253 V AC/DC for world-wide use.

Detailed information about the power supply can be found in chapter "Technical data".

### 3.3 Operation

The instrument can be adjusted with the following adjustment media:

- With integrated indicating and adjustment unit
- an adjustment software according to FDT/DTM standard, e.g. PACTware and a Windows PC

The entered parameters are generally saved in VEGAMET 391, when used with PACTware and PC optionally also on the PC.

**Information:**

When using PACTware and the respective DTM, additional settings can be carried out which are not possible or only partly possible with the integrated indicating and adjustment unit. Communication is carried out via the integrated USB interface or one of the optional interfaces (RS232/Ethernet).
Further instructions for setting up the web server and e-mail functions are stated in the online help of PACTware or the VEGAMET 391 DTMs as well as the operating instructions manual "RS232/Ethernet connection".

3.4 Packaging, transport and storage

Packaging
Your instrument was protected by packaging during transport. Its capacity to handle normal loads during transport is assured by a test according to DIN EN 24180.

The packaging of standard instruments consists of environment-friendly, recyclable cardboard. For special versions, PE foam or PE foil is also used. Dispose of the packaging material via specialised recycling companies.

Transport
Transport must be carried out under consideration of the notes on the transport packaging. Nonobservance of these instructions can cause damage to the device.

Transport inspection
The delivery must be checked for completeness and possible transit damage immediately at receipt. Ascertained transit damage or concealed defects must be appropriately dealt with.

Storage
Up to the time of installation, the packages must be left closed and stored according to the orientation and storage markings on the outside.

Unless otherwise indicated, the packages must be stored only under the following conditions:

- Not in the open
- Dry and dust free
- Not exposed to corrosive media
- Protected against solar radiation
- Avoiding mechanical shock and vibration

Storage and transport temperature
- Storage and transport temperature see chapter "Supplement - Technical data - Ambient conditions"
- Relative humidity 20 … 85 %
4 Mounting

4.1 General instructions

Installation possibilities

The instrument is designed for recessed installation in a front panel, housing front plate or a switching cabinet door. The required cut-out is 92 x 92 mm according to EN 60529. When installed correctly, protection rating IP 65 is guaranteed. As an alternative, the instrument can be mounted into a switching cabinet or housing by means of four screws (fixed with screws on rear of housing). As an option, a mounting adapter for carrier rail mounting is available.

A VEGAMET 391 in Ex version is an auxiliary, intrinsically safe instrument and may not be installed in explosion-endangered areas.

Before setup, the Ex separating wall must be attached with Ex versions. Safe operation can be only ensured if the operating instructions manual and the EG type approval certificate are observed. VEGAMET 391 must not be opened.

4.2 Mounting instructions

Front panel mounting

1 Check the correct hold of the seal directly behind the front plate and shift the instrument from the front into the front panel cut-out.
2 Shift the two tensioning elements into the provided gaps.
3 Screw in the two screws of the tensioning elements steadily with a screwdriver.

Fig. 2: Front panel mounting
1 Front panel, front plate or switching cabinet door
2 Tensioning elements
3 Slotted screw
Screw mounting

Fasten the instrument by means of four screws (max. ø 4 mm) on the inner side of the housing or the mounting plate according to the following illustration.

![Screw mounting diagram]

Fig. 3: Screw mounting
1 Fixing screws
2 Rear of the housing or mounting plate

Carrier rail mounting

1 Fasten the mounting plate to the instrument with the four attached hexagon screws.
2 Screw the carrier rail adapter to the mounting plate by using the four attached Phillips head screws.

![Carrier rail mounting diagram]

Fig. 4: Carrier rail mounting
1 Hexagon screws
2 Mounting plate
3 Carrier rail adapter
4 Phillips head screws
5 Connecting to power supply

5.1 Preparing the connection

Note safety instructions
Always keep in mind the following safety instructions:
- Connect only in the complete absence of line voltage
- If overvoltages are expected, install overvoltage arresters

Take note of safety instructions for Ex applications
In hazardous areas you should take note of the appropriate regulations, conformity and type approval certificates of the sensors and power supply units.

Select power supply
The voltage supply can be 20 ... 253 V AC/DC, 50/60 Hz.

Select connection cable
The operating voltage of VEGAMET 391 is connected with standard cable according to the national installation standards.

Standard two-wire cable can be used for connecting the sensors. The screening is absolutely necessary to ensure interference-free operation with HART sensors.

Cable screening and grounding
Connect the cable screen on both ends to ground potential. In the sensor, the screen must be connected directly to the internal ground terminal. The ground terminal on the outside of the sensor housing must be connected to the potential equalisation (low impedance).

If potential equalisation currents are expected, the screen connection on the side of VEGAMET 391 must be made via a ceramic capacitor (e.g. 1 nF, 1500 V). The low frequency potential equalisation currents are thus suppressed, but the protective effect against high frequency interference signals remains.

Select connection cable for Ex applications
Take note of the corresponding installation regulations for Ex applications. In particular, make sure that no potential equalisation currents flow over the cable screen. In case of grounding on both sides this can be achieved by the use of a capacitor or a separate potential equalisation.

5.2 Connection procedure

Move on to electrical connection and proceed as follows:

1. Mount the instrument as described in the previous chapter
2. Remove terminal strip 1 on the upper side of the instrument
3. Connect sensor cable to terminal 1/2 (active input) or 5/6 (passive input)
4. If necessary, connect digital inputs to 8 ... 12
5. Plug terminal strip 1 to the upper side of the instrument
6. Remove terminal strip 2 on the lower side of the instrument
7 Connect power supply (switched off) to terminal 13/14
8 If necessary, connect relays or other outputs
9 Plug in terminal strip 2 on the lower side of the instrument
10 For connection of additional relais to terminal strip 3, you have to proceed as described before

The electrical connection is finished.

Remember that with Ex applications, the Ex separating wall must be plugged onto the upper side of the instrument before setup.

Information:
• On the active input (terminal 1/2), VEGAMET 391 provides power for the connected sensors. Power supply and measurement data are transmitted over the same two-wire cable. This mode is provided for connection of measuring transducers without separate operating voltage (sensors in two-wire version).
• On the passive input (terminals 5/6), the sensors are not supplied with energy - only the measured value is transmitted. This input is for sensors with their own separate operating voltage (sensors in four-wire version). On a VEGAMET 391 in Ex version, the passive input is not available due to approval/technical reasons.
5.3 Wiring plan

Wiring plan for two-wire sensor

Fig. 5: Terminal assignment with two-wire sensor

1. Operating relay 1
2. Operating relay 2
3. Operating relay 3
4. Operating relay 4
5. Operating relay 5
6. Operating relay 6
7. Current output
8. Operating voltage of the signal conditioning instrument
9. Measurement data input with sensor supply (active input)
10. Connection for HART modem for sensor parameter adjustment
11. Measurement data input (passive input), not with Ex-ia version
12. Digital input 1 ... 4
13. Common ground for digital input 1 ... 4
14. 4 ... 20 mA/HART sensor (two-wire version)
Fig. 6: Terminal assignment with four-wire sensor

1. Operating relay 1
2. Operating relay 2
3. Operating relay 3
4. Operating relay 4
5. Operating relay 5
6. Operating relay 6
7. Current output
8. Operating voltage of the signal conditioning instrument
9. Measurement data input with sensor supply (active input)
10. Connection for HART modem for sensor parameter adjustment
11. Measurement data input (passive input), not with Ex-ia version
12. Digital input 1 … 4
13. Common ground for digital input 1 … 4
14. 4 … 20 mA/HART sensor (four-wire version)
15. Power supply for four-wire sensor
6 Setup with the integrated indicating and adjustment unit

6.1 Adjustment system

Function

The integrated indicating and adjustment unit is used for measured value display, adjustment and diagnosis of VEGAMET 391. The indication and adjustment are carried out via four keys and a clear, graphic-capable display with background lighting. The adjustment menu with selectable language is clearly structured and enables easy setup.

Certain adjustment options are not available or only partially available with the integrated indicating and adjustment unit, e.g. the settings for flow measurement. For such applications, the use of PACTware with appropriate DTMs is recommended.

Indicating and adjustment elements

![Diagram of indicating and adjustment elements](image)

Fig. 7: Indicating and adjustment elements
1 LC display
2 Adjustment keys
3 Status indication operation
4 Status indication fail safe relay
5 Status indication operating relay 1 … 6

Key functions

- **[OK]** key:
  - Move to the menu overview
  - Confirm selected menu
  - Edit parameter
  - Save value

- **[->]** key to select:
  - Menu change
  - Select list entry
  - Select editing position
6.2 Setup steps

Parameter adjustment

Through parameter adjustment, the instrument is adapted to the individual application conditions. A measurement loop calibration is the most important step and should always be carried out. A scaling of the measured value to the desired physical variable and unit, possibly including a linearization curve, is often useful. The adaptation of the relay switching points or the setting of an integration time to smooth the measured value are further standard adjustment options.

For instruments with Ethernet interface, the instrument must be provided with an IP address and subnet mask suitable for the instrument. As an alternative, addressing via DHCP and a host name is also possible. If necessary, the e-mail/webserver can be also configured with PACTware.

A setup assistant is available for easy, convenient setup. It guides the user through the standard applications and settings step by step.

Information:

When using PACTware and the respective DTM, additional settings can be carried out which are not possible or only partly possible with the integrated indicating and adjustment unit. Communication is carried out via the integrated USB interface or one of the optional interfaces (RS232/Ethernet).

Further instructions for setting up the web server and e-mail functions are stated in the online help of PACTware or the VEGAMET 391 DTMs as well as the supplementary instructions manual "RS232/Ethernet connection".

Switch on phase

After being switched on, VEGAMET 391 first of all carries out a short self-check. The following steps are carried out:

- Internal check of the electronics
- indication of the instrument type, firmware version as well as the instrument TAG (instrument name)
- The output signals jump briefly to the set fault value
Then the current measured values will be displayed and outputted.

**Measured value indication**

The measured value indication shows the digital indication value, the measurement loop name (measurement loop TAG) and the unit. An analogue bar graph can also be blended in. If flow measurement is activated, an additional indication window with totalizer is available. By pushing the [>] key you can move between the different indication options.

![Measured value indication example](image)

→ By pushing [OK], you move from the measured value indication into the main menu. Here, you have the choice between the setup assistant for the most important settings or the complete classical menu.

**Main menu/Setup assistant**

At the beginning of every setup or parameter adjustment, you have the choice of continuing with the setup assistant or the classic menu guidance. We recommend using the setup assistant for the initial setup. If later on individual settings should be corrected or added, the most expedient way to do this is via the classic menus.

![Setup assistant menu](image)

→ Select the menu item "Setup assistant" with [>] and confirm with [OK].

**Setup assistant**

The setup assistant leads you step-by-step through the standard settings. All steps must be passed completely, it is not possible to interrupt the procedure. Following the individual steps which can be passed through with the assistant:

- Device-TAG (individually adjustable instrument name)
- Measurement loop TAG (individually adjustable measurement loop designation)
- Type of input (4 ... 20 mA or HART)
- Measured variable (for example level or process pressure)
- Adjustment unit (for example m or bar)
- Min./Max. adjustment
- Activation of the fail safe relay
- Configuration of the relay outputs (e.g. setup of pump control or overfill protection)
- Adjustment date/time
- Network settings with option "Ethernet interface"
When changing the measurement, the assistant can be opened any time. The subsequent steps can be also reached via the classical menu guidance. The description of the individual menu items is available in the classical menu guidance. In chapter "Application examples" you will find further information to the setup.

Classical menu guidance/main menu

The main menu is divided into six areas with the following functions:

- **Device settings**: Includes the device-TAG, settings for network connection such as date/time setting, …
- **Measurement loop**: Includes settings for input selection, adjustment, damping, linearization, scaling, outputs, …
- **Display**: Includes settings to the displayed measured value, language setting und brightness of the background lighting
- **Diagnosis**: Includes information to the device status, error messages, input current, digital inputs
- **Further settings**: Includes simulation, reset, PIN, sensor address, …
- **Info**: Shows serial number, software version, last change, instrument features, MAC addr., …

→ Select the requested menu item via the respective keys and confirm with [OK].

Device settings - Device-TAG

You can assign an unambiguous name to VEGAMET 391 via the Device-TAG. This function is recommended when several instruments are implemented and a good documentation of larger systems is required.

→ Carry out your settings via the appropriate keys and save with [OK].

Device settings - Host Name/IP addr.

For instruments with integrated Ethernet interface, the instrument must be provided with an IP address/Subnet mask suitable for your network. Depending on the network, a gateway address may also be required. As an alternative, addressing via DHCP and a host name is also possible. These data are available from your network administrator. Keep in mind that your settings are only effective after a restart of VEGAMET 391. Further information on these network parameters is available in the supplementary instructions manual "RS232/Ethernet connection" and in the online help of the corresponding DTM.
→ Carry out your settings via the appropriate keys and save with [OK].

LAN/Internet IP adress LAN/Internet
DHCP Fixed IP adress
192.168.200.200
Subnetmask: 255.255.255.000

→ Carry out your settings via the appropriate keys and save with [OK]. Disconnect briefly the operating voltage so that the modified settings become effective.

Device settings - Communication protocol

For instruments with integrated RS232 interface, you determine here which mode this serial interface should operate in. The following options are available:

- **VVO protocol**: Direct standard connection between signal conditioning instrument and PC for parameter adjustment and enquiry (e.g. with PACTware and DTM)
- **PPP**: Dial-up connection between signal conditioning instrument and modem for independent transmission of e-mails (dial-out connection) or enquiry via web browser (dial-in connection)
- **ASCII protocol**: Direct standard connection between signal conditioning instrument and PC for enquiry with terminal programs, e.g. Hyperterminal

→ Carry out your settings via the respective keys and save with [OK]. Further information is available in the supplementary instructions manual "RS232/Ethernet connection" and the online help of the respective DTM.

Device settings - Date/Time

With instruments with integrated RS232/Ethernet interface, the date and time can be entered in this menu item. These time settings are buffered in case of voltage loss via a capacitor as well as as battery up to 10 years.

→ Carry out your settings via the appropriate keys and save with [OK].
Measurement loop - Input

The VEGAMET 391 can process measured values from 4 ... 20 mA/HART sensors via analogue communication as well as via digital HART protocol.

Analogue 4 ... 20 mA transmission
In the standard setting of VEGAMET 391 the measured value transmission is carried out via analogue 4 ... 20 mA signal. An adjustment in the sensor influences directly the input variable of VEGAMET 391. Only carry out the adjustment on one instrument, either on VEGAMET 391 or on the sensor. The adjustment in VEGAMET 391 is always carried out in mA (analogue transmission).

Digital HART transmission
For transmission via HART, VEGAMET 391 must be informed about which sensor value should be used for further processing. Depending on the sensor type, this can be distance, pressure or temperature. With all HART sensors, the unchanged initial value of the sensor is always transmitted to VEGAMET 391. Thus, adjustment must always be carried out on VEGAMET 391, never on the sensor. Different parameters and measuring units are available.

When HART sensors from other manufacturers are connected, the options PV (Primary Value) and SV (Secondary Value) are available. The prerequisite for this is the support of the HART commands 0, 1, 3, and 15. This information and which measured values are transmitted can be found in the operating instructions manual of the respective sensor manufacturer.

Carry out your settings via the appropriate keys and save with [OK].

Meas. loop - Parameter

The measured variable defines the application of the measurement loop, the following settings are available depending on the connected sensor:

- Level
- Process pressure
- Universal
- Temperature
- Interface
- Flow (only after activating via PACTware or DTM)

Carry out your settings via the appropriate keys and save with [OK].
**Meas. loop - Adjustment**

Through the adjustment the input value of the connected sensor is converted into a percentage value. This conversion step allows any input value range to be depicted in a relative range (0 % up to 100 %).

Before carrying out the adjustment, the requested adjustment unit can be selected. With the input selection "Analogue", the adjustment unit is always "mA". If the HART input is activated, the available unit depends on the sensor type. With radar, ultrasonic and guided microwave this is always the distance in metres or feet "m(d)" or "ft(d)", and with pressure transmitters it is e.g. "bar" or "psi".

![Units of measurement](image)

The following illustrations and examples relate to the min./max. adjustment of a radar sensor with HART communication.

- With **[OK]** you prepare the percentage value for editing, with **[->]** you place the cursor to the requested position. Set the requested percentage value with **[+]** and save with **[OK]**.
- After entering the percentage value for the min. adjustment, the suitable distance value must be entered. If you want to use the currently measured distance value, select the menu item "Accept" (live adjustment or adjustment with medium). If the adjustment should be carried out independent of the measured level, then select the option "Edit". Enter now the distance value in m [m(d)] for the empty vessel that is suitable for the percentage value, e.g. distance from the sensor to the vessel bottom (dry adjustment or adjustment without medium).
- Save your settings with **[OK]** and move to "Max. adjustment" with **[->]**.
- As described previously, enter now the percentage value for max. adjustment and confirm with **[OK]**.
- After entering the percentage value for the max. adjustment, the suitable distance value must be entered. If you want to use the currently measured distance value, select the menu item "Accept" (live adjustment or adjustment with medium). If the adjustment should be carried out independent of the measured level, then
select the option "Edit". Enter now the distance value in m [m(d)] for the full vessel that is suitable for the percentage value (dry adjustment or adjustment without medium). Keep in mind that the max. level must be below the radar antenna.

After entering the percentage value for the max. adjustment, the suitable distance value must be entered. If you want to use the currently measured distance value, select the menu item "Accept" (live adjustment or adjustment with medium). If the adjustment should be carried out independent of the measured level, then select the option "Edit". Enter now the distance value in m [m(d)] for the full vessel that is suitable for the percentage value (dry adjustment or adjustment without medium). Keep in mind that the max. level must be below the radar antenna.

→ Finally save your settings with [OK], the adjustment is finished.

**Meas. loop - Damping**

To suppress fluctuations in the measured value display, e.g. caused by an agitated product surface, an integration time can be set. This time can be between 0 and 999 seconds. Remember that the reaction time of the entire measurement will then be longer and the sensor will react to measured value changes with a delay. In general, a period of a few seconds is sufficient to smooth the measured value display.

![Damping Time Selector](image)

→ Carry out your settings via the appropriate keys and save with [OK].

**Meas. loop - Linearization curve**

A linearization is necessary for all vessels in which the vessel volume does not increase linearly with the level, for example, with a cylindrical or spherical tank. Corresponding linearization curves are preprogrammed for these vessels. They represent the correlation between the level percentage and vessel volume. By activating the appropriate curve, the volume percentage of the vessel is displayed correctly. If the volume should not be displayed in percent but e.g. in l or kg, a scaling can be also set.

![Linearization Curve Selector](image)

→ Carry out your settings via the appropriate keys and save with [OK].
Scaling means converting the measured value into a certain parameter and unit. The linearized percentage value is the source signal which is used as basis for the scaling. The indication can then show the volume in litres e.g., instead of the percentage value. Indication values from max. -99999 to +99999 are possible.

→ Carry out your settings via the appropriate keys and save with [OK].

Meas. loop - Meas. loop TAG

In this menu item you can enter an unambiguous designation for each measurement loop, e.g. the measurement loop name or the tank or product designation. In digital systems and in the documentation of larger plants, a singular designation should be entered for exact identification of individual measurement points.

→ Carry out your settings via the appropriate keys and save with [OK].

Meas. loop - Outputs - Relays outputs

Under "Outputs", you find the relay/current outputs. With the relay output, the requested mode ("Overfill protection/Dry run protection" or "Pump control") must first be selected.

- **Overfill protection**: Relay is switched off when the max. level is exceeded (safe currentless condition), relay is switched on again when the level falls below the min. level (switch on point < switch off point)
- **Dry run protection**: Relay is switched off when the level falls below the min. level (safe currentless condition), relay is switched on again when the max. level is exceeded (switch on point > switch off point)
- **Pump control**: With several pumps having the same function, the pumps will be alternately switch on and off according to the adjustable criteria

Additional modes such as "Switching window", "Flow" and "Tendency" can be only adjusted via PACTware and DTM.

Relay 6 can be also configured as fail safe relay. The following example shows the adjustment of an overfill protection. Further information to pump control, tendency recognition or flow measurement are available in chapter "Application examples".
Select the requested mode and save with [OK]. By pushing [->], you reach the next menu item.

Now enter the reference value to which the relay switching points relate. By pushing [->], you reach the next menu item.

Now enter the switching points for switching the relay on and off.

In the following window the reaction of the relay in case of failure can be determined. Here you can define whether, in case of failure, the switching condition of the relay remains unchanged or the relay is switched off.

The current output is used to transfer the measured value to a superimposed system, for example to a PLC, a control system or a measured value indication. This is an active output, i.e. a current is provided actively. The processing must hence have a passive current input.

The characteristics of the current output can be set to 0 ... 20 mA, 4 ... 20 mA or inverted. The reaction in case of failure can also be adapted to the requirements. The measured variable you refer to can also be selected.

Carry out your settings via the appropriate keys and save with [OK].
In the menu item "Display - Indication value", you can set the requested indication value. The following options are available:

- **Percent**: adjusted measured value without taking a probably stored linearization into account
- **Lin. percent**: adjusted measured value by taking a probably stored linearization into account
- **Scaled**: adjusted measured value by taking a probably stored linearization into account as well as the values entered under "Scaling"
- **Sensor value**: input value delivered by the sensor. Presentation in the selected adjustment unit

→ Carry out your settings via the appropriate keys and save with **[OK]**.

### Display - Language

In the menu item "Display - Language", the requested display language can be adjusted. The following languages are available:

- **Deutsch**
- **English**
- **French**
- **Spanish**
- **Russian**
- **Italian**
- **Dutch**

→ Carry out your settings via the appropriate keys and save with **[OK]**.

### Display - Brightness

In the menu item "Display - Brightness", the brightness of the background lighting can be continuously adjusted.
→ Carry out your settings via the appropriate keys and save with [OK].

Diagnostics

If the instrument signals a fault, further information about the fault is available under the menu item "Diagnosis - Device status". In addition, the input current as well as the input status for the digital inputs can be displayed.

Additional settings - Simulation

The simulation of a measured value is used to check the outputs and connected components. The simulation can be applied to the percentage value, the lin. percentage value and the sensor value.

Note:

Please note that connected system parts (valves, pumps, motors, control systems) are influenced by the simulation, thus unintentional plant operating conditions can occur. The simulation is terminated automatically after approximately 10 minutes.

→ Carry out your settings via the appropriate keys and save with [OK].

Additional settings - Reset

A reset to basic adjustment changes all settings (with only a few exceptions) back to factory default. Exceptions are: Host name, IP-address, subnet mask, time, language.
Additional settings - PIN

The signal conditioning instrument can be locked with a PIN to protect the adjusted parameters against unauthorized modification. After activation, it is not possible to carry out a parameter adjustment via the built-in indicating and adjustment unit without entering the previously determined PIN. This locking does not apply to parameter adjustment with PACTware and the respective DTM.

Additional settings - Sensor address

With every 4 ... 20 mA/HART sensor, the measured value can be transmitted via analog current signal or digital HART signal. This is regulated via the HART mode or the address. If a HART sensor is set to address 0, the sensor is in the standard mode. Here the measured value is transmitted digitally on the 4 ... 20 mA cable.

In mode HART Multidrop, an address from 1 ... 15 is assigned to the sensor. By doing so, the current is fixed limited to 4 mA and the measured value transmission is only made digitally.

Via the menu item "Sensor address", the address of the connected sensor can be modified. For this purpose, you have to enter the address of the connected sensor (default setting 0) and in the next window the new address.

Info

In the menu item "Info" the following information is available:

- Sensor type and serial number
- Date of manufacture and software version
- Date of last change using PC
- Features of VEGAMET 391
- MAC address (with interface option Ethernet)

Optional settings

Additional adjustment and diagnostics options are available via the Windows software PACTware and the suitable DTM. Connection can be made optionally via the built-in standard interface or one of the optionally offered interfaces (RS232/Ethernet). Further information is available in chapter "Parameter adjustment with PACTware", in the...
online help of PACTware or the DTM as well as in the operating instructions manual "RS232/Ethernet connection". An overview of the standard functions and their adjustment options can be found in chapter "Functional overview" in the "Supplement".
6.3 Menu schematic

Information:
Depending on the instrument version and application, the highlighted menu windows are not always available.

Measured value indication

<table>
<thead>
<tr>
<th>91.4 %</th>
<th>TAG-No. 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>69.6 %</td>
<td>TAG-No. 1</td>
</tr>
<tr>
<td>2.70 m³/min</td>
<td>390 m³</td>
</tr>
</tbody>
</table>

Setup assistant

Device TAG

Device Name

Units of measurement

Min. adjustment

Max. adjustment

Relay output

Adjust pump control?

LAN/Internet (DHCP)

IP address

Subnet mask

Communication protocol

Setup assistant

Cancel assistant?

Setup with the integrated indicating and adjustment unit
Device settings

**Device TAG**

**Device Name**

**Communication protocol**

**Date/Time**

- **LAN/Internet**
  - DHCP
  - IP address: 0.0.0.0
  - Subnetmask: 0.0.0.0

Measurement loop - Input

**Meas. loop**

**Input**

- **Parameter**
  - Analogue
    - Change input?
  - 4-20mA

**Sensor Selection**

**Sensor search**

- Sensor search running ...

Meas. loop - Parameter

**Meas. loop**

**Input**

- **Parameter**
  - Level
  - Pressure
Meas. loop - Adjustment

Device settings
Meas. loop
Display
Diagnostics
Additional adjustments
Info

Units of measurement
Density units
Density

Meas. loop
Input Parameter
Adjustment
Damping
Linearization curve

Min. adjustment
4.000 mA
7.484 mA

Max. adjustment
100.00 %
20.000 mA
15,571 mA

Meas. loop - Damping

Device settings
Meas. loop
Display
Diagnostics
Additional adjustments
Info

Meas. loop
Parameter
Adjustment
Damping
Linearization curve
Scaling

Damping
0 s

Meas. loop - Linearization curve

Device settings
Meas. loop
Display
Diagnostics
Additional adjustments
Info

Meas. loop
Adjustment
Damping
Linearization curve
Scaling
Meas. loop TAG

Linearization curve
Linear
Horiz., cylinder
Sphere
To square root
Linearizer table
Meas. loop - Scaling

Scaling units
- Other
- %

Scaling
- 100% = 100.00 %
- 0% = 0.00 %

Meas. loop - Meas. loop TAG

TAG - No. 1

Meas. loop - Outputs - Relay

Outputs
- Relay output
  - Current output

Relay output
- Relay 1
- Relay 2
- Relay 3
- Relay 4
- Relay 5

Relay operating node 1
- Overfill prot.
  - Off
  - On

Basic meas. value 1
- Percent

Switch points 1
- Switch point Off:
  - 100.0 %
- Switch point On:
  - 0.0 %

Pump acknowledgment
- On

Acknowledgment time
- 10 s
Meas. loop - Outputs - Current output

Display

Diagnostics

Device settings
Meas. loop
Display
Diagnostics
Additional adjustments
Info

Displayed value

Language

Brightness

Device status

Device status

Sensor status

Switch on period

Relay 1
Relay 2
Relay 3
Relay 4

OK

OK

Input 1
Input 2
Input 3
Input 4

3.83 mA

Low

Low

Low

Low

0 h

0 h

0 h

0 h

0 mA

0 mA

0 mA

0 mA

Percent

Percent

Percent

Percent

English

English

English

English

50 %

50 %

50 %

50 %
Additional settings - Simulation

Device settings
Meas, loop
Display
Diagnostics
Additional adjustments
Info

Simulation
Start
simulation ▼

Simulation
Percent
Lin, percent
Sensor value

Simulation running
001.0
% -10.0 110.0

Additional settings - Reset

Device settings
Meas, loop
Display
Diagnostics
Additional adjustments
Info

Reset
Select
reset

Reset
Basic settings
Totalizer
Failure rel. 1
Failure rel. 2

Reset
Basic settings
Reset
now?

Reset
Please wait

Additional settings - PIN

Device settings
Meas, loop
Display
Diagnostics
Additional adjustments
Info

PIN
Enable?

PIN
0000

Additional settings - Change sensor address (only with option RS232/Ethernet interface)

Device settings
Meas, loop
Display
Diagnostics
Additional adjustments
Info

Sensor address
Change
now?

Previous address
00

New address
00
## Info

<table>
<thead>
<tr>
<th>Sensor type</th>
<th>Date of manufacture</th>
<th>Date of last change using PC</th>
<th>Device characteristics</th>
</tr>
</thead>
<tbody>
<tr>
<td>Serial number</td>
<td>Software version</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11112222</td>
<td>1.00</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**MAC address**

00:30:87:98:96:87
7 Setup with PACTware

7.1 Connecting the PC

For a brief connection to the PC, for example for parameter adjustment, you should use the USB interface. The necessary connection socket is on the lower side of all instrument versions. Keep in mind that correct functioning of the USB interface is only guaranteed in the (limited) temperature range of 0 … 60 °C.

Note:
The connection via USB requires a driver. First of all, install the driver before connecting VEGAMET 391 to the PC.

The required USB driver is included on the CD "DTM Collection". You should always use the latest version to ensure support of all instrument functions. The system requirements for operation correspond to those of the "DTM Collection" or of PACTware.

During installation of the driver package "DTM for Communication", the suitable instrument driver is installed automatically. When VEGAMET 391 is connected, the driver installation is completed autonomously and is ready for operation without a restart.

Connection of the PC via USB

With the Ethernet interface, the instrument can be connected directly to an existing PC network. Any standard patch cable can be used. A cross-over cable must be used when connecting the instrument directly to the PC. To reduce EMC interferences, the supplied split ferrite should be connected to the Ethernet cable. Each instrument then gets its own IP address under which it can be accessed from anywhere in the network. The parameter adjustment of the instrument via PACTware and DTM can be carried out from any PC. The measured values can be made available to individual users within the network.

Fig. 8: Connection of the PC via USB
1 USB interface of the PC
2 Mini-USB connection cable (in the scope of delivery)
3 USB interface of VEGAMET 391
company network as HTML chart. As an alternative, the independent, time or event-controlled transmission of measured values via e-mail is also possible. The measured values can also be called up via a visualisation software.

**Note:**
To contact the instrument, a corresponding IP address must be available in the instrument. Each instrument is preset to address 192.168.200.200. Enter the address and subnet mask corresponding to your network directly via the keyboard. As an alternative, addressing is also possible via DHCP and a host name. Briefly interrupt the operating voltage after each modification, then the instrument is accessible via its IP address or host name everywhere in the network.

In addition, these specifications must be entered in the DTM (see chapter "Parameter adjustment with PACTware").

---

**Fig. 9: Connection of the PC via Ethernet**
1. Ethernet interface of the PC
2. Ethernet connection cable (Cross-Over cable)
3. Ethernet interface

---

**Connection of the modem via RS232**
The RS232 interface is particularly suitable for easy modem connection. External analog, ISDN and GSM modems with standard interface can be used. The necessary RS232 modem connection cable is included with the delivery. To reduce EMC interference, you should mount the supplied ferrite bead on the RS232 modem connection cable. Via a visualisation software, measured values can be retrieved remotely and further processed. Alternatively, the autonomous time or event controlled transmission of measured values via e-mail is also possible. Remote parameter adjustment of the instrument and the connected sensors is also possible with PACTware.
Connection of the modem via RS232

Via the RS232 interface, direct parameter adjustment and measured value enquiry of the instrument can be carried out with PACTware. Use the RS232 modem connection cable supplied with the instrument and an additionally connected null modem cable (e.g. article no. LOG571.17347). To reduce EMC interference, you should mount the supplied ferrite bead on the RS232 modem connection cable.

If there is no RS232 interface available on the PC or if it is already occupied, you can also use a USB-RS232 adapter (e.g. article no. 2.26900).

Connection of the PC via RS232

Fig. 10: Connection of the modem via RS232
1 Analogue, ISDN or GSM modem with RS232 interface
2 RS232 modem connection cable (in the scope of delivery)
3 RS232 interface

Fig. 11: Connection of the PC via RS232
1 RS232 interface of the PC
2 RS232 interlink cable (article no. LOG571.17347)
3 RS232 modem connection cable (in the scope of delivery)
4 RS232 interface
Assigment RS232 modem connection cable

<table>
<thead>
<tr>
<th></th>
<th>1</th>
<th>2</th>
<th>3</th>
</tr>
</thead>
<tbody>
<tr>
<td>RXD</td>
<td>4</td>
<td>2</td>
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<tr>
<td>TXD</td>
<td>3</td>
<td>3</td>
<td></td>
</tr>
<tr>
<td>RTS</td>
<td>6</td>
<td>7</td>
<td></td>
</tr>
<tr>
<td>CTS</td>
<td>2</td>
<td>8</td>
<td></td>
</tr>
<tr>
<td>GND</td>
<td>5</td>
<td>5</td>
<td></td>
</tr>
<tr>
<td>DTR</td>
<td>1</td>
<td>4</td>
<td></td>
</tr>
</tbody>
</table>

Fig. 12: Terminal assignment of the RS232 modem connection cable

1 Name of the interface cable
2 Assignment of the RJ45 plug (view contact side)
3 Assignment of the RS232 plug (view soldering side)

### 7.2 Parameter adjustment with PACTware

**Prerequisites**

As an alternative to the integrated indicating and adjustment unit, the adjustment can be also carried out via a Windows PC. For this, the configuration software PACTware and a suitable instrument driver (DTM) according to the FDT standard are required. The actual PACTware version as well as all available DTMs are compiled in a DTM Collection. Furthermore, the DTMs can be integrated into other frame applications compliant with the FDT standard.

**Note:**
To ensure that all instrument functions are supported, you should always use the latest DTM Collection. Furthermore, not all described functions are included in older firmware versions. The latest instrument software can be also downloaded from our homepage. A description of the update procedure is also available in the Internet.

Further setup steps are described in the operating instructions manual "DTM Collection/PACTware" attached to each DTM Collection and which can also be downloaded from the Internet. A detailed description is available in the online help of PACTware and the DTMs as well as in the supplementary instructions manual "RS232/Ethernet connection".
**Connection via USB**
When connecting via USB, the instrument serial number must be entered as address in the DTM during project setup without assistant (offline mode). To do this, click with the right mouse key in the project window on the USB-DTM and select "Additional functions - Change DTM addresses".

**Connection via Ethernet**
When connecting via Ethernet, VEGAMET 391 must be provided with a suitable IP address and subnet mask. If the project setup is carried out without assistant (online mode), IP address and subnet mask must be entered additionally in the DTM. Click in the project window with the right mouse key to the Ethernet DTM and choose "Add. functions - Modify DTM addresses".

**Standard/Full version**
All device DTM s are available as a free-of-charge standard version and as a full version that must be purchased. In the standard version, all functions for complete setup are already included. An assistant for simple project configuration simplifies the adjustment considerably.

Saving/printing the project as well as import/export functions are also part of the standard version.

In the full version there is also an extended print function for complete project documentation as well as a save function for measured value and echo curves. In addition, there is a tank calculation program as well as a multiviewer for display and analysis of the saved measured value and echo curves.

### 7.3 Setup web server/e-mail, remote enquiry

Setup and application examples of the web server, the e-mail functions and the visualisation WEB-VV are specified in the supplementary instructions "RS232/Ethernet connection".

The connection via Modbus-TCP or ASCII protocol is described in an additional supplementary instruction "Modbus-TCP, ASCII protocol".

Both supplementary instructions are attached to each instrument with RS232 or Ethernet interface.
8 Application examples

8.1 Level measurement in a cylindrical tank with overfill protection/dry run protection

Functional principle
The level is detected via a sensor and transmitted to the signal conditioning instrument by means of a 4 ... 20 mA signal. Here, an adjustment is carried out converting the input value delivered by the sensor into a percentage value.

Due to the geometrical form of the cylindrical tank, the vessel volume does not increase linear with the level. This can be compensated by selecting the linearization curve integrated in the instrument. This curve states the relation between percentage level and vessel volume. If the level should be displayed in litres, also a scaling must be carried out. For this purpose, the linearized percentage value is converted into a volume, for example with the unit litres.

The filling and emptying is controlled via relay 1 and 2 integrated in the signal conditioning instrument. During filling, relay mode "Overfill protection" is adjusted. The relay is hence switched off (safe currentless condition) when the max. level is exceeded, when falling below the min. level it is switched on again (switch on point < switch off point). During emptying, mode "Dry run protection" is used. This relay is hence switched off when falling below the min. level (safe currentless condition), when falling below the min. level it is switched on again (switch on point > switch off point).

Example
A cylindrical tank has a capacity of 10000 litres. The measurement is carried out with a level sensor operating according to the principle of the guided microwave. The filling by a tank car is controlled via relay 1 and a valve (overfill protection). The discharge is carried out via a pump and is controlled by relay 2 (dry run protection). The max.
volume should be at 90 % level, these are 9538 litres with a standard vessel (according to bearing chart). The min. level should be adjusted to 5 %, this corresponds to 181 litres. The volume should be displayed in litres.

**Adjustment**

Carry out the adjustment in the signal conditioning instrument as described in chapter "Setup steps". No additional adjustment must hence be carried out on the sensors. For the max. adjustment, fill the vessel up to the requested max. level and accept the actually measured value. If this is not possible, the respective current value can be entered alternatively. For the min. adjustment, empty the vessel up to the min. level or enter the respective current value.

**Linearisation**

To display the percentage level correctly, select under "Measurement loop - Linearization curve" the entry "Cylindrical tank".

**Scaling**

The display the volume in litres, you have to enter under "Measurement loop - Scaling" as unit "Volume" in litres. Finally, the allocation is carried out, in this example 100 % ≙ 10000 litres and 0 % ≙ 0 litres.

**Relay**

Percent is selected as reference value for the relays. The mode of relay 1 is set to overfill protection, relay 2 gets mode dry run protection. To ensure that the pump switches off in case of failure, the reaction in case of failure should be adjusted to switching status OFF. The switching points are adjusted as follows:

- **Relay 1**: Switch-off point 90 %, switch-on point 85 %
- **Relay 2**: Switch-off point 5 %, switch-on point 10 %

**Information:**

The switch on and off point of the relays must not be adjusted to the same switching point because this would cause a permanent switch-in on and off when this threshold is reached. To avoid this effect also with fluctuating product surface, a difference (hysteresis) of 5 % is useful between the switching points.

### 8.2 Pump control 1/2 (running time controlled)

**Functional principle**

Pump control 1/2 is used to control several pumps with the same function dependent on the previous running time. Always the pump with the shortest running time is switched on and the pump with the longest running time switched off. With increased requirement, all pumps can also run at the same time dependent on the entered switching points. With this measure, a steady utilization of the pumps is achieved and the reliability increased.

All relays with activated pump control are not assigned to a certain switching point but are switched on or off depending on the operating time. The signal conditioning instrument selects the relay with the shortest operating time when the switch-on point is reached and the relay with the longest operating time when the switch-off point is reached.
Probable failures of the pumps can be processed in addition via the digital inputs.

With this pump control, there are two different versions:

- **Pump control 1**: The upper switching point determines the switch-off point for the relay, whereas the lower switching point determines the switch-on point.
- **Pump control 2**: The upper switching point determines the switch-on point for the relay, whereas the lower switching point determines the switch-off point.

**Example**

Two pumps should empty the vessel when a certain level is reached. At 80% filling, the pump with the shortest running time should switch on. If the level nevertheless increases, a second pump should switch on at 90%. Both pumps should switch off again at 10% filling.

**Setup**

Select in the DTM navigation section the menu items "Meas. loop - Outputs - Relay".

- Set mode "Pump control 2" for relay 1 and 2.
- Enter the switching points for the concerned relays as follows:
  - Relay 1 upper switching point = 80.0%
  - Relay 1 lower switching point = 10.0%
  - Relay 2 upper switching point = 90.0%
  - Relay 2 lower switching point = 10.0%

The function of the pump control 2 is shown in detail in the following diagram. The previously described example is used as a basis.

**Pump monitoring**

With a pump control, pump monitoring can be switched on. For this purpose, a return signal is required on the respective digital input. The assignment of the digital inputs to the relais is fixed:

- Digital input 1 - Relay 1
- Digital input 2 - Relay 2

![Diagram of pump control 2](image-url)
Digital input 3 - Relay 3
Digital input 4 - Relay 4

If the pump monitoring for a relay was switched on, a timer is started when the relay is switched on (time allowance with parameter "Report time"). If the checkback signal comes from the pump on the respective digital input within the defined report time, the pump relay remains energized, otherwise the relay is immediately switched off and a fault signal outputted. A fault signal and switching off of the relay is carried out even if the relay is already switched on and the pump checkback signal changes during the running time of the pump. In addition, a switched-off relay of the pump control is looked for and switched on instead of the disturbed relay. A Low signal on the digital input is evaluated as a pump error signal.

To undo the fault message, the signal on the digital input must change to "Good" or must be reset via the menu. If the fault message is reset and the pump still delivers a failure, a fault message is triggered after the enquiry time. The enquiry time is started as described above when switching on the relay.

Switch on reaction of the pump control 2
When the signal conditioning instrument is switched on, the relays are at first in a switched-off status. Depending on the input signal and the switched-on period of the individual relays, the following relay conditions can occur after the start procedure:

- Input signal is higher than the upper switching point -> Relay with the shortest switch on period is switched on
- Input signal is between lower and upper switching point -> Relay remains switched off
- Input signal is smaller than the lower switching point -> Relay remains switched off

8.3 Pump control 3/4 (sequentially controlled)

Functional principle

Pump control 3/4 is used to control several pumps with the same function alternately and in a fixed sequence. In case of an increased requirement, all pumps can run at the same time depending on the entered switching points. With this measure, a steady utilization of the pumps is reached and the reliability increased.

All relays with activated pump control are not assigned to a certain switching point but are switched on and off alternately. The signal conditioning instrument selects when reaching a switching on point, the relay which is next in the sequence. When reaching a switching off point, the relays are switched off in the sequence they were switched on.

Via the digital inputs, possible fault signals of the pumps can also be evaluated. You can find the description in the application example "Pump control 1/2" under "Pump monitoring".

With this pump control, there are two different versions:
Pump control 3: The upper switching point determines the switch-off point for the relay, whereas the lower switching point determines the switch-on point.

Pump control 4: The upper switching point determines the switch-on point for the relay, whereas the lower switching point determines the switch-off point.

The sequence cannot be changed, the relay with the lowest index is switched on first, the relay with the next higher index, after the relay with the highest index, it is returned to the relay with the lowest index, for example Rel. 1 -> Rel. 2 -> Rel. 3 -> Rel. 4 -> Rel. 1 -> Rel. 2 ...

The sequence applies only to those relays assigned to the pump control.

**Example**

In a waste water disposal system, a sump should be pumped empty when a certain level is reached. Three pumps are available for this. At 60 % level, pump 1 should run until the level has fallen below 10 %. If the 60 % point is exceeded again, the same task is transferred to pump 2. In the third cycle, pump 3 is activated; after that, pump 1 again. If the level continues to rise despite operation of a pump, an additional pump switched on when the level exceeds the 75 % switching point. And if the level still rises further due to extreme inflow and exceeds the 90 % limit, pump 3 is also switched on.

**Setup**

Select in the DTM navigation section the menu items "Meas. loop - Outputs - Relay".

- Set mode "Pump control 4" for relays 1 … 3.
- Enter the switching points for the concerned relays as follows:
  - Relay 1 upper switching point = 60.0 %
  - Relay 1 lower switching point = 10.0 %
  - Relay 2 upper switching point = 75.0 %
  - Relay 2 lower switching point = 10.0 %
  - Relay 3 upper switching point = 90.0 %
  - Relay 3 lower switching point = 10.0 %

The function of the pump control 4 is shown in detail in the following diagram. The previously described example is used as a basis.

---

**Fig. 15: Example of a pump control 4**
If all pumps have the same capacity and are used for the same task alternately, the running time should always be roughly the same. The respective operating hours are summed up individually in the signal conditioning instrument and can be read out in the menu "Diagnose – Switched-on time". If a considerable difference between the pumps is determined, it means the capacity of one of the pumps must have fallen considerably. This information can be consulted for diagnosis and service, e.g. to recognize plugged-up filters or worn out bearings.

Since in this case, all pumps are operated alternately in the same range, the switch on and switch off points should be theoretically by the same. Due to this, all relays would always switch together. To reach the respective switching condition, the requested switching points must be assigned to a relay, switching points are assigned to the other relays which are never reached in normal operation, for example 110 % and -10 %.

Note:
The index of the lastly switched on relay is not saved in case of voltage loss, this means that after switching on the signal conditioning instrument, always the relay with the lowest index starts.

8.4 Tendency recognition

Functional principle
The function of the tendency recognition is to recognize a defined change within a certain time period and to transfer this information to a relay output.

Principle of operation
The information for tendency recognition is generated out of the measured value change per time unit. The output variable is always the measured value in percent. The function can be configured for rising and falling tendency. The actual measured value is determined and summed with a sample rate of a second. After the max. reaction time, the average value is generated out of this sum. The real measured value change results then of the newly calculated average value less the previously calculated average value. If this difference exceeds the defined percentage value, the tendency recognition responds and the relay deenergises.

Note:
The activation and configuration of the tendency recognition requires PACTware with the suitable DTM. Setting parameters via the integrated indicating and adjustment unit is not possible.

Parameter
- **Measured value change higher**: Measured value change per time unit, at which the tendency recognition should respond
- **Max. reaction time**: Time after which a new measured value generation is carried out and the measured value change is recalculated
Hysteresis: is automatically always 10 % of the value of "Measured value change larger than"

Reaction in case of failure: In case of a failure, the relay goes into the defined condition

Note:
After switching on or a failure, always two complete cycles must be executed until a measured value difference can be calculated and a tendency can be outputted.

Example
The level in a basin should be monitored on rising tendency. If the rise is higher than 25 % per minute, an additional emptying pump should be switched on. The max. reaction time should be one minute. In case of a probable failure, the pump should be switched off.

Setup
Select in the DTM navigation section the menu items "Meas. loop - Outputs - Relay".

- E.g. set for relay 1 the mode "Rising tendency"
- Select under "Reaction in case of failure" the option "Switching condition off"
- Enter the following values into the parameter fields:
  - Measured value more than 25 %/min.
  - Max. reaction time 1 min.

The function of the tendency recognition is shown in detail in the following diagram. The previously described example is used as a basis.

![Diagram of tendency recognition](image)

*Fig. 16: Example for tendency recognition*

1. Old average value = 25 %, new average value = 25 %
   Difference < 25 % -> Relay ON
2. Old average value = 25 %, new average value = 37.5 %
   Difference < 25 % -> Relay ON
3. Old average value = 37.5 %, new average value = 62.5 %
   Difference = 25 % -> Relay OFF
4. Old average value = 62.5 %, new average value = 75 %
   Difference < 25 % -> Relay ON
5. tm -> max. reaction time
8.5 Flow measurement

**Functional principle**
For flow measurement in open flumes, a constriction or standardised flume must be used. Depending on the flow volume, this constriction generates a certain amount of backup. The flow can be determined from the height of this backup. The flow volume is outputted by an appropriate number of pulses on the relay or current output and can thus be further processed by connected downstream instruments.

There is also the possibility to sum up the flow volume by means of a totalizer, the result is available on the display and as PC/DCS value.

**Flume**
Depending on the type and version, each flume generates a different backwater. The data of the following flumes are available in the instrument:

- Palmer-Bowlus-Flume
- Venturi flume, trapezoidal weir, rectangular weir
- Rectangular weir, V-Notch

**Setup**
The configuration of the flow measurement loop requires PACTware with the suitable DTMs. The example refers to a flow measurement with a radar sensor. The following setup steps must be carried out:

- Selection of the parameter "Flow"
- Carrying out adjustment
- Select flume (linearization)
- Set scaling
- Parameter adjustment of pulse outputs
- Parameter adjustment of the totalizer

**Parameter - Flow**
Select in the DTM window "Parameter" the option "Flow" with the requested unit of measurement.

**Adjustment**

**Min. adjustment:** Enter the suitable value for 0 %, i.e. the distance from the sensor to the medium as long as there is no flow. These are in the following example 1.40 m.

**Max. adjustment:** Enter the suitable value for 100 %, i.e. the distance from the sensor to the medium, with the max. flow volume. This is in the following example 0.80 m.
Linearisation curve
Select in the DTM window "Linearization" the option "Flow" and then the used flume (in the above example V-notch).

Scaling
Select in the DTM window "Scaling" under "Parameter" the option "Flow". Finally the allocation of a value must be carried out, i.e. the flow volume is assigned to the 0 and 100 % value. As the last step, select the requested meas. unit. For above example: 0 % = 0 and 100 % = 400, meas. unit m³/h.

Outputs
First of all decide if you want to use a relay and/or a current output. In the DTM window "Outputs" you can use any of the three outputs as long as these are not yet used for other tasks.

Finally select under "Mode" (relay) or "Output characteristics" (current output) the option "Flow volume pulse" or "Sampling pulse". Enter under "Pulse output all" the flow volume after which a pulse should be outputted (e.g. 400 m³ corresponds to one pulse per hour with a flow volume of 400 m³/h).

In mode "Sampling pulse" an additional pulse is outputted after a defined time. This means that a timer is started after each pulse after which another pulse is outputted. This applies only if already a pulse was outputted after exceeding the flow volume.

Due to sludge at the bottom of the flume, it can happen that the min. adjustment originally carried out can no longer be reached. Therefore small quantities will continuously enter the flow volume detection despite the "empty" flume. The option "Min. flow volume suppression" offers the possibility to suppress measured flow volumes below a certain percentage value for the flow volume detection.

Totalizer
If a flow measurement is set up, the flow value can also be summed up and displayed as flow volume. The graph can be selected in the menu item "Display". The following parameters must be adjusted for the totalizer:

- Measuring unit: Selection of the unit by which the totalizer adds.
- Indicating format: Selection of the indicating format (number of decimal positions of the counter)
Information:
The totalizer can be reset in the menu "Additional settings" - "Reset"
9 Maintenance and fault rectification

9.1 Maintenance

If the instrument is used properly, no special maintenance is required in normal operation.

9.2 Rectify malfunctions

Reaction when malfunctions occur

The operator of the system is responsible for taking suitable measures to remove interferences.

Causes of malfunction

A maximum of reliability is ensured. Nevertheless, faults can occur during operation. These may be caused by the following, e.g.:

- Measured value from sensor not correct
- Voltage supply
- Interference on the cables

Fault rectification

The first measures to be taken are to check the input and output signal as well as to evaluate the error messages via the display. The procedure is described below. Further comprehensive diagnostics can be carried out on a PC with PACTware and the suitable DTM. In many cases, the causes can be determined in this way and faults rectified.

24 hour service hotline

However, should these measures not be successful, call the VEGA service hotline in urgent cases under the phone no. +49 1805 858550.

The hotline is available to you 7 days a week round-the-clock. Since we offer this service world-wide, the support is only available in the English language. The service is free of charge, only the standard telephone costs will be charged.

Failure message

The signal conditioning instrument and the connected sensors are permanently monitored during operation and the values entered during parameter adjustment are checked for plausibility. If irregularities occur or in case of incorrect parameter adjustment, a fault signal is triggered. In case of an instrument defect or line break/shortcircuit, a fault signal is also triggered.

The fault indication lights in case of failure and the current output as well as the relays react according to the configured fault mode. If relay 6 was configured as fail safe relay, it will deenergize. In addition, one of the following error messages is outputted on the display.

? E003

- CRC error (error with self-check)
  → Carry out a reset
Send instrument for repair

? E007
- Sensor type not compatible
  → Search for sensor again and allocate under "Meas. loop - Input"

? E008
- Sensor not found
  → Check connection of the sensor
  → Check HART address of the sensor

? E013
- Sensor signals failure, no valid measured value
  → Check sensor parameter adjustment
  → Send sensor for repair

? E014
- Sensor current > 21 mA or short-circuit
  → Check sensor, e.g. on failure
  → Remove short-circuit

? E015
- Sensor in boot phase
- Sensor current < 3.6 mA or line break
  → Check sensor, e.g. on failure
  → Remove line break
  → Check connection of the sensor

? E016
- Empty/full adjustment reversed
  → Carry out a fresh adjustment

? E017
- Adjustment span too small
  → Carry out a fresh adjustment and increase the distance between min. and max. adjustment

? E021
- Scaling span too small
  → Carry out a fresh scaling, increase the distance between min. and max. scaling.
? E030
  • Sensor in boot phase
  • Value not valid
  → Check sensor parameter adjustment

? E034
  • EEPROM defective
  → Carry out a reset
  → Send instrument for repair

? E035
  • EEPROM CRC error
  → Carry out a reset
  → Send instrument for repair

? E036
  • Instrument software not executable (during software update or after failed update)
  → Wait until software update is finished
  → Carry out another software update

? E053
  • Sensor measuring range not read correctly
  → HART communication error: Check sensor cable and screening

? E062
  • Pulse priority too small
  → Increase under "Output" the entry "Pulse output all" so that max. one pulse per second is outputted.

? E110
  • Relay switching points too close together
  → Increase the difference between the two relay switching points

? E111
  • Relay switching points interchanged
  → Change relay switching points for "On/Off"
Several relays are assignef to the pump control which are not set to the same failure mode

All relays which are assigned to the pump control must be set to the same failure mode

Several relays are assigned to the pump control which are not configured to the same mode

All relays which are assigned to the pump control must be set to the same mode

A monitored pump signals failure

Check the faulty pump. For acknowledgement, carry out the reset "Failure relay 1 … 4" or switch the instrument OFF and ON again

Depending on the failure reason and measures taken, the steps described in chapter "Set up" must be carried out again, if necessary.

9.3 Instrument repair

If a repair is necessary, please proceed as follows:

You can download a return form (23 KB) from our Internet homepage www.vega.com under: "Downloads - Forms and certificates - Repair form".

By doing this you help us carry out the repair quickly and without having to call back for needed information.

- Print and fill out one form per instrument
- Clean the instrument and pack it damage-proof
- Attach the completed form and, if need be, also a safety data sheet outside on the packaging
- Please ask the agency serving you for the address of your return shipment. You can find the respective agency on our website www.vega.com under: "Company - VEGA worldwide"
10 Dismounting

10.1 Dismounting steps
Take note of chapters "Mounting" and "Connecting to power supply" and carry out the listed steps in reverse order.

10.2 Disposal
The instrument consists of materials which can be recycled by specialised recycling companies. We use recyclable materials and have designed the electronics to be easily separable.

WEEE directive 2002/96/EG
This instrument is not subject to the WEEE directive 2002/96/EG and the respective national laws. Pass the instrument directly on to a specialised recycling company and do not use the municipal collecting points. These may be used only for privately used products according to the WEEE directive.

Correct disposal avoids negative effects to persons and environment and ensures recycling of useful raw materials.

Materials: see chapter "Technical data"
If you have no way to dispose of the old instrument properly, please contact us concerning return and disposal.
11 Supplement

11.1 Technical data

**General data**

<table>
<thead>
<tr>
<th>Series</th>
<th>Installation device for mounting in front panel or housing</th>
</tr>
</thead>
<tbody>
<tr>
<td>Weight</td>
<td>620 g (1.367 lbs)</td>
</tr>
<tr>
<td>Housing materials</td>
<td>Valox 357 XU</td>
</tr>
<tr>
<td>Connection terminals</td>
<td>Pluggable spring-loaded terminal with coding</td>
</tr>
<tr>
<td>Max. wire cross-section</td>
<td>2.5 mm² (AWG 14)</td>
</tr>
</tbody>
</table>

**Voltage supply**

| Operating voltage | 20 ... 253 V AC, 50/60 Hz, 20 ... 253 V DC |
| Max. power consumption | 7 VA; 3 W |

**Sensor input**

| Number of sensors | 1 x 4 ... 20 mA (HART) |
| Type of input (selectable) | |
| Active input | Sensor power supply by VEGAMET 391 |
| Passive input | Sensor has own power supply |
| Measured value transmission (switchable with RS232/Ethernet interface option) | |
| 4 ... 20 mA | analogue for 4 ... 20 mA sensors |
| HART protocol | digital for HART sensors |
| Deviation of measured value (4 ... 20 mA) | ±16 µA (0.1 % from 4 ... 20 mA) |
| Terminal voltage | |
| Non-Ex version | 28.5 ... 22 V at 4 ... 20 mA |
| Ex version | 19 ... 14.5 V at 4 ... 20 mA |
| Current limitation | approx. 26 mA |
| Detection line break | ≤ 3.6 mA |
| Detection shortcircuit | ≥ 21 mA |
| Adjustment range 4 ... 20 mA sensor | |
| Empty adjustment | 2.4 ... 21.6 mA |
| Full adjustment | 2.4 ... 21.6 mA |
| min. adjustment delta | 16 µA |
| Adjustment range HART sensor | ± 10 % of sensor measuring range |
| min. adjustment delta | 0.1 % of sensor measuring range |
| Connection cable to the sensor | two-wire screened standard cable |
## Digital input

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>4 x digital input</td>
</tr>
<tr>
<td>Type of input</td>
<td>Passive</td>
</tr>
<tr>
<td>Switching threshold</td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>-3 ... 5 V DC</td>
</tr>
<tr>
<td>High</td>
<td>11 ... 30 V DC</td>
</tr>
<tr>
<td>Max. input voltage</td>
<td>30 V DC</td>
</tr>
<tr>
<td>Max. input current</td>
<td>30 mA</td>
</tr>
<tr>
<td>Max. sampling rate</td>
<td>10 Hz</td>
</tr>
</tbody>
</table>

## Relay outputs

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>6 x operating relay</td>
</tr>
<tr>
<td>Function</td>
<td>Switching relay for level, fault signal or pulse relay for flow/sampling pulse</td>
</tr>
<tr>
<td>Contact</td>
<td>Floating spdt</td>
</tr>
<tr>
<td>Contact material</td>
<td>AgSnO2, hard gold-plated</td>
</tr>
<tr>
<td>Turn-on voltage</td>
<td>min. 10 mV DC, max. 250 V AC/60 DC</td>
</tr>
<tr>
<td>Switching current</td>
<td>min. 10 µA DC, max. 3 A AC, 1 A DC</td>
</tr>
<tr>
<td>Breaking capacity</td>
<td>min. 50 mW, max. 500 VA, max. 54 W DC (with U less than 40 V)</td>
</tr>
<tr>
<td>Min. programmable switching hysteresis</td>
<td>0.1 %</td>
</tr>
<tr>
<td>Mode pulse output</td>
<td></td>
</tr>
<tr>
<td>Pulse length</td>
<td>350 ms</td>
</tr>
</tbody>
</table>

## Current output

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Specification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Quantity</td>
<td>1 x output</td>
</tr>
<tr>
<td>Function</td>
<td>Current output for level or flow/sampling pulse</td>
</tr>
<tr>
<td>Range</td>
<td>0/4 ... 20 mA, 20 ... 0/4 mA</td>
</tr>
<tr>
<td>Resolution</td>
<td>1 µA</td>
</tr>
<tr>
<td>Max. load</td>
<td>500 Ω</td>
</tr>
<tr>
<td>Fault signal (switch over)</td>
<td>0; &lt; 3.6; 4; 20; 20.5; 22 mA</td>
</tr>
<tr>
<td>Accuracy</td>
<td></td>
</tr>
<tr>
<td>Standard</td>
<td>±16 µA (0.1 % from 4 ... 20 mA)</td>
</tr>
<tr>
<td>with EMC interferences</td>
<td>±80 µA (0.5 % of 4 ... 20 mA)</td>
</tr>
<tr>
<td>Temperature error relating to 20 mA</td>
<td>0.005 %/K</td>
</tr>
<tr>
<td>Mode pulse output</td>
<td></td>
</tr>
</tbody>
</table>

1) If inductive loads or stronger currents are switched through, the gold plating on the relay contact surface will be permanently damaged. The contact is then no longer suitable for switching low-level signal circuits.
- Voltage pulse: 12 V DC at 20 mA with load 600 Ω
- Pulse length: 200 ms

### USB Interface

- Quantity: 1 x on front plate
- Plug connection: Mini-B (4-pole)
- USB specification: 2.0 (Fullspeed)
- Max. cable length: 5 m (196 in)

### Ethernet Interface (Optional)

- Quantity: 1 x, cannot be combined with RS232
- Data transmission: 10/100 MBit
- Plug connection: RJ45
- Max. cable length: 100 m (3937 in)

### RS232 Interface (Optional)

- Quantity: 1 x, cannot be combined with Ethernet
- Plug connection: RJ45 (modem connection cable on 9-pole D-SUB in the scope of delivery)
- Max. cable length: 15 m (590 in)

### Clock (Only with Interface Option)

- Accuracy/Deviation:
  - typical: 20 ppm (correspond to 10.5 min./year)
  - max.: 63 ppm (correspond to 33 min./year)

- Power reserve of the lithium battery (Li/MnO2):
  - typical: 10 years at 20 °C
  - min.: 4 years

### Indications

- Measured value indication:
  - graphic-capable LC display (65 x 32 mm), lighted
  - Max. indicating range: -99999 ... 99999

- LED displays:
  - Status operating voltage: 1 x LED green
  - Status fault signal: 1 x LED red
  - Status operating relay 1 ... 6: 6 x LED yellow

2) Limited temperature range, see ambient conditions
Operation

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjustment elements</td>
<td>4 x keys for menu adjustment</td>
</tr>
<tr>
<td>PC adjustment</td>
<td>PACTware with respective DTM</td>
</tr>
</tbody>
</table>

Ambient conditions

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Ambient temperature</td>
<td></td>
</tr>
<tr>
<td>Instrument in general</td>
<td>-20 … +60 °C (-4 … +140 °F)</td>
</tr>
<tr>
<td>USB interface</td>
<td>0 … +60 °C (32 … +140 °F)</td>
</tr>
<tr>
<td>Storage and transport</td>
<td>-40 … +80 °C (-40 … +176 °F)</td>
</tr>
</tbody>
</table>

Electrical protective measures

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<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Protection rating</td>
<td></td>
</tr>
<tr>
<td>Front</td>
<td>IP 65</td>
</tr>
<tr>
<td>Instrument</td>
<td>IP 20</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Overvoltage category</td>
<td>II</td>
</tr>
<tr>
<td>Protection class</td>
<td>II</td>
</tr>
</tbody>
</table>

Electrical separating measures

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Reliable separation between power supply, input and digital part</td>
<td></td>
</tr>
<tr>
<td>Reference voltage</td>
<td>250 V</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>3.75 kV</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Galvanic separation between relay output and digital part</td>
<td></td>
</tr>
<tr>
<td>Reference voltage</td>
<td>250 V</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>4 kV</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential separation between Ethernet interface and digital part</td>
<td></td>
</tr>
<tr>
<td>Reference voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>1 kV</td>
</tr>
</tbody>
</table>

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Potential separation between RS232 interface and digital part</td>
<td></td>
</tr>
<tr>
<td>Reference voltage</td>
<td>50 V</td>
</tr>
<tr>
<td>Isolation resistance</td>
<td>50 V</td>
</tr>
</tbody>
</table>

Approvals

Depending on the version, instruments with approvals can have different technical data.

For these instruments, the corresponding approval documents have to be taken into account. These are part of the delivery or can be downloaded under [www.vega.com](http://www.vega.com) via "VEGA Tools" and "serial number search" as well as via "Downloads" and "Approvals".
### 11.2 Overview applications/functionality

The following charts provide an overview of the standard applications and functions of signal conditioning instruments VEGAMET 391/624/625 and VEGASCAN 693. They also give information about whether the respective function can be activated and adjusted via the integrated indicating and adjustment unit (OP) or via PACTware/DTM.

<table>
<thead>
<tr>
<th>Application/Function</th>
<th>391</th>
<th>624</th>
<th>625</th>
<th>693</th>
<th>OP</th>
<th>DTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Level measurement</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Process pressure measurement</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Differential measurement</td>
<td>-</td>
<td>-</td>
<td>•</td>
<td>-</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Interface measurement</td>
<td>-</td>
<td>-</td>
<td>•</td>
<td>-</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Pressurized vessel</td>
<td>-</td>
<td>-</td>
<td>•</td>
<td>-</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Pump control</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Totalizer</td>
<td>•</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Tendency recognition</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Flow measurement</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Simulation sensor value/%-value/lin-%-value</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Simulation scaled values</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Live adjustment</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Measured value limitation (suppression of negative measured values)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Selection linearisation curve (cylindrical tank, spherical tank)</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Creation of individual linearisation curves</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Allocate fail safe relay</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Modify allocation of outputs</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Switch on/Switch off delay relay</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>-</td>
<td>-</td>
<td>•</td>
</tr>
<tr>
<td>Passive input with Ex version</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Modify HART address of the connected sensors</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Activate/deactivate measurement loop</td>
<td>-</td>
<td>-</td>
<td>-</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
</tbody>
</table>

#### Instrument version with interface option

<table>
<thead>
<tr>
<th>Application/Function</th>
<th>391</th>
<th>624</th>
<th>625</th>
<th>693</th>
<th>OP</th>
<th>DTM</th>
</tr>
</thead>
<tbody>
<tr>
<td>Adjust the time</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Assign/modify IP-addr./Subnet mask/Gateway addr.</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Assign/modify DNS server addr.</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
<td>•</td>
</tr>
<tr>
<td>Parameter adjustment of PC/DCS output</td>
<td>•</td>
<td>•</td>
<td>•</td>
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3) Operating Panel (integrated indicating and adjustment unit)  
4) only with VEGAMET 391
11.3 Dimensions

![Diagram of dimensions](image-url)

- **Dimensions**: 73 mm (2.87")
- **Dimensions**: 92 mm x 92 mm (3.62" x 3.62")
- **Dimensions**: 96 mm (3.78")
- **Dimensions**: 100 mm (3.94")
- **Dimensions**: 135 mm (5.32")
- **Dimensions**: 140 mm (5.51")
- **Dimensions**: 119.5 mm (4.71")
- **Dimensions**: 198.5 mm (7.83")
- **Dimensions**: 260 mm (10.24")
- **Dimensions**: 300 mm (11.81")
11.4 Industrial property rights

VEGA product lines are global protected by industrial property rights. Further information see http://www.vega.com.

Only in U.S.A.: Further information see patent label at the sensor housing.


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11.5 Trademark

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All statements concerning scope of delivery, application, practical use and operating conditions of the sensors and processing systems correspond to the information available at the time of printing.

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