D-CON II Electronics
Operating Manual

Communications Unit for
Dry Solids Flowmeter (D-Mass)

English

GTS, Inc.
PO Box 799, Shalimar, FL 32579
Phone: +1 850-651-3388 Fax: +1 850-651-4777
E-mail: info@onthelevel.com Web: http://www.onthelevel.com

1 Contents

2 Notes on this document

2.1 Amendments

Rev.	Date	Amendment
1	04/2016	First issue in new format.
2	05/2016	Polarity corrected, small layout change.
3	05/2016	Pinout corrected.
4	11/2017	Added linearization, extended menu trees.

Tab. 1 Amendments

2.2 Validity

This document is valid for the following devices:

- DSF DCON II Electronics

❏ is a placeholder for any characters.

2.3 Representation

In our operating manuals, we use symbols that indicate special dangers and topics:

	General warning		High voltage warning
	Nuclear radiation warning		Hand injuries warning
	Reference to an explosion-relevant topic		Wear foot protection
	Instruction for optimum and safe functioning		Wear protective helmet

Tab. 2 Warning symbols overview

In our operating manuals, we use a multi-stage system for the warning symbols:

CAUTION
Hazard with a low level of risk which, if not avoided, could cause minor or moderate injury.

WARNING
Hazard with a medium level of risk which, if not avoided, could result in death or serious injury.

DANGER
Hazard with a high level of risk which, if not avoided, could result in death or serious injury.

Inputs and the like are represented as follows:

Font	**Application**
“abc”	Input "abc" or menu item "abc".
<abc>	"abc" button.

Tab. 3 Representation

2.4 Safety instructions

Read these operating instructions carefully before starting all work!

- Devices may only be installed, connected, commissioned and serviced by qualified and authorized personnel under strict observance of these operating instructions, any relevant standards, legal requirements and certificates (depending on application). The manual assumes that you have the required training and skills for the necessary mechanical and electrical work. Otherwise, obtain support from trained personnel.
- Strictly follow the work instructions and proceed with care. Safety risks arise when departing from the manners of usage and work procedures presented in this manual. In certain cases, the approval, warranty and the manufacturer's responsibility will be invalidated.
- Alterations concerning the installation and/or parameter settings may only be made in accordance with these operating instructions and detailed knowledge of the behaviour of a connected controller and the possible influences on the operation processes to be controlled.

- Before opening the housing, switch off the device (de-energise) to avoid contact with live parts and sparking.
- The device contains highly electrostatic-sensitive components. Electrostatic charges must be avoided. The device must be operated when electrostatically grounded.

3 Device description

3.1 Area of application

The DSF DCON II Electronics communication unit may only be used to measure velocity with a DYNAvel sensor, or for velocity and concentration measurements with a DSF sensor.

In combination with a DYNAvel sensor, the analogue concentration input additionally allows one to calculate and output a mass flow rate.

DSF DCON II Electronics may only be in non-hazardous areas. For safety reasons, no network cable should be connected to the back Ethernet port during normal operation.

Any other use is prohibited.

3.2 System set-up

A measuring system comprises a sensor and a DSF DCON II Electronics communication unit:

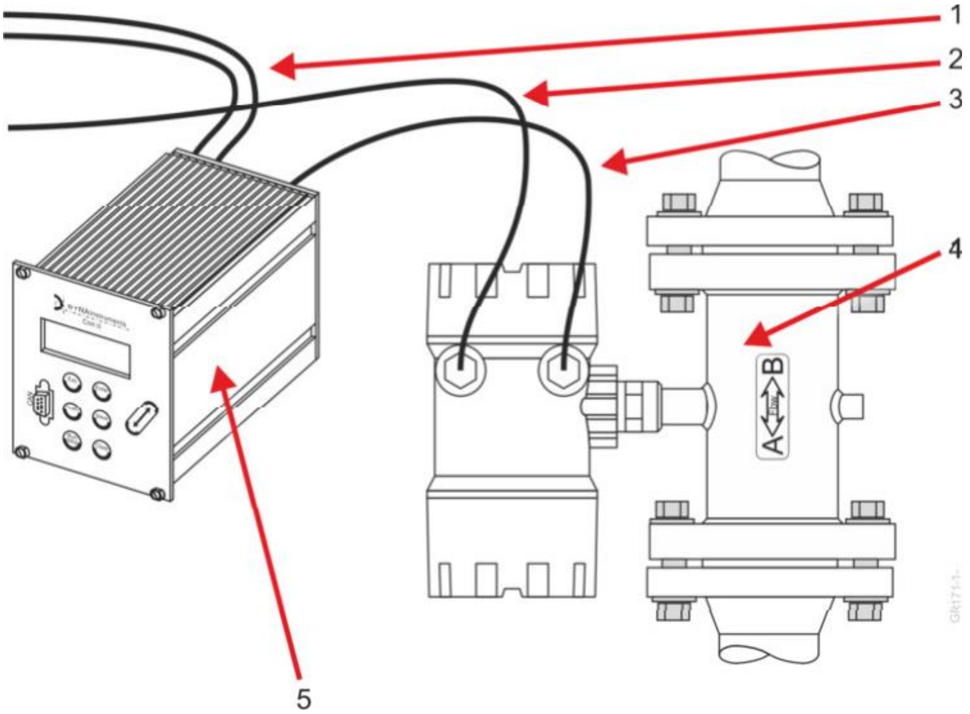

Fig. 1 Wiring principle of the measuring system

1 Two 20 mA outputs
2 Power supply cable 24 V_{DC} for the sensor
3 CAN bus cable:
- to the sensor: configuration
- from the sensor: measurements, simulation values, error messages
4 Sensor
5 DSF DCON II Electronics communication unit

3.3 Functionality

The DSF DCON II Electronics communication unit is connected via a CAN bus cable to a DYNAvel or
DSF sensor. Error messages and threshold violations from the sensor are transmitted to the DSF DCON II Electronics communication unit via the CAN bus cable.

The analogue input can be configured via the software module, e.g. for additional radiometric concentration measurements.

From both measurements, i.e. velocity and concentration, the DYNAcal software module calculates the mass flow rate, which can be output as an analogue value.

In the opposite direction, settings are transmitted via the CAN bus line which allow adaptation to the respective conveying process and the sensor mechanism used (e.g. distance of the sensor rings).

The microprocessor-based electronics equipment serves three main tasks:

- Processing of sensor signals
- Calculation of the mass flow rate based on solid velocity and concentration
- Digital output of measurements on the CAN bus and communication with other connected components
- Analogue output of measurements via the 20 mA analogue output.

The measuring system consists of the following modular components, which communicate with each other via the CAN bus cable:

- Sensor:
  Measurement of process parameters.
- DSF DCON II Electronics
  communication unit:
  Configuration
  Calculations
  Measurement display
  Analogue value output (velocity, concentration or mass flow rate)
  Threshold monitoring with two relay outputs
  Alarm relay output

The CAN bus allows for the connection of a DSF DCON II Electronics device and a sensor.

The exchange of messages between distributed I/O devices via the CAN bus not only ensures high data security, but also an easy exchange of individual components and a low-cost expansion of existing systems.

The installation requires:

- Power supply for sensor and communication unit
- A cable connection between the sensor and the communication unit
- Termination of the CAN bus (120 Ω) at both ends.

By its very nature, this bus system allows for the connection of two or more participants. In this case too, termination must take place at both bus ends:

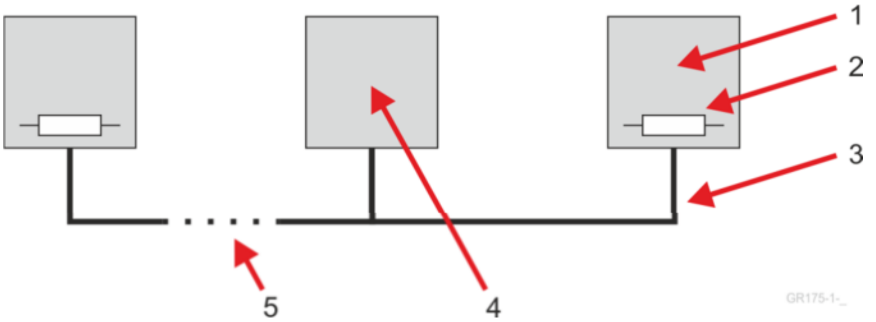

Fig. 2 CAN bus wiring principles

1 Participants with termination (end position)
2 Termination
3 CAN bus
4 Participants without termination
5 Possibly other participants

In the case of extension, the CAN bus connection is removed, the cable connection routed through, and the new end is terminated again.

Several sensors and several DSF DCON II Electronics communication units can be connected to the same CAN
bus. In this case, please observe the correct configuration of CAN bus addresses.

3.4 Technical data

Parameter	**Value**
Supply voltage (230 V_{AC} variant - see nameplate)	170 … 260 V_{AC}
Max. Power input (230 V_{AC} variant - see nameplate)	46 VA
Fuse (230 V_{AC} variant - see nameplate)	0.5 A slow
Power supply (24 V_{DC} variant - see nameplate)	18 … 36 V_{DC}
Max. Power consumption (24 V_{DC} variant - see nameplate)	20 W
Fuse (24 V_{DC} variant - see nameplate)	1.6 A fast-blow
Power supply output *	24 V_{DC}, max. 8 W
Analogue output type **	20 mA, elec. isolated
Analogue output max. load	500 Ω
Relay outputs (for upper/lower threshold and alarm) max. resistive load ***	AC: 250 V; 1 A; 200 VA DC: 30 V; 1 A
Analogue input type	20 mA, elec. isolated
Communication interfaces	CAN bus RS485, optional Ethernet, optional
Permissible ambient temperature during storage and transport	-10 °C … +40 °C
Permissible ambient temperature during operation	0 °C … +40 °C, non-condensing
International Protection Rating	IP20
Weight	1.4 kg
Dimensions (W x H x D)	107 x 129 x 173 mm

Tab. 4 Technical data

* Use only for sensors that consume up to the maximum power specified. Otherwise, malfunctions or damage to the DSF DCON II Electronics device may occur. The connection cable must be provided with a power switch.

** Equalization 4/20 mA via the "`Analogue Output`" menu, see section 6.6.1.

*** All relays must switch the same voltage (and possibly phase).

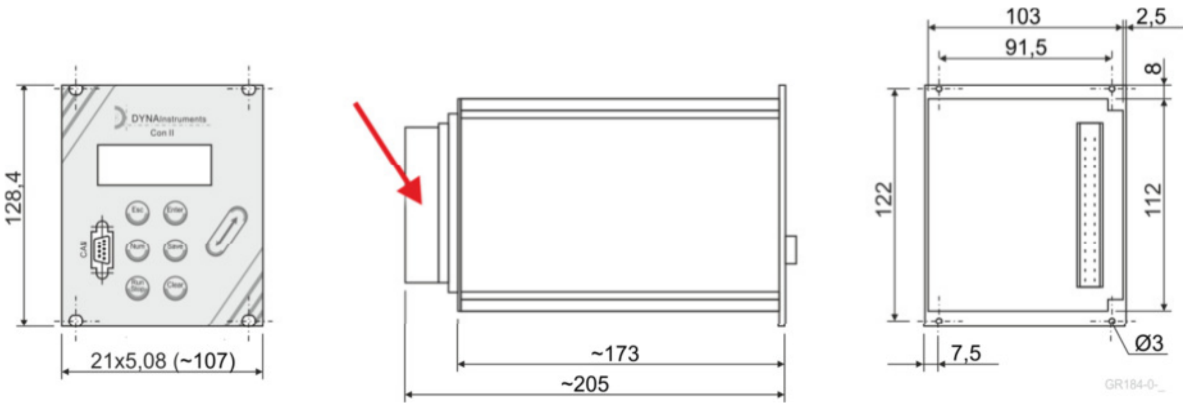

Fig. 3 Device dimensions in detail (in mm), arrow on the detachable plug connector

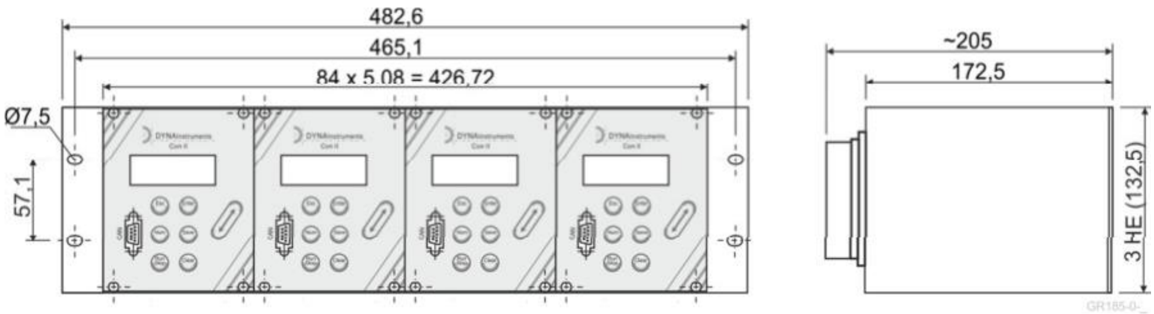

Fig. 4 Dimensions of four devices in a 19 "frame (in mm)

3.5 Mechanical design

The front features the following components:

- Display (LCD)
- Keyboard
- CAN bus plug connector

The back features the following components:

- Plug connectors for power supply, inputs, and outputs
- Ethernet/RS485 connector
- Fuse holder

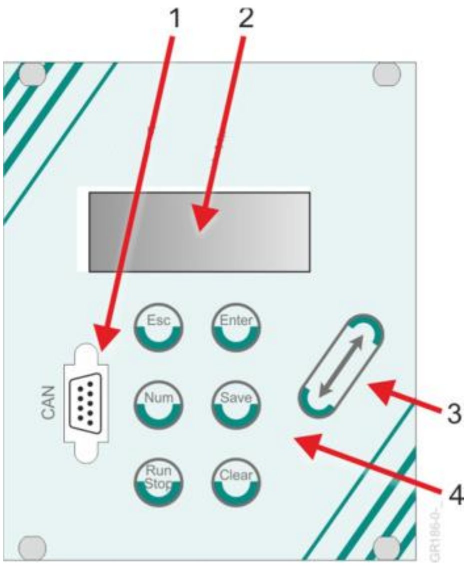

Fig. 5 Front view

1 CAN bus connector
2 LCD
3 Keypad (right/up and left/down buttons)
4 Keypad

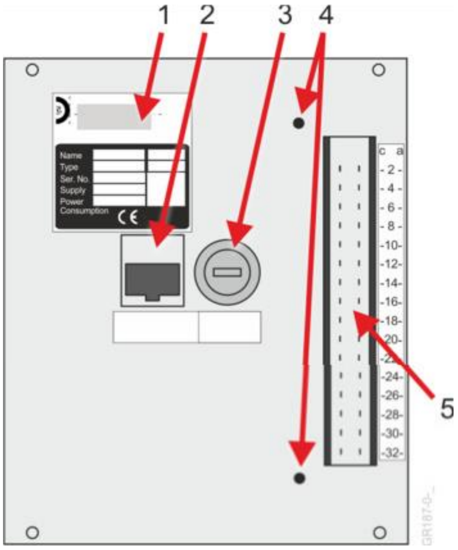

Fig. 6 Back view

1 Nameplate
2 Ethernet plug connector
3 Fuse holder (changing the fuse, see section 8)
4 Thread for screwing the plug
5 Plug connector for power supply and inputs and outputs

4 Transport and storage

All system components must be transported, stored, and operated in a non-corrosive environment.

Transport the product in its original packaging.

Observe the permissible environmental conditions (see section 3.4).

5 Commissioning

To commission the measuring system, the sensor and the DSF DCON II Electronics device must be put into operation.

The following sections describe the steps required to establish a functioning measuring system.

5.1 Commissioning the sensor

One can find the relevant information in the sensor operating manual.

5.2 Installing the DSF DCON II Electronics device

WARNING

It is possible to supply the device with incorrect operating voltage.

Risk of electric shock and device destruction.

DSF DCON II Electronics devices are available with different operating voltages. Please ensure that the voltage shown on the nameplate matches the power supply.

Devices may be used only as intended. The interconnection with external electrical equipment must be checked for compliance with the technical regulations.

The installation of the circuits must be in accordance with the applicable regulations (proof of the installer's competence, protected wiring, etc.).

All connections may only be made in a voltage-free state. The PE connection is to be made with low inductance with the PE of the system according to the local provisions. The connecting lines must be permanently installed outside of the operating equipment.

Please provide a separate fuse and a power switch, as the unit lacks an operating switch.

One will need a terminal box (see section 5.3) if the cable outside diameter does not match the diameter range of the cable gland (see section 3.2) or the core diameter is too large for the connection terminals.

The special transmission technology of the CAN bus and the voltage input filter ensure interference suppression. Nevertheless, the cable must not be routed together with power lines.

The cables of the power supply output (see Tab. 4) must not be routed together with power lines.

Prevent electrostatic charging. The appliance must be earthed.

Use contact grease for a high longevity and good contact between the electrical connections.

Installation in hazardous areas must comply with user country regulations and EN 60079-14.

Procedure:

1. Provide cable:
   - If possible, only use cables terminated with ferrules.
   - CAN bus: According to ISO 11898 2x2, twisted pair, outer diameter see section 3.2, minimum cable cross section 0.5 mm² required for a 1000 m transmission distance.
   - Permissible diameter of cables to be connected to the connection terminals via a plug connector (it may differ from the cables above if a terminal box is used): max. 1.5 mm².
2. Use screw terminals to screw the cable to the connector according to wiring diagram (see section 11). In this respect, please observe:
   - CAN bus (2a/2c/4a/4c)
     Ensure that the shielding of the CAN bus is **not** grounded.
   - Current outputs (6a/6c and 8a /8c)
     Please observe the technical data (see Tab. 4).

12

- Optional current input (10a/10c)
  This input is not electrically isolated.
- DIN1 (12a/12c)
  With the appropriate configuration (see section 6.6.6) a zero alignment (see section 6.5) can be started by closing the connection between the two contacts.
- Relay min (22a/22c)
  The relay is normally closed: The contact opens when the device is disconnected from the power supply, or when the measurement falls below a set lower threshold.
- Relay max (24a/24c)
  The relay is normally closed: The contact opens when the device is disconnected from the power supply, or when the measurement falls below a set lower threshold.
- Relay fault (26a/26c)
  The relay is normally closed: The contact opens when the device is disconnected from the power supply, or when the system experiences a failure.
- Power supply (30a/30c)
  Observe the nameplate and the technical data (see Tab. 4).
- PE connection (32a/32c)
  Connection for potential Equalization. Establish the ground potential connection here.

3. If the DSF DCON II Electronics communication unit is not one end of the CAN bus, the termination must be switched off, see section 5.3.
4. Insert the plug with the screw terminal into the plug connector on the rear panel of the device and screw with two M3x10 screws.

5.3 CAN bus termination of the DSF DCON II Electronics device

The device is supplied with activated CAN bus termination. Perform the following steps only if the device is not connected to the end of the bus.

1. Disconnect the plug with the screw terminal from the device.
2. Disassemble the device if necessary.
3. Remove the front panel. To do this, unscrew the four screws:

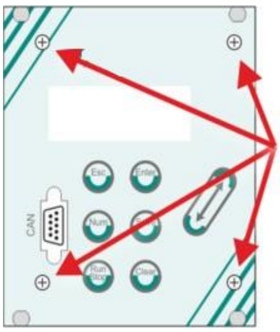

Fig. 7 Fixing screws of the front panel

4. Identify the switch for CAN bus termination on the back of the front panel:

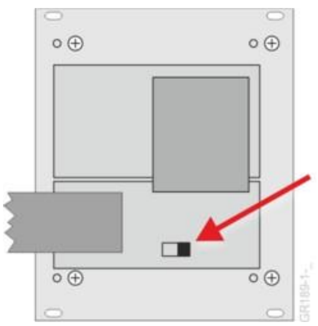

Fig. 8 Switch for CAN bus termination

5. Move the switch to the desired position:
   - to the left: CAN bus termination is switched off
   - to the right: CAN bus termination activated
6. Screw back the front panel on the device.
7. Re-establish the plug connection.

5.4 Connect the DSF DCON II Electronics device via a terminal box

If a terminal box is required (see section 5.1), it must meet the following specifications:

- Shielding: Yes (terminal box must be made of metal).
- Potential Equalization: Yes, using a cable of at least 6 mm^2.
- Dimensions: Depending on cable dimensions and number of cables.
- Connection terminals: No ground contact.

5.5 Switching on the DSF DCON II Electronics device for the first time

1. Ensure that all cable connections are made correctly.
2. Apply the operating voltage.
3. Please ensure that the device display indicates no address faults after approximately 45 seconds of operation.

5.6 Adjusting the measuring system to the process

The sensor connected to the DSF DCON II Electronics communication unit has been supplied by the factory with a basic calibration. This ensures that all internal disturbance variables are compensated.

For the measuring system to deliver accurate readings in your process, it must be adapted for your process. This is due to the individual physical characteristics of conveying processes, which influence the measured values.

The adjustment to the process depends on the type of sensor. In the event that you do not instruct GTS, Inc. to undertake the adjustment, the procedure is shown below. For

basic information on operation, please refer to section 6.2.

For information on how individual menu items can be used, please refer to section 6.6.6.

Process adjustment process:

1. DYNAvel and DSF: Set the correct parameters for the velocity measurement (see section 6.3 and its sub-sections).
2. DSF: Perform linearization (see section 6.4 and its sub-section).

Note:

If you are using a DSF Sensor and intend to carry out a linearization using

the full pipe method (see section 21) with removed sensor, then perform

the above steps in reverse.

6 Operation

The DSF DCON II Electronics communication unit can and should be used in continuous operation. If you disconnect the operating voltage, wait at least ten seconds before connecting it again. Otherwise, the built-in operating system goes from a brownout and starts an integrity check that can take a few minutes.

If you have changed parameters, wait 30 seconds before deactivating the affected devices (DSF DCON II Electronics communication unit and/or sensor). Otherwise, the new setting may not be saved.

6.1 Structure of the display

The display shows 4 lines with 20 characters.

The top three lines display menu items and values. The bottom line tells you which buttons are currently available.

If there is a string of question marks where a value should be, the value cannot be displayed in the current configuration. In this case, check whether a suitable physical unit has been selected and whether the position of the decimal point is meaningful.

A star in a line indicates that there is a note, warning, or error. Press "`<Esc>`" to display the error text and error code (see section 8).

6.2 Operating concept

The Equalization and configuration of all connected CAN bus participants are performed via the microprocessor-controlled DSF DCON II Electronics communication unit.

The DSF DCON II Electronics communication unit features an illuminated 4 x 20-character LCD, and a keypad. The CAN bus address, measured value(s) and error messages are displayed in the main display
("measuring mode").

When configuring the device ("Setting mode"), the display shows menu items and configuration values.

Use the keyboard on the front panel (see Fig. 5) to operate the menu.

Keys have the following functions:

Key	**Function**
Enter	Shows the highlighted menu.
	Accepts the entry and moves the cursor to the next field.
Esc	Scrolls to the next higher menu level or to the main display.
	Displays the error code.
Num	Increases the figure highlighted by the cursor by 1.
	Moves a selected decimal point.
	Scrolls cyclically through selection parameters.
Save	Transmits parameters, which have been previously accepted with <Enter>, to the CAN bus node.
↑↓	Up/Down: Moves the cursor through the menus.
	Left/Right: Moves the cursor between digits.
Run/Stop	Starts/stops the integrator.
	Triggers the zero alignment.
Clear	Sets the integrator value to zero.
	Deletes a linearization point.

Tab. 5 Key functions

In configuration mode, the selected participant is configured with the keyboard, whereby the online help in the lower display row facilitates navigation.

Parameters may also be entered via the CAN bus interface on the front panel. To do so, it is necessary to use a CAN bus USB adapter and the Pro Visual software. This method also allows for parameter backup.

The CAN bus address is a numeral and designates the group.

Thus, there are 10 groups from 0 to 9.

Depending on the device variant, the configurable software modules have the following names, for example:

- DYNAvel
- DYNAdens
- DYNAain
- DYNApres
- DYNAvccf

Use the arrow keys to select the module to be configured.

16

There is a basic flowchart of the display and input levels with the corresponding keypad operation:

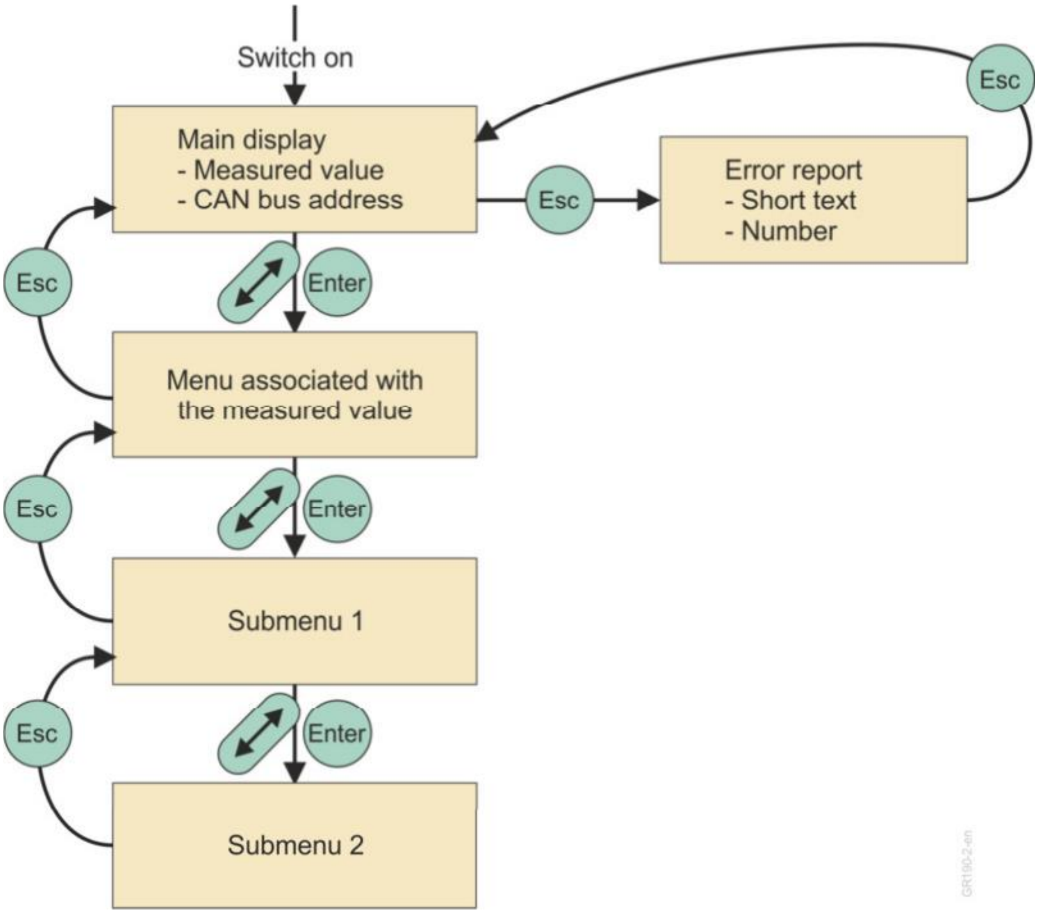

Fig. 9 Operation flowchart

Current parameters are displayed in configuration mode.

Press "Enter" to activate the input field and change parameters.

Press "Num" to cycle through selectable parameters.

When entering numeric parameters, move the cursor with the arrow keys to scroll through the numeric field. Individual numbers can be increased with the Num key by 1. Numbers selected outside the input area are changed to the highest or lowest possible value.

A changed parameter is confirmed with 'Enter'. It may happen that the value changes slightly. This is not a malfunction, but due to the manner in which parameters are internally processed and the result of rounding operations.

With 'Save', the changed parameter is transmitted to the CAN bus node.

Press "Esc" to abort your changes and return parameters to their original values.

6.3 Adjust velocity measurement to the process

The procedure is described in the following sub-sections.

6.3.1 Adjusting the installation direction

1. Make a note of the system on-time.
2. Note "AB" label on the sensor.
3. In the main display, move the cursor to the "`Vel`" line and press <`Enter`>.

4. Select the menu item "Correlation > Parameters".
5. Set "Flow" to the flow direction of the product:
   - "AB" if the product flows from A to B.
   - "BA" if the product flows from B to A.

6.3.2 Ensuring correct sensor distance

The velocity measurement can only be accurate if the device has been set to the correct sensor dimensions.

1. Read the sensor distance from the nameplate of the sensor (field "Sensor distance").
2. In the main display, move the cursor to the "Vel" line and press <Enter>.
3. Select the menu item "Correlation > Parameters".
4. Place "Distance" to the sensor distance determined above.

6.3.3 Setting the sampling frequency

1. Determine what will be the highest conveyor speed to be expected.
2. In the main display, move the cursor to the "Vel" line and press <Enter>.
3. Select the menu item "Correlation > Parameters".
4. Enter the correct value for the "DAQ Period" parameter. See "DAQ Period" in section 6.6.6.

6.3.4 Setting the signal output for the velocity measurement

1. Determine what will be the highest conveyor speed to be expected.
2. In the main display, move the cursor to the "Vel" line and press <Enter>.
3. Select menu item "Analogue Output > Analogue Output".
4. Set the highest possible conveying speed, usually rounded to a straight value. This value must correspond to the configuration in the process control.

6.3.5 Perform loop test for the analogue signal "velocity"

1. In the connected process control, assign the highest possible conveying speed to the maximum analogue signal.
2. In the main display, move the cursor to the "Vel" line and press <Enter>.
3. Select the menu item "Analogue Output > Adjust 4mA".
4. Press ↑↓ button until the process control indicator shows the velocity "0".
5. Press "Save".
6. Select the menu item "Analogue Output > Adjust 20mA".
7. Press ↑↓ button until the highest possible conveying speed is displayed in the process control.
8. Press "Save".

6.3.6 Adjusting the gain

1. Start the conveying process and set it to the maximum possible mass flow rate.
2. Execute the following steps for all available "Preamp Gain" values:
   - 2.1. In the main display, check whether the velocity display is greater than zero and appears to be meaningful.
   - 2.2. Place cursor on the "Vel" line and press <Esc>.
   - 2.3. Make sure that no CCF warning "Bad CCF" or override warning "Hi Input" is present.

2.4. Press <Esc>.

2.5. Press <Enter>.

2.6. Select the menu item "Adaption > Analogue Circuit".

2.7. Make a note of the current "Preamp Gain" if the above check of the speed display has been positive and no CCF warning is present.

2.8. Adjust "Preamp Gain" by one step.

2.9. Go back to the main display.

3. Set "Preamp Gain" to the highest recorded value.
4. Select the menu item "Adaption > Gain".
5. If the "live Gain" is less than 5, then use the next higher "Preamp Gain".
6. Record the selected "Preamp Gain" in the notes.

6.4 Adjust density measurement to the process

6.4.1 Setting the value displays for the density and mass flow measurement

1. In the main display, move the cursor to the "Dens" line and press <Enter>.
2. Select the menu item "Measuring Range > Range Units".
3. Set the desired value display.
4. Go back to the main display.
5. In the main display, move the cursor to the "Flow" line and press <Enter>.
6. Select the menu item "Measuring Range > Range Units".
7. Set the desired value display.

6.4.2 Setting the signal output for the density or mass flow measurement

The device profile has been defined when purchasing the device. This profile determines whether density or mass flow measurements are issued as an analogue signal to the outside. This determines in which menu meaningful settings can be made.

1. Determine the maximum expected value of the product density or mass flow in the conveyor system.
2. In the main display, move the cursor to the "Dens" line (product density) or the "flow" line (mass flow) and press <Enter>.
3. Select the menu item "Analogue Output > Output Scaling".
4. Set the maximum value.

6.4.3 Perform preparations for linearization

By adapting the density measurement to the process, a linearization table is formed which contains between two and ten linearization points:

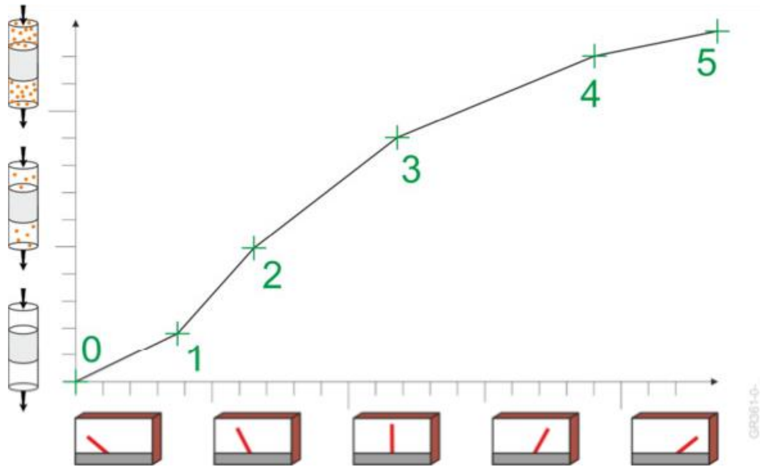

Fig. 10 Linearization table with 6 linearization points

The linearization table dissipates/solves the direct relationship between the measured value that is influenced by disturbance variables and the display value. The linearization table thus compensates the disturbance variables, ensuring that the display is in conformity with the real product concentration.

There are two procedures for adapting to the process which can be applied, depending on the conditions on site. Both methods are presented in the following sub-sections.

1. Ensure that the measuring system has been operating for at least 30 minutes since switching on.
2. Ensure that the pipe is not conveying any product.
3. Set the damping time (see menu item "`Damping`") and note it down:
   - If you intend to apply the full pipe method:
     Set the damping time to 5 seconds.
   - If you intend to apply the conveying method:
     Set the damping time to a value which compensates for the turbulence in the pipe that is expected during conveyance, but which does not make the measurement too sluggish.
4. Make a note of the set damping time ("`Damping`").
5. In the main display, move the cursor to the "`Dens`" line and press <`Enter`>.
6. Select the menu item "`Measuring Range > Range Units`".
7. Set "`Display Unit`" to "`kg/m³`".
8. Set "`Decimal places`" to "`1`".
9. Select the menu item "`Measuring Range > Range Limits`".
10. Set "`S min`" to "`0`" and "`S max`" to "`100`".
11. In the main display, move the cursor to the "`Dens`" line and press <`Enter`>.
12. Select the menu item "`Density Input > Linearization > Calibration Table`".
13. Set "`Factor`" to "`1`".
14. If the measured value recording for the linearization points is to be stopped automatically, set the "`Avg. time`" to the desired value. Otherwise, enter a value that is significantly greater than the expected run times selected manually.
15. Set "`Input 0`" to "`0`" and "`Output 0`" to "`0`".
16. Set "`Input 1`" to "`100`" and "`Output 1`" to "`100`".

17. Remove remaining linearization points (press <Clear> in "Input" line).
18. Press "Save".
19. Select the menu item "Density Input > Gain".
20. Set the "Dens Gain" to "16x".
21. Apply the maximum expected product concentration to the sensor:
    - If full pipe method is planned: Fill sensor completely with product.
    - If conveying method is planned: Have the product conveyed at maximum flow rate.
22. Gradually reduce "Dens Gain" until the value at "Signal" is less than 70.
23. Empty the sensor again or stop the process.
24. Calculate the cross-sectional area of the sensor from its inside diameter and record the figure. Observe the breakdown of the sensor product name in the associated operating instructions.
25. Now continue with the full pipe method (see section 6.4.4) or conveying method (see section 6.4.5).

6.4.4 Perform the linearization in full pipe method

Advantage:

- No interfering influences caused by start-up and shut-down processes.

Disadvantage:

- The pipe system may need to be opened in order to reach a fitting, or a temporary construction must be made outside the system.
- Adjustment to the process will be inaccurate if the maximum product concentration during operation is much lower than in the fully filled pipe.

The following is required for this method:

- Product scale to determine the mass of the filled product.
- Production system in a state in which product conveyance can be freely started and stopped, or temporary structure in which the product can be filled. It is preferable to carry out the process with removed sensor, since the stopped process can produce different densities than those measured in a laboratory sample.

Procedure:

1. Read the density value in the main display and note it down as "idle density".
2. In the main display, move the cursor to the "Vel" line and press <Enter>.
3. Select the menu item "Adaption > Analogue Circuit".
4. Make a note of the set "Preamp Gain".
5. Go back to the main display.
6. Fill sensor completely with product.
7. A highest possible density should now be displayed in the "dens" line, but not higher than 80 kg/m³. If necessary, change the gain several times until the optimal setting is found:
   - 7.1. Place cursor on the "Vel" line and press <Enter>.
   - 7.2. If the gain is too small:
     Select the menu item "Adaption > Analogue Circuit" and increase the "Preamp Gain". If this is not enough, select the menu item "Density Input > Gain" and increase "Dens Gain".

7.3. If the gain is too high:
Select the menu item "Density Input > Gain" and reduce "Dens Gain". If this is not enough, select the menu item "Adaption > Analogue Circuit" and reduce "Preamp Gain".

7.4. Return to the main display and observe the density display.

8. In the main display, move the cursor to the "Dens" line and press <Enter>.
9. Select the menu item "Density Input > Linearization > Calibration Table".
10. Perform the following several times (usually 3 times):

10.1. Go to the "Input 1" line in the linearization table.

10.2. Fill sensor completely with product.

10.3. Tap on the sensor so that the product condenses.

10.4. Quickly press <Enter> and then <Run/Stop>.

10.5. After the set damping time (see menu point "Damping"), press Run/Stop.

10.6. Deduct the idle density from the value indicated in "Input 1" and record this input value.

10.7. Press <Esc>.

10.8. Allow the accumulated product to flow into a container.

10.9. Remove a defined volume of the product and weigh it with a scale.

10.10. Perform the following calculation:
Output = weight/volume
Record the output value.

11. Calculate mean value of the input values.
12. Enter this value under "Input 1".
13. Press <Enter>.
14. Mean value of the output values.
15. Enter this value under "Output 1".
16. Press <Enter>.
17. Press <Save>.
18. If the above steps have been carried out with removed sensor, install it now in the conveyor system, supply it with power and allow it to warm up for approx. 30 minutes.
19. Reset "Preamp Gain" to the original value (see Notes).
20. Perform zero alignment (see section 6.5).
21. Set the damping time to a value which compensates for the turbulence in the pipe that is expected during conveyance, but which does not make the measurement too sluggish. 10 seconds is generally a good initial value.
22. Set the conveyor system to the highest conceivable flow rate and convey the product for a period of time.
23. Go to the main display and observe the density.
24. Change "Preamp Gain" until the indicator is as high as possible but below 80 kg/m³. This value may only be exceeded during short peaks.
If the conveyor system cannot be set to the highest conceivable flow rate, then correct the "Preamp Gain" according to the following rule of three:

Preamp_Gain = current_Preamp_Gain · current_throughput / max_throughput

Select the "Preamp Gain" so that it is as close as possible to the calculated value, but does not exceed it.

22

6.4.5 Perform linearization in the conveying method

Advantage:

- No mechanical modification of the system is required.
- The adjustment can be carried out with realistic flow rates. This leads to good results.

Disadvantage:

- Influences through start-up and run-down processes.

The following is required for this method:

- Product scale or other means of reliably determining the mass of the product being conveyed.
  Note:
  If the product cannot be weighed, then the mass flow of the system must be known during the measurements for the linearization points. In this event, a velocity measurement must also be performed in each case. This can then be used to calculate the mass transported.
- Production system in a state in which product conveyance can be started and stopped freely.
- Copy of Tab. 6.

Note: In the following process, one determines linearization points. These can only be entered into the linearization table after the last linearization point has been recorded. Premature entry of the linearization points results in subsequent incorrect linearization points. The order of the linearization points in the table does not matter since they are sorted automatically.

During adjusting to the process, please complete the following table:

Number of the point	**Input**	**Output**	**m**	**m_{CON}**
0	0 %	0		
1				
2				
3				
4				
5				
6				
7				
8				
9				

Tab. 6 Table for calculation of the linearization points

Procedure for each linearization point:

1. Perform zero alignment (see section 6.5).
2. In the main display, move the cursor to the "`Sum`" line and press <`Run/Stop`. This starts the totals summation.
3. Select the menu item "`Density Input > Linearization > Calibration Table`".
4. In the linearization table, go to the "`Input`" line of a linearization point, which is labelled "`unused`".

23

5. Simultaneously start the conveyance process and press <Run/Stop>.
6. After the desired runtime, stop the process and wait until no product flows.
7. Press <Run/Stop>.
8. Record the value indicated in the "Input" line as an" input" value for this linearization point.
9. Briefly press the buttons <Clear>, <Enter> and <Save> one after the other.
10. In the main display, move the cursor to the "Sum" line and press <Run/Stop>. This stops the totals summation.
11. Record the value indicated in the "Sum" line as the m_{CON} value for this linearization point.
12. Note the weight of the product conveyed (determined with a scale or similar) as the m-value for this linearization point.
13. Perform the following calculation:
    Output = 100 kg/m³ * m / m_{CON}
14. Record this value as the "output" value for this linearization point.
15. Repeat the process until all linearization points have been determined.

After all desired linearization points have been recorded, the values can be transferred to the system:

1. Check the notes in the table to determine if there are adjacent points whose input values are spaced apart less than 5% of the total input spectrum. In such cases, it is useful to calculate an averaged point from the two points in question and use it instead of the two original points.
2. Enter the recorded linearization points into the linearization table in the DSF DCON II Electronics communication unit (see section 6.6.6).

6.5 Zero point alignment

Contamination or other disturbances can lead to the concentration indicator of the measuring system not going to zero during a stopped process. Use the zero alignment to correct this.

The zero alignment function is controlled by a number of parameters (see section 6.6.6).

Procedure:

1. Ensure that no product is flowing and there is no excessive product build up in the sensor pipe.
2. Trigger zero alignment. Use one of the following triggers, depending on the configuration (see section 6.6.6):
    - In the main display, move the cursor to the "Dens" line and press <Run> until the countdown bar in the lower left of the display has disappeared. The zero alignment is started after the button has been released.
    - Briefly set the DIN1 input to ground.

If the zero alignment fails because the required conditions (see configuration) were not fulfilled, a star appears on the "Dens line as a warning (see section 6.1). This warning persists until a successful zero alignment has been performed.

6.6 Reference: configuration menus

The following sections present all available parameters and their location in the configuration menu trees. A description of the parameters can be found in section 6.6.6,

Whether individual menu trees or menu items are available depends on the application for which the DSF DCON II Electronics communication unit has been manufactured in the factory. All technically possible menu trees are shown below.

6.6.1 DYNAdens configuration menu

```
1   Measuring Range
    1.1   Range Limits
```

```
        1.1.1   S max
        1.1.2   S min
  1.2   Range Units
        1.2.1   Display Unit
        1.2.2   Decimal places
2 Upper Threshold
  2.1   Upper Threshold
  2.2   S1
  2.3   H1
3 Lower Threshold
  3.1   Lower Threshold
  3.2   S2
  3.3   H2
4 Analogue Output
  4.1   Output Scaling
        4.1.1   20mA =>
  4.2   Adjust 4mA
        4.2.1   Calibr.  4 mA Output
  4.3   Adjust 20mA
        4.3.1   Calibr. 20 mA Output
5 Simulation
  5.1   Simulation
  5.2   Value
  5.3   Alarm Relay
6 Damping
  6.1   Damping
        6.1.1   Damping time
  6.2   Rapid Reaction
        6.2.1   Reaction
        6.2.2   Trigger Step
        6.2.3   Damping cut-off
7 Fault
  7.1   Accepted Limit
  7.2   Output Value
  7.3   Alarm Relay
8 Density Input
  8.1   Gain
        8.1.1   Input Type
        8.1.2   Dens Gain
        8.1.3   Signal
  8.2   Zero Alignment
        8.2.1   Parameters
                8.2.1.1   Offset
                8.2.1.2   Avg Time
        8.2.2   Triggers
                8.2.2.1   Manual/UI
                8.2.2.2   DIN1 assert
        8.2.3   Conditions
                8.2.3.1   Velocity
                8.2.3.2   Dens in>
                8.2.3.3
  8.3   Linearization
        8.3.1   Calibration Table
                8.3.1.1   Table ID
                8.3.1.2   Factor
                8.3.1.3   Avg. time
                8.3.1.4   Signal
                8.3.1.5   Input 0
                8.3.1.6   Output0
                8.3.1.7   Input 1
                8.3.1.8   Output1
                8.3.1.9   Input 2
                8.3.1.10  Output2
                8.3.1.11  Input 3
                8.3.1.12  Output3
                8.3.1.13  Input 4
                8.3.1.14  Output4
```

```
                8.3.1.15  Input 5
                8.3.1.16  Output5
                8.3.1.17  Input 6
                8.3.1.18  Output6
                8.3.1.19  Input 7
                8.3.1.20  Output7
                8.3.1.21  Input 8
                8.3.1.22  Output8
                8.3.1.23  Input 9
                8.3.1.24  Output9
        8.3.2   Calibration Info
                8.3.2.1   Table ID
                8.3.2.2   Mod date
                8.3.2.3   Mod time
                8.3.2.4   Fingerprint
    8.4   HW Mode (not generally accessible)
9   Periods
    9.1   DAQ Block
    9.2   DAQ Period
    9.3   Transmission
10  System
    10.1  Language
          10.1.1  Language
    10.2  Date + Time
          10.2.1  Date
          10.2.2  Time
    10.3  CAN Group Address
          10.3.1  Show CAN Group
          10.3.2  I/O CAN Group
    10.4  DSF DCON II Electronics profiles (not generally accessible)
```

6.6.2 DYNAvel configuration menu

```
1   Measuring Range
    1.1   S max
    1.2   S min
2   Upper Threshold
    2.1   Upper Threshold
    2.2   S1
    2.3   H1
3   Lower Threshold
    3.1   Lower Threshold
    3.2   S2
    3.3   H2
4   Analogue Output
    4.1   Analogue Output
          4.1.1   20mA =>
    4.2   Adjust 4mA
          4.2.1   Calibr.  4 mA Output
    4.3   Adjust 20mA
          4.3.1   Calibr. 20 mA Output
5   Simulation
    5.1   Simulation
    5.2   Value
    5.3   Alarm Relay
6   Damping
    6.1   Damping
          6.1.1   Damping time
    6.2   Rapid Reaction
          6.2.1   Reaction
          6.2.2   Trigger Step
          6.2.3   Damping cut-off
7   Adaption
    7.1   Gain
          7.1.1   Automatic
          7.1.2   fix Gain
          7.1.3   Live Gain
```

```
          7.1.4   Gain Factor
    7.2   Adjustment
          7.2.1   Umax
          7.2.2   Umin
          7.2.3   Limit
    7.3   Analogue Circuit
          7.3.1   Preamp Gain
8   Fault
    8.1   Accepted Limit
    8.2   Output Value
    8.3   Alarm Relay
9   Correlation
    9.1   Parameter
          9.1.1   DAQ Period
          9.1.2   Distance
          9.1.3   Flow
    9.2   CCF Limit
          9.2.1   CCF Limit
          9.2.2   Actual CCF
          9.2.3   Averaged CCF
    9.3   Factory Values (not generally accessible)
10  Periods
    10.1  DAQ Block
    10.2  Transmission
11  System
    11.1  Language
          11.1.1  Language
    11.2  Date + Time
          11.2.1  Date
          11.2.2  Time
    11.3  CAN Group Address
          11.3.1  Show CAN Group
          11.3.2  I/O CAN Group
    11.4  DSF DCON II Electronics profiles (not generally accessible)
```

6.6.3 DYNAcal configuration menu

```
1   Measuring Range
    1.1   Range Limits
          1.1.1   S max
          1.1.2   S min
    1.2   Range Units
          1.2.1   Display Unit
          1.2.2   Decimal places
2   Upper Threshold
    2.1   Upper Threshold
    2.2   S1
    2.3   H1
3   Lower Threshold
    3.1   Lower Threshold
    3.2   S2
    3.3   H2
4   Analogue Output
    4.1   Output Scaling
          4.1.1   20mA =>
    4.2   Adjust 4mA
          4.2.1   Calibr.  4 mA Output
    4.3   Adjust 20mA
          4.3.1   Calibr. 20 mA Output
5   Simulation
    5.1   Simulation
    5.2   Value
    5.3   Alarm Relay
6   Damping
    6.1   Damping
          6.1.1   Damping time
    6.2   Rapid Reaction
```

```
        6.2.1   Reaction
        6.2.2   Trigger Step
        6.2.3   Damping cut-off
7   Fault

    7.1   Accepted Limit
    7.2   Output Value
    7.3   Alarm Relay
8   Creeping Quantity
    8.1   Suppression
    8.2   Limit
9   Scaling
    9.1   Cal.Factor
    9.2   Diameter
10  Periods
    10.1  DAQ Period
    10.2  Transmission
11  System
    11.1  Language
          11.1.1  Language
    11.2  Date + Time
          11.2.1  Date
          11.2.2  Time
    11.3  CAN Group Address
          11.3.1  Show CAN Group
          11.3.2  I/O CAN Group
    11.4  DSF DCON II Electronics profiles (not generally accessible)
```

6.6.4 DYNApres configuration menu

```
1   Measuring Range
    1.1   Range Limits
          1.1.1   S max
          1.1.2   S min
    1.2   Range Units
          1.2.1   Display Unit
          1.2.2   Decimal places
2   Upper Threshold
    2.1   Upper Threshold
    2.2   S1
    2.3   H1
3   Lower Threshold
    3.1   Lower Threshold
    3.2   S2
    3.3   H2
4   Simulation
    4.1   Simulation
    4.2   Value
    4.3   Alarm Relay
5   Damping
    5.1   Damping
          5.1.1   Damping time
    5.2   Rapid Reaction
          5.2.1   Reaction
          5.2.2   Trigger Step
          5.2.3   Damping cut-off
6   Fault
    6.1   Accepted Limit
    6.2   Output Value
    6.3   Alarm Relay
7   Periods
    7.1   Transmission
8   System
    8.1   Language
          8.1.1   Language
    8.2   Date + Time
          8.2.1   Date
          8.2.2   Time
```

```
    8.3   CAN Group Address
          8.3.1   Show CAN Group
          8.3.2   I/O CAN Group
    8.4   DSF DCON II Electronics profiles
```
(not generally accessible)

6.6.5 DYNAvccf configuration menu

```
1   Measuring Range
    1.1   S max
    1.2   S min
2   Upper Threshold
    2.1   Upper Threshold
    2.2   S1
    2.3   H1
3   Lower Threshold
    3.1   Lower Threshold
    3.2   S2
    3.3   H2
4   Analogue Output
    4.1   Analogue Output
          4.1.1   20mA =>
    4.2   Adjust 4mA
          4.2.1   Calibr.  4 mA Output
    4.3   Adjust 20mA
          4.3.1   Calibr. 20 mA Output
5   Simulation
    5.1   Simulation
    5.2   Value
    5.3   Alarm Relay
6   Damping
    6.1   Damping
          6.1.1   Damping time
    6.2   Rapid Reaction
          6.2.1   Reaction
          6.2.2   Trigger Step
          6.2.3   Damping cut-off
7   System
    7.1   Language
          7.1.1   Language
    7.2   Date + Time
          7.2.1   Date
          7.2.2   Time
    7.3   CAN Group Address
          7.3.1   Show CAN Group
          7.3.2   I/O CAN Group
    7.4   DSF DCON II Electronics profiles
```
(not generally accessible)

6.6.6 Description of the configuration menus

Here you will find information about menu items to make it easier for you to make the adjustments. Many menu items are available for several software modules. To the right of the name of the menu item, you will find the software module menu where this menu item is available.

The menu items are arranged in the order as they appear in the menus.

Measuring Range **DYNAcal, DYNAdens, DYNApres, DYNAvccf, DYNAvel**

Use the numeric keys to introduce the limits within which measurements will be displayed and output. Select the limits as close as possible to expected measurement results.

Important: Measurements above or below the defined maximum and minimum value are set to the maximum value and zero respectively.

In the DYNAdens and DYNAcal software modules you can also set the type of measured value display. To this end, settings have been divided into two submenus.

The physical unit to be displayed can be selected via "Display Unit" in the "Range Units" menu. The number of decimal places can be selected under "Decimal places".

Upper Threshold **DYNAcal, DYNAdens, DYNApres, DYNAvccf, DYNAvel**

Enable/disable the threshold monitoring by pressing <`Num` and enter the threshold value (S1) to be monitored with its hysteresis (H1).

H1 must be less than or equal to S1. If the threshold value and hysteresis match, the unit operates without hysteresis.

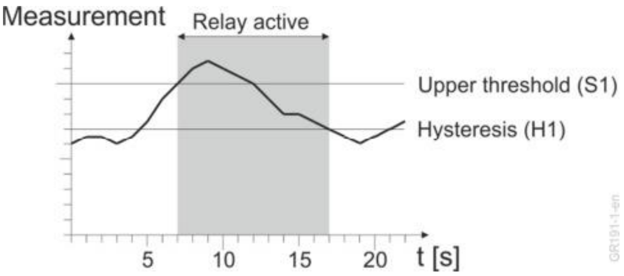

Fig. 11 Upper threshold and hysteresis

The upper threshold relay is enabled if the measurement exceeds S1 and disabled if it falls below H1.

Lower Threshold **DYNAcal, DYNAdens, DYNApres, DYNAvccf, DYNAvel**

Enable/disable threshold monitoring by pressing <`Num`> and enter the threshold (S2) to be monitored with its hysteresis (H2).

H2 must be greater than or equal to S2. If the threshold value and hysteresis match, the unit operates without hysteresis.

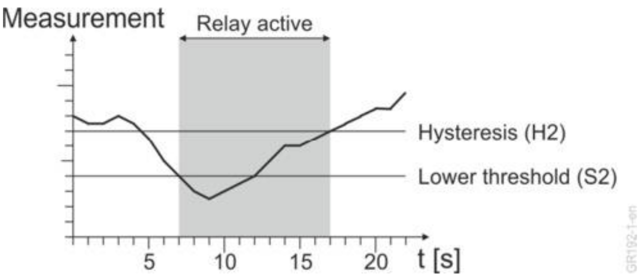

Fig. 12 Lower threshold and hysteresis

The lower threshold relay is enabled if the measurement exceeds S2 and disabled if it falls under H2.

Analogue Output **DYNAcal, DYNAdens, DYNAvccf, DYNAvel**

Enter the measurement corresponding to the maximum analogue output of 20 mA.

From this menu, you can also perform a software calibration of the analogue output.

The output currents change during the calibration. Therefore, do not select the menu items for the calibration if a process control system is connected, as this can trigger unintended process control functions.

Connect a current meter to the output. Use the arrow keys to set the output current in the submenu items to 4 and 20 mA.

Please note that the fixed output value set with this function can also be used for loop testing.

Simulation **DYNAcal, DYNAdens, DYNApres, DYNAvccf, DYNAvel**

Enable/disable the output of a simulated value. This may also be outside the specified measuring range limits.

If simulation output is enabled, you can choose whether it should trigger the alarm relay.

Simulations are useful in several situations:

- Loop tests
  Loop tests verify connections between components and the system response for specific measurements.
- Test of subsystems:
  Use simulation values to perform a functional evaluation of process and control units before the entire system is functional.
- Calibration of 20 mA measurement transmission routes:
  Verifies whether simulated measurements lead to correct signals and displays.

Damping — DYNAcal, DYNAdens, DYNApres, DYNAvccf, DYNAvel

You may increase damping time to smooth out a disturbed measurement. On the other hand, you should bear in mind that this may cause a slow response upon large measurement changes.

One may use the rapid reaction to ensure a fast response in the case of significant measurement changes (e.g. while starting-up and shutting-down the transport process).

The following parameters must be configured:

- Deviation of the current measurement from the previous (averaged) value to trigger a rapid reaction.
- Percentage value to which the damping time will be thus reduced.

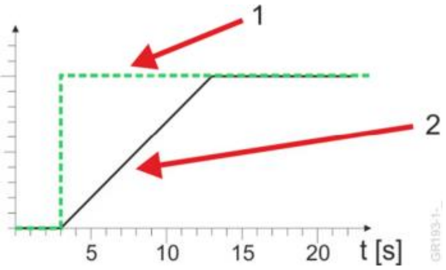

Fig. 13 Measurement profile without rapid reaction for a 10s damping time

1 Change in physical dimensions
2 Change in the measurement displayed

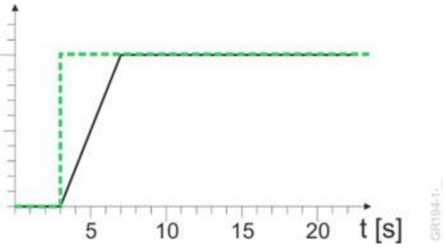

Fig. 14 Measurement profile with rapid reaction to 40% for a 10s damping time

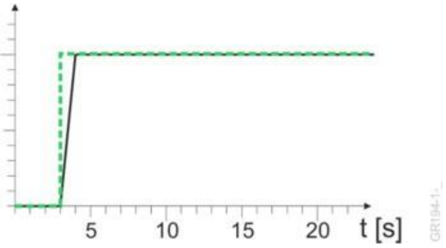

Fig. 15 Measurement profile with rapid reaction to 10 % for a 10s damping time

Adaption — DYNAvel

The currently used gain (1 ... 132) is displayed under "`live Gain`". This value is transmitted every second from the DYNAvel software module.

If the automatic gain setting is not used, the gain value to be used can be entered in the "fix Gain" field.

"Use the "Automatic suboption to indicate whether electronics should automatically adjust to the solid concentration, or whether the gain should be set manually.

There are two other selection criteria whereby sensor electronics evaluate the measurement signal level. With "Peak", the system monitors whether the current measurement signal exceeds or falls below a specified range. With "Mean", the system monitors whether the mean measurement signal exceeds or falls below a specified range. The mean value is determined via DAQ block. The "Mean" setting is recommended to deal with highly variable measurements.

Use "Adjustment" to determine the percentage of the measurement signal that may exceed a certain voltage range. If exceeded, the automatic gain control adjusts the gain factor. Parameters have the following meaning:

- "Umax" is the measuring voltage under which measurements are classified as good.
- "Umin" is the measuring voltage above which measurements are classified as good.
- "Limit" is the proportion of a DAQ block (percentage) that meets the following conditions:
  - DAQ block measurements lying above "Umax" do not exceed the "Limit" percentage.
  - DAQ block measurements lying above "Umin" exceed the "Limit" percentage.

A useful setting here is 4 V, 0.2 V, and 25%.

If the gain range (1 ... 132) proves insufficient to bring the signals within this range, the submenu "Analog Circuit" allows for setting up (1 ... 8) another gain stage ("Preamp gain"). The lower the measured solid concentration, the higher these values must be selected.

Correlation **DYNAvel**

Under "Parameters", one can set the sensor distance d ("Distance") (see nameplate or operating instructions of the sensor), and the sampling period ("DAQ Period", factory setting) of the analogue signals, which are calculated according to the following relationship:

t_{Sample} [µs] = 20 · d [mm] / v_{max} [m/s]

where v_{max} is the maximum velocity to be measured with 1% accuracy.

Example:

d = 20 mm
v_{max} = 16 m/s
t_{Sample} = 25 µs

Use "Direction" to adjust the flow direction of the product.

Use "CCF Limit" to set up estimate limits for the correlation calculation.

If both signals issued by the sensor are identical, the CCF estimate would be 100%. In reality, however, measurement signals vary due to statistical and flow-induced fluctuations of the solid movement. A 50 to 70 per cent signal coincidence suffices for correlation calculation purposes.

To smooth the correlation function, the currently determined CCF ("actual CCF") is averaged with the previous CCF ("Averaged CCF"), which nonetheless dampens the output value. Possible settings are 1 to 0 (no smoothing), 1 to 1 (equal weighting), and 1 to 2.

The setting 1 to 2 is appropriate for non-time-critical measurements.

Factory Values **DYNAvel**

Here you can find settings that have been uniquely configured in the factory during production.

Fault **DYNAcal, DYNAdens, DYNApres, DYNAvccf, DYNAvel**

Due to the statistical nature of measurement signals, interference with a minor influence on measuring may occur at irregular intervals. Use this menu item to specify the number of faults (measuring signal is too large, poor correlation, measuring range exceeded or undershot) allowed in succession before the device switches to the alarm state. Five (5) is regularly used for this setting.

You may choose which measurement should be output upon alarm:

- Zero.
- Last measurement.
- Upper range limit (see "Measuring Range").
- Lower range limit (see "Measuring Range").
- Simulation value (see "Simulation").

You can also choose if the alarm relay should be triggered.

Density Input **DYNAdens**

In this menu you can influence how the system performs the concentration measurements.

The item "Gain" shows the origin of the concentration measurement signal under "Input type". This value is set in the factory.

Use the "Gain" parameter to increase the gain from 1 to 5 for small input signals.

The "Signal" item displays the current measurement.

Use the "Zero Alignment" to make settings for the zero alignment process. For information on the meaning and process of the zero alignment, see section 6.5.
Certain variants of the DSF DCON II Electronics communication unit activate a relay output while the zero alignment is running.

Presets for the zero alignment and current correction value can be found under "Parameters".

- The correction value resulting from the last zero alignment can be found under "Offset". If necessary, you can also change the correction value manually.
- Use "Avg Time" to set how long the measurement signals are to be averaged until the measuring system equates this mean value with the zero value of the concentration display.

Select the way a zero alignment can be triggered in the "Triggers" menu:

- If "Manual/UI" is set to "acpt", a zero alignment can be carried out via <Run/Stop> if the cursor is on the "Dens" line of the main display.
- If "DIN1 assert" is set to "acpt", a zero alignment can be made by briefly setting the DIN1 input (see section 11) to ground.

Select the conditions under which a zero alignment is triggered in the "Conditions" menu.

- If "Velocity" is set to "must be 0", a zero alignment is only possible if the displayed velocity is zero. Possible velocity simulation (see menu item "Simulation") will be ignored.
- If the displayed concentration is greater than the percentage value selected here, zero alignment will be disabled. The percentage value has the same meaning as in the linearization table.

All information and settings for the linearization table can be found under the item "Linearization". See section 6.3 for information on the linearization process.

The linearization table can be accessed under the item "Calibration Table":

- "Table ID"
  Number of the linearization table that is currently displayed. The value is 1 and currently cannot be changed.
- "Factor"
  All measurements are not only linearised via the linearization table, but are also multiplied by this value. This can be helpful in the following situation:

- The linearization table must contain percentages for the output values. In this case, the conversion into product density for the display can be determined with a suitably selected factor.
- Use "`Avg Time`" to set how long the sensor measurement signals are to be averaged until the measuring system automatically transfers this mean value into the currently selected "`Input`" line.
- "`Signal`"
  The current concentration value measurement can be seen here.
- "`Input x`"
  This is the first of the two values which define the linearization point x. This value is the measuring signal from the sensor.
  Use <`Clear`> to set the linearization point to "`unused`". This is then not taken into account for the linearization.
  A change is only permanently stored by pressing <`Save`>.
- "`Output x`"
  This is the second of the two values which define the linearization point x. This value is the real product concentration in the sensor.
  A change is only permanently stored by pressing <`Save`>.

The "`Calibration Info`" displays information about the linearization table:

- "`Table ID`"
  Number of the linearization table that is currently displayed. The value is 1 and currently cannot be changed.
- "`Mod date`"
  Date on which the linearization table was last changed.
- "`Mod time`"
  Time at which the linearization table was last changed.
- "`Fingerprint`"
  Hash value (identifier) of the linearization table. This value changes each time the table is changed. Based on this value, you can quickly verify that the table is unchanged.

Creeping Quantity — DYNAcal

Measurements under this value will be set to 0.

This function is overridden during a simulation.

Scaling — DYNAcal

The mass flow rate is calculated as:

$\dot{m} = v \cdot k \cdot A \cdot C$

where
v = velocity
k = concentration
A = cross-sectional area
C = correction factor

The correction factor and the diameter can be entered in the submenu items.

Periods — DYNAdens, DYNApres, DYNAvccf, DYNAvel

"`DAQ Block`" indicates the block length. This value is set at the factory and must not be changed.

Use "`DAQ Period`" to set the period in which the input signal is sampled. This value is set at the factory and must not be changed.

Transmission specifies the period at which the averaged measurement from the block will be transmitted to the DYNAcal software module and, ultimately, via the CAN bus. This value can, for example, be reduced if there are specific requirements on the response speed of the system.

System **DYNAcal, DYNApres, DYNAvccf, DYNAvel**

Use this menu item to set the following parameters:

- Menu language.
- Date and time.
- CAN bus group for display and I/O.
  Use "`Show CAN Group`" to specify which bus sensor must provide the measurement display.
  Use "`I/O CAN Group`" to specify which bus sensor you can configure via the DSF DCON II Electronics communication unit.
  Please ensure that these settings match the connected sensors, as otherwise no communication is possible.

7 Maintenance

The functionality of the device is stable over long periods and regular adjustments, etc. are thus not necessary. Therefore, the device is largely maintenance-free. However, the following activities should be performed:

Activity	**Frequency**
Remove dust from the outside of the device. Please see section 3.1.	Yearly; at shorter intervals if operating in very dusty environments.
Replace internal battery.	Every three years. Initiate contact with GTS, Inc. Support 850-651-3388.

Tab. 7 Maintenance work

8 Troubleshooting and repair

Repairs to the device may only be performed by specially trained and authorized personnel.

As soon as the device fault is reported, verify the following points:

- Has regular maintenance been performed?
- Is the installation perfect otherwise (fixed installation, correct and undamaged cabling)?
- Is the configuration unchanged?

Fault	**Cause/remedy**
No display.	No power supply. Check the power supply. Ensure tight fit of the plug on the back. Disconnect the power supply. Check fuse (see Fig. 6) (turn screw cap with screwdriver). Replace only with identical fuse.
Despite constant material flow, measurement reads 0 m/s.	The measurement signal is too weak. Increase "Preamp" or "Gain Factor". See "Adaption" in section 6.6.6.
Measurements are provided even without material flow.	Check the grounding of the sensor mechanism and sensor electronics. Both sensor components must be connected to the same ground point on the transport system.
Message "Address absent" on the display.	No communication with the sensor. Check whether the CAN bus address specified is correct. Check the sensor power supply. Check CAN bus connectors on both sides. Check the CAN bus cable for continuity. Check termination of the CAN bus (see Fig. 2).
Message "Bus hub absent" on the display.	An internal software module is not operational. If this message occurs during operation, restart the DSF DCON II Electronics communication unit. If the error persists, contact GTS, Inc. Support 850-651-3388.
Message "Bad CCF" on the display.	See error code 2000 in Tab. 9.
Message "Chksm!" on the display.	See error code 0100 in Tab. 9.
Message "CompFail" on the display.	See error code 0004 in Tab. 9.
Message "Compsatg" on the display.	See error code 0008 in Tab. 9.
Message "E. cntr" on the display.	See error code 0800 in Tab. 9.
Message "Hi Input" on the display.	See error code 4000 in Tab. 9.
Message "Range" on the	See error code 1000 in Tab. 9.

display.	
Message "Simul" on the display.	See error code 0400 in Tab. 9.
Message "Sns. t/o" on the display.	See error code 0040 in Tab. 9.
Message "Starting" on the display.	See error code 0200 in Tab. 9.
Message "Tared" on the display.	See error code 0200 in Tab. 9.
A "*" or a "!" appears on the line of the software module.	There is information, a warning or an error for the software module. Switch the software module display over to the fault indicator by pressing "Esc". Search the indicated error code in Tab. 9 and note the relevant information.
Error message "Error 255" on the display.	See information on "Address absent" in this table.

Tab. 8 Faults and their solutions

The following table represents errors with an associated error code. If the error code shown on the display is not listed in the table, several faults occur simultaneously. In this case, follow the table instructions.

Error code	**Cause/remedy**
0004	Zero alignment has failed. The configured conditions for a successful zero alignment are not given. Check the configuration and the state of your system.
0008	The device is currently performing a zero alignment. This state will be automatically terminated.
0040	Communication problem with sensor. Check power supply, CAN bus wiring and address settings.
0100	Sensor reports that essential data are corrupted in the system memory. Restart sensor. If the error persists, contact GTS, Inc.Support.
0200	"vel" line: The system is in a start-up process. Data are therefore subject to uncertainty. During a start-up process, the system undergoes strong density and velocity fluctuations. Measurements generated during this phase tend to be overly disturbed, which can interfere with a downstream control. The sensor therefore bypasses this stage with estimated data based on the last start-up process, and protects the system against unnecessary control processes. "dens" line: Sensor is in tared state, that is the displayed values refer to a tare value.
0400	This is a simulated value. See "Simulation" in section 6.6.6.

0800	The error has occurred so frequently that the associated error counter has overflowed. Also note other reported errors.
1000	Measured value lies outside the configured range. See "`Measuring Range`" in section 6.6.6.
2000	The CCF is below the set threshold. See "`Correlation`" in section 6.6.6. Check the adjusted "`CCF Limit`". If this value seems appropriate, the sensor might be subject to excessive turbulence. Check your conveying process.
4000	The measurement signal is too high. Check the settings for the gain ("`Adaption`" in section 6.6.6). If you have selected manual gain adjustment, reduce the gain value.

Tab. 9 Error Codes

Determine the individual errors from the overall error code:

1. Observe the following graphic and follow the arrow in the corresponding table for each error code digit.
2. Go to the table row corresponding to the displayed character.
3. For each table cell with an angle arrow, note the individual error under the table. Read information about the individual error in the error code table.

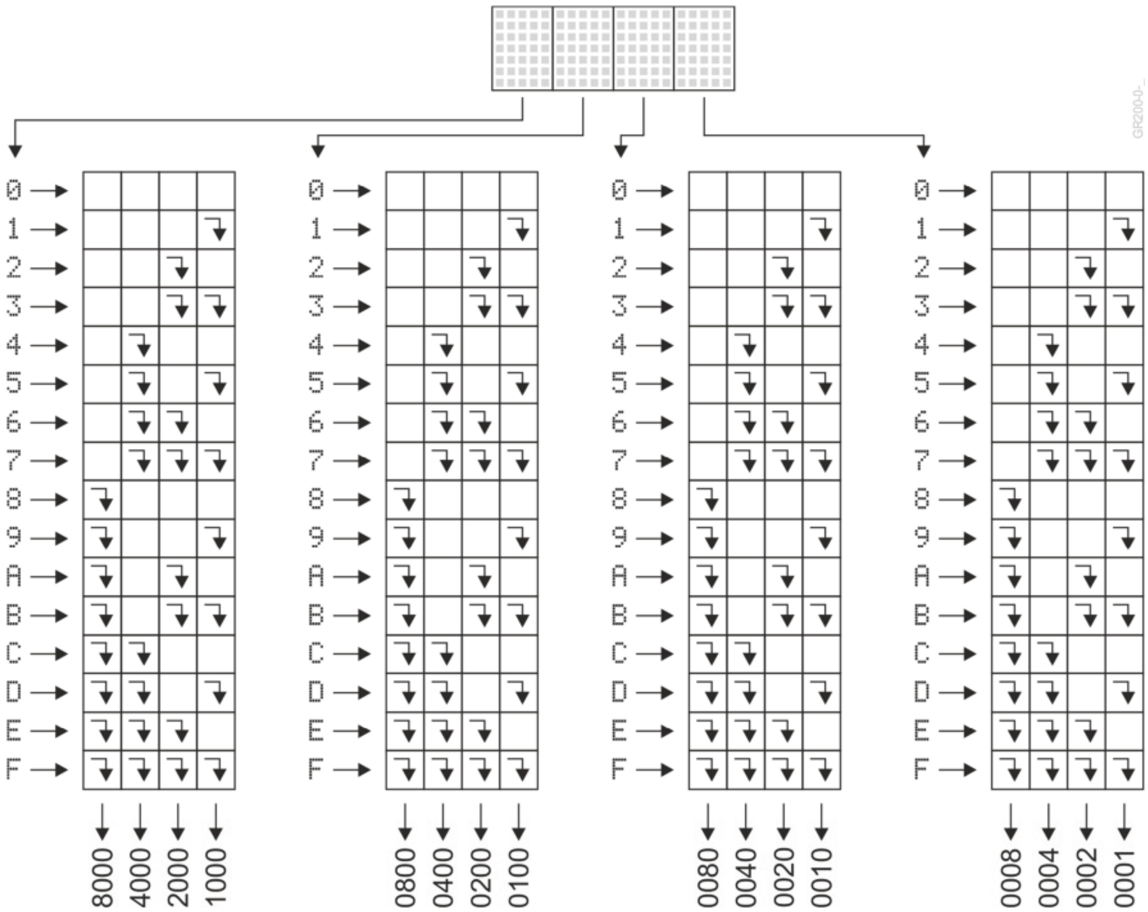

Fig. 16 Troubleshooting several errors

Example: Error code "6100" refers to individual errors 4000, 2000 and 0100.

Customers may not carry out maintenance work on internal parts. Repairs of such nature usually require a return of the device to the factory. Please contact GTS, Inc. for further details on the return procedure.

40

9 Decommissioning

9.1 Dismantling

Before dismantling, make a note of the configuration in the tables in section 13, so that the settings can be restored when the device is replaced.

1. Disconnect the power supply.
2. Loosen and remove cables (see Installation).
3. If the cables are to be used for another device, electrically insulate the ends of the cables and store them safely until they are reused.
4. Loosen screws on the front panel of the rack.
5. Remove device.

9.2 Disposal

Dispose of packaging according to local regulations.

Dispose of the device according to local regulations. If you send the device to GTS, Inc. free of charge, proper disposal will be ensured.

41

10 Certification

The devices are designed and tested for operational safety according to state-of-the-art technology and have left the factory in perfect condition. The devices comply with the relevant standards and regulations (see section 11).

The measuring system described in these instructions therefore meets the legal requirements of the EC directives. By affixing the CE mark, GTS, Inc. confirms that the device has been successfully tested.

Structure of the nameplate

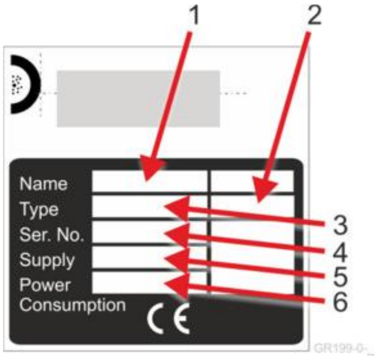

Fig. 17 Structure of the nameplate

1 Device name
2 Hardware revision (software revision is printed on a separate label)
3 Device variant, see "Structure of the device name"
4 Serial number
5 Electric power supply
6 Power consumption

Structure of the device name

The device name follows this format:

DSF DCON II Electronics II 21/A/B

A: Current outputs
o No current output
b One current output
2b Two current outputs

B: Operating voltage
24VDC 24 Volt DC voltage
230VAC 230 Volt AC voltage

11 Wiring diagrams

Wiring with terminal box:

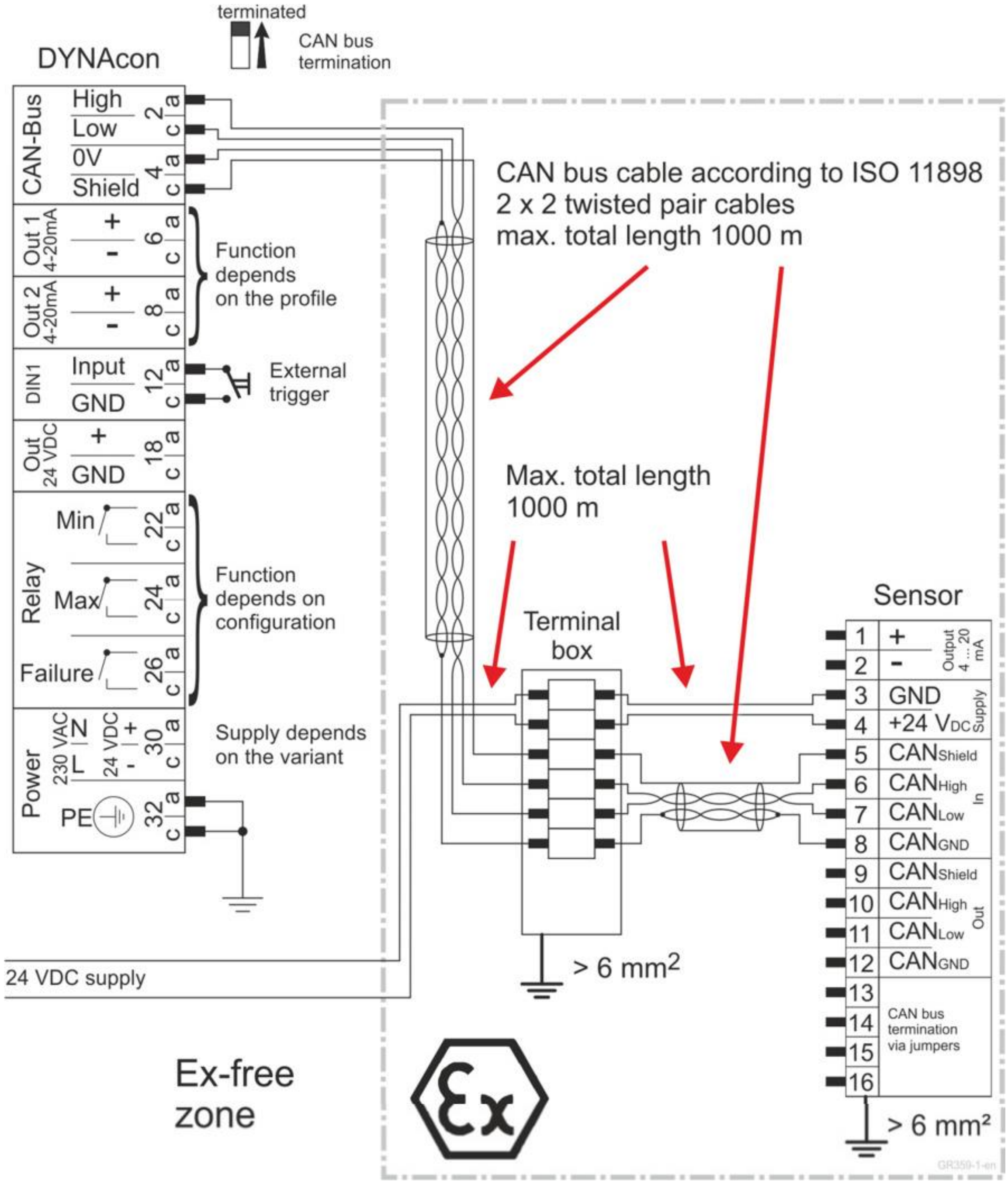

Fig. 18 Wiring diagram with terminal box

Wiring without terminal box:

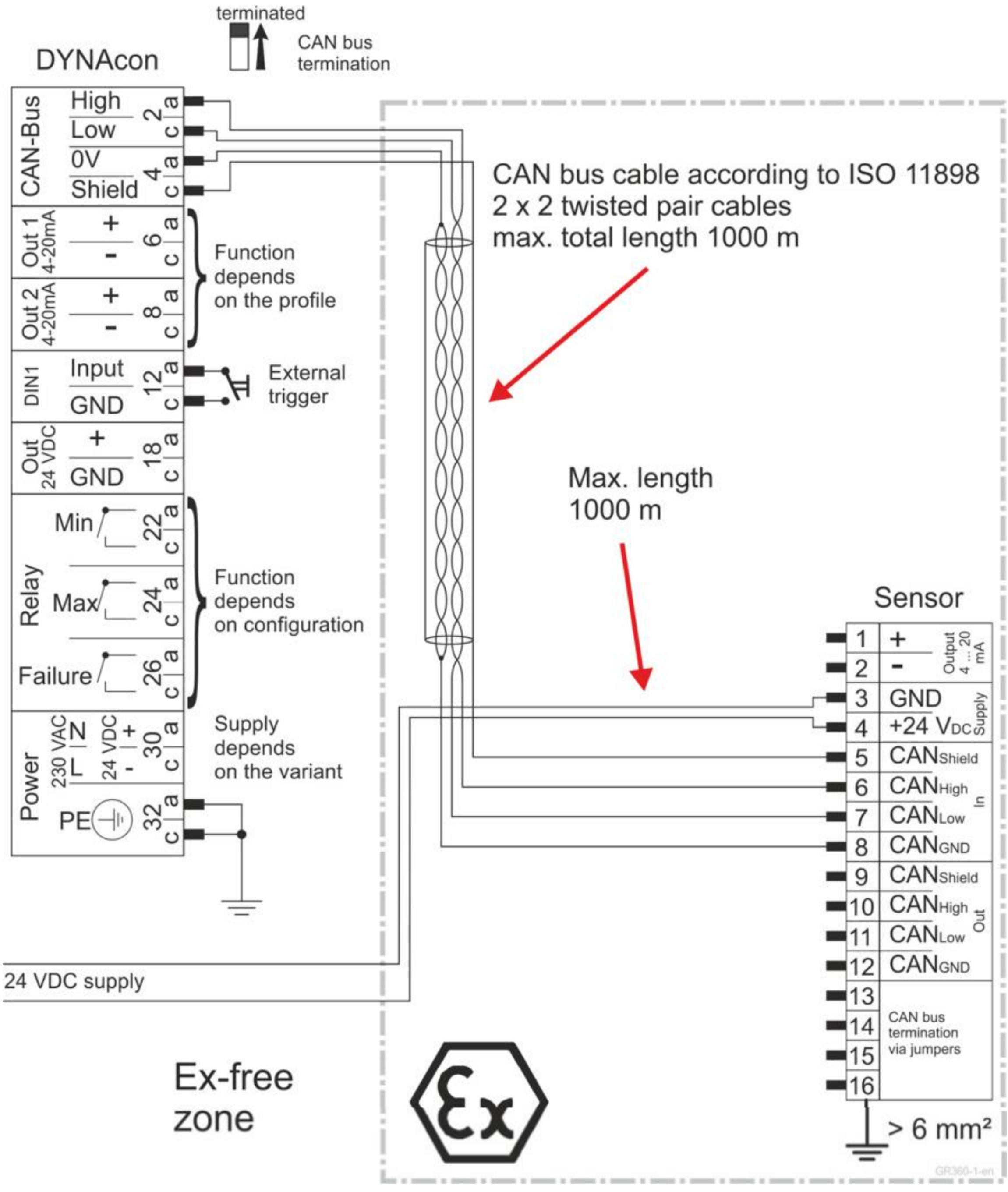

Fig. 19 Wiring diagram without terminal box

12 Applied standards and regulations

Area	Standard
Device	DIN EN 61326-1:2013 (EMC measuring instruments) DIN EN 61010-1:2010 (Safety measuring instruments)
Documentation	DIN EN 82079-1:2013-06
Production processes and quality assurance	ISO 9001:2008 (General processes) DIN EN ISO/IEC 80079-34:2011 (Ex)

Tab. 10 Applied standards

13 Configuration

Please fill out the tables with your configuration. This recording is useful when replacing a device or for multiple identical installations.

Date: ______________ Tag no.: __________

Sensor item name: __________________________ Serial number: ____________

DYNAdens configuration:

1	Measuring Range				
	1.1	Range Limits			
		1.1.1	S max		kg/m3
		1.1.2	S min		kg/m3
	1.2	Range Units			
		1.2.1	Display Unit		
		1.2.2	Decimal places		
2	Upper Threshold				
	2.1	Upper Threshold			
	2.2	S1			kg/m3
	2.3	H1			kg/m3
3	Lower Threshold				
	3.1	Lower Threshold			
	3.2	S2			kg/m3
	3.3	H2			kg/m3
4	Analogue Output				
	4.1	Output Scaling			
		4.1.1	20mA =>		kg/m3
	4.2	Adjust 4mA			
		4.2.1	Calibr. 4 mA Output		
	4.3	Adjust 20mA			
		4.3.1	Calibr. 20 mA Output		
5	Simulation				
	5.1	Simulation			
	5.2	Value			kg/m3
	5.3	Alarm Relay			
6	Damping				
	6.1	Damping			
		6.1.1	Damping time		s
	6.2	Rapid Reaction			
		6.2.1	Reaction		
		6.2.2	Trigger Step		
		6.2.3	Damping cut-off		
7	Fault				
	7.1	Accepted Limit			s
	7.2	Output Value			

	7.3	Alarm Relay			
8	Density Input				
	8.1	Gain			
		8.1.1	Input Type		
		8.1.2	Dens Gain		
		8.1.3	Signal		kg/m3
	8.2	Zero Alignment			
		8.2.1	Parameters		
			8.2.1.1 Offset		kg/m3
			8.2.1.2 Avg Time		s
		8.2.2	Triggers		
			8.2.2.1 Manual/UI		
			8.2.2.2 DIN1 assert		
		8.2.3	Conditions		
			8.2.3.1 Velocity		
			8.2.3.2 Dens in>		
			8.2.3.3		
	8.3	Linearization			
		8.3.1	Calibration Table		
			8.3.1.1 Table ID		
			8.3.1.2 Factor		
			8.3.1.3 Avg. time		
			8.3.1.4 Signal		
			8.3.1.5 Input 0		
			8.3.1.6 Output0		
			8.3.1.7 Input 1		
			8.3.1.8 Output1		
			8.3.1.9 Input 2		
			8.3.1.10 Output2		
			8.3.1.11 Input 3		
			8.3.1.12 Output3		
			8.3.1.13 Input 4		
			8.3.1.14 Output4		
			8.3.1.15 Input 5		
			8.3.1.16 Output5		
			8.3.1.17 Input 6		
			8.3.1.18 Output6		
			8.3.1.19 Input 7		
			8.3.1.20 Output7		
			8.3.1.21 Input 8		
			8.3.1.22 Output8		
			8.3.1.23 Input 9		

8.3.1.24 Output9		
8.3.2 Calibration Info		
8.3.2.1 Table ID		
8.3.2.2 Mod date		
8.3.2.3 Mod time		
8.3.2.4 Fingerprint		
8.4 HW Mode (not generally accessible)		
9 Periods		
9.1 DAQ Block		
9.2 DAQ Period		µs
9.3 Transmission		s
10 System		
10.1 Language		
10.1.1 Language		
10.2 Date Time		
10.2.1 Date		
10.2.2 Time		
10.3 CAN Group Address		
10.3.1 Show CAN Group		
10.3.2 I/O CAN Group		
10.4 DSF DCON II Electronics Profile (not generally accessible)		

DYNAvel configuration:

1	Measuring Range				
	1.1	S max			m/s
	1.2	S min			m/s
2	Upper Threshold				
	2.1	Upper Threshold			
	2.2	S1			m/s
	2.3	H1			m/s
3	Lower Threshold				
	3.1	Lower Threshold			
	3.2	S2			m/s
	3.3	H2			m/s
4	Analogue Output				
	4.1	Analogue Output			
		4.1.1	20mA =>		m/s
	4.2	Adjust 4mA			
		4.2.1	Calibr. 4 mA Output		
	4.3	Adjust 20mA			
		4.3.1	Calibr. 20 mA Output		
5	Simulation				
	5.1	Simulation			
	5.2	Value			m/s
	5.3	Alarm Relay			
6	Damping				
	6.1	Damping			
		6.1.1	Damping time		s
	6.2	Rapid Reaction			
		6.2.1	Reaction		
		6.2.2	Trigger Step		
		6.2.3	Damping cut-off		
7	Adaption				
	7.1	Gain			
		7.1.1	Automatic		
		7.1.2	fix Gain		x
		7.1.3	Live Gain		x
		7.1.4	Gain Factor		x
	7.2	Adjustment			
		7.2.1	Umax		V
		7.2.2	Umin		V
		7.2.3	Limit		
	7.3	Analog Circuit			
		7.3.1	Preamp Gain		

8 Fault		
8.1 Accepted Limit		s
8.2 Output Value		
8.3 Alarm Relay		
9 Correlation		
9.1 Parameter		
9.1.1 DAQ Period		µs
9.1.2 Distance		mm
9.1.3 Flow		
9.2 CCF Limit		
9.2.1 CCF Limit		
9.2.2 Actual CCF		
9.2.3 Averaged CCF		
9.3 Factory Values (not generally accessible)		
10 Periods		
10.1 DAQ Block		
10.2 Transmission		s
11 System		
11.1 Language		
11.1.1 Language		
11.2 Date Time		
11.2.1 Date		
11.2.2 Time		
11.3 CAN Group Address		
11.3.1 Show CAN Group		
11.3.2 I/O CAN Group		
11.4 DSF DCON II Electronics Profile (not generally accessible)		

DYNAcal configuration:

1 Measuring Range				
	1.1 Range Limits			
		1.1.1 S max		t/h
		1.1.2 S min		t/h
	1.2 Range Units			
		1.2.1 Display Unit		
		1.2.2 Decimal places		
2 Upper Threshold				
	2.1 Upper Threshold			
	2.2 S1			t/h
	2.3 H1			t/h
3 Lower Threshold				
	3.1 Lower Threshold			
	3.2 S2			t/h
	3.3 H2			t/h
4 Analogue Output				
	4.1 Output Scaling			
		4.1.1 20mA =>		t/h
	4.2 Adjust 4mA			
		4.2.1 Calibr. 4 mA Output		
	4.3 Adjust 20mA			
		4.3.1 Calibr. 20 mA Output		
5 Simulation				
	5.1 Simulation			
	5.2 Value			t/h
	5.3 Alarm Relay			
6 Damping				
	6.1 Damping			
		6.1.1 Damping time		s
	6.2 Rapid Reaction			
		6.2.1 Reaction		
		6.2.2 Trigger Step		
		6.2.3 Damping cut-off		
7 Fault				
	7.1 Accepted Limit			s
	7.2 Output Value			
	7.3 Alarm Relay			
8 Creeping Quantity				
	8.1 Suppression			
	8.2 Limit			t/h
9 Scaling				

51

	9.1 Cal.Factor		
	9.2 Diameter		mm
10	Periods		
	10.1 DAQ Period		ms
	10.2 Transmission		s
11	System		
	11.1 Language		
	11.1.1 Language		
	11.2 Date Time		
	11.2.1 Date		
	11.2.2 Time		
	11.3 CAN Group Address		
	11.3.1 Show CAN Group		
	11.3.2 I/O CAN Group		
	11.4 DSF DCON II Electronics Profile (not generally accessible)		

DYNApres configuration:

1	Measuring Range				
	1.1	Range Limits			
		1.1.1	S max		kPa
		1.1.2	S min		kPa
	1.2	Range Units			
		1.2.1	Display Unit		
		1.2.2	Decimal places		
2	Upper Threshold				
	2.1	Upper Threshold			
	2.2	S1			kPa
	2.3	H1			kPa
3	Lower Threshold				
	3.1	Lower Threshold			
	3.2	S2			kPa
	3.3	H2			kPa
4	Simulation				
	4.1	Simulation			
	4.2	Value			kPa
	4.3	Alarm Relay			
5	Damping				
	5.1	Damping			
		5.1.1	Damping time		s
	5.2	Rapid Reaction			
		5.2.1	Reaction		
		5.2.2	Trigger Step		
		5.2.3	Damping cut-off		
6	Fault				
	6.1	Accepted Limit			s
	6.2	Output Value			
	6.3	Alarm Relay			
7	Periods				
	7.1	Transmission			s
8	System				
	8.1	Language			
		8.1.1	Language		
	8.2	Date Time			
		8.2.1	Date		
		8.2.2	Time		
	8.3	CAN Group Address			
		8.3.1	Show CAN Group		

53

54

DYNAvccf configuration:

1	Measuring Range				
	1.1	S max			
	1.2	S min			
2	Upper Threshold				
	2.1	Upper Threshold			
	2.2	S1			
	2.3	H1			
3	Lower Threshold				
	3.1	Lower Threshold			
	3.2	S2			
	3.3	H2			
4	Analogue Output				
	4.1	Analogue Output			
		4.1.1	20mA =>		
	4.2	Adjust 4mA			
		4.2.1	Calibr. 4 mA Output		
	4.3	Adjust 20mA			
		4.3.1	Calibr. 20 mA Output		
5	Simulation				
	5.1	Simulation			
	5.2	Value			
	5.3	Alarm Relay			
6	Damping				
	6.1	Damping			
		6.1.1	Damping time		s
	6.2	Rapid Reaction			
		6.2.1	Reaction		
		6.2.2	Trigger Step		
		6.2.3	Damping cut-off		
7	System				
	7.1	Language			
		7.1.1	Language		
	7.2	Date Time			
		7.2.1	Date		
		7.2.2	Time		
	7.3	CAN Group Address			
		7.3.1	Show CAN Group		
		7.3.2	I/O CAN Group		
	7.4	DSF DCON II Electronics Profile (not generally accessible)			

14 Index

This page was intentionally left blank.

This page was intentionally left blank.

Contact

GTS, Inc.
PO Box 799, Shalimar, FL 32579
Phone: +1 850-651-3388 Fax: +1 850-651-4777
E-mail: info@onthelevel.com Web: http://www.onthelevel.com