höntzsch
flow measuring technology

Operating Instructions

flowtherm NT.2

Software status from 1.03

Multifunctional handheld unit with data logger for measuring flow rate, flow velocity, temperature, pressure and other variables

Overview and brief introduction of controls and connections

Please ensure that the correct sensor (FA, VA or TA) is selected (see under 5.3.20.1)!

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1 Safety Instructions

Danger to life, risk of injury and damage to material or property.
Read the Operating Instructions carefully before initial operation.
Observe general safety precautions as well as those included in various sections of these Operating Instructions.

Hazard risks:
- non-observance of the Operating and Safety Instructions
- modifications to the device by the customer
- handling the device outside the specified operating conditions
- handling the sensors outside the specified operating conditions
- use of unsuitable power supplies and peripheral devices
- improper use of the device

Prevention of voltage hazards:
- use only the dedicated adapter plug for the mains supply
- make sure that the PC is correctly connected to the mains (earthed safety socket, earthing) when using a USB connection
- when connecting analog outputs or inputs to peripheral devices make sure that these are correctly connected to the mains (earthed safety socket, earthing)

Danger when installing the sensors in pressurized pipelines:
- sensors for use in pressurized pipelines are to be inserted or retracted only in depressurized conditions; non-observance may result in serious injuries to personnel
- when installing or removing under pressure, the appropriate protective equipment must be used, e.g. ball valve and probe guide pieces with chain guard or spindle probe guide pieces

1.1 Specific information

- pay special attention to the mains voltage when using voltage converters
- observe the maximum power rating when connecting sensors powered by more than 12 V
- when operating out of doors make sure that the battery compartment cover and sensor plug are screwed on tightly, the connector sockets not in use are firmly capped, and the USB connection cover is tightly sealed, otherwise the IP65 protection cannot be guaranteed

1.2 Handling batteries and accumulators

- All batteries/accumulators must be replaced at the same time. Do not replace single cells! All replacements must be identical (cell type / nominal capacity / make) and fitted the right way round. Possible reverse polarity of single cells is to be avoided (electrolyte formation)
- Recharge batteries with a suitable charger away from the unit
- Remove batteries when they are dead or if the device is not being used for any length of time to avoid leakage
- Batteries contain hazardous substances and must never be disposed of in household waste
- Never recharge normal batteries

2 Scope of Delivery

- Handheld unit flowtherm NT.2
- Operating Instructions and Data Sheet flowtherm NT.2
- FA, VA or TA sensor(s) as ordered
- relevant Data Sheet for above
- other sensors such as Pt100, if ordered
- accessories for sensors, e.g. extension rod for FA sensor, if ordered
- CD-ROM with PC software HLOG II and USB cable (optional)
- adapter plug and USB cable (optional)
- various connection and extension cables, connectors (optional)
- carrying case (optional)

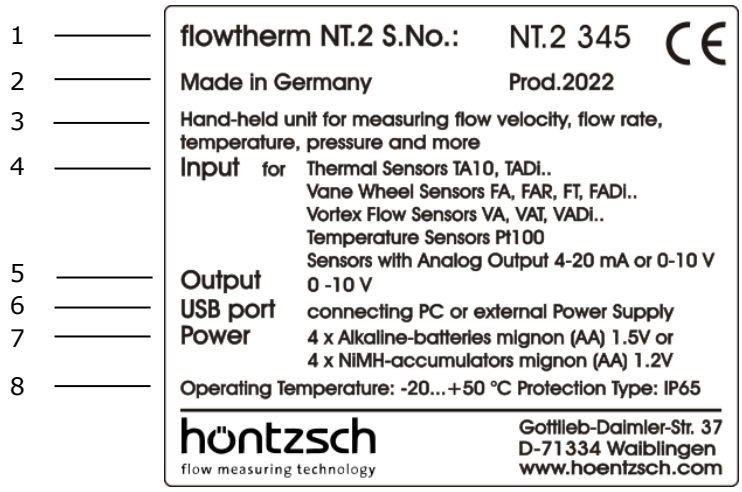
Please check that everything listed in the Delivery Note / Technical Data Sheet is included in the delivery.

2.1 Description, type plate

The flowtherm NT.2 is a multifunctional handheld unit with data logger for measuring flow velocity, volume flow/flow rate, standard flow rate, mass flow rate, temperature, pressure and other variables, insofar as they are measurable / deducible with connectable sensors:

Sensors that can be connected:
- vane wheel FA, FAR, FT, FADi, FAR-Di
- vortex VA, VAT, VADi
- thermal TA10, TADi
- temperature Pt100
- 2-wire 4-20 mA max. 12 V supply
- 3- or 4-wire 4-20 mA output and max. 12 V supply
- 3- or 4-wire 0-10 V output and max. 12 V supply

The following type plate is found on the back of the unit:



Description of type plate specifications:

1: Description
see Section 2.1

2: Unit and serial no.

3: Year of production

4: Inputs
see Description Section 2.1
see Connector sockets Page 2
see Wiring diagrams Section 4.1 and 4.2

5: Output
see Connector sockets Page 2
see Wiring diagrams Section 4.1 and 4.2

6: USB connection
see Electrical data Section 3.2 and 3.3
see Connector sockets Page 2

7: Power supply
see Electrical data Section 3.2 and 3.3

8: Operating conditions
see Safety Instructions Section 1
see Operating conditions Section 3.1

3 Technical Specifications

3.1 Operating conditions

Ambient temperature of connection housing in service	: -20 ... +50 °C
Type of protection	: IP65

3.2 Housing and connection

Type of protection	: IP65 with battery compartment cover and sensor plug screwed on tightly, connector sockets not in use firmly capped, and USB connection cover tightly sealed	
Material	: electrically conductive ABS plastic	
External measurements, weight	: W/H/L = 96/42/197 mm, approx. 520 g	
Connections	: 5-pin connector plug	for thermal sensors
	8-pin connector plug	for vane wheel, vortex or temperature sensors
	12-pin connector plug	for analog output (optional), analog inputs or additional sensors
	USB	for data logger readout, device configuration and external power supply via PC or mains adapter

3.3 Electrical data

Power supply : via 4 alkaline manganese (LR6) Mignon (AA) 1.5V batteries
(maximum permissible nominal capacity 4000 mAh per cell)
running time (Duracell Industrial) approx. 30 hours
(using FA sensor with minimum display light)
or via 4 NiMH rechargeable Mignon (AA) 1.2V batteries
running time (Ansmann Digital 2850 mAh) approx. 31 hours
(using FA sensor with minimum display light)

In order to extend the operating time the mode „auto-off" has to be activated. If this mode is activated the display turns off automatically after a few minutes without pressing any keys.

Turning off the 12 V output for power supply of potential connectable sensors extends the operating time as well.

Open the battery compartment with a screw driver. Always change all 4 batteries at the same time, checking for correct polarity. Only ever recharge batteries away from the unit using a suitable charger. Always ensure that all 4 rechargeable batteries are fully charged before inserting. To close the compartment press it firmly in the seal (in the direction of the connector sockets) and screw down tightly.

Mains supply : via USB connection with PC or adapter plug; input voltage Um ≤ 6 VDC

Supply current : via USB connection not less than 300 mA

Analog output (optional) : 0 … 10 V with inner resistance of 1000 Ohm;
measuring value, unit, starting value, end value and offset adjustable

Analog input 4-20 mA : for connection of sensor in 2-wire system with ≤ 12 V;
allocation of unit, initial value and final value adjustable

Analog input 0-10 V : for connection of sensors with voltage output;
input resistance ≤ 1 MOhm
≤ 12 V power supply for sensors, (≤ 25 mA);
allocation of unit, initial value and final value adjustable

3.4 Measurement uncertainty

Input FA : +/- 1 Hz

Input VA : +/- 1 Hz

Input TA : +/- (0.7 % of measured value + 0.02 % of terminal value)
Temperature display : +/- 1 Kelvin

Analog input 0-10 V : +/- (0.3 % of measured value + 0.02 % of terminal value)

Analog input 4-20 mA : +/- (0.3 % of measured value + 0.02 % of terminal value)

Input Pt100 : +/- 0.2 Kelvin

Analog output 0-10 V (opt.) : +/- (0.1 % of measured value + 0.01 % of terminal value)

All values apply for a set damping rate of 30 seconds during measurement. In addition, the measurement uncertainty of the utilised sensors must be taken into consideration.

4 Initial Operation / Startup

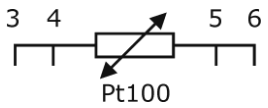
For installation and operation of the system the national regulations currently in force, the recognised standards of good practice and these Operating Instructions apply.

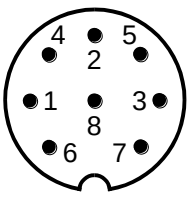
4.1 Wiring diagram for the 8-pin connector plug

Electrical connection must be carried out according to the relevant wiring diagram.
Incorrect connection can cause serious damage to the electronics.

Wiring diagram with view of solder contacts:

Pin assignment
Pin 1: v/FA+FAR signal 1 ⎍ or v/VA signal ⎍
Pin 2: ground ⊥
Pin 3: Pt100
Pin 4: Pt100
Pin 5: Pt100
Pin 6: Pt100
Pin 7: v/FAR signal 2 ⎍
Pin 8: V+
Housing: shield





4.2 Wiring diagrams for the 12-pin connector plug

Electrical connection must be carried out according to the relevant wiring diagram.
Incorrect connection can cause serious damage to the electronics.

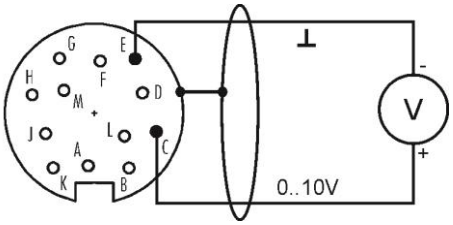
Note: 12 V output for power supply of connectable sensors can be switched on/off, see 5.3.22

Wiring diagrams with view of solder contacts:

4.2.1 Analog output 0-10 V (optional)

C = analog output channel 1
E = signal – (0 V)

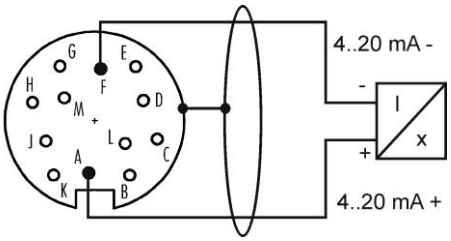
plug shell = shielding



4.2.2 Analog input 4-20 mA (2-wire system current for 12V supply)

A = power supply + (12V)
F = power supply – (GND)

plug shell = shielding

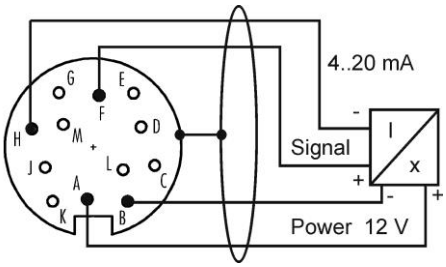


4.2.3 Analog input 4-20 mA (3 or 4-wire system current for 12V supply)

A = power supply + (12V)
B = power supply – (GND_D)

F = signal +
H = signal – (GND_A)

plug shell = shielding

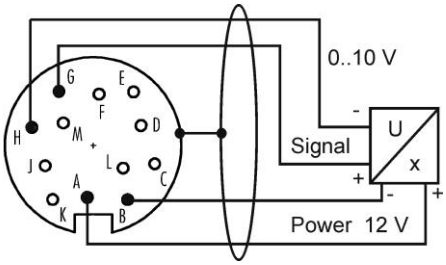


4.2.4 Analog input 0-10 V (3 or 4-wire system voltage for 12V supply)

A = power supply + (12V)
B = power supply – (GND_D)

G = signal +
H = signal – (GND_A)

plug shell = shielding



5 Operation

5.1 Key functions

Switch on: with the ok key (also ⏻ symbol)
hold down until text appears in the display.

Switch off: with the f4 key (also ◎ symbol)
press the key for 1 second until the display goes off.

Control keys: f1, f2 and f3 are keys with variable function, identified in the bottom row of the display depending on user level.

Arrow keys: **In measured value display / view after switch on:**
during measured value display the arrow keys have the following function:
◄ and ► : shift the display. Switching to 1, 2 or 3 measured values or displaying the grapphical view. Depending on the selection, the character size of the display value changes.

▲ and ▼ : if the display is set so that only measured values from 1, 2 or 3 input channels are displayed simultaneously or the graphical view is displayed, then these keys can be used for scrolling through the input channels.

In the menus and input boxes:
▲, ▼, ◄ and ► are control keys for navigating within the various menus and menu levels.

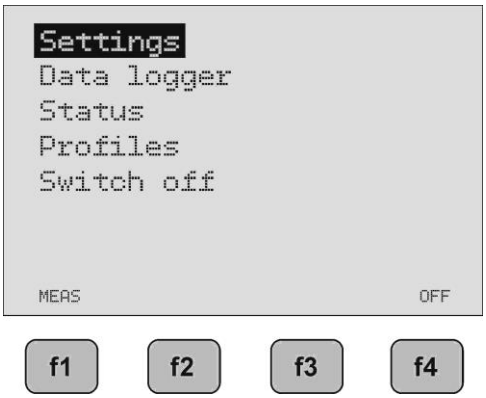
ok key: **In the measured value display / view after switch on:**
ok is a control key for waking up the display from the energy saving mode or to reset the brightness of the display to the chosen level after it has been dimmed.

In the menus and input boxes:
ok is a control key to select and save.

Examples for key functions in the menus:

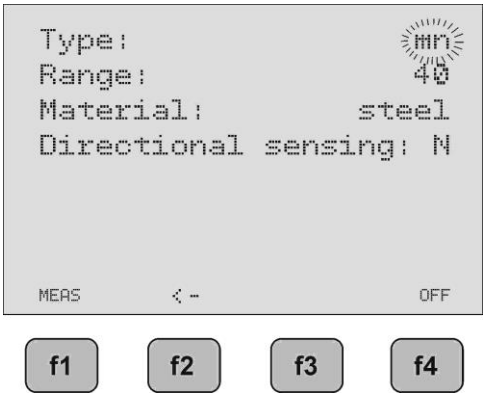
Menu selection list:

With ▲ ▼ up or down in the list; the selected element is highlighted.
With ◄ a menu level higher (backwards).
With ► a menu level lower (forwards) = select.
With ok select = a menu level lower (forwards).
With f1 return to measured value display.
With f4 switch off.



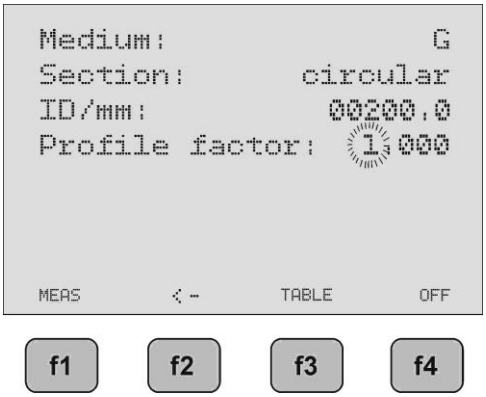
Parameter value selection window:

With ▲ ▼ new selection element; the selected element flashes (here "mn").
With ok select and save and return to selection list.
With f1 return to measured value display without saving.
With f2 return to selection list without saving.
With f4 switch off.

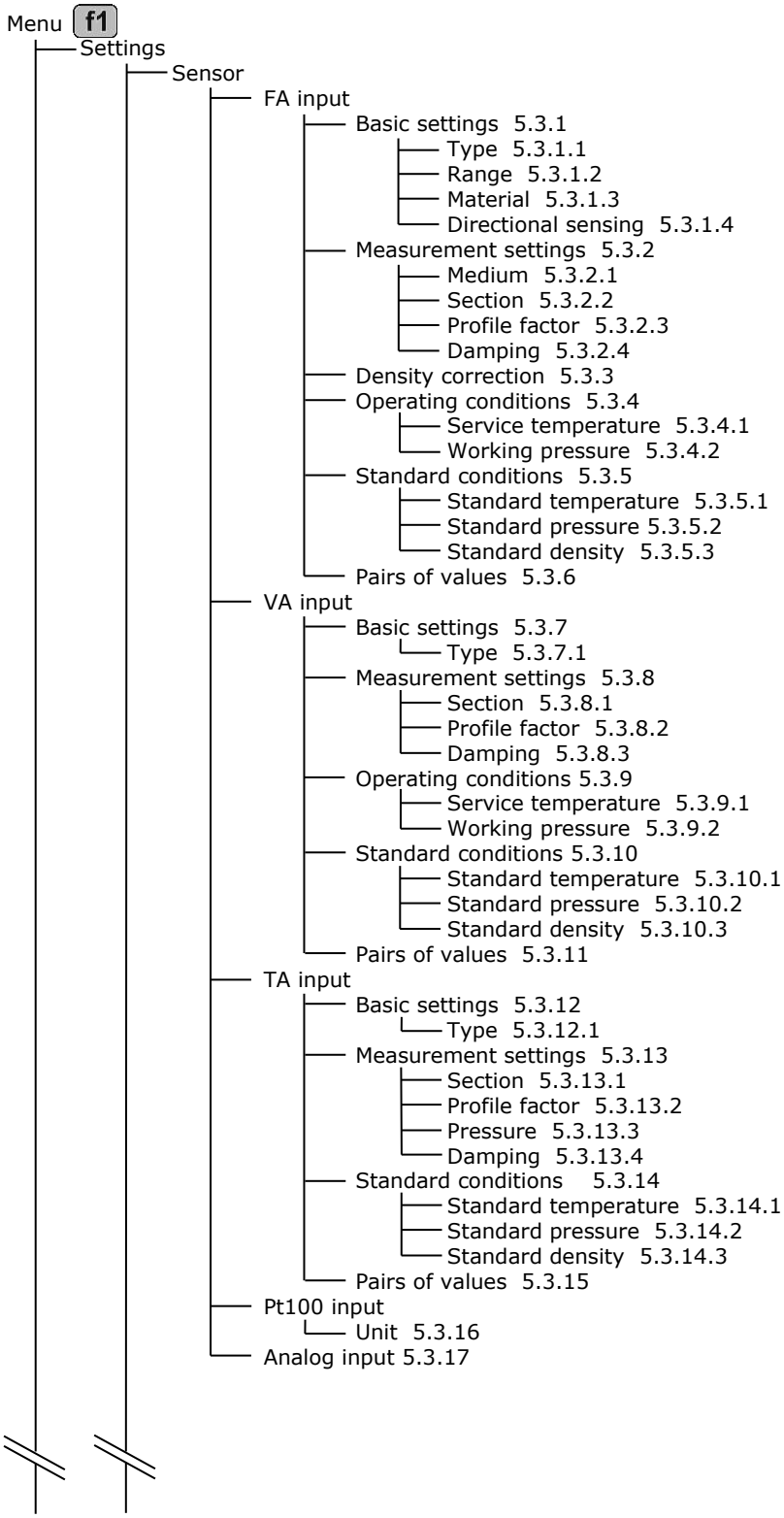


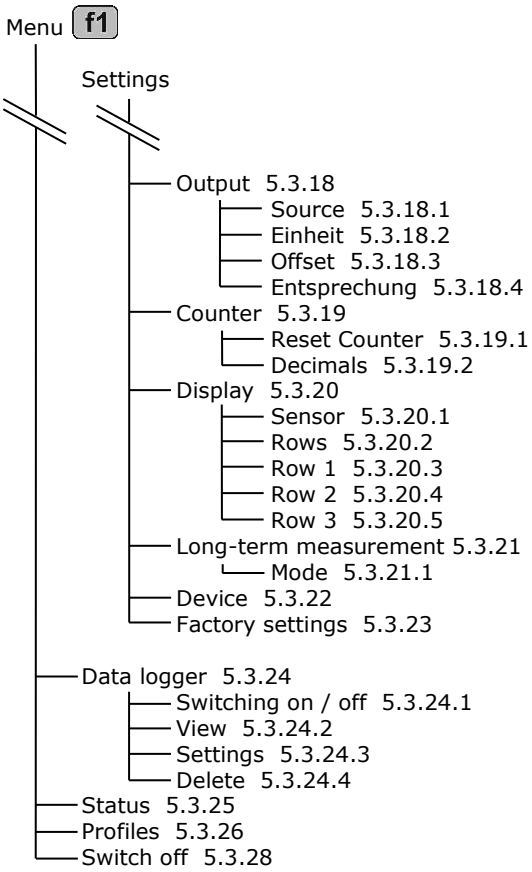
Parameter value digit (numeric/text) setting:

With ▲ ▼ change digit; the selected and editable digit flashes (here "1").
With ◄ ► 1 digit to the left or right respectively.
With ok select and save and return to selection list.
With f1 return to measured value display without saving.
With f2 return to selection list without saving.
With f4 switch off.



5.2 Setup menu after switch on





LM-Start f2
5.3.27

Logger f3
- Switching on / off 5.3.24.1
- View 5.3.24.2
- Settings 5.3.24.3
- Delete 5.3.24.4

Off f4
5.3.28

5.3 Parameter settings

Settings for vane wheel sensors FA:

5.3.1 FA - Basic settings

Menu -> Settings -> Sensor -> FA input -> Basic settings

The connected **vane wheel sensor** determines the parameter type, measuring range, material and directional sensing to be set.

5.3.1.1 Type

Setting the vane wheel type:
This can be determined from the serial no. on the sensor.

Selection:	**mc**	=	**micro -** for use in for instance: cylinder probes with OD 14, 16, 18 mm measuring tubes with ID 9.7 mm
	mn	=	mini for use in for instance: cylinder probes with OD 25 mm measuring tubes with ID 18.2 mm
	md	=	midi for use in for instance: cylinder probes with OD 30 mm
	pairs of values	=	special calibration characteristic specifically matched to the measuring task based on up to 30 supporting points. Input or changing the points, see under 5.3.6

Distinctive feature of sensors with vane wheel types **md3** and **ms** (measuring tube):
These sensors are always supplied with a special calibration characteristic. Therefore, always select **pairs of values**. For input or change see (5.3.6) pairs of values.

5.3.1.2 Range

Setting the vane wheel measuring range:
This can be determined from the serial no. on the sensor.

Selection:	**20**	=	measuring range up to 20 m/s
	40	=	measuring range up to 40 m/s
	80	=	measuring range up to 80 m/s
	120	=	measuring range up to 120 m/s

Exceeding the measuring range can cause permanent damage to the vane wheel!

5.3.1.3 Material

Setting the vane wheel sensor material:
This can be determined from the serial no. on the sensor.

Selection:	**steel**	=	**E**
	aluminium	=	**A**
	titanium	=	**T**

5.3.1.4 Directional sensing

Setting the directional sensing function: such sensors are identified by an "R" in the serial number.

Selection:	**Y**	= directional sensing **yes**, measured value display **with prefix**
	N	= directional sensing **no**, measured value display **without prefix**

5.3.2 FA - Measurement settings

Menu -> Settings -> Sensor -> FA Input -> Measurement settings

The task to be carried out determines the parameter, medium, section and profile factor to be set.

5.3.2.1 Medium

Setting the medium:
Selecting pairs of values in the basic settings (5.3.1.1) has no impact on the measurement.

Selection: **G** = **Gases**, the characteristic for air/gases is applied
F = **Liquids (Fluids)**, the characteristic for water/liquids is applied

Use only "GF" sensors (see technical documents) for measuring in liquids; otherwise the sensor can be permanently damaged!

5.3.2.2 Section

Setting the measuring section for measuring in pipelines for flow rate display:

Selection: **Circular** = for pipes with circular section
di/mm: enter the ID in mm
Rectangular = for pipes with rectangular section
a/mm: enter the inner surface a in mm
b/mm: enter of the inner surface b in mm

5.3.2.3 Profile factor

The profile factor PF specifies the ratio of mean flow velocity in the measuring section and the flow velocity measured from the sensor. Requirements are: centric sensor positioning, non-rotational inlet flow and adequately dimensioned input/output sections. (See also Documents U117 and U205)

Following profile factors are to be set for vane wheel cylinder probes (ZS..) subject to pipe diameter:

Pipe ID in mm	PF for ZS16 (mc)	PF for ZS18 (mc)	PF for ZS25 (mn) and ZS30 (md)
40	0.914	0.898	
50	0.933	0.916	0.735
60	0.950	0.932	0.760
70	0.964	0.948	0.784
80	0.976	0.962	0.807
90	0.987	0.975	0.829
100	0.994	0.986	0.849
120	1.004	1.004	0.882
170	1.008	1.021	0.938
180	1.008	1.021	0.945
220	1.008	1.021	0.955
...	1.009	1.021	0.960

For measurements in larger free jet as well as larger ducts or measuring tubes PF = 1.000 results in the local/punctual velocity.

With f3 TABLE a profile factor subject to the vane wheel type (5.3.1.1) and diameter of the measuring surface (5.3.2.2) is recommended. This value can be verified or also amended before saving. If rectangular is selected, the surface is converted to circular for the proposed value and this value is approximate. If the sensor is a ZS18 (mc), the value must be amended according to the table above.

PF = 1.000 must always be set for FADi... measuring tubes calibrated with pairs of values!

5.3.2.4 Damping

The damping rate set here affects the measured value display, if FA is selected as sensor in the display settings (5.3.20.1). The damping also affects the analog output if in the settings for the output (5.3.18) FA has been selected as source.

Damping/s: enter the damping time of 01 to 99 seconds

Example 10 seconds: after every second the arithmetical average of the last 10 seconds is displayed.

5.3.3 FA - Density correction

Menu -> Settings -> Sensor -> FA Input -> Density correction

Liquids:
Liquids are virtually density resistant. No density correction needed.

Gases and vapours:
The density of gases and vapours can be strongly modified against pressure and temperature. Such severe modifications have a minor impact on the measured value of a vane wheel sensor. This impact manifests itself in a determinable correction value, which is added to or subtracted from the measured value. The percentaged impact of this correction value is however negligible with average to high velocity flow. With low and very low values, consideration of the density correction becomes more expediant.

To determine this correction value the measuring range initial value (starting value) of a vane wheel is examined. The specified starting value in the vane wheel sensor documents arises from a medium density of 1.204 kg/m³ (calibration conditions). The only slightly deviating actual starting value, even with considerably different working density of the medium (in the actual application) ensures in good approximation of the following:
actual starting value = specified starting value x root of (density during calibration / working density of the medium).
The correction value is now the difference between real and specified starting value. The characteristic of the sensor is displaced by this value.

If the operating density of the medium is greater than the calibration density of 1.204 kg/m³, then the determined correction value must be deducted from the measured value. If it is less than the calibration density of 1.204 kg/m³, then the determined correction value must be added to the measured value.

The working medium density is needed to calculate the correction value.

Example:
A ZS25GE-mn40/100/p10 sensor with a specified starting value of 0.5 m/s is used in air at 1.013 bar and 100 °C, that is, with a working medium density of 0.946 kg/m³.

Entered in formula:
actual starting value = 0.5 m/s x root of (1.204 kg/m³ / 0.946 kg/m³) = 0.5 m/s x 1.128
= 0.564 m/s

correction value = 0.564 m/s – 0.5 m/s
= 0.064 m/s

With a displayed value of 15.00 m/s (without correction) and with density correction on, the correction value of 0.064 m/s would be allowed for and a corrected value of 15.06 m/s would be displayed.

Setting:

Selection:	**N**	= density correction **no**	
	J	= density correction **yes**	then enter the density of the sample gas:
		W-density/kg/m3:	enter the working medium density in kg/m³

If the working medium density is not known, it can be determined with the formula:

W-density = P / (R * T)

where P = absolute pressure in Pa, R = specified gas constant in J/(kg*K), T = temperature in K.

Here the specific gas constants of some gases:

sample gas	**specific gas constant** in J/(kg*K)	**sample gas**	**specific gas constant** in J/(kg*K)
dry air	287	hydrogen H_2	4124
steam H_2O	462	methane CH_4	518
argon Ar	208	nitrogen N_2	297
carbon dioxide CO_2	189	oxygen O_2	260
carbon monoxide CO	297	propane C_3H_8	189
helium He	2077	sulphur dioxide SO_2	130

5.3.4 FA- Operating conditions

Menu -> Settings -> Sensor -> FA input -> Operating conditions

When choosing the relevant units (see 5.3.20.6) service temperature and working pressure are needed for calculation purposes. The operating conditions can be entered in this menu or determined with connected sensor.

5.3.4.1 Service temperature

Measured or entered unit in °C

5.3.4.2 Working pressure

Measured or entered unit in hPa

5.3.5 FA – Standard conditions

Menu -> Settings -> Sensor -> FA input -> Standard conditions

Standard conditions for Höntzsch are 0 °C (32 °F) and 1013 hPa (14.7 psia). Any standard can be set via the standard temperature and standard pressure parameters.

5.3.5.1 Standard temperature

Input value in °C

5.3.5.2 Standard pressure

Input value in hPa

5.3.5.3 Standard density

Input value in kg/m³ depending on set standard conditions for calculating the mass flow rate.

5.3.6 FA – Pairs of values

Menu -> Settings -> Sensor -> FA Input -> Pairs of values

If pairs of values is selected (see 5.3.1.1), then the values stored here for determining the measured value are applied as a calibration curve.

Selection: **Configuration** = enter the **quantity** of pairs of values (minimum 2, maximum 30) for processing and display

Pairs of values = display and amend pairs of values.
A pair of values always consists of a velocity value in m/s and a frequency value in Hz.
The condition being: the pairs of values must be ever increasing, i.e. the next velocity and frequency value must always be greater than the previous one.

Example for quantity = 03
01:000.50m/s, 00010Hz
02:010.00m/s, 00350Hz
03:040.00m/s, 01770Hz

If the frequency measured value is greater than in the last pair of values, then the velocity value is calculated. However, this means that the measurement uncertainty increases as this value is then outside the calibrated range. The measuring range in the serial no. and technical data sheet must not be exceeded, as this may cause permanent damage to the vane wheel! (for further information refer to 5.3.1.2)

Settings for vortex sensors VA:

5.3.7 VA – Basic settings

Menu -> Settings -> Sensor -> VA Input -> Basic settings

The connected **vortex sensor** determines the parameter type.

5.3.7.1 Type

Setting the type of vortex sensor:
Refer to the relevant technical documents for selection options.

Selection: **KKZ** = the **calibration number (KKZ)** is individually determined for each sensor and modifies the basic characteristics
KKZ: enter as an 8-digit figure, in which each digit has a 0..9..A..F range (hexadecimal = 16 possible variables).
The actual KKZ can be found in the technical data sheet, calibration certificate or directly on the sensor

Pairs of values = special calibration characteristic specifically matched to the measuring task based on up to 30 supporting points. Entering or amending the points, see under 5.3.11.
The actual pairs of values are documented in the technical documents.

5.3.8 VA - Measurement settings

Menu -> Settings -> Sensor -> VA Input -> Measurement settings

The measuring task to be carried out determines the parameter, section and profile factor to be set.

5.3.8.1 Section

Setting the measuring section for measuring in pipelines for flow rate display:

Selection: **Circular** = for pipes with circular section
di/mm: enter the ID in mm
Rectangular = for pipes with rectangular section
a/mm: enter the inner surface a in mm
b/mm: enter the inner surface b in mm

5.3.8.2 Profile factor

The profile factor PF specifies the ratio of mean flow velocity in the measuring section and the flow velocity measured from the sensor. Requirements are: centric sensor positioning, non-rotational inlet flow and adequately dimensioned input/output sections. (See also Documents U155 and U206).

Following profile factors are to be set for vortex sensors VA40 subject to the pipe diameter:

Pipe ID in mm	PF for VA40	Pipe ID in mm	PF for VA40
80	0.719	160	0.808
90	0.729	170	0.819
100	0.738	180	0.830
110	0.750	190	0.839
120	0.761	200	0.842
130	0.773	300	0.845
140	0.784	400	0.850
150	0.796	...	0.860

For measurements in larger free jet as well as larger ducts or measuring tubes PF = 1.000 results in the local/punctual velocity.

With f3 TABLE a profile factor subject to the set diameter of the measuring surface (5.3.8.1) is recommended. This value can be verified or also amended before saving. With rectangular selected as measuring surface, the surface is converted to circular for the proposed value and this value is approximate.

PF = 1.000 must always be set for VADi… measuring tubes calibrated with pairs of values!

5.3.8.3 Damping

The damping rate set here affects the measured value display, if VA is selected as sensor in the display settings (see 5.3.20.1). The damping also affects the analog output if in the settings for the output (5.3.18) VA has been selected as source.

Damping/s: enter the damping time from 01 to 99 seconds

Example 10 seconds: after every second the arithmetical average from the last 10 seconds is displayed.

5.3.9 VA – Operating conditions

Menu -> Settings -> Sensor -> VA Input -> Operating conditions

When selecting the relevant units (see 5.3.20.6) service temperature and working pressure are needed for calculation purposes. The operating conditions can be entered in this menu, or determined with connected sensor.

5.3.9.1 Working temperature

Measured or entered value in °C

5.3.9.2 Working pressure

Measured or entered value in hPa

5.3.10 VA – Standard conditions

Menu -> Settings -> Sensor -> VA Input -> Standard conditions

Standard conditions for Höntzsch are 0 °C (32 °F) and 1013 hPa (14.7 psia). Any standard can be set via the standard temperature and standard atmospheric pressure parameters.

5.3.10.1 Standard temperature

Input value in °C

5.3.10.2 Standard atmospheric pressure

Input value in hPa

5.3.10.3 Standard density

Input value in kg/m³ depending on set standard conditions for calculating the mass flow rate.

5.3.11 VA – Pairs of values

Menu -> Settings -> Sensor -> VA Input -> Pairs of values

If pairs of values is selected (see 5.3.7.1), then the values stored here for determining the measured value are applied as a calibration curve.

Selection: **Configuration** = enter the **quantity** of pairs of values (minimal 2, maximal 30) for processing and display

Pairs of values = display and change of pairs of values.
A pair of values always consists of a velocity value in m/s and a frequency value in Hz.
The condition being: the pairs of values must be ever increasing, i.e. the next velocity and frequency value must always be greater than the previous one.

Example for quantity = 03
01:000.50m/s, 00010Hz
02:010.00m/s, 00350Hz
03:040.00m/s, 01770Hz

If the frequency measured value is greater than in the last pair of values, then the velocity value is calculated. However, this means that the measurement uncertainty increases as this value is then outside the calibrated range.

Settings for thermal sensors TA:

5.3.12 TA – Basic settings

Menu -> Settings -> Sensor -> TA Input -> Basic settings

The connected **thermal sensor** determines the parameter type.

5.3.12.1 Type

Setting the type of thermal sensor:
Refer to the relevant technical documents for selection options.

Selection: **KKZ** = the **calibration number (KKZ)** is individually determined for each sensor and modifies the basic characteristics.
KKZ: enter as a 14-digit figure, in which each digit has a 0..9..A..F range (hexadecimal = 16 possible variables).
The actual KKZ can be found in the technical data sheet, calibration certificate or directly on the sensor

Pairs of values = special calibration characteristic specifically matched to the measuring task based on up to 30 supporting points. Entering or amending the points, see under 5.3.15.
The actual pairs of values can be found in the technical documents.

5.3.13 TA - Measurement settings

Menu -> Settings -> Sensor -> TA Input -> Measurement settings

The task to be carried out determines the parameter, section and profile factor to be set.

5.3.13.1 Section

Setting the measuring section for measuring in pipelines for flow rate display:

Selection: **Circular** = for pipes with circular section
di/mm: enter the ID in mm
Rectangular = for pipes with rectangular section
a/mm: enter the inner surface a in mm
b/mm: enter the inner surface b in mm

5.3.13.2 Profile factor

The profile factor PF specifies the ratio of mean flow velocity in the measuring section and the flow velocity measured from the sensor. Requirements are: centric sensor positioning, non-rotational inlet flow and adequate dimensioned input/output sections. (See also Documents U232 and U234)

Following profile factors are to be set for thermal flow sensors TA10 subject to the pipe diameter:

Pipe ID in mm	PF for thermal sensors TA10
25	0.725
27.2	0.740
35.9	0.790
40	0.810
41.8	0.820
50	0.840
...	0.840

For measuring in larger free jet as well as larger ducts or measuring tubes with setting PF = 1.000 the local/punctual velocity will be displayed.

With f3 TABLE a profile factor subject to the set diameter of the measuring surface (5.3.13.1) is recommended. This value can be verified or also amended before saving. With rectangular selected as measuring surface, the surface is converted to circular for the proposed value and this value is approximate.

PF = 1.000 must always be set for TADi.. measuring tubes calibrated with pairs of values!

5.3.13.3 Pressure

B Working pressure in hPa as absolute pressure for zero correction.

5.3.13.4 Damping

The damping rate set here affects the measured value display, if TA is selected as sensor in the display settings (5.3.20.1). The damping also affects the analog output if in the settings for the output (5.3.18) TA has been selected as source.

Damping/s: enter the damping time of 01 to 99 seconds

Example 10 seconds: after every second the arithmetical average of the last 10 seconds is displayed.

5.3.14 TA – Standard conditions

Menu -> Settings -> Sensor -> TA Input -> Standard conditions

Standard conditions for Höntzsch are +21 °C (70 °F) and 1014 hPa (14.7 psia). Any standard condition can be set via the standard temperature and standard atmospheric pressure parameters.

5.3.14.1 Standard temperature

Input value in °C

5.3.14.2 Standard pressue

Input value in hPa

5.3.14.3 Standard density

Input value in kg/m³ depending on set standard conditions for calculating the mass flow rate.

5.3.15 TA - Pairs of values

Menu -> Settings -> Sensor -> TA Input -> Pairs of values

If pairs of values is selected (see 5.3.12.1), then the values stored here for determining the measured value are applied as a calibration curve.

Selection: **Configuration** = enter the **quantity** of pairs of values (minimal 2, maximal 30) for processing and display

Pairs of values = display and change of pairs of values.
A pair of values always consists of a velocity value in m/s and a frequency value in Hz.
The condition being: the pairs of values must be ever increasing, i.e. the next velocity and frequency value must always be greater than the previous one.

Example for quantity = 03
01:000.50m/s, 06000Hz
02:010.00m/s, 08350Hz
03:040.00m/s, 12770Hz

If the frequency measured value is greater than in the last pair of values, then the velocity value is calculated. However, this means that the measurement uncertainty increases as this value is then outside the calibrated range.

Note: For switching between different calibration gases each pair of values calibration for the respective calibration gas can be saved in its own profile (see 5.3.26)

Resetting the factory settings (see 5.3.23) has no impact on the saved profile. Changing the pairs of values for the various calibration gases can only be reconstructed via the documentation in the Technical Data Sheet and calibration certificate.

Pt100 input settings for temperature measurement:

5.3.16 PT100 - Unit

Menu -> Settings -> Sensor -> Pt100 Input -> Unit

The parameter unit to be set here affects the measured value display

Selection: **°C** = display of **temperature** in °C
°F = display of **temperature** in °F

Analog input settings:

5.3.17 Analog input

Menu -> Settings -> Sensor -> Analog input

Input: Selection: **4-20mA** = **current input** 4-20 mA is selected
0-10V = **voltage input** 0-10 V is selected

Designation: for each of the two inputs a designation of up to 13 digits for the sensor can be entered.
Example: pressure sensor

Equivalency: for each of the two inputs a display equivalency can be defined. For this purpose the desired initial value of 4 mA or 0 V and the desired final value of 20 mA or 10 V is entered respectively.
Example: 4 ... 20 mA -> 900 ... 1600 hPA

Unit: for each of the two inputs a unit of up to 5 digits for measured value display can be entered.
Example: hPa
(unused digits are marked with an "*" and are not shown in the display and data logger)

Settings for the analog output:

5.3.18 Analog output (optional)

Menu -> Settings -> Output

5.3.18.1 Source

Setting the source for the analog output

5.3.18.2 Unit

Setting the unit for the analog output

5.3.18.3 Offset/V

Linear offset over the complete range of the analog output

5.3.18.4 Equivalent

Setting the measured value correspondence

Selection: **FA, VA, TA** = **sensor** according to the selection (5.3.20.1)

equivalent: starting value analog output at 0 V in the selected unit
end value analog output at 10 V in the selected unit

Example: 0 ... 10 V -> 0 ... 40 m³/h

PT100 = t**emperature sensor** Pt100

equivalent: starting value analog output at 0 V in the unit of the PT100 (siehe 5.3.16)
end value analog output at 10 V in the unit of the PT100 (siehe 5.3.16)

Example: 0 ... 10 V -> -20 ... +100 °C

Counter settings:

5.3.19 Counter

Menu -> Settings -> Counter

Saettings for the counter,

5.3.19.1 Reset Counter

Resets counter to 0

5.3.19.2 Decimals

Determines the number of decimal places (0, 1 or 2) for display

Display settings:

5.3.20 Display

Menu -> Settings -> Display

Settings for measured value display. Determines the quantity of the simultaneously displayed values / input channel and assignment of these values to the 3 channels.

5.3.20.1 Sensor

Selection: **Sensor:** = flow sensor selection
FA: = **vane wheel sensor**
VA: = **vortex sensor**
TA: = **thermal sensor**
Only the selected sensor may be connected!

5.3.20.2 Rows

The number of rows determines in how many input channels (1, 2 or 3) the measured values are displayed simultaneously after switch on.

5.3.20.3 Row 1

Selection of which measured value is allocated to input channel 1 and displayed as Row 1.

Selection:	**Date**	= **actual date**
	Time	= **actual time**
	Unit	= unit of selected **flow sensor** (see 5.3.20.6 and 5.3.20.7)
	Pt100 input	= **temperature sensor Pt100**
	20mA input	= **analog input 4-20 mA**
	10V input	= **analog input 0-10 V**
	TAT input	= **temperature measurement of thermal sensor TA** (only relevant if a TA sensor is selected under 5.3.20.1)
	Counter	= **Counter** (see 5.3.19)

5.3.20.4 Row 2

Selection of which measured value is allocated to input channel 2 and displayed as Row 2.

Selection: (see 5.3.20.3)

5.3.20.5 Row 3

Selection of which measured value is allocated to input channel 3 and displayed as Row 3.

Selection: (see 5.3.20.3)

5.3.20.6 Units for FA and VA sensors

Selection of unit for measured value display and data logger

Selection:	**m/s**	= flow velocity in meter / second
	ft/min	= flow velocity in feet / minute
	m3/h	= flow rate in m³/hour calculated flow velocity and measuring section (FA: 5.3.2.2, VA: 5.3.8.1)
	l/s	= flow rate in liter / second calculated from flow velocity and measuring section (FA: 5.3.2.2, VA: 5.3.8.1)
	l/min	= flow rate in liter / minute calculated from flow velocity and measuring section (FA: 5.3.2.2, VA: 5.3.8.1)
	cfm	= flow rate in cubic feet / minute calculated from flow velocity and measuring section (FA: 5.3.2.2, VA: 5.3.8.1)
	kg/h	= mass flow rate in kg / hour calculated from flow velocity and measuring section (FA: 5.3.2.2, VA: 5.3.8.1), operating conditions (FA: 5.3.4, VA: 5.3.9), standard conditions (FA: 5.3.5, VA: 5.3.9) and the entered standard density.
	N-m3/h	= standard flow rate in standard-m³ / hour calculated from flow velocity and measuring section (FA: 5.3.2.2, VA: 5.3.8.1), operating conditions (FA: 5.3.4, VA: 5.3.9) and standard conditions (FA: 5.3.5, VA: 5.3.10).
	N-l/min	= standard flow rate in standard-liter / minute calculated from flow velocity- and measuring section (FA: 5.3.2.2, VA: 5.3.8.1), operating conditions (FA: 5.3.4, VA: 5.3.9) and standard conditions (FA: 5.3.5, VA: 5.3.10).

5.3.20.7 Units for TA sensors

Selection of unit for measured value display and data logger

Selection:	**N-m/s**	=	standard flow velocity in meter / second
	N-ft/min	=	standard flow velocity in feet / minute
	N-m3/h	=	standard flow rate in m³/ hour calculated from flow velocity, measuring section (see 5.3.13.1) and standard conditions (5.3.14)
	N-l/s	=	standard flow rate in liter / second calculated from flow velocity, measuring section (see 5.3.13.1) and standard conditions (5.3.14)
	N-l/min	=	standard flow rate in liter / minute calculated from flow velocity, measuring section (see 5.3.13.1) and standard conditions (5.3.14)
	N-cfm	=	standard flow rate in cubic feet / minute calculated from flow velocity, measuring section (see 5.3.13.1) and standard conditions (5.3.14)
	kg/h	=	mass flow rate in kg / hour calculated from flow velocity, measuring section (see 5.3.13.1) and standard conditions (5.3.14) and the entered standard density (5.3.14.3)

Long-term measurement settings:

5.3.21 Long-term measurement

Menu -> Settings -> Long-term measurement

5.3.21.1 Mode

Setting measuring mode for long-term measurement
Note: The function long-term measurement is not available in the graphical view of the measurement value display.

Selection:	**Start/Stop**	=	**Start/Stop mode** for long-term measurement
	Start	=	**Start mode** long-term measurement also enter: **interval/s** = duration seconds
	Auto	=	**automatic mode** for long-term measurement also enter: **interval/s** = duration in seconds **no. of values** = number of long-term measured values
	Single measurements	=	**single mode** with averaging via individually saved values

Description of long-term measurement with selection of various measuring modes:

LM Start/Stop mode is set:

1. press f2 LM-START to start long-term measurement. Displayed is the instantaneous value and the measurement period in seconds (e.g. S00010) continually in the status field top right.

2. press f2 LM-STOP to stop long-term measurement, the display is frozen and the average value is displayed above the measurement period in seconds (e.g. S00030).

3. press f2 LM-OK to exit display of average value, the instantaneous value is once again displayed and is ready for a new measurement. Start a new measurement as described under 1.

LM Start mode is set:

1. press f2 LM-START to start long-term measurement. The instantaneous value is displayed and the duration of measurement in seconds (e.g. S00010) is displayed continually. The bar above the control key description shows the progress of the measurement period in relation to the set interval.

2. press f2 LM-STOP before reaching the set interval and long-term measurement stops, the display is frozen and the average value is displayed above the measurement period in seconds (e.g. S00020).
If LM-STOP is not activated, the measurement period runs up to the set interval, then long-term measurement is stopped, the display is frozen and the average value is displayed above the measurement period in seconds (e.g S00030).

3. press f2 LM-OK to exit display of average value, the instantaneous value is once again displayed and is ready for a new measurement. Start a new measurement as described under 1.

LM Automatic mode is set:

1. if f2 LM-START is pressed, long-term measurement commences, in the 1st interval displaying the instantaneous value, in the status field top right the measurement period in seconds (e.g. S00010) continually and below this the number of measured values (R00001). The bar above the control key description shows the progress of the measurement period in relation to the set interval. By default after every interval the display is frozen. If the measurement period is 10 seconds or more, the display can be switched to instantaneous value by pressing f3 CURR . Pressing f3 AVG again the frozen average of the previous interval is shown again.

2. if f2 LM-AUTO is pressed before the set number of long-term measurement transmissions is reached, then long-term measurement is aborted and awaits a new input as under 1.
If LM-AUTO is not activated, the measurement period runs to the end of the set number of intervals, long-term measurement is then stopped, the display frozen and displays the last average value above the displayed measurement period in seconds in the status field top right, and below it the number of recorded values.

3. press f2 LM-OK to exit display of average value, the instantaneous value is once again displayed and is ready for a new measurement. Start a new measurement as described under 1.

If the data logger is switched on (see 5.3.24.1), the displayed average is saved to the data logger with time stamp after each interval sequence, in the 3 modes described above.

LM single measurement mode is set:

1. each time f2 LOG + is pressed the displayed instantaneous value is buffered as an individual value and the number of the buffered values (e.g. +00010) is displayed in the status field top right.

2. by pressing f3 LOG – the last recorded individual value is deleted and in the status field top right the number of buffered values (e.g. +00010) is reduced by one. At the most the last 10 individual values may be discarded.

3. by pressing f1 AVG the average value of the buffered single measurements is calculated and shown on the frozen display and the number of single measurements used for averaging are displayed in the status field.

4. by pressing f2 LOG-OK display of the average value is exited, the instantaneous value is once again displayed and is ready for a new measurement. Start a new measurement as described under 1.

If the data logger is switched on (see 5.3.24.1), the average is saved to the data logger with time stamp by pressing f1 AVG.

Device settings:

5.3.22 Device

Menu -> Settings -> Device

The parameter to be set here affects the flowtherm NT.2

Selection:

Date = sets the **actual date**

Time = sets the **actual time**
When changing the batteries the date and time are buffered for several hours.

Language = selection of man-machine language **German**, **English**, **French** or **Japanese**

12 V Output = Switching on and off the 12 V output for the supply of connectable sensors at the 12-pin connector.

Light = Setting of the illumination mode:

On:	Permanent turned on
Dimmer:	Illumination is dimmed to a residual brightness after a certain time without pressing any keys
Auto-Off:	Illumination is dimmed after a certain time without pressing any keys and thereafter turned off.

Brightness = Setting the illumination brightness

Supply = **battery**: 4 Alkali-Mangan Mignon (AA)
accumulator: 4 NiMh Mignon (AA)

Factory settings:

5.3.23 Factory settings

Menu -> Settings -> Factory settings

The flowtherm NT.2 is reset to factory settings, all settings are lost if they have not been previously saved to a profile of their own (see 5.3.26)

The factory settings are preset as those found in the shipping documents. The values of customer or application-specific measuring tasks as defined in the documents are taken into account.

Before restoring the factory settings the following confirmation prompt appears:

Restor factory setting?

Confirm with ok . Cancel with ◄ or f1 MESS.

Before resetting to factory settings save the actual settings to a profile (see 5.3.26), otherwise they will be lost. Cancelling the factory settings does not affect the saved profile.

Data logger:

5.3.24 Data logger

Menu -> Data logger or f3 *LOGGER*

The data logger is for saving measured values generated in various measuring modes of long-term or

single measurement (see 5.3.21.1). The contents of the data logger can be viewed on the unit or downloaded, saved and subsequently processed via the USB port on a Windows PC with help of the optional HLOG II software.

The measured values, defined under (5.3.20) for rows 1...3 are saved to the data logger. Date and time are not logged separately, if these have been selected for measurement display.
Note: In this way the possible number of data records to be logged can be increased, as the length of the data record is thus reduced. This has no impact on the time stamp for the logged values.

5.3.24.1 On / Off

Selection: **Data logger** = **On** or **Off**
Switch data logger on or off
With data logger on the data for long-term measurement (see 5.3.21) is saved to the data logger
The data logger can also be switched on from the measured value display with f3 LOGGER (via Selection: Settings -> Data logger or with f3 LOGGER-OFF switched off.

5.3.24.2 View

The contents of the data logger are shown on the display:

With ▼ to the next data set

With ◄ back to menu

With ok or f1 MESS back to measured value display

5.3.24.3 Settings

Designation = freely adjustable **measuring point designation** with max. 8 digits for all subsequently saved data logger values until entering a new measuring point designation.

5.3.24.4 Delete

Delete the contents of the data logger:

Before deleting a prompt appears:

Delete data logger? Confirm with ok. Cancel with ◄ or f1 MESS.

All the values saved to the data logger are deleted accordingly.

Before deleting, the data logger contents should be downloaded and saved via the USB port to a Windows PC with the help of the optional HLOG II software, otherwise they will be lost.

Device status:

5.3.25 Device status

Menu -> Status

Display of status:

Hardware = **hardware version**
Software = **software version**

S. No.	= **serial no.**
Memory/%	= display of **free space for data logger** in %
Battery/%	= display of **battery capacity** in % "0" is displayed when supply is via the USB connection.
Profile	= last loaded profile (see 5.3.26)
TA-Version	= version of TA-Modul

Device profiles:

5.3.26 Profiles

Menu -> Profiles

The entire parameter inputs can be saved in the profiles under a freely definable name with up to 8 characters and can subsequently be reloaded.

For example, all parameter inputs for a specific sensor can be saved to a profile or also to an appointed measuring point.

Up to 100 different profiles can be saved. Available profile storage locations are marked with an * after the profile name. Profiles cannot be deleted but may be overwritten.

Returning to the factory settings (see 5.3.23) has no impact on the saved profiles.

Selection:	**Load**	= **loading a saved profile** by selecting from the list
	Save	= **saving the active parameter settings** to a profile by selecting from the list in an available profile storage field and input of a new name or in an already occupied profile storage location by overwriting and changing or retaining the name

Keys:

5.3.27 Key F2 - LM-Start

f2 Function key for operating long-term measurement (see 5.3.21)
Note: The long-term measurement function is not available in the graphical view of the measured value display.

5.3.28 Key 4 Switch off / OFF (reset)

f4 Function key for switching off the device; active in all menus except during long-term measurement.

6 PC connection

The USB interface of the flowtherm NT.2 can be used to establish a connection to a PC. With the Höntzsch software HLOG II (from version 1.7) the flowtherm NT.2 can be configured and the data logger of the handheld unit can be read out.

7 Troubleshooting

Fault	Cause	Troubleshooting
Device cannot be switched on	Dead batteries	Insert new / re-charged batteries
	Faulty electronics	Return to Höntzsch
No measured value display or analog output = 0V no value	Sensor contaminated	Clean according to instructions
	Profile factor set at 0.000	Set profile factor to the corresponding value of nominal diameter and sensor type
	Unit setting (5.3.20.1) does not correspond to the connected flow sensor	Adjust the setting (5.3.20.1) to the connected sensor or connect compatible sensor
analog output = 0V no measured value or	The setting of the output does not match the source.	Correct analog output setting. (5.3.18)
value of analog output does not match display	Incorrect scaling of the analog output.	Correct analog output setting. (5.3.18)
Measured value too low	Sensor type or KKZ set incorrectly	Compare and correct settings according to details in the Technical Data Sheet
	Sensor contaminated	Clean according to instructions
	Profile factor set too low	Set profile factor to the corresponding value of nominal diameter and sensor type
	Input/output section too short	Change sensor position; improve flow conditions with a flow straightener
	Rotational flow	Reposition sensor in flow direction; use flow straightener
	Vortex VA sensors: reduced acoustic coupling in the sensor elements as a result of vibration or impact	Return sensor to Höntzsch for checking
Measured value too high	Sensor type or KKZ set incorrectly	Compare and correct settings according to details in the Technical Data Sheet
	Profile factor set too high	Set profile factor to the corresponding value of nominal diameter and sensor type
	EMC problem	See reference to electromagnetic compatibility (EMC) in the sensor documents

8 Replacement Parts

- upper housing with keypad
- lower housing
- battery compartment cover
- seal for upper housing
- connector socket cap
- USB connection cover
- 12-pin connector plug

9 Installation

The current European Specifications for Assembly, the recognised standards of good practice and this Instruction Manual apply.

10 Maintenance

Any maintenance and repair work is to be carried out solely by Höntzsch GmbH & Co. KG.

11 Declaration of conformity, Manufacturer`s Declaration

We, Höntzsch GmbH & Co. KG
Gottlieb-Daimler-Str. 37
D-71334 Waiblingen

bearing sole responsibility, hereby declare that the product

handheld unit
flowtherm NT.2

referred to in this declaration, is in conformity with the following standards or normative documents:

Provisions of the Directive	**Reference no. and date of issue**
2014/30/EU: Electromagnetic Compatibility	EN 61000-6-4: 2007 + A1: 2011 EN 61000-6-2: 2006 + Corrigendum 1: 2011
2011/65/EU: Hazardous Substances in Electrical and Electronic Equipment	

Waiblingen, 13.05.2022 Jürgen Lempp / Managing Director

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Subject to alteration