GF Piping Systems

User Manual

U1000 Ultrasonic Flowmeter

Original instruction manual

Follow the instruction manual

The instruction manual is part of the product and is an important element of the safety concept.

- Read and follow the instruction manual.
- Always keep the instruction manual available at the product.
- Pass on the instruction manual to all subsequent users of the product.

Contents

1 Intended use

The U1000 ultrasound flowmeter is used to obtain an optimal measurement of the volume flow and flow rate in steel and plastic pipes with inside diameter from 20 mm (0.8") to 110 mm (4.3").

Typical applications

- Hot water metering and flow measurement
- Flow measurement and heat measurement
- Cold water metering and flow measurement
- Tap water metering and flow measurement
- Service water metering and flow measurement
- High-purity water metering and flow measurement

2 About this document

This document contains all the information necessary for installation, operation and maintenance of the product.

2.1 Warnings

This instruction manual contains warning notices that alert you to the possibility of injuries or damage to property. Always read and pay attention to these warnings!

⚠CAUTION

Risk of fatal or serious injury!

There is a risk of fatal or serious physical injury if warnings are ignored!

⚠CAUTION

Danger of minor physical injury!

Failure to pay attention to these warnings will lead to a risk of physical injury!

NOTICE

Risk of damage to property!

Failure to comply leads to a risk of damage to property (loss of time, loss of data, device fault etc.)!

Other symbols

Symbol	Meaning
1.	Actions required in a numbered sequence.
▶	Actions required

Symbol	Meaning
• •	Listing of items on various levels

2.2 Other related documents

- Georg Fischer industrial planning fundamentals

These documents are available through agents of GF Piping Systems or at www.gfps.com.

2.3 Abbreviations

Abbreviation	Description
ABS	Acrylonitrile-butadiene-styrene
DA	Double acting function
EMC	Electromagnetic Compatibility
FC	Fail safe to close function
FO	Fail safe to open function
LCD	Liquid crystal display
LED	Light-emitting diode
MOSFET	Metal oxide semiconductor field effect transistor
PB-INSTAFLEX	Polybutene plastic piping system
PE-ELGEF	Polyethylene plastic piping system
PP-PROGEF	Polypropylene plastic piping system
PVDF-SGEF	PVDF (polyvinylidene fluoride) plastic piping system
SPNO MOSFET	Single-pole normally open metal oxide semiconductor field effect transistor
VC-U-PVC	Polyvinyl chloride

3 Safety and responsibility

- ▶ Only use the product for the intended purpose, see Intended Use.
- ▶ Do not use any damaged or faulty product. Sort out any damaged product immediately.
- ▶ Make sure that the piping system has been installed professionally and that it is inspected regularly.
- ▶ Have the product and accessories installed only by persons who have the required training, knowledge or experience.
- ▶ Regularly train personnel on all questions regarding the locally regulations applying to occupational safety and environmental protection, especially for pressurised pipelines.

4 Transport and storage

- ▶ Protect the product against external forces during transport (impacts, knocks, vibrations etc.).

- Transport and / or store the product unopened in its original packaging.
- Protect the product from dust, dirt, moisture as well as heat and ultraviolet radiation.
- Ensure that the product is not damaged either by mechanical or thermal influences.
- Before assembling, check the product for damage during transport.

5 Design and function

5.1 Design

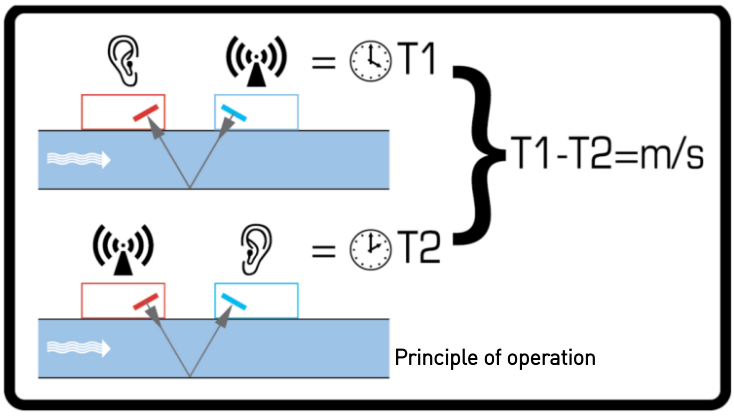
1	Power supply (AC/DC)	4	Guide rail
2	Pipe clamp	5	User interface
3	Electronics module	6	Pipe

The U1000 consists of an electronics module (3) and a guide rail (4), which together form a single unit which is fixed to the pipe (6) by pipe clamps (2).

The U1000 is supplied with power through an external 12 – 24 V power adapter (1).

5.2 Principle of operation

The U1000 takes accurate flow measurements by determining the difference between the transmission times of two ultrasound signals.

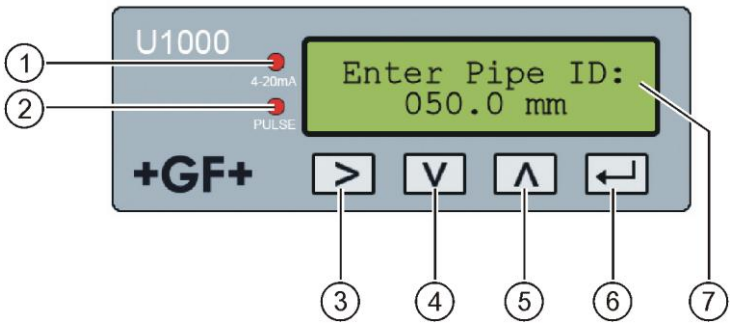


A periodic voltage pulse acts on the transducer crystals and produces an ultrasound beam at a certain frequency. The beam is first transmitted by the downstream transducer (blue) to the upstream transducer (red).

The beam is then sent in the opposite direction, i.e. from the upstream transducer (red) to the downstream transducer (blue). The time taken for the ultrasound to pass through the liquid in this direction is slightly shortened by the speed at which the liquid flows through the pipe.

The resulting time difference T1 – T2 is directly proportional to the speed at which the liquid flows through the pipe.

5.3 Control elements



1	LED 4 - 20 mA is lit when the current output is active
2	LED Pulse is lit when the pulse output is active
3	Button (selection button) switches backwards and forwards through the displayed options
4	Button (reduce value) reduces the value incrementally in the digital input fields
5	Button (increase value) increases the value incrementally in the digital input fields
6	Button (confirm input) confirms the value displayed, ends data input, changes to another menu or the flow values screen
7	LCD display with backlighting (2 rows x 16 characters)

6 Technical specifications

Data	Kv value	
Measurement technology	Transmission time	
Measurement channels	1	
Resolution of time calculation	± 50 ps	
Dynamics (turn-down ratio)	200:1	
Flow rate	0.1 – 10 m/s	
Usable liquid types	High purity water, clean water with ‹ 3 percent by volume of particle content	
Accuracy	± 3 % of flow value with a flow rate of › 0.3 m/s	
Repeatability	± 0.5 % of measured value	
Selectable units of measurement	Flow rate	m/s, ft/s
	Volume flow	l/s, l/min, m^3/min, m^3/hr gal/s, gal/min, USgal/s, USgal/min
	Volume	l, m^3, gals, USgals
Languages supported	English	
Power input	12 – 24 V (AC or DC)	
Power consumption	7 VA max.	
Cable	5 m shielded (6-wire)	
Pulse output		
Output	Optically insulated MOSFET, volt-free normally open contact	
Insulation	2,500 V	
Pulse width	Default value	25 ms
	Programmable range	3 – 99 ms
Pulse repeat rate	Up to 166 pulses/s (depending on pulse width)	
Frequency based mode	200 Hz max.	
Max. voltage/current load	48 V AC / 500 mA	
Current output		
Output	4 – 20 mA	
Resolution	0.1 % of total scale	
Maximum load	620 Ω	
Insulation	1,500 V optically insulated	
Alarm current	3.5 mA	

Data	Kv value
Housing	
Material	Polycarbonate
Mounting	Fixed to the pipe
Protection class	IP54
Fire classification	UL94 V-0
Dimensions	250 mm x 48 mm x 90 mm (electronics module + guide rail)
Weight	0.5 kg
Ambient conditions	
Pipe temperature	0 °C to 85 °C
Operating temperature (electronics)	0 °C to 50 °C
Storage temperature	-10 °C to +60 °C
Humidity	90% relative humidity at < 50 °C
Display	
LCD	2 rows x 16 characters
Viewing angle	30° min., 40° max.
Active surface area (W) x (H)	83 mm x 18.6 mm
Keypad	
Format	Keypad with 4 buttons

6.1 Default values

The settings are configured at the factory for either metric or imperial dimensions and weights.

Parameters	Metric dimensions	Imperial dimensions
Dimensions	mm	Inches
Volume flow	l/min	USgal/min
Pipe size	50 mm	2"
4 - 20 mA	On	On
Flow at maximum current	Corresponds to 2 m/s	Corresponds to 2 m/s
Flow at minimum current	0	0
Pulse output	On	On
Volume per pulse	10 l	10 US gallons
Pulse width	25 ms	25 ms
Damping	20 s	20 s
Calibration factor	1.000	1.000
Leak flow rate suppression	0.10 m/s	0.10 m/s
Zero offset	0.000 l/min	0.000 gal/min

7 Scope of delivery

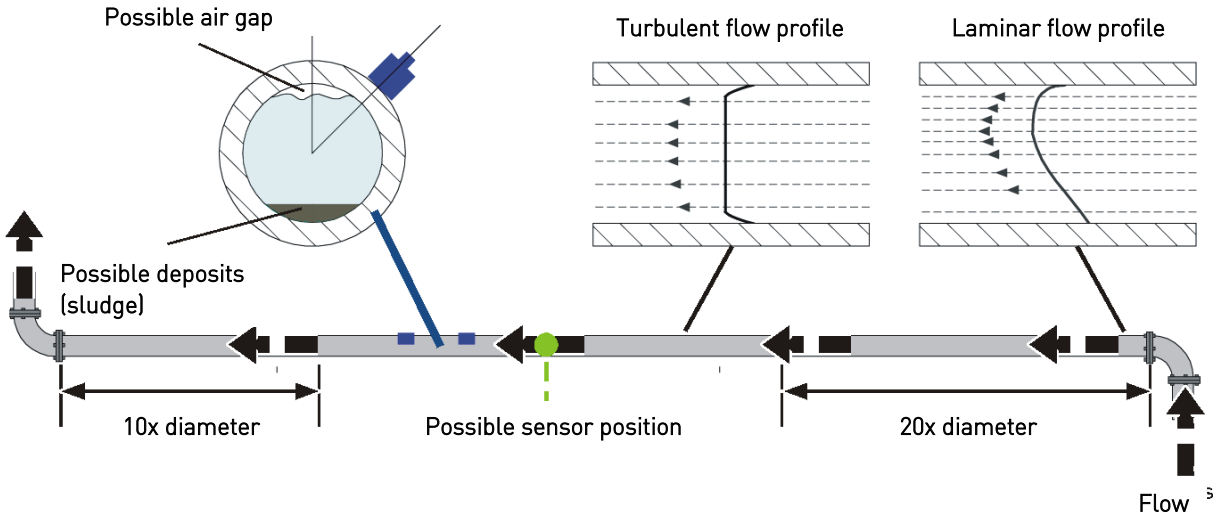
Component	Pcs.
U1000 electronics module	1
Guide rail	1
Syringe with sound-conductive paste	1
Pipe clamps	2
Cable	1
Adapter for small pipes ‹ 40 mm	1
Adapter for small pipes ‹ 60 mm	1

8 Installation

8.1 Positioning the transducers

The U1000 requires an even and uniform flow profile, since distortions in the flow can cause unpredictable measurement errors.

In many applications, however, it is not possible to have a uniform flow rate through 360°. This may be, for example, because there are air bubbles inside the top of the pipe, or turbulence in the pipe, or sludge at the bottom of the pipe.



Experience has shown that the most accurate results are obtained if the guide rail of the transducers is not mounted vertically to the pipe, but turned at an angle of about 45° to the right or left on the pipe.

NOTICE

Incorrect measurements

Measurements can be distorted if the transducers are positioned close to upstream pipe components and fittings such as pipe bends, T-branches, valves, pumps and similar obstacles.

To ensure that the U1000 is positioned at a place that has an undistorted flow profile, the transducers must be mounted sufficiently far from possible sources of distortion to prevent these from having any effect on the measurement.

- Install a straight section of pipe with length 20 times the diameter on the upstream side of the transducer.
  In exceptional cases, a pipe with length 10 times the diameter may be sufficient.
- Install a pipe section with length 10 times the diameter on the downstream side of the transducer.
  In exceptional cases, a pipe with length 5 times the diameter may be sufficient.

8.2 Preparation

- Before attaching the transducers, make sure that desired position meets the distance requirements.
  See Section 8.1 "Positioning the transducers", Page 12.
- Clean the pipe to remove any grease residues.
- Remove any dirt and flaking paint in order to ensure an even surface.

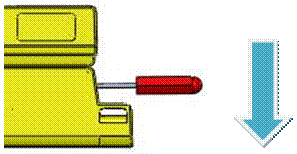
NOTICE

Maximum accuracy

A smooth and even contact between pipe surface and transducer is an important factor for obtaining a sufficiently strong ultrasound signal.

8.3 Removing the electronics module from the guide rail

- Insert a small screwdriver in the opening at one end of the guide rail.



- Press the screwdriver downward to lever up the clamp connection that holds the electronics module.
- Repeat the procedure at the other end of the guide rail.

8.4 Adjusting the sensor distance

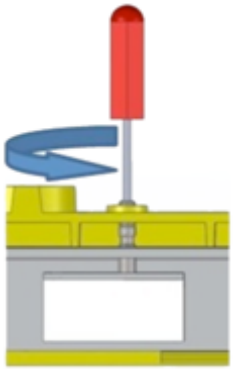
NOTICE

Maximum accuracy

The two sensors must be placed at defined distance relative to each other, where the distance depends on the pipe diameter and pipe material.

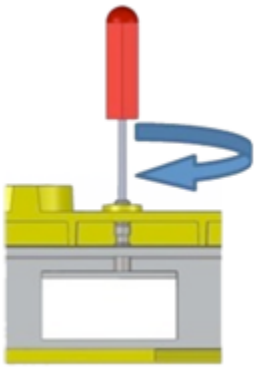
Optimal sensor distance

	Pipe material and pipe diameter			
	PVDF-SGEF, ABS, PVC-U/PVC-C	PP-PROGEF	PE-ELGEF, PB-INSTAFLEX	Steel
Sensor distance	[mm]	[mm]	[mm]	[mm]
B1	25 – 31	25 – 30	25 – 33	–
A2	32 – 38	30 – 36	34 – 40	25 – 30
C1	39 – 43	37 – 41	41 – 45	31 – 36
B2	44 – 50	42 – 48	46 – 52	37 – 43
A3	51 – 56	49 – 54	53 – 58	44 – 49
C2	57 – 62	55 – 60	59 – 64	50 – 55
B3	63 – 68	60 – 66	65 – 70	56 – 61
D2	69 – 74	67 – 72	71 – 76	62 – 67
C3	75 – 80	73 – 78	77 – 82	68 – 73
E2	81 – 86	79 – 84	83 – 88	74 – 79
D3	87 – 93	85 – 92	89 – 95	80 – 85
C4	94 – 99	93 – 97	96 – 101	86 – 91
E3	100 – 105	98 – 103	102 – 107	92 – 97
D4	106 – 111	104 – 109	108 – 113	98 – 103
F3	112 – 115	110 – 115	114 – 115	104 – 109
E4	–	–	–	110 – 115



▶ Loosen the sensor mounting screws.

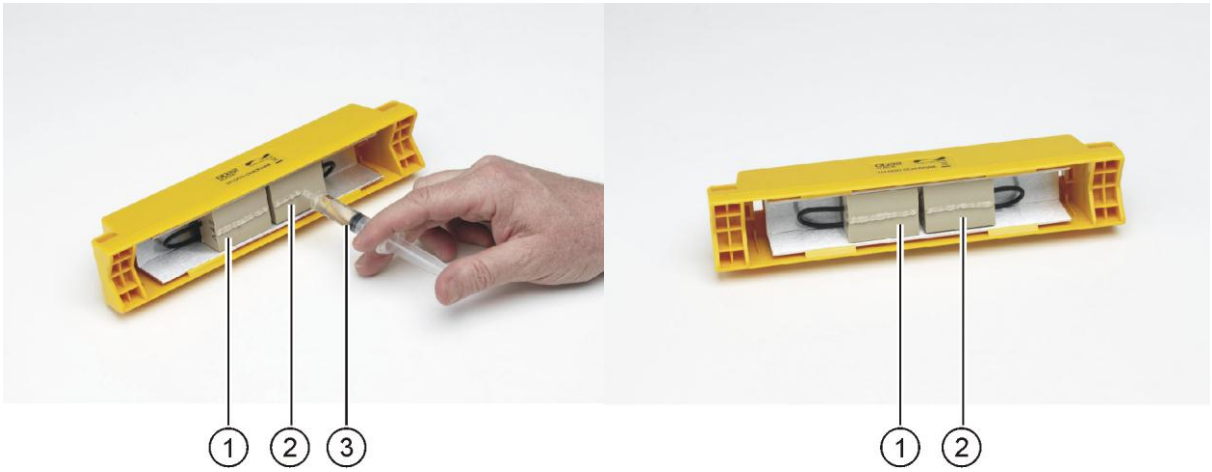
▶ Move the sensors to the optimal position (see Table).



▶ Tighten the sensor mounting screws.

8.5 Mounting the U1000 on the pipe

8.5.1 Apply sound-conductive paste



▶ Using the syringe, apply sound-conductive paste (3) to the sensor contact surfaces (1) and (2).

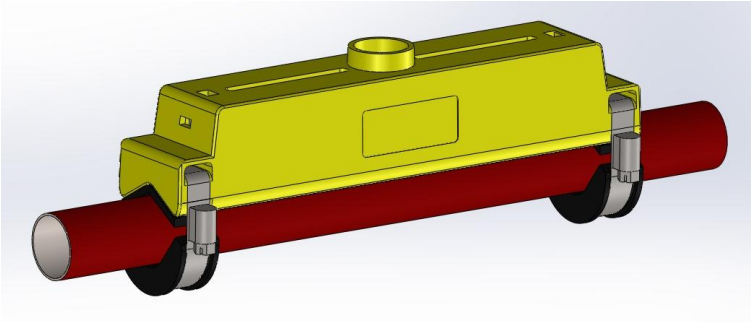
8.5.2 Selecting the pipe adapter

Two adapters are available for attaching the measuring device to pipes with an outside diameter of ≤ 60 mm.

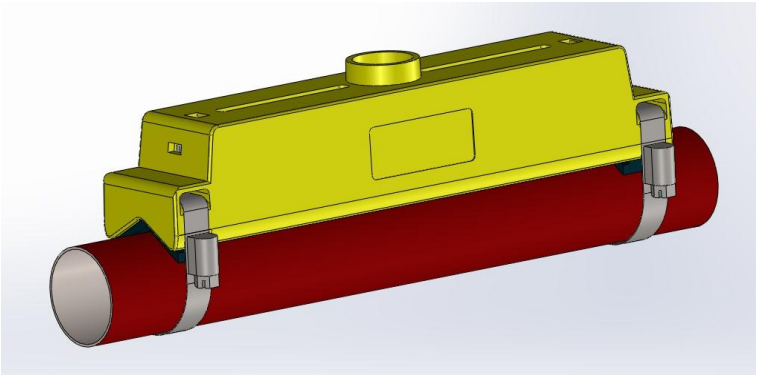
NOTICE

If these adapters are not necessary, store them away for a possible later change of position.

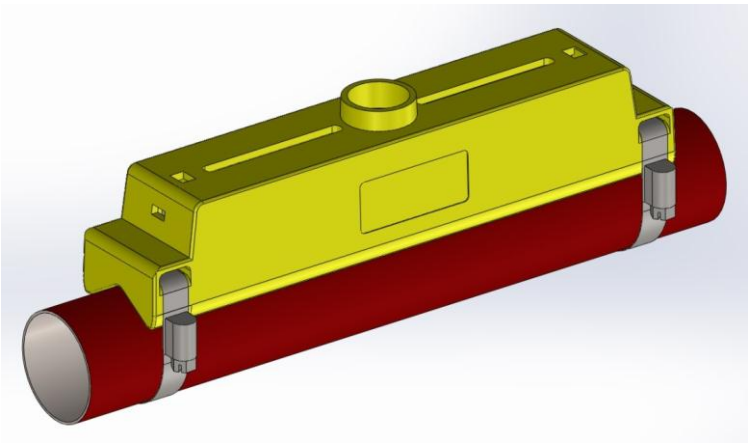
Outside diameter less than 40 mm – top and bottom pipe adapters (black)



Outside diameter 40 mm – 60 mm – top pipe adapter (black)

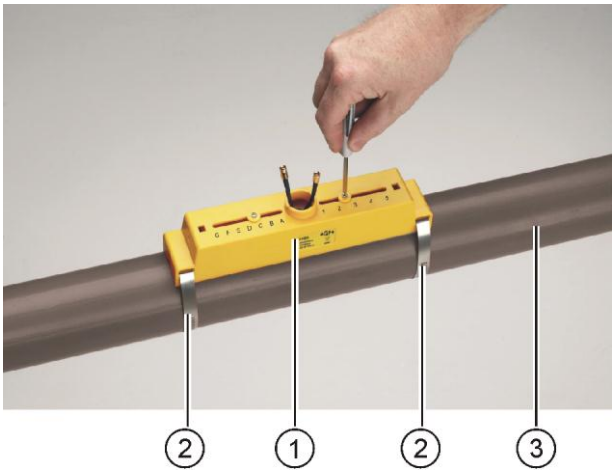


Outside diameter more than 60 mm



The adapters are placed on the pipe so that the top pipe adapter engages in the end pieces on the guide rail.

8.5.3 Mounting the guide rail

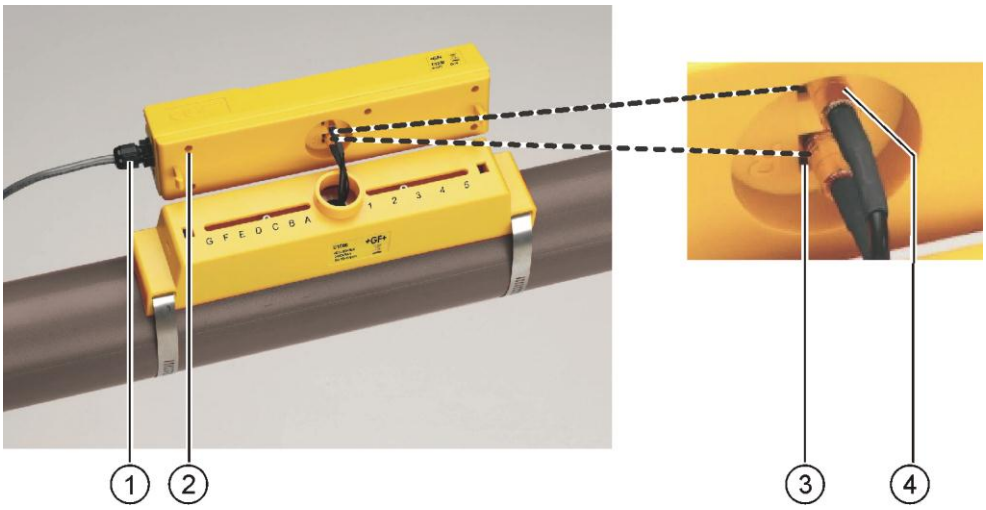


- ▶ Mount the guide rail (1) and pipe adapters if necessary (see Section 8.5.2 "Selecting the pipe adapter ", Page 16) on the pipe (3) using the pipe clamps (2).
- ▶ Loosen the mounting screws and remove along with the washers.

NOTICE

Store the mounting screws and washers away for future maintenance work or for a possible change of position later.

8.5.4 Install the electronics module



- ▶ Connect the power supply (1) to the electronics module (2).
- ▶ Plug the cables of the two sensors into the sockets (3) and (4) on the electronics module. The cables can be assigned as desired.

- Set the electronics module (1) on the guide rail (2) and engage it in the clamp connections at both ends.

8.6 Moving the guide rail

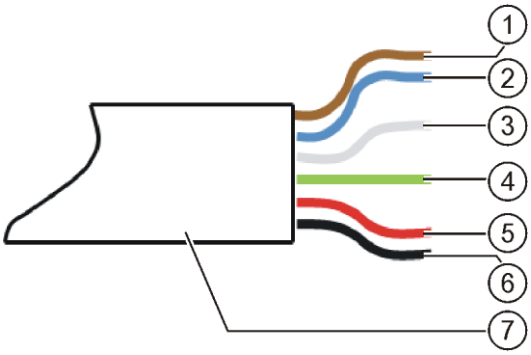
If it becomes necessary to change the position of the guide rail or the sensors:

- Separate the electronics module from the guide rail.
  See Section 8.3 "Removing the electronics module from the guide rail", Page 13.
- Pull the two sensor cables out of the electronics module.
- Loosen the pipe clamps and remove the guiderail from the pipe.
- Wipe away any residual sound-conductive paste from the sensors using a dry, lint-free cloth.
- Press the sensors into the guide rail so that the washers and mounting screws can be attached again.
- Complete the rest of the original installation procedure.
  See Section 8.5 "Mounting the U1000 on the pipe", Page 15.

8.7 Electrical connection of the U1000

NOTICE

The U1000 operates in the voltage range 12 – 24 V (AC/DC). To fully meet the requirements of EMC regulations, a 12 V connection is recommended for domestic and light industrial applications.



The U1000 6-wire interface cable

1	12 V / 24 V input (brown)	
2	12 V / 24 V return conductor (blue)	
3	Pulse + (white)	The SPNO MOSFET relay in the electronics module supplies an insulated switching signal for a switchable current of up to 500 mA and a voltage of up to 48 VAC. This relay also provides 2500 V insulation. Galvanically speaking, it is a volt free output.
4	Pulse - (green)	
5	Output (+), 4 - 20 mA (red)	The 4 - 20 mA current output is an insulated current source designed for loads of ‹ 620 Ω. The alarm current is triggered by flows outside the specified range or by signal loss, and is set at 3.5 mA.
6	Return conductor (-), 4 - 20 mA (black)	
7	Non-insulated shielding	

⚠CAUTION

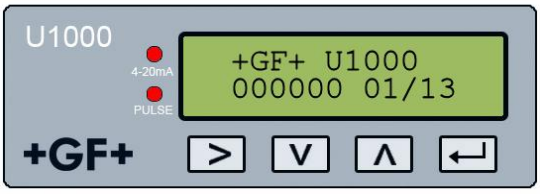
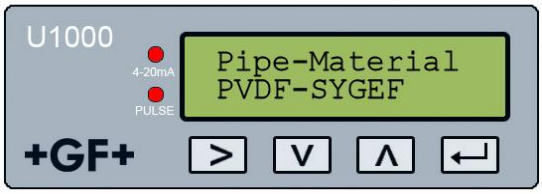
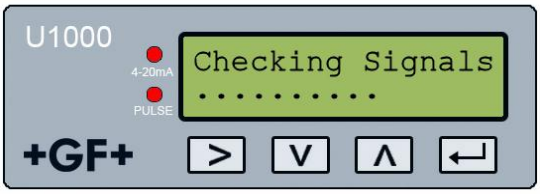
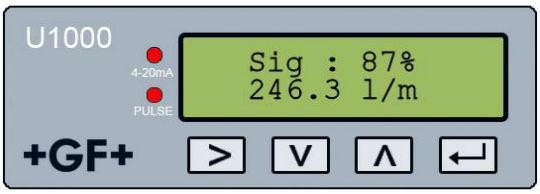
Electric shock due to short-current!

Before connecting the U1000 to an external power supply, make sure that the power supply is switched off.

- ▶ Connect the external power supply using the brown (1) and blue (2) wires.
- ▶ Connect the pulse output to the system control using the white (3) and green (4) wires.
- ▶ Connect the current output to the system control using the red (5) and black (6) wires.
- ▶ Connect the cable shield (7) to ground.

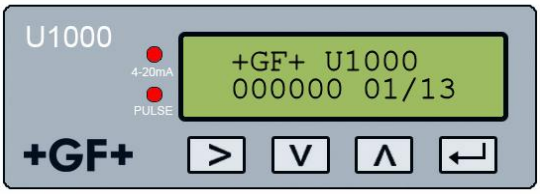
9 Startup

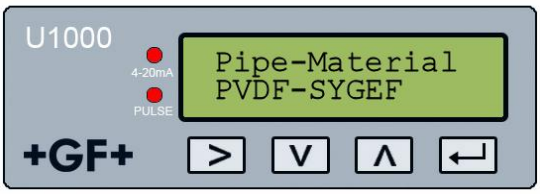
9.1 Preparation

	▶ Switch on the U1000 for the first time. The GF start screen is displayed for 5 s.
	The hundreds digit (050.0) for the pipe inside diameter flashes. ▶ Select a pipe inside diameter and a pipe material from the displayed list. See Section 10.1 "Entering the pipe inside diameter", Page 21. 
	The U1000 searches for a valid signal.
	If a valid signal is detected, the signal strength and flow are displayed. The direction of flow at switch-on time is taken as a positive flow value and the current and pulse output refer to this flow direction. If the flow direction is reversed, the volume flow is still displayed. The activity indicator changes from a star to an exclamation mark, no more pulses are generated and the 4 - 20 mA current output changes to a 3.5 mA alarm status.

10 Operation

10.1 Entering the pipe inside diameter

	▶ Switch on the U1000 for the first time. The GF start screen is displayed for 5 s.  The hundreds digit (050.0) for the pipe inside diameter flashes. 
∧	▶ Press the button. The flashing hundreds digit (050.0) increases from 0 to 1.
∨	▶ Press the button. ▶ The flashing hundreds digit (050.0) decreases from 1 to 0.
>	▶ Press the button. The tens digit (050.0) flashes.
∧	▶ Press the button. The flashing tens digit (050,0) increases through the number sequence 0, 1, 2, 3, 4, 5, 6, 7, 8, 9 ,0. ▶ Press and hold the button. The number sequence scrolls automatically.
∨	▶ Press the button. The flashing tens digit (050,0) decreases through the number sequence 9, 8, 7, 6, 5, 4, 3, 2, 1, 0. ▶ Press and hold the button. The number sequence scrolls automatically.
>	▶ Press the button. The ones digit (005.0) flashes. ▶ Set a value in the same way as for the tens digit.
>	▶ Press the button. The decimal digit (000.5) flashes. ▶ Set a value in the same way as for the tens digit.

↵	▶ Press the button. The entered value is stored and the next screen is displayed: 
Λ	▶ Press the button. The list of pipe materials scrolls upward. ▶ Press and hold the button. The list scrolls automatically.
V	▶ Press the button. The list of pipe materials scrolls downward. ▶ Press and hold the button. The list scrolls automatically.
↵	▶ Press the button. The selected pipe material is stored and the input procedure ends.

If it is necessary to change the preset parameter values (for example, if a different measurement unit is required), then a password must be entered to open the system menu.
See Section 11 "Password-protected menus", Page 24.

10.2 Setting the pulse output

The pulse output can be set in two different operating modes:

Volume based mode

- After a measured volume of 10 l (preset value), a pulse is sent => 1 pulse/10 l.
- The maximum number of pulses that can be sent without storing is calculated using the two default parameters Vol per pulse =1 and Pulse width = 25 ms, with the formula 1/(0.025x2) giving a value of 20 pulses/s.
- If the volume flow in the pipe is so high that more than 20 pulses/s are generated, a pulse overload error may occur if the number of stored pulses exceed a value of 1,000.
- To avoid this, the Vol per pulse value can be adjusted as necessary.
  See Section 11 "Password-protected menus", Page 24.

Frequency based mode

In frequency-based mode, the pulse output frequency is proportional to the volume flow within a frequency range of 0 – 200 Hz.

10.3 Current output 4 - 20 mA

- The preset output value of 4 - 20 mA is active if the 4 - 20 mA LED is lit.
- The preset flow value for the 20 mA output is calculated automatically according to the set pipe size.
- The preset flow value for the 4 mA output is 0. To change this, see Section 11 "Password-protected menus", Page 24.
- If the flow value is greater than the value set for the 20 mA output, or there is negative flow, or a flow signal cannot be detected, then an alarm current of 3.5 mA is generated.

NOTICE

The 4 – 20 mA current output is pre-calibrated ex works.

10.4 Switching off and on again

If the power supply is switched off and then on again after the pipe inside diameter is entered for the first time, then the last applied configuration is used.

If the configuration is changed for some reason, the password-protected menu must be used. See Section 11 "Password-protected menus", Page 24.

11 Password-protected menus

11.1 Overview

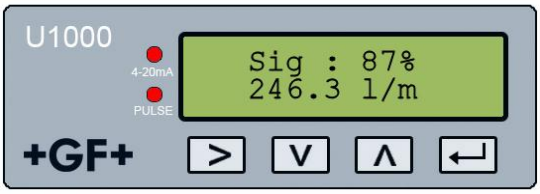
Password-protected menus allow the preset values to be adapted as required:

- To change the dimensions from mm to inches or vice versa
- To change from volume flow to flow rate measurement
- To change between system units l/m³ or Impgal/USgal
- To change between flow units l/s, l/min or gal/s, gal/min or USgals/s, USgals/min
- To change the preset value for flow at maximum current
- To change the preset value for flow at minimum current
- To change the type of pulse output
- To change the pulse output parameters

NOTICE

The password for the password-protected area is: 71360.

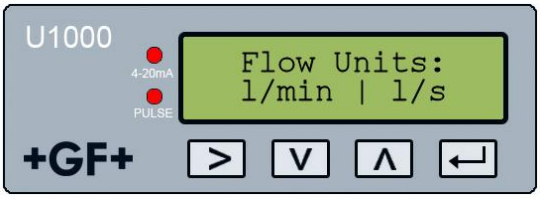
11.2 Opening a password-protected menu

	Signal strength and the present flow are displayed: 
↵	▶ Press the button. You are prompted for the password. If the password is not entered, the display automatically changes back to the flow value after a few seconds.
	▶ Enter the password. See Section 11.4 "Changing the numerical values in data menus", Page 26.
	▶ Make all the desired changes.
↵	▶ Press the button. The current parameter is skipped.
↵	▶ Press the button User Menu: Exit. The new values are stored and the password-protected menu is closed.

11.3 Changing the selection menus

NOTICE

The procedure for changing the preset values is the same for all menus.

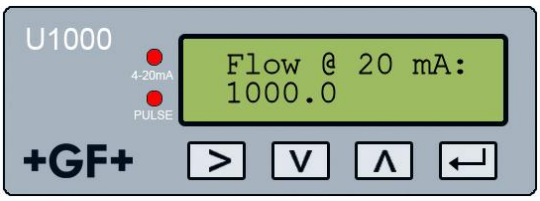
	▶ Open the password-protected menu. See Section 11.2 "Opening a password-protected menu", Page 24.
	▶ For example, select the Flow Units parameter.  The current value (l/min) flashes
>	▶ Press the button. The value (l/s) flashes.
↵	▶ Press the button. The new value (l/s) is stored and the next screen is displayed.

11.4 Changing the numerical values in data menus

NOTICE

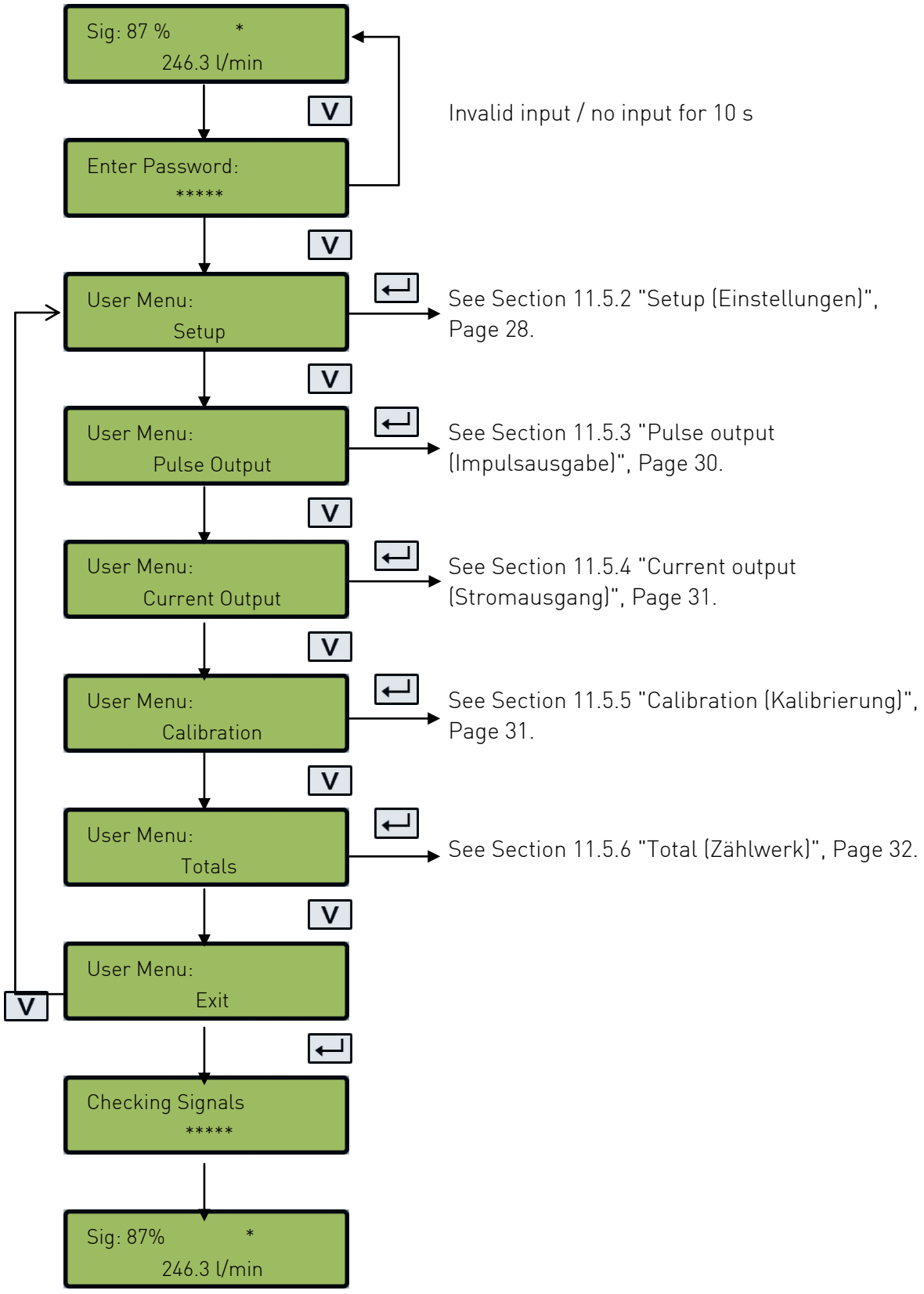
The procedure for changing numerical values is the same for all menus.

In this example, the preset value for the flow at maximum current is changed from 1,000 l to 1,258 l.

	▶ Open the password-protected menu. See Section 11.2 "Opening a password-protected menu", Page 24.
	▶ As an example, select the parameter for the flow at maximum current.  The thousands digit (1000.0) flashes
>	▶ Press the button twice. The hundreds digit (1000.0) flashes.
Λ	▶ Press the button twice. The flashing hundreds digit (1000.0) changes to 2.
>	▶ Press the button. The tens digit (1200.0) flashes.
Λ	▶ Press the button five times. The flashing tens digit (1200.0) changes to 5.
>	▶ Press the button. The ones digit (1250.0) flashes.
V	▶ Press the button twice. The flashing ones digit (1250.0) changes to 8.
↵	▶ Press the button. The new value (1258.0) is stored and the next screen is displayed.

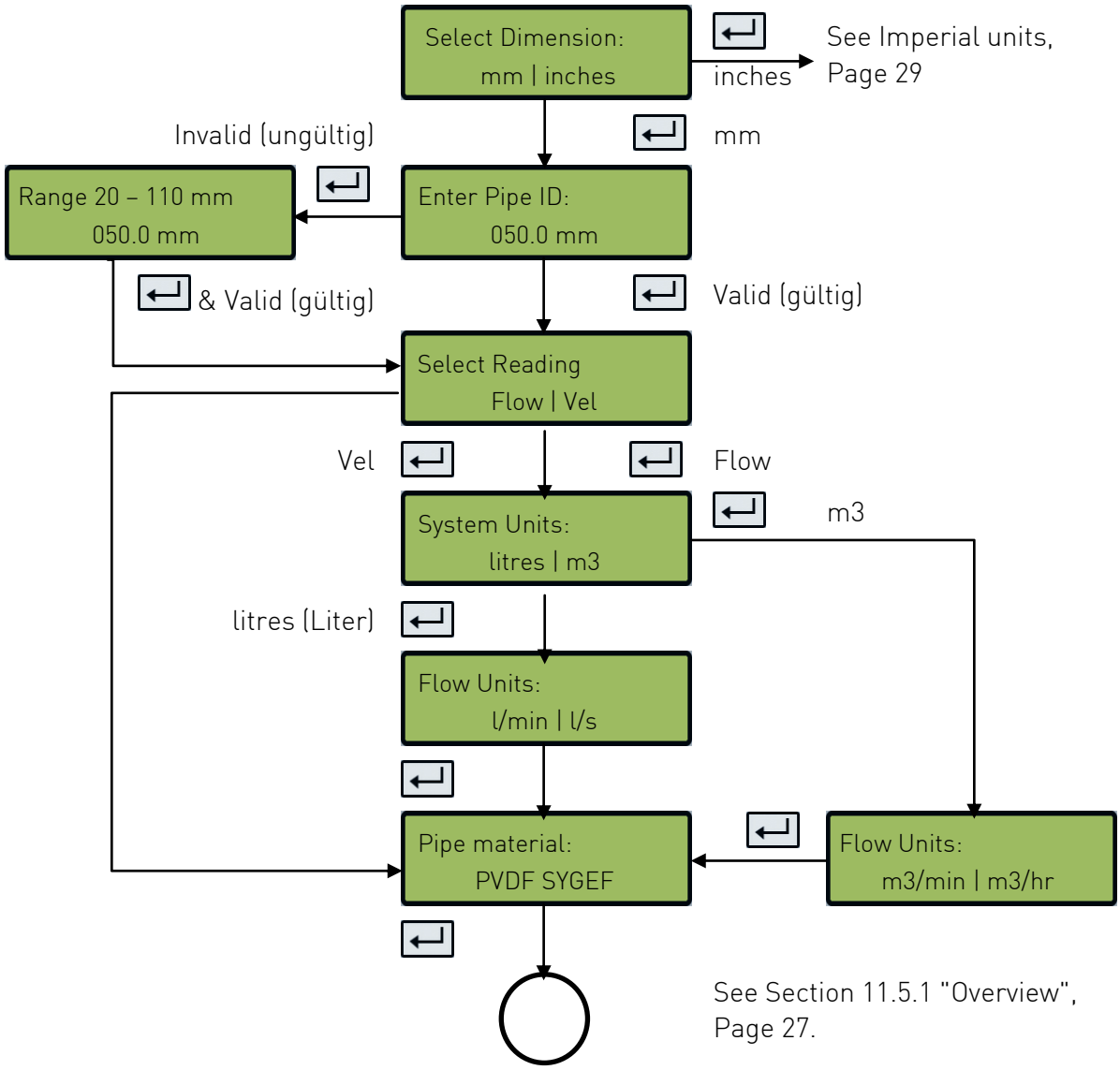
11.5 Password-protected menu structure

11.5.1 Overview

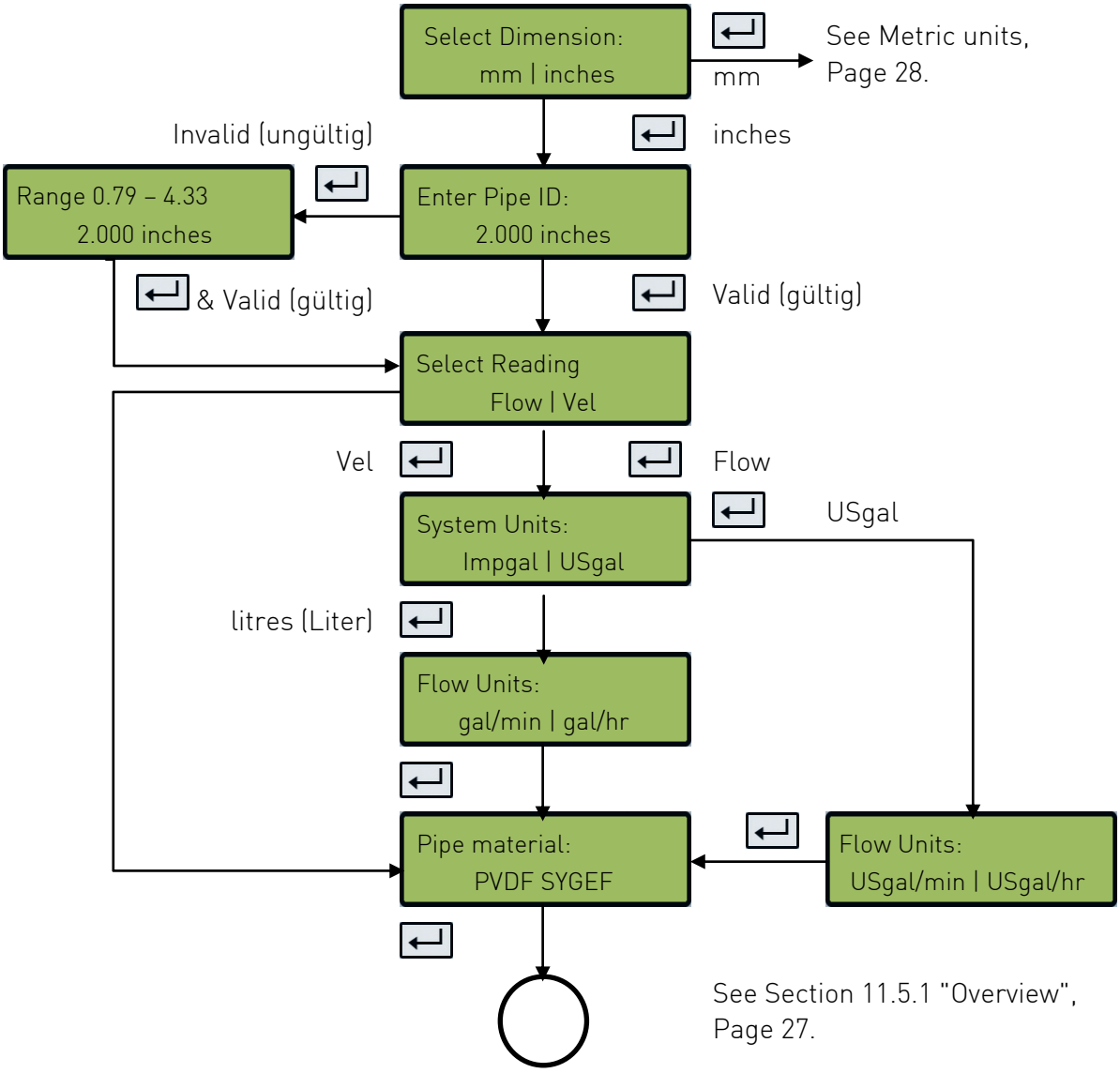


11.5.2 Setup (Einstellungen)

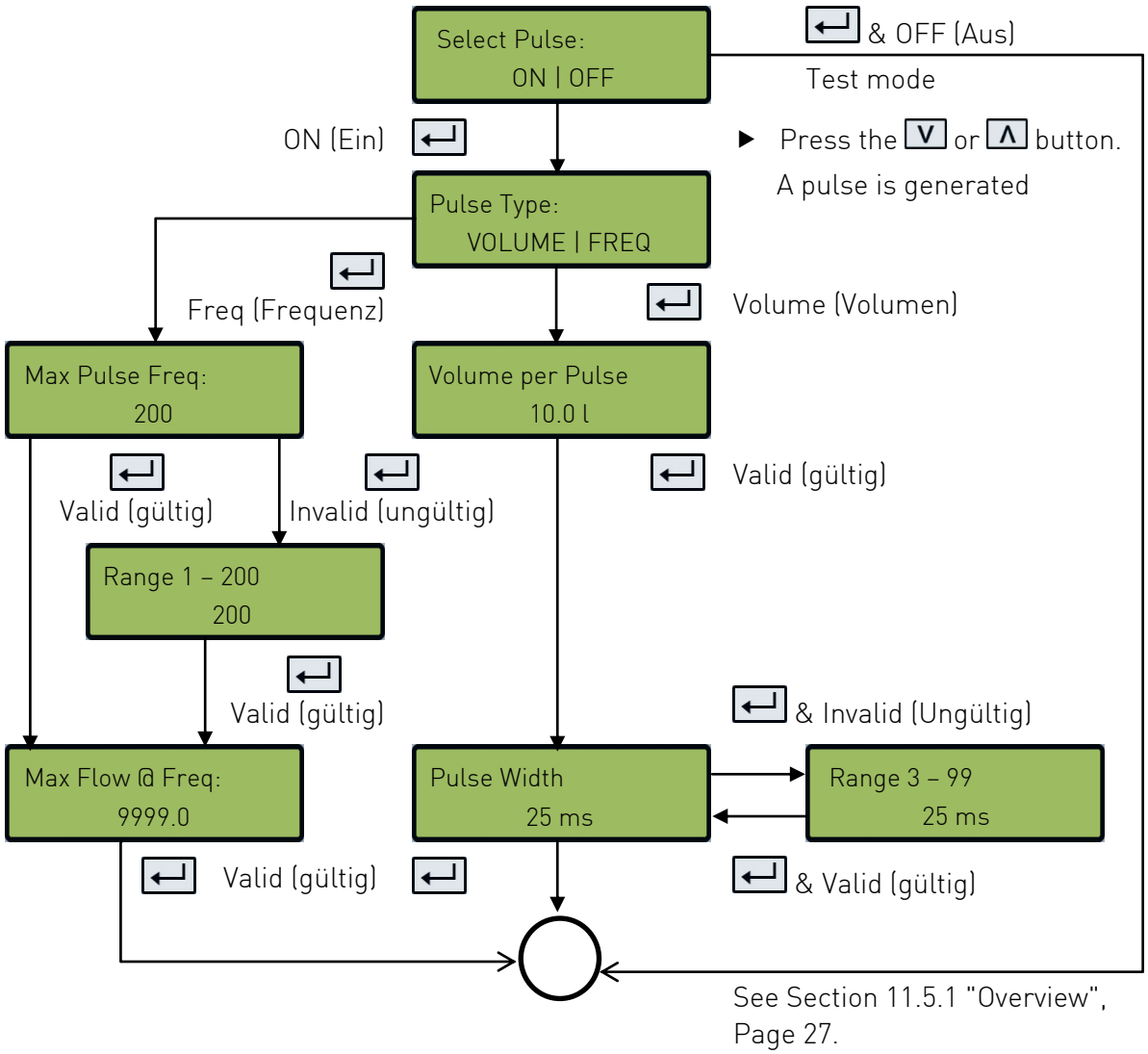
Metric units



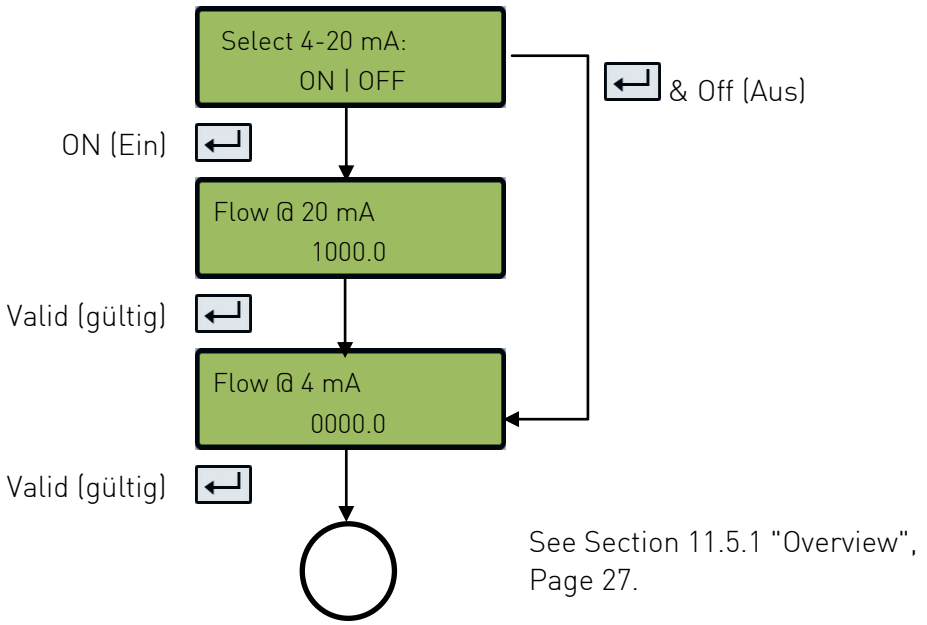
Imperial units



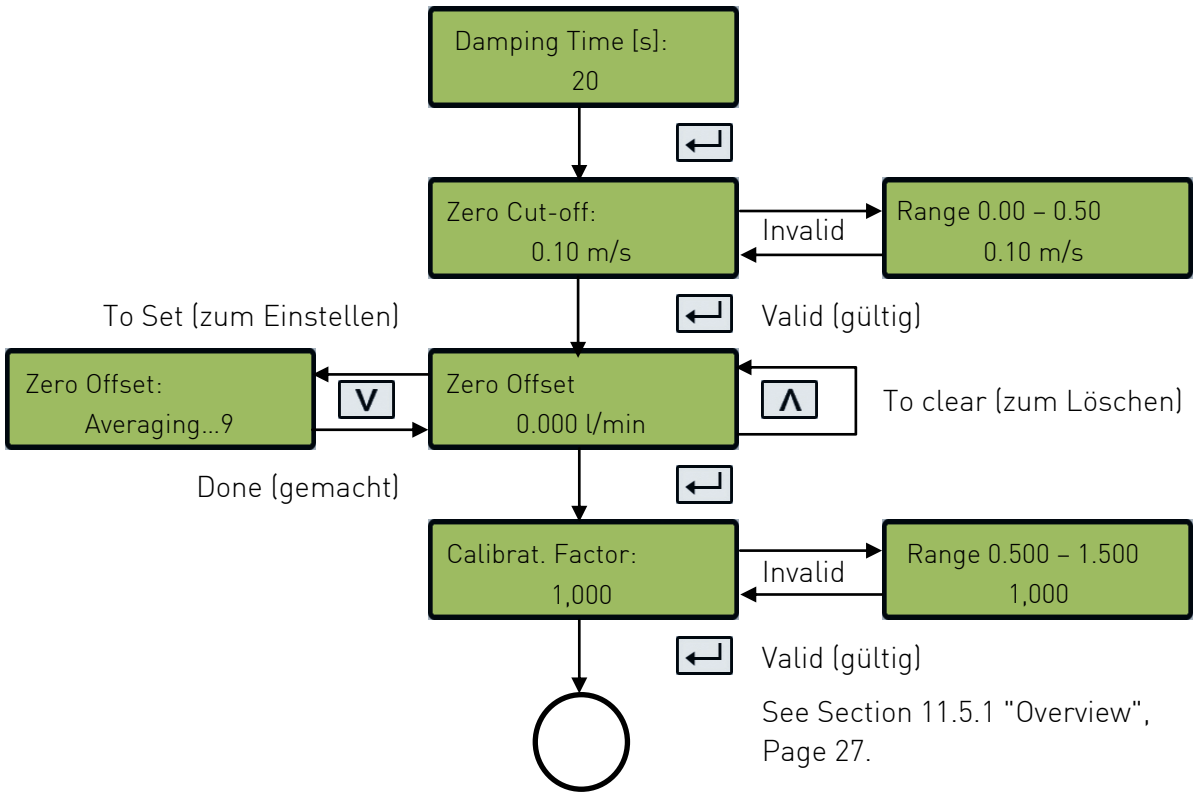
11.5.3 Pulse output (Impulsausgabe)



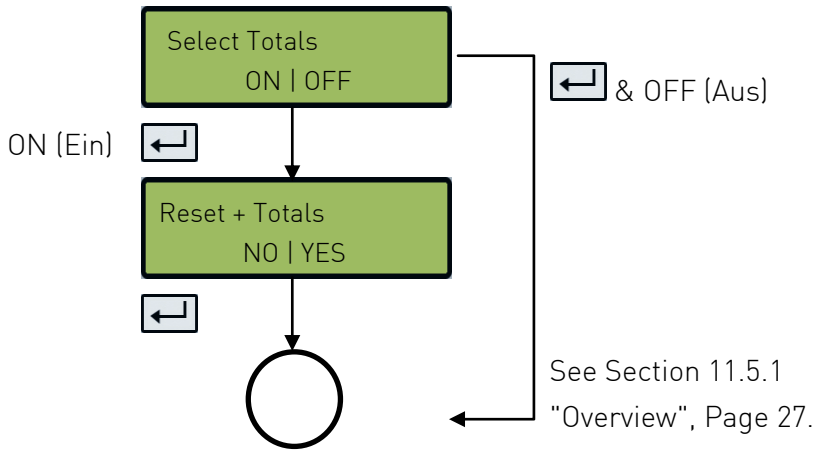
11.5.4 Current output (Stromausgang)



11.5.5 Calibration (Kalibrierung)



11.5.6 Total (Zählwerk)



NOTICE

If the totalizer is activated, the display switches back and forth between the flow value and the total.

- ▶ Press the > button

  Each screen is displayed for 30 s.

11.5.7 Overview of displayed texts in English and German

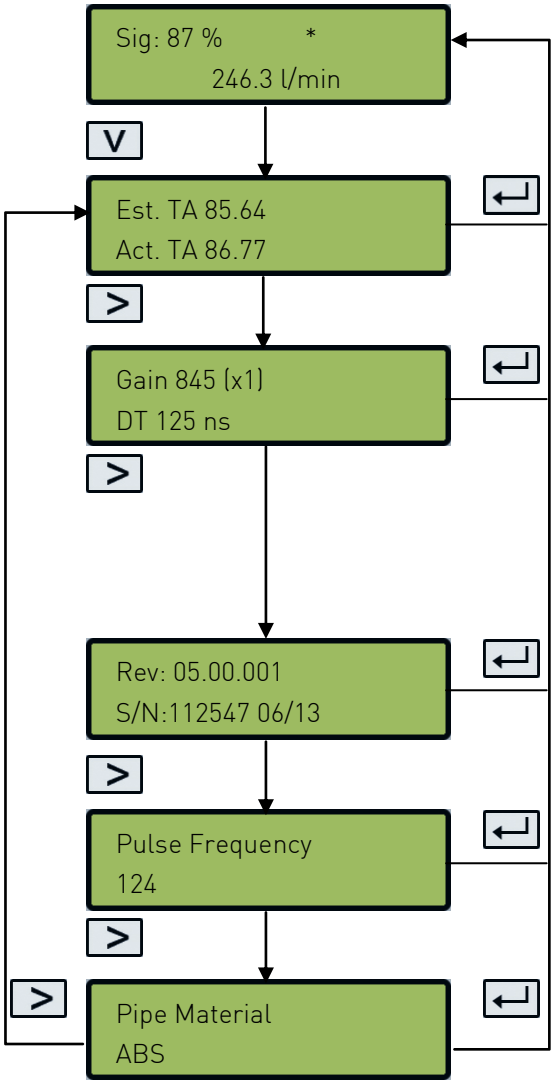
English	Deutsch
^ To Clear	^ Zum Löschen
Averaging	Durchschnittsbestimmung
Calibrat. Factor:	Kalibrier Faktor:
Damping Time (s):	Dämpfungszeit (s):
Done	Abgeschlossen
Flow @ 20 mA	Durchfluss bei 20 mA
Flow @ 4 mA	Durchfluss bei 4 mA
Freq	Frequenz
Invalid	Ungültig
Max Flow @ Freq:	Max. Durchfluss bei Freq.:
Max Pulse Freq:	Max. Impulsfrequenz:
NO | YES	NEIN | JA
OFF	AUS
ON	AN
ON | OFF	AN | AUS
Pulse Type:	Impulstyp:
Pulse Width	Impulsbreite
Range	Bereich
Range 3 – 99	Bereich 3 – 99
Reset + Total:	Zurücksetzen + Summe
Select 4 – 20 mA:	Auswahl 4 – 20 mA:
Select Pulse:	Auswahl Impuls:
Select Totals:	Auswahl Summen:
v to Set	v (Wert verringern oder bestätigen)
Valid	Gültig
Volume	Volumen
VOLUME | FREQ	VOLUMEN | FREQUENZ
Volume per Pulse:	Volumen pro Impuls
Zero Cut-off:	Nullsperrung:
Zero Offset	Nullpunktausgleich

12 Diagnosis

NOTICE

The diagnosis menu provides additional information and various diagnosis options.

- In the diagnosis menu, the keypad is less responsive than in normal operating mode. The buttons therefore have to be pressed for a longer time.



The estimated transmission time (Est. TA) and actual transmission time (Act. TA) are displayed. There should be a certain ratio between these two values.

The gain factor is displayed as an indication of signal strength and switch setting. The values for a good signal 600 – 970 and switch setting (x1).

The current time difference (DT) between upstream and downstream signals in [1 ns = 10^{-9} s].

The software version (Rev.) and serial number (S/N) of the U1000.

If the frequency-based option (pulse frequency) is selected, the present pulse output frequency is displayed, proportional to the flow rate.

The currently selected pipe material is displayed.

13 Maintenance

⚠CAUTION

Risk of injury and loss of product quality through the use of spare parts not provided by GF Piping Systems!

Risk of injury and damage to property.

- If repairs are necessary, please contact your national agent for GF Piping Systems.

13.1 Maintenance plan

- Set the maintenance intervals according to the operating conditions (e.g. ambient temperature).
- Carry out the following maintenance tasks as part of the regular system inspection.

Maintenance interval	Maintenance task
6 – 12 months	▶ Renew the sound-conductive paste

For questions regarding maintenance of the product, please contact your national GF Piping Systems representative.

14 Troubleshooting

Fault type	Error message	Cause and remedy
System error	Poor signal	The device is not receiving a signal from one or both transducers. ▶ If this message continues to be displayed, replace the sensors. See Section 8.6 "Moving the guide rail", Page 18.
	Pulse overload	The Vol per pulse value is set too low. ▶ Increase this value in the password-protected menu, see Section 11 "Password-protected menus", Page 24.
	No BBME	This message indicates a device error. ▶ Switch the U1000 off then on again. ▶ If this message continues to be displayed, please contact the GF Piping Systems Service department.
Error	Invalid password	An invalid password has been entered. ▶ Enter the correct password: 71360.
Warning messages	Range 20 – 110 mm 0.000 mm	An invalid pipe inside diameter has been entered. ▶ Enter a value within the indicated range.
	Range 0 – 99999 0000.0	The 4 - 20 mA current output is switched on and, in the password-protected area, an invalid value has been entered for the flow at maximum / minimum current. ▶ Enter a value within the indicated range.
	Range 1 – 200 200	An invalid frequency value has been entered for frequency-based pulse output. ▶ Enter a value within the indicated range.
	Range 3 – 99 00	An invalid pulse width value has been entered for volume-based pulse output. ▶ Enter a value within the indicated range.

Fault type	Error message	Cause and remedy
	Range 0.000 – 0.500 0000.0	An invalid value has been entered for **leak flow rate suppression**. ▶ Enter a value within the indicated range.
	Range 0.5 – 1.5 0000.0	An invalid value has been entered for **calibration factor**. ▶ Enter a value within the indicated range.

15 Removal

- ▶ Switch off the external power supply and prevent it from being switched on again.
- ▶ Disconnect all cable connections.
- ▶ Loosen the pipe clamps and remove the U1000 completely from the pipe along with all connecting cables.

16 Disposal

- ▶ Before disposing of the different materials, separate them into recyclable materials, normal waste and special waste.
- ▶ Comply with local legal regulations and provisions when recycling or disposing of the product, individual components and packaging.
- ▶ Comply with national regulations, standards and directives.

	A product marked with this symbol must be taken to a separate collection point for electrical and electronic devices. If you have any questions regarding disposal of the product, please contact your national agent for GF Piping Systems.

Notes

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