РАСХОДОМЕРЫ УЛЬТРАЗВУКОВЫЕ

ALTOSONIC GFM 700F/700 F-EEx

ATEX/700 F/HT-EEx ATEX/700 K

4 Technical data

4.1 Versions, full-scale ranges, accuracies

Versions	Primary head (S)	Signal converter (C)
GFM 700 K integral system	GFS 700 K	GFC 700 K
GFM 700 F remote system	GFS 700 F	GFC 700 F
GFM 700 F-EEx	GFS 700 F-EEx	GFC 700 F - EEx
(Ex versions (remote system))	Approval to ATEX (Ex II 2 G)	signal converter is installed
	EEX de IIC T6 oder EEx d IIC T6	in non hazardous area
	DEMKO Nr. 00ATEX2118 X	

Full-scale ranges (configurable)	$Q_{100\%}$ volume flow	$v_{100\%}$ flow velocity
Standard	14 – 25000 m^3/h	2 – 25 m/s
	60 – 88000 US Gal/min	6.6 – 80 ft/s
Option	14 – 30000 m^3/h	2 – 30 m/s
	60 – 156000 US Gal/min	6.6 – 100 ft/s

Error limits

Accuracy

DN $\geq$ 80 / $\geq$ 3"	v < 2 m/s	$\pm$ 0.04 m/s ($\pm$ 0.13 ft/s)
	v $\geq$ 2 m/s	$\pm$ 2% of measured value
DN $\leq$ 65 / $\leq$ 1½"		$\pm$ 2% of measured value + 0.04 m/s
		($\pm$ 2% of measured value + 0.13 ft/s)

Repeatability $\pm$ 0.5% of measured value

4.2 GFS 700 Primary head

Diameter	DN 50 – 600 / 2" – 24" (option DN 700 – 1200 / 28" – 48")		

Flange connections			Pressure rating (standard)
to DIN 2501	DN 50, DN 80:	PN 40	40 bar / 580 psig
	DN 65, DN 100 – 150:	PN 16	16 bar / 230 psig
	DN 200 – 600:	PN 10	10 bar / 150 psig
to ANSI B 16.5	2" – 24": Class 150 lb / RF		19 bar / 275 psig
Special versions	max. 100 bar / 900 lb		

Max. operating data	Gas-Temperature	Operating pressure	
Integral systems		standard	option
Ambient temperature $\leq$ **40°C** / $\leq$ **104°F**	$\leq$ 140°C / 284 °F	$\leq$ 25 bar / 360 psig	$\leq$ 40 bar / 580 psig
Ambient temperature $\leq$ **60°C** / $\leq$ **140°F**	$\leq$ 60°C / 140 °F	$\leq$ 25 bar / 360 psig	$\leq$ 40 bar / 580 psig
Remote systems	$\leq$ 180°C / 356 °F	$\leq$ 25 bar / 360 psig	$\leq$ 40 bar / 580 psig
Hazardous-duty versions	$\leq$ 180°C / 356 °F	$\leq$ 20 bar / 300 psig	–

Max. allowable flow velocity	$\leq$ 25 m/s / $\leq$ 80 ft/s, optionally $\leq$ 30 m/s / $\leq$ 100 ft/s

Max. allowable meter size (DN) as a function of process product	DN_{max} [mm] = 200 x ρ_{Gas} [kg/m^3] or [inches] = 0.47 x ρ_{gas} [lb/ft3] Density ρ_{Gas} in kg/m^3 **or** in [lb/ft^3]

Protection category (IEC 529 / EN 60529)	IP 65 equivalent to NEMA 4 and 4X

Materials

Measuring tube and flanges

Standard	DN 50-300	2"-12"	SS 1.4301 (measuring tube) and steel (flanges)
	DN 350-600	14"-24"	steel
Option	DN 50-600	2"-24"	SS 1.4404
	DN 50-600	(only DIN)	SS 1.4571

Ultrasonic sensors SS 1.4301

Gaskets Viton

4.3   GFC 700 Signal converter

Versions

Integral systems **(K)**	GFC 700 K signal converter mounted on primary head
Remote systems **(F)**	GFC 700 F signal converter with wall mount (rotating design) and additional terminal box
Option **MP**	signal converter equipped with magnet sensors, to set the signal converter by means of hand held bar magnet without opening the housing

Power supply	**1. AC Version**	**AC / DC Version**	
	Standard	Option	
1. Rated voltage	115 / 230 V	24 V AC	24 V DC
Tolerance band	+/- 13 %	20 – 27 V AC	18 – 32 V DC
Frequency	48 – 63 Hz	48 – 63 Hz	–
Power consumption (incl. primary head)	Max. 13 VA	approx. 10 VA	approx. 8 W

When connected to functional extra-low voltage (24 V) safety separation (PELV) is essential to VDE 0100 / VDE 0106 and IEC 364 / IEC 536 or equivalent national standards.

Analog Output

Function	• continuous flowrate measurement or measurement of sound velocity to determine (composition of) liquid product
	• all operating data configurable
	• galvanically isolated
	• for active and passive mode
	• useable as internal power supply for the binary outputs
Current	for Q = 0%: 0 – 16 mA settings in 1 mA increments
	for Q = 100%: 4 – 20 mA (I_{max} = 22 mA)
Active mode	load max. 680 Ohm
Passive mode	external voltage $\leq$ 18 V DC
	load $\leq$ 680 Ohm
Low-flow cutoff	cutoff "on" value 1 – 19% of $Q_{100\%}$,
	cutoff "off" value 2 – 20% setting in 1% increments
Time constant	0.04 – 3600 s, setting in increments of 1, 0.1 or 0.01 s
Forward / reverse measurement	direction identified via status output (or pulse output)
Internal power supply for binary outputs	U_{int} = 19 – 32 V DC / $I \leq$ 50 mA

Pulse output

Function	– continuous flow counting **or** measurement of sound velocity to determine (composition of) liquid product
	– all operating data configurable
	– galvanically isolated
	– active and passive mode
Pulse rate for Q = 100%	10 – 3600000 pulses/h
	0,167 – 60000 pulses/min optionally in pulse per liter, m^3,
	0.0028 – 1000 pulses/s (= Hz) US gallons or user-defined unit
Pulse width	automatic: pulse duty cycle 1:1, max. 1000 Pulse/s = max. 1000 Hz
	variable: 30, 50, 100, 200, 500 ms, $\leq$ 10 Pulse/s $\leq$ 10 Hz
Active mode	connection: electronic totalizer
	internal voltage: 19 – 32 V DC, from current output
	load current: I_{max} < 50 mA, operation with status output
Passive mode	connection: electronic or electromechanical totalizer
	external voltage: $U_{ext} \leq$ 32 V DC / $\leq$ 24 V AC
	load current: $I_{max} \leq$ 150 mA
Low-flow cutoff	cutoff "on" value: 1 – 19%
	cutoff "off" value: 2 – 20% of $Q_{100\%}$, setting in 1% increments
Time constant	0.04 – 3600 s, setting in increments of 1, 0.1 or 0.01 s
Forward / reverse measurement	direction identified via status output or current output (status output only available in non-EEx version)

Local display		3-field LCD
Display function		actual flowrate, measurement of sound velocity to determine (composition of) liquid product, forward, reverse and sum totalizer (7-digit) and status messages; each can be set for continuous or sequential display
Units:	actual flowrate	m^3, liter, US gallons per second, minute or hour, or in user-defined unit, e.g. liter/h or US gallon/day
	totalizer	m^3, liter, US gallons or in user-defined unit, e.g. hecto liter or US million gallon (min. 1 year overflow time)
Language of plain texts		English, French, German, Dutch, other on request
Display 1st line (top)		8-character, 7-segment numeral and sign display, and symbols for key acknowledgement
	2nd line (middle)	10-character, 14-segment text display
	3rd line (bottom)	5 markers to identify display in measuring mode

Housing	
Material	die-cast aluminium with polyurethane finish
Protection category	IP 67 (IEC 529 / EN 60529) equivalent to NEMA 4 and 4X

Signal cable only for remote systems (**F**) length up to 10 m / 30 ft (max. 20 m / 60 ft, option)

4.4 Environmental conditions

In accordance with EN IEC 61010-1 the following enviromental conditions have to be observed .

The GFM 700 is designed to operate safe under the following conditions:
a)   suitable for indoor and outdoor use, the housing of the signal converter is usable up to Protection Category IP67
b)   IP 67 is only warranted when using suitable cabling in the cable glands
c)   use up to an altitude of 2000 m above see level
d)   suitable for an operation ambient temperature range - 40 …. +60 °C
e)   suitable for an storage temperature range   -40 …. + 80 °C
f)   suitable for use in atmospheres with a relative humidity up op 80%
g)   mains supply voltage fluctuations up to $\pm$ 13 % of the nominal voltage range
h)   withstands over voltages up to category II on the main supply voltage (IEC 60364-4-443)
i)   connected to protective earth conductor (Protection Class I)
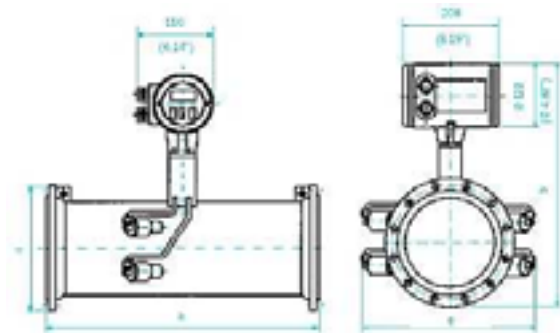j)   rated pollution degree 2

4.5   Dimensions and weights

Flange connections   to DIN 2501 / pressure PN, s. Tabelle: dimensions b_{DIN} and c_{DIN} | maximum operation
to ANSI / class 150 lb/RF: dimensions b_{ANSI} and c_{ANSI} | pressure, see Sect. 4.2
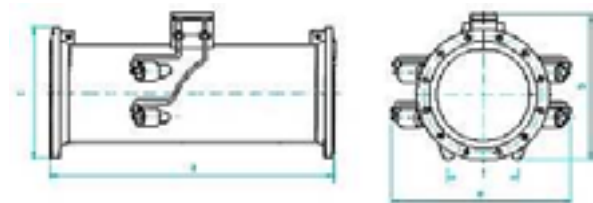
Meter size to ...			Dimensions in mm and (inches)						Weight
DIN		**ANSI**	**a**	**b_{DIN}**	**b_{ANSI}**	**c_{DIN}**	**c_{ANSI}**	**e**	** approx.
DN mm	PN	inches							in kg
50	40	2	500 (19.69)	198 (7.80)	198 (7.80)	165 (6.50)	165 (6.50)	370 (14.57)	15 (33)
65	16	2 ½	500 (19.69)	216 (8.50)	212 (8.35)	185 (7.28)	178 (7.01)	380 (14.96)	20 (44)
80	40	3	500 (19.69)	230 (9.06)	235 (9.25)	200 (7.87)	210 (8.27)	390 (15.35)	20 (44)
100	16	4	500 (19.69)	252 (6.66)	257 (10.12)	220 (8.66)	229 (9.02)	410 (16.14)	20 (44)
125	16	5	500 (19.69)	280 (11.02)	282 (11.10)	250 (9.84)	254 (10.00)	430 (16.93)	30 (66)
150	16	6	500(19.69)	312 (12.28)	310 (12.20)	285 (11.22)	280 (11.02)	460 (18.11)	35 (77)
200	10	8	600 (23.62)	365 (14.37)	367 (14.45)	340 (13.39)	343 (13.50)	490 (19.29)	40 (88)
250	10	10	600 (23.62)	419 (16.50)	425 (16.73)	395 (15.55)	407 (16.02)	570 (22.44)	45 (99)
300	10	12	700 (27.56)	470 (18.50)	489 (19.25)	445 (17.52)	483 (19.02)	610 (24.02)	55 (121)
350	10	14	700 (27.56)	515 (20.28)	530 (20.87)	505 (19.88)	534 (21.02)	650 (25.59)	65 (143)
400	10	16	700 (27.56)	571 (22.48)	587 (23.11)	565 (22.24)	597 (23.50)	690 (27.17)	75 (165)
450	10	18	800 (31.50)	621 (24.45)	631 (24.84)	615 (24.21)	635 (25.00)	740 (29.13)	95 (210)
500	10	20	800 (31.50)	674 (26.54)	690 (27.17)	670 (26.38)	699 (27.52)	780 (30.71)	120 (265)
550	10	22	800 (31.50)	755 (29.72)	740 (29.13)	780 (30.71)	750 (29.53)	820 (32.28)	150 (331)
600	10	24	800 (31.50)	780 (30.71)	797 (31.38)	780 (30.71)	813 (32.01)	870 (34.25)	175 (386)

Please note for compact flowmeter: *   dimension "**b**" see Table plus 210 mm
**   weight see Table plus approx. 3.0 kg
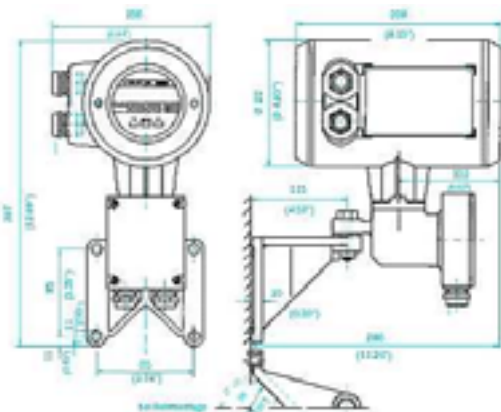
GFM 700 K   Compact flowmeter
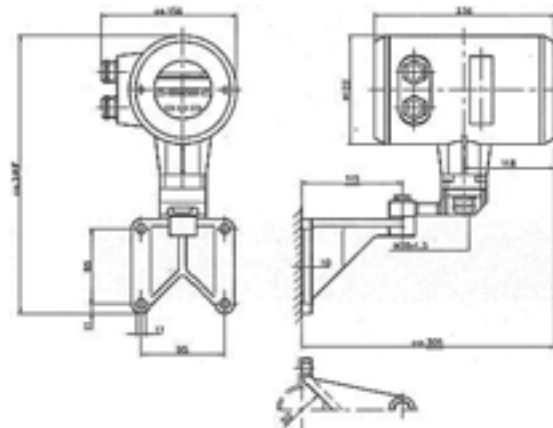

GFS 700 S   Primary head

GFC 700 F   Signal converter
wall mounting (rotatable)
weight approx. 4.2 kg

GFC 700 F – EEx   Signal converter
wall mounting (rotatable)
weight approx. 4.2 kg

5   Installation notes

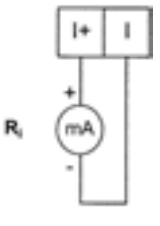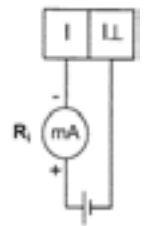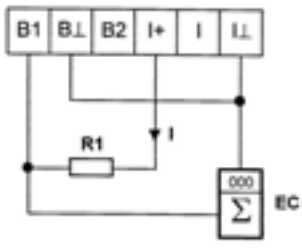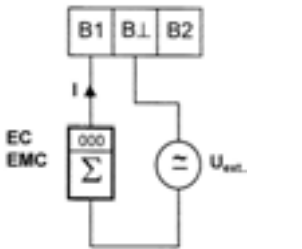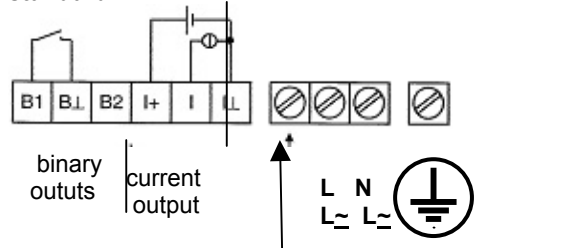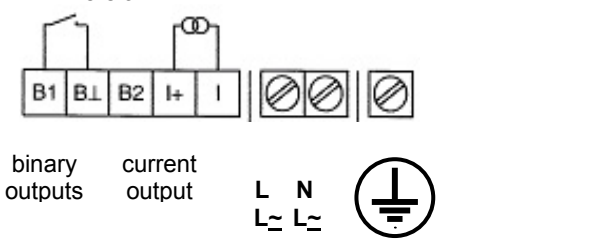|		
Inlet run:	• downstream of a compressure or nozzle	$\geq 40 \times DN$
	• downstream of a fan	$\geq 30 \times DN$
	• downstream of fully open control valve	$\geq 20 \times DN$
	• downstream of a 90° bend (elbow)	$\geq 20 \times DN$
	• downstream of a reducer ($\alpha/2 < 4°$)	no additional inlet run required
Outlet run:		$\geq 10 \times DN$ (DN = meter size)
Installation conditions	Select position such that the measuring beam is approximately horizontal. Fit the mating flanges precisely at right angles to the pipeline.	

6.1   Electrical connection

- **Power supply, power consumption and load rating** of outputs, see "Technical data"

- **Current and pulse outputs (I + P) are galvanically isolated** from all input and output circuits.

• **Selection of connection diagrams**	**Standard operation**	**EEx operation**
Current output	2) passive/active	1) active (also standard)
Pulse output	3) passive	4) passive (also standard)
Power supply and connection terminals	5)	6)

1) Current output active **Standard** and **EEx**

$R_i \leq 680\ \Omega$

2) Current output passive Standard

$U_{ext.} \leq 18$ V DC
$R_i \leq 680\ \Omega$

3) Pulse output active **Standard**

$U_{Output} = 19$ V – 32 V
$R1 \geq 650\ \Omega$
$I \leq 50$ mA
EC electronic totalizer

4) Pulse output passive **Standard** and **EEx**

$U_{ext.} \leq 32$ V DC ≤ 24 V AC
$I \leq 150$ mA
EC electronic totalizer
EMC electromechanical totalizer

5) Power supply connection and all outputs **standard**

binary oututs
current output
only internal connection
L N
L~ L~
protective conductor terminal

6) Power supply connection and all outputs **EEx** version

binary outputs
current output
power supply
L N
L~ L~
protective conductor terminal

6.2 Electrical installation to the mains supply voltage

⚠ The GFM 700 is intended for permanent connection to the mains. It is required (for example for service) to mount an external switch or circuitbreaker near the product for disconnection from the mains. It must be reached easily by the operator and marked as the disconnecting device for this product. The switch or circuitbreaker has to be suitable for the application and shall also be in accordance with local (safety) requirements and requirements of the building installation.

⚠ The protective conductor clamp terminal size M5, press-fitted, in the terminal compartment (Inear the power connection terminals) shall always be connected to the protective earth conductor of the main supply. Conductors up to 4mm^2 can be connected.

⚠ The diameter of the conductors of the main supply, including the protective earth conductor shall to be in accordance with the general requirements.

7 Operation of the signal converter

7.1 Table of settable functions

Fct.	Text	Description and settings
1.0	OPERATION	Main menu 1.0 Operation
1.1.0	BASIC. PARAM	Submenu 1.1.0 Basis parameters
1.1.1	FULL SCALE	Full-scale range for flowrate $Q_{100\%}$, see Fct. 3.1.1
1.1.2	REV. SCALE	Different range for reverse flow required? See Fct. 3.1.2
1.1.3	REV. VALUE	Full-scale range for reverse flow $Q_{R100\%}$, see Fct. 3.1.3
1.1.4	ZERO SET.	Zero setting, see Fct. 3.1.4
1.2.0	DISPLAY	Submenu 1.2.0 Display
1.2.1	DISP. FLOW	Unit for flowrate display, see Fct. 3.2.1
1.2.2	DISP. TOTAL.	Function of totalizer display, see Fct. 3.2.2
1.2.3	UNIT TOTAL.	Unit for totalizer display required? See Fct. 3.2.3
1.2.4	DISP. SP. S.	Display of sound velocity required? See Fct. 3.2.4
1.2.5	CYCL. DISP.	Cyclic display required? See Fct. 3.2.5
1.3.0	CUR. OUTP. I	Submenu 1.3.0 Current output I
1.3.1	TIMECONST.I	Time constant of current output I, see Fct. 3.3.6
1.3.2	L.F.CUTOFF I	Low-flow cutoff (SMU) for current output required? See Fct. 3.3.7
1.3.3	CUTOFF ON	Cutoff "on" value SMU-I, see Fct. 3.3.8
1.3.4	CUTOFF OFF	Cutoff "off" value SMU-I, see Fct. 3.3.9
1.4.0	FREQ. OUTP.F	Submenu 1.4.0 Frequency output F
1.4.1	PULSRATE or PULSE/UNIT	Pulse rate for 100% flowrate or for sound velocity, see Fct. 3.4.3 or Pulse value for flowrate unit, see Fct. 3.4.3
1.4.2	L.F.CUTOFF F	Low-flow cutoff (SMU) for frequency output required? See Fct. 3.4.3
1.4.3	CUTOFF ON	Cutoff "on" value SMU-F, see Fct. 3.4.7
1.4.4	CUTOFF OFF	Cutoff "off" value SMU-F, see Fct. 3.4.8
2.0	TEST	Main menu 2.0 Test functions
2.1	TEST DISP.	Carry out display test (Sect. 7.1.1) Start with → key, duration approx. 30 Sec. Test interruption with ↵ key.
2.2	TEST I	Test current output I (Sect. 7.1.2) • 0 mA • 4 mA • 20 mA • 2 mA • 10 mA • 22 mA Displayed value present directly at current output. Actual value again present at output after pressing the ↵ key.
2.3	TEST F	Test frequency output F (Sect. 7.1.3) • 1 Hz • 100 Hz • 10 Hz • 1000 Hz Displayed value present directly at current output. Actual value again present at output after pressing the ↵ key.
2.4	PROCESSOR	Test microprocessor (Sect. 7.1.4) Start with ↵ key, duration approx. 2 Sec. End of test: *NO ERROR* or *ERROR* displayed.

Fct.	Text	**Description** and settings
3.0	**INSTALL**	**Main menu 3.0 Installation**
3.1.0	**BASIS.PARAM.**	**Submenu 3.1.0 Basisparameters**
3.1.1	FULL SCALE	Full-scale range for flowrate $Q_{100\%}$ Unit: select from list under Fct. 3.2.1 Value: $9.5*10^{-7}$ - 150.8 m^3/Sec or 3.9 - 1,987,200 US Gal/min After selecting unit, call numerical value with ↵ key, 1st digit flashes.
3.1.2	REV. SCALE	Different range for reverse flow required? Setting NO or YES
3.1.3	REV. VALUE	Full-scale range for reverse flow (appears only if *YES* set under Fct. 3.2.1) Unit: select from list under Fct. 3.2.1 Value: $9.5*10^{-7}$ - 150.8 m^3/Sec or 3.9 - 1,987,200 US Gal/min Value must not be larger than that of Fct. 3.1.1! After selecting unit, call numerical value with ↵ key, 1st digit flashes.
3.1.4	ZERO SET	Zero setting • *FIXED.VALUE* • *VALUE.MEASU.* (Carry out only at "zero" flow and with completely filled measuring tube). 1) Inquiry: *CALIB. NO* or *YES* 2) if YES: calibration (duration approx.20 Sec) with zero display in *PERCENT* of $Q_{100\%}$ 3) Inquiry: *STORE NO* or *YES*.
3.1.5	METER SIZE	Meter size Unit: *mm* or *inches* Value: *25 - 1200 mm* or *0.98 - 48 inches* After selecting unit, call numerical value with ↵ key, 1st digit flashes.
3.1.6	GK VALUE	Primary head constant GK (see also primary head nameplate). Range: *0.5 - 14*
3.1.7	FLOW DIR	Define direction of forward flow, see Sect. 5.4. Setting: + or −, acc. to direction of arrow on primary head.
3.1.8	MIN SP. S.	Minimum sound velocity Minimum value used for $I_{0\%}$ or $F_{0\%}$ (when function *SOUND.VELO.* selected in 3.3.1 or 3.4.1) Value: 0 to 5000 m/s
3.1.9	MAX SP. S	Maximum sound velocity Maximum value used for $I_{100\%}$ or $F_{100\%}$ (when function SOUND.VELO. selected in 3.3.1 or 3.4.1) Value: 1 - 5000 m/s

Fct.	Text	Description and settings
3.2.0	DISPLAY	Submenu 3.2.0 Display
3.2.1	DISP. FLOW	Unit for flowrate • m^3/Sec • Liter/Sec • US Gal/Sec • m^3/min • Liter/min • US Gal/min • m^3/hr • Liter/hr • US Gal/hr • h Liter/hr or US.MGal/DAY (factory set, can be changed as required, see Fct. 3.6.6, 3.6.7+3.6.8 and Sect. 5.14) • PERCENT • NO DISPLAY
3.2.2	DISP. TOTAL	Function of totalizer display • + *TOTAL.* (forward totalizer) • − *TOTAL.* (reverse totalizer) • +/− *TOTAL.* (forward and reverse totalizers, alternating) • *SUM TOTAL.* (sum of + and −- totalizers) • *ALL TOTAL.* (alternating, sum, + and −-totalizers) • *TOTAL. OFF* (totalizer switched off)
3.2.3	UNIT TOTAL.	Unit for totalizer display • *m^3* • *Liter* • *US Gal* • *h Liter* or *US.Mgal* (see Fct. 3.2.1 "hLiter/hr" and "US.Mgal/DAY")
3.2.4	DISP. SP. S	Display of sound velocity (in m/s) required? <u>Setting:</u> *NO* or *YES*
3.2.5	CYCL. DISP.	Cyclic display required? <u>Setting:</u> *NO* or *YES*
3.2.6	ERROR MSG.	Which error messages to be displayed? • *NO MESSAGES* (no error messages) • *US ERROR* (only ultrasonic errors) • *TOTAL.ERROR* (only errors of internal totalizer) • *ALL ERRORS* (all errors)

Fct.	Text	Description and settings
3.3.0	CUR.OUTP. I	Submenu 3.3.0 Current output I

3.3.1	FUNCTION I	Function, current output I
		• *OFF* (switched off)
		• *F/R IND.*
		  (F/R indication, e.g. for F)
		• *1 DIR.* (1 flow direction)
		• *I<I 0 PCT*
		  (Forward / Reverse flow,
		  e.g. in 0 - 20 mA range:
		  F=10 - 20 mA and R=10 - 0 mA)
		• *2 DIR.* (Forward/Reverse flow,
		  F/R-measurement)
		• *SP. SOUND* (sound velocity)

3.3.2	RANGE I	Range for current output I, see Sect. 5.7.2 • *0 - 20 mA* • *4 - 20 mA* • *OTHER RANGE* (see Fct. 3.3.3, 3.3.4 + 3.3.5)
3.3.3	I 0 PCT.	Current for 0% flow ($I_{0\%}$) (appears only if *OTHER RANGE* set under Fct. 3.3.2). <u>Value:</u> *00 to 16 mA*
3.3.4	I 100 PCT.	Current for 100% flow ($I_{100\%}$) of full-scale range (Fct. 3.1.1) (appears only if *OTHER RANGE* set under Fct. 3.3.2). <u>Value:</u> *04 - 20 mA* (value must be at least 4 mA greater than that of Fct. 3.3.4).
3.3.5	I MAX mA	Current limitation (I_{max}) see Fct. 5.7.2 (appears only if *OTHER RANGE* is set under Fct. 3.3.2) <u>Value:</u> *04 20 mA* (value must be at least 4 mA greater than that of Fct. 3.3.4).
3.3.6	TIMECONST. I	Time constant of current output I <u>Value:</u> *0.04 - 3600 Sec*
3.3.7	L.F.CUTOFF I	Low flow cutoff (SMU) for current output required? <u>Setting:</u> *NO* or *YES*
3.3.8	L.F.CUTOFF ON	Cutoff "on" value for SMU-I (appears only if YES set under Fct. 3.3.7) <u>Value:</u> *01 - 19 PERCENT* of $Q_{100\%}$ (Fct. 3.1.1)
3.3.9	L.F.CUTOFF OFF	Cutoff "off" value for SMU-I (appears only if YES set under Fct. 3.3.7) <u>Value:</u> *02 - 20 PERCENT* of $Q_{100\%}$ (Fct. 3.1.1), value must be greater than that of Fct. 3.3.8.

Fct.	Text	Description and settings
3.4.0	FREQ. OUTP.F	Submenu 3.4.0 Frequency output F
3.4.1	FUNCTION F	Function, frequency output F • *OFF* (switched off) • *F/R IND.* (F/R indication, e.g. for I) • *1 DIR.* (1 flow direction) • *2 DIR.* (forward / reverse flow, F/R measurement) • *SP. SOUND* (sound velocity)
3.4.2	PULSOUTP	Unit of frequency output F • *PULSRATE* (setting in pulses per unit time) • *PULSE/UNIT* (setting in pulses per unit volume)
3.4.3	PULSRATE	Pulse rate for 100% flowrate or for sound velocity, see Fct. 3.1.1 or 3.1.8 + 3.1.9 (appears only if *PULSRATE* set under Fct. 3.4.2) <u>Value:</u> $2.778*10^{-3}$ - 1000 *PuLSe/Sec* (= Hz) or 0.1667 - 60,000 *PuLSe/min* or 10 - 3,600,000 *PuLSe/hr* <u>After selecting unit, call numerical value with ↵ key, 1 digit flashes.</u>
3.4.3	PULSE/UNIT	Pulse value for flowrate unit (appears only if *PULSE/UNIT* set under Fct. 3.4.2) <u>Unit:</u> *PuLSe* per m^3, *Liter*, *US Gal* or unit of Fct. 3.6.6, 3.6.7+3.6.8 <u>Value:</u> 0.0001 to $9.9999*10^9$ PuLSe (no check, but $Q_{100\%}$*pulse value $\leq 3.600.000$ pulses/hr). <u>After selecting unit, call numerical value with ↵ key, 1 digit flashes.</u>
3.4.4	PULSWIDTH	Pulse width for frequenc $\leq$ 10 Hz • *30 mSec* • *200 mSec* • *50 mSec* • *500 mSec* • *100 mSec*
3.4.5	TIMECONST. F	Time constant of frequency output F • *40 mSec* • *SAME AS I* (time constant for F same as for I, see Fct. 3.3.6)
3.4.6	L.F.CUTOFF F	Low-flow cutoff (SMU) for frequency output required? <u>Setting:</u> *NO* or *YES*
3.4.7	CUTOFF ON	Cutoff "on" value SMU-F (appears only if *YES* set under Fct. 3.4.6) <u>Value:</u> *01* - *19 PERCENT* of $Q_{100\%}$ (Fct. 3.1.1)
3.4.8	CUTOFF OFF	Cuttoff "off" value SMU-F (appears only if *YES* set under Fct. 3.4.6) <u>Value:</u> *02* - *20 PERCENT* of $Q_{100\%}$ (Fct. 3.1.1),, value must be greater than of Fct. 3.3.8

Fct.	Text	Description and settings
3.5.0	**USER DATA**	**Submenu 3.5.0 User data**
3.5.1	LANGUAGE	Language for display texts, see Sect. 5.11 • *GB/USA* (English) • *D* (german) • *F* (French) • *N* (Dutch)
3.5.2	ENTRY.CODE. 1	Entry code 1 for setting level required? See Sect. 5.12 • *NO* = Entry with → key only • *YES* = Entry with → key and 9-keystroke code Setting of the code under Fct. 3.5.3
3.5.3	CODE 1	Set Code 1, see Sect. 5.12 (appears only if *YES* set under Fct. 3.6.2) • <u>Factory setting:</u> →, →, →, ↵, ↵. ↵, ↑, ↑, ↑ • <u>Different code required:</u> Press any 9-keystroke combination and then press the same combination again. Each keystroke acknowledged by "*". *WRONG CODE* appears if 1st and 2nd entries are not equal. Press ↵ + → keys and repeat entries.
3.5.4	LOCATION	Tag name setting (measurement point no.) max. 10 digits. Required only for flowmeters of "HHC" design (operator control via Hand-Held Communicator MIC 500, connected to current output). <u>Factory setting:</u> *ALTOMETER* <u>Characters assignable to each place:</u> A..Z / a..z / 0..9 / + / -./ underscore character = blank character.
3.5.5	OUTP. HOLD	Hold values of outputs during settings? <u>Setting:</u> *NO* or *YES*
3.5.6	UNIT TEXT	Text for user-defined unit <u>Factory setting:</u> hLiter/hr or US.MGal/DAY <u>Characters assignable to each place:</u> A..Z / a..z / 0..9 / + / −-./ underscore character = blank character. Fraction bar "/" in 7th place is unalternable.
3.5.7	FACT. QUANT	Conversion factor for quantity F_M F_M = quantity per 1 m^3! <u>Factory setting:</u> *1.00000 E1* (for hecto Liter) or *2.64172 E-4* (for US M.gallons) <u>Value setting:</u> *0.00001∗10^{-9} - 9.99999∗10^{+9}*
3.5.8	FACT. TIME	Conversion factor for time F_T F_T in seconds! <u>Factory setting:</u> *3.60000 E3* (for hour) or *8.64000 E4* (for day) <u>Value setting:</u> *0.00001∗10^{-9} - 9.99999∗10^{+9}*

Fct.	Text	Description and settings
3.5.9	TOTAL. RESET	Totalizer reset (+ and −- totalizer together) Inquiry: NO or YES
3.5.10	ENABL. RESET	Enable totalizer reset for RESET/QUIT menu. Inquiry: NO or YES
3.5.11	PLAUSIB ERR.	Error limit in % of measured value for plausibility statement. Measured values that are outside the specified band are not processed. Every measured value outside the specified band will increase an internal counter by "1", until a maximum counter value (see Fct. 3.6.13) has been reached. The corresponding measurement channel will then be made inactive and an indication will be visible on the display. Value setting: 1 - 99 PERCENT Factory setting: 20 PERCENT
3.5.12	WEIGHT P.OK	Weight factor for correct measurements. The internal plausibility counter is increased by the number programmed, when the measured value is correct. The higher the number the faster an inactive channel will become active again. Value setting: 1 - 50 Factory setting: 4
3.5.13	N.ER.PLAU SIB.	Limit value for the counter of incorrectly measurements (see Fct. 3.6.11). When '0' is set, the plausibility function will become inactive. Value setting: 0 - 10,000 Factory setting: 0

7.2 Error messages

Fct.	Text	Description and settings
4.0	**PARAM. ERROR**	**Main menu 4.0 Parameter error**
4.1.0	**FLOW VELOC.**	**FLOW VELOCITY "v" incorrect: Ensure condition $0.5\ \text{m/s} \leq v \leq 60\ \text{m/s}$ or $1.5\ \text{ft/s} \leq v \leq 180\ \text{ft/s}$ is met!**
4.1.1	FULL SCALE	Full-scale range for flowrate $Q_{100\%}$, see Fct. 3.1.1
4.1.2	METER SIZE	Meter size, see Fct. 3.1.5
4.2.0	**F/R FLOW**	**FULL-SCALE RANGE(S) for forward/reverse flow incorrect: Ensure condition $F \geq R$ is met!**
4.2.1	FULL SCALE	Full-scale range for forward flowrate $Q_{F100\%}$, see Fct. 3.1.1
4.2.2	REV. SCALE	Different range for reverse flow required? See Fct. 3.1.2
4.2.3	REV. VALUE	Full-scale range for reverse flow $Q_{R100\%}$, see Fct. 3.1.3
4.3.0	**I RANGE**	**CURRENT OUTPUT I RANGE incorrect: Ensure condition $I_{100\%} - I_{0\%} \geq 4\ \text{mA}$ is met!**
4.3.1	I 0 PCT	Current for 0% flow ($I_{0\%}$), see Fct. 3.3.3
4.3.2	I 100 PCT	Current for 100% flow ($I_{100\%}$), see Fct. 3.3.4
4.4.0	**I MAXIMUM**	**CURRENT LIMITATION incorrect: Ensure condition $I_{max} \geq I_{100\%}$ is met!**
4.4.1	I 100 PCT	Current for 100% flow ($I_{100\%}$), see Fct. 3.3.4
4.4.2	I MAX mA	Setting of max. output current (I_{max}), see Fct. 3.3.5
4.5.0	**LFC. I RANG.**	**LOW-FLOW CUTOFF RANGE I incorrect: Ensure condition cutoff "off". Cutoff "on" $\geq 1\%$ is met!**
4.5.1	L.F. CUTOFF I	Low-flow cutoff (SMU) for current output required? See Fct. 3.3.7
4.5.2	CUTOFF ON	Cutoff "on" value SMU-I, see Fct. 3.3.8
4.5.3	CUTOFF OFF	Cutoff "off" value SMU-I, see Fct. 3.3.9
4.6.0	**LFC. F RANG.**	**LOW-FLOW CUTOFF RANGE F incorrect: Ensure condition cutoff "off". Cutoff "on" $\geq 1\%$ is met!**
4.6.1	L.F. CUTOFF F	Low-flow cutoff (SMU) for frequency output required? See Fct. 3.4.6
4.6.2	CUTOFF ON	Cutoff "on" value SMU-F, see Fct. 3.4.7
4.6.3	CUTOFF OFF	Cutoff "off" value SMU-F, see Fct. 3.4.8

Fct.	Text	Description and settings
4.7.0	**F > 1 kHz**	**OUTPUT FREQUENCY too high: must be less than 1 kHz!**
4.7.1	FULL SCALE	Full-scale range for flowrate $Q_{100\%}$, see Fct. 3.1.1
4.7.2	PULSOUTP.	Unit of frequency output F, see Fct. 3.4.2
4.7.3	PULSRATE or PULSE/UNIT	Pulse rate for 100% flowrate or for sound velocity, see Fct. 3.4.3 or Pulse value for flowrate unit, see Fct. 3.4.3
4.8.0	**F <> PULSW.**	**FREQUENCY/PULSE WIDTH ASSIGNMENT is incorrect**
4.8.1	PULSOUTP.	Unit of frequency output F, see Fct. 3.4.2
4.8.2	PULSRATE or PULSE/UNIT	Pulse rate for 100% flowrate or for sound velocity, see Fct 3.4.3 or Pulse value for flowrate unit, see Fct. 3.4.3
4.8.3	PULSWIDTH	Pulse width for frequencies ≤ 10 Hz, see Fct. 3.4.4
4.9.0	**PULS/T.TIME**	**Incorrect ASSIGNMENT of UNIT for F and SOUND VELOCITY**
4.9.1	FUNCTION F	Function of frequency output F, see Fct. 3.4.1
4.9.2	PULSOUTP.	Unit of frequency output F, see Fct. 3.4.2
4.10.0	**LFC. I/T.TIME**	**LOW-FLOW CUTOFF I incorrect: Ensure low-flow cutoff is "off" when function of current output is sound velocity.**
4.10.1	FUNCTION I	Function of current output I, see Fct. 3.3.1
4.10.2	L.F.CUTOFF I	Low-flow cutoff (SMU) for current output required? See Fct. 3.3.7
4.11.0	**LFC. F/T.TIME**	**LOW-FLOW CUTOFF F incorrect: Ensure low-flow cutoff is "off" when function of frequency output is sound velocity.**
4.11.1	FUNCTION F	Function of frequency output F, see Fct. 3.4.1
4.11.2	L.F.CUTOFF F	Low-flow cutoff (SMU) for frequency output required? See Fct. 3.4.6
4.12.0	**V.S. min>max**	**MAX. SOUND VELOCITY MUST BE LARGER THAN MIN. SOUND VELOCITY.**
4.12.1	MIN SP. S	Minimum sound velocity, sound velocity for $I_{0\%}$ or $F_{0\%}$
4.12.2	MAX SP. S	Maximum sound velocity, sound velocity for $I_{100\%}$ or $F_{100\%}$

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