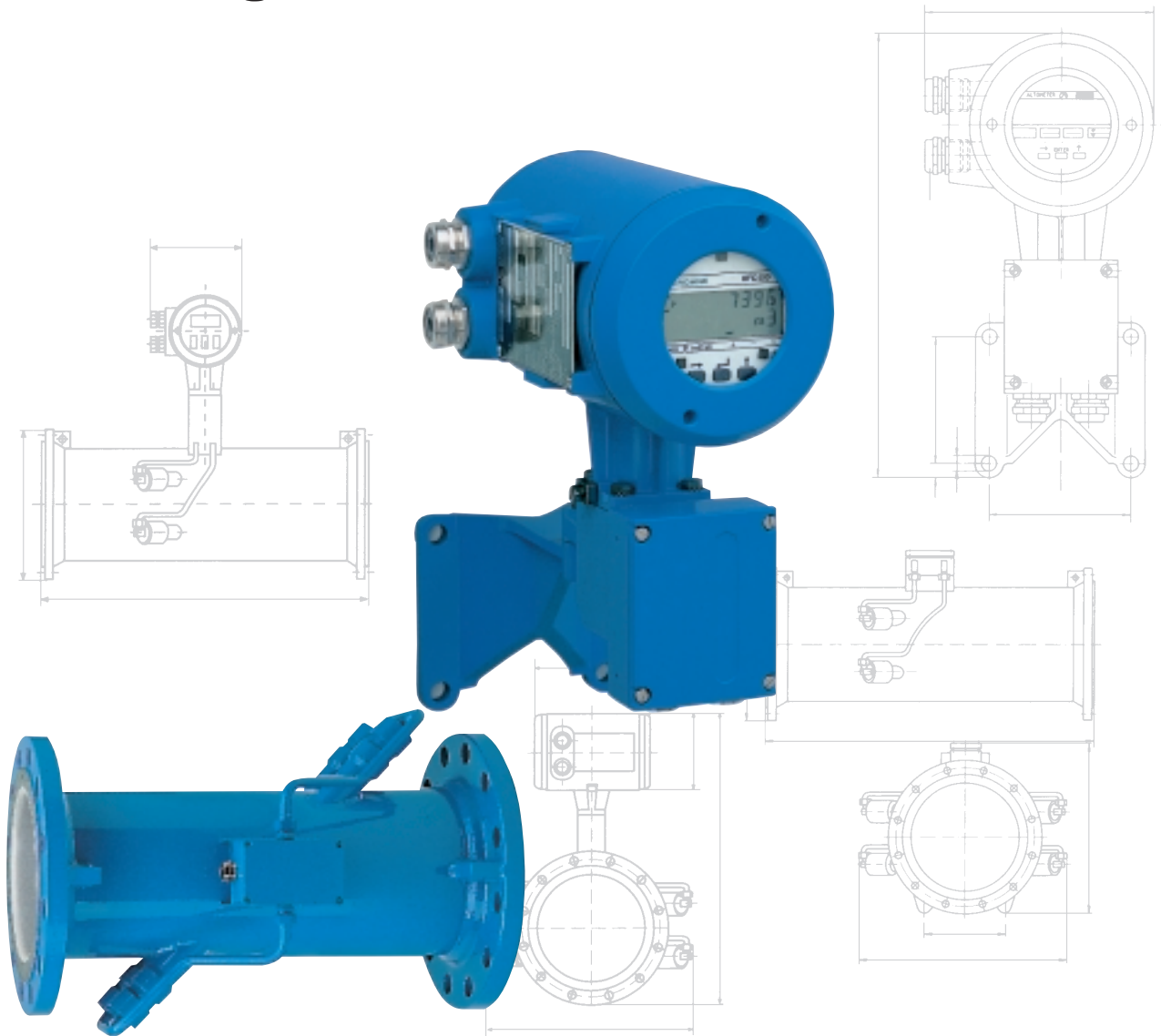


GFM 700 Ultrasonic gas flowmeter



**First ultrasonic
gas flowmeter**
with two beams

Variable area flowmeters

Vortex flowmeters

Flow controllers

Electromagnetic flowmeters

Ultrasonic flowmeters

Mass flowmeters

Level measuring instruments

Communications engineering

Engineering systems & solutions



GFM 700 Ultrasonic gas flowmeter

for liquids

**First ultrasonic gas flowmeter
with two beams**

Non-contact ultrasonic gas flow measurement and volume counting, suitable for all gases available meter sizes DN 50-600 and 2"-24".

Wide range of application

The large range of products that can be measured accurately and easily make this a truly universal device. Just a few examples:

- Natural gas
- Air
- Methane
- Nitrogen
- Determination of the molecular weight of gases
- Measurement in hazardous locations, Zones 1 and 2

Calibrated on **EN 45 001** certified calibration rigs, calibration accuracy better than 99.97% of the measured value.



GFS 700 Primary head

- Non-contact measurement, independent of the Reynolds number and the viscosity
- No constriction of the pipe cross-section
- No additional pressure drop
- No mechanically moving parts
- Pressure and temperature have no effect on measurements
- Easy to install
- No maintenance requirement



GFC 700 Signal converter

- Digital signal processing and sequencing control
- Measuring error less than 2% of the measured value
- Linear outputs, current, pulse and status
- Scaleable in metric or US units
- Forward and reverse flow measurement
- Optionally available: operation via bar magnet without opening the housing
- Low power consumption
- Low operating costs



Size, flow velocity, flowrate

Diagram:

Selection of meter size / nominal pipe size

Flow velocities in m/s or ft/s and the flowrate in m³/hr or US gal/min can be determined for each meter size (DN) using the diagram below.

Example: v in m/s

Nominal pipe size DN 150
 Required measuring range 1000 m³/hr

For a flow velocity of 1 m/s at DN 150, the table gives a flowrate of 63.617 m³/hr. For 1000 m³/hr, the flow velocity v is thus

$$v = \frac{1000 \text{ m}^3/\text{hr}}{63.617 \text{ m}^3/\text{hr}} \times 1 \text{ m/s} = 15.72 \text{ m/s}$$

Flow table for v = 1 m/s

DN	m ³ /hr
50	7.0686
65	11.946
80	18.096
100	28.274
125	44.179
150	63.617
200	113.10
250	176.71
300	254.47
350	346.36
400	452.39
500	706.86
600	1017.9

Precise determination of flow velocities

For range setting, use the flow table below to determine the precise flow velocity for each nominal pipe size.

Example: v in ft/s

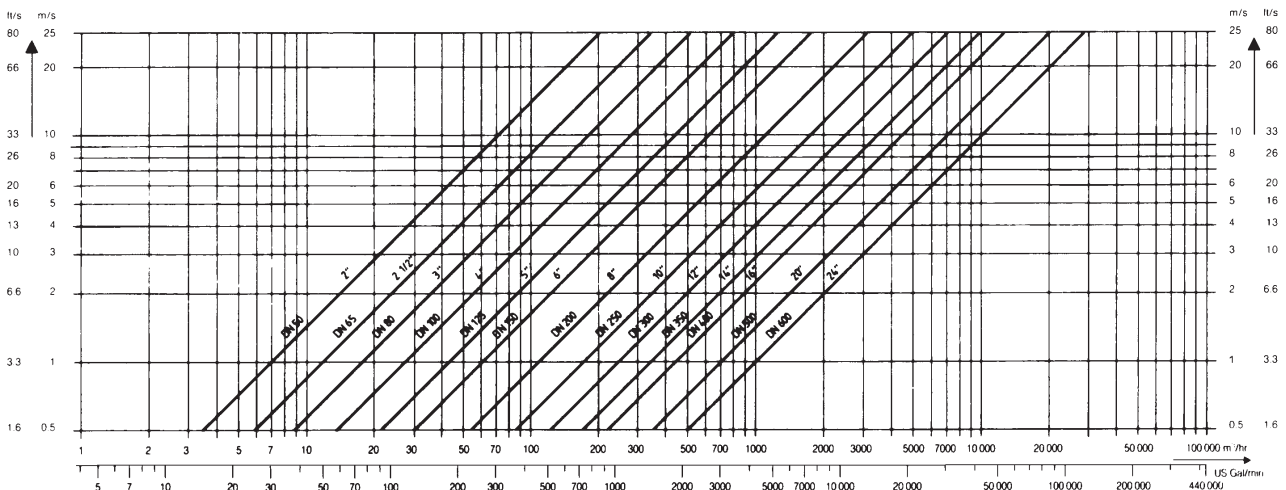
Nominal pipe size 6"
 Required measuring range 5000 US gal/min

For a flow velocity of 3.3 ft/s at 6", the table gives a flowrate of 280.11 gal/min. For 5000 gal/min, the flow velocity v is thus

$$v = \frac{5000 \text{ US gal/min}}{280.11 \text{ gal/min}} \times 3.3 \text{ ft/s} = 58.91 \text{ ft/s}$$

Flow table for v = 10 ft/s

inches	US gal/min
2	31.13
3	79.68
4	124.49
5	194.52
6	280.11
8	497.98
10	778.05
14	1525.0
16	1991.9
20	3112.8
24	4481.8



Technical data

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 Ex versions (remote system)	GFS 700 F-EEx version to European standard, EEx de IIC T6 (zone 1 and 2), DEMKO No. 92C.106274	GFC 700 F signal converter is installed a non hazardous area

Full-scale ranges (configurable)	Q _{100%} volume flow	v _{100%} flow velocity
Standard	14 - 25000 m ³ /h / 60 - 88000 US Gal/min	2 - 25 m/s / 6.6 - 65 ft/s
Option	14 - 35600 m ³ /h / 60 - 156000 US Gal/min	2 - 35 m/s / 6.6 - 115 ft/s

Error limits	Accuracy:	Repeatability
	DN ≥ 80 / ≥ 3": v < 2 m/s (6.6 ft/s) v ≥ 2 m/s (6.6 ft/s) DN ≤ 65 / ≤ 2½":	± 0.04 m/s (± 0.13 ft/s) ± 2% of measured value ± 2% of measured value + 0.04 m/s (± 2% of measured value + 0.13 ft/s)
	± 0.5% of measured value	

GFS 700 Primary head

Meter size	DN 50 - 600 / 2" - 24" (optionally DN 700 - 1200 / 28" - 48")
-------------------	---

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

Max. operating data	Gas temperature	Operating pressure		operating pressure dependent on flange connections
		standard	option	
<u>Integral systems</u>				} operating pressure dependent on flange connections
ambient temperature ≤ 40°C / ≤ 104°F	≤ 140°C / ≤ 284°F	≤ 25 bar / ≤ 360 psig	≤ 40 bar / ≤ 580 psig	
ambient temperature ≤ 60°C / ≤ 140°F	≤ 60°C / ≤ 140°F	≤ 25 bar / ≤ 360 psig	≤ 40 bar / ≤ 580 psig	
<u>Remote systems</u>	≤ 180°C / ≤ 356°F	≤ 25 bar / ≤ 360 psig	≤ 40 bar / ≤ 580 psig	
<u>Hazardous-duty versions</u>	≤ 180°C / ≤ 356°F	≤ 20 bar / ≤ 300 psig	-	

Max. allowable flow velocity	≤ 25 m/s / ≤ 80 ft/s, optionally ≤ 30 m/s / ≤ 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/ft ³] 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
---	-----------------------------------

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	2. AC Version	AC / DC Version	
	Standard	Option	Option	
1. Rated voltage	230 / 240 V	200 V	24 V AC	24 V DC
Tolerance band	200 - 260 V	170 - 220 V	20 - 27 V AC	18 - 32 V DC
2. Rated voltage	115 / 120 V	100 V	-	-
Tolerance band	100 - 130 V	185 - 110 V	-	-
Frequency	48 - 63 Hz	48 - 63 Hz	48 - 63 Hz	-
Power consumption (incl. primary head)	approx. 10 VA	approx. 10 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.

Current 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 for Q = 100%: 4 - 20 mA } settings in 1 mA increments (I _{max} = 22 mA)
Active mode	Load max. 680 Ohm
Passive mode	external voltage: ≤ 18 V DC load ≤ 680 Ohm
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 pulse output)
Internal power supply for binary outputs	U _{int} = 19 - 32 V DC / I ≤ 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 - 3 600 000 pulses/h 0,167 - 60 000 pulses/min 0,0028 - 1 000 pulses/s (= Hz) } optionally in pulse per liter, m ³ , 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, ≤ 10 Pulse/s ≤ 10 Hz
Active mode	connection: electronic counter internal voltage: 19 - 32 V DC, from current output
Passive mode	load current: I _{max} < 50 mA, operation with status output connection: electronic or electromechanical counter external voltage: U _{ext} ≤ 32 V DC / ≤ 24 V AC load current: I _{max} ≤ 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)

Local display

Display function	3-field LCD 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
counter	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 (IEC 529 / EN 60529)	IP 65 equivalent to NEMA 4 and 4X

Signal cable only for remote systems (F) length up to 10 m / 30 ft (max. 30 m / 90 ft, option)

Background

Flowtubes UFM 500

Clamp-on UFM 600/610

Weld-on UFM 800 W

Open channel UFM 800 C

Gas-tube flowtube GFM 700

Custody transfer ALTOSONIC V

Calibration

Installation notes

Sizing guide

Ordering guide

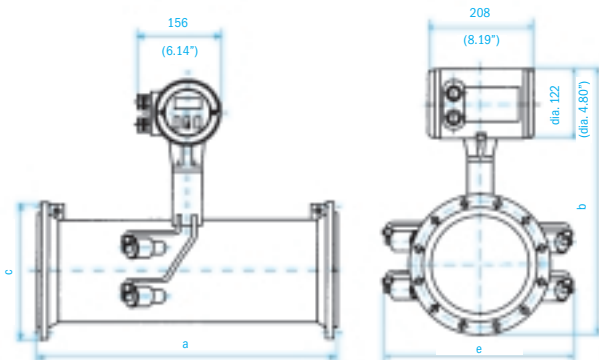
Dimensions and weights

Flange connections to DIN 2501 / pressure rating PN, see Table: Dimensions b_{DIN} and c_{DI} } max. allowable
 to ANSI / Class 150 lb/RF: Dimensions b_{ANSI} and c_{ANSI} } operating pressure

Meter size to ...			Dimensions in mm and (inches)							Weight **
DIN	PN	ANSI inches	a	b_{DIN} *	b_{ANSI} *	c_{DIN}	c_{ANSI}	e	approx. in kg (lb)	
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 1/2	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)	

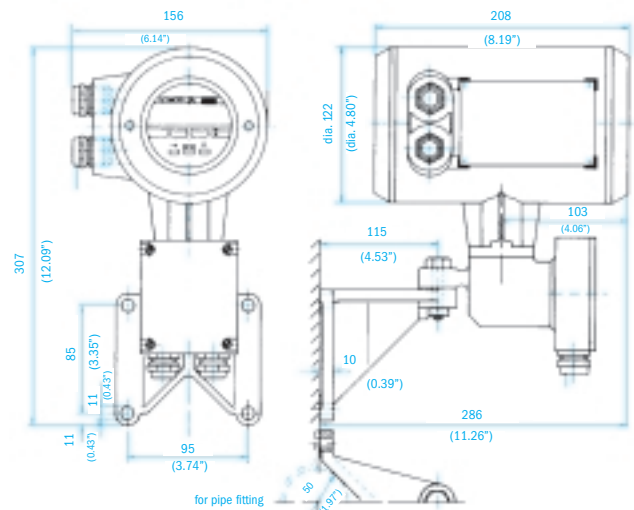
Please note for integral flowmeters: * dimensions plus "b" 210 (plus 8.27")
 ** weight plus approx. 3.0 kg (plus approx. 6.6 lb)

GFM 700 K Integral flowmeter

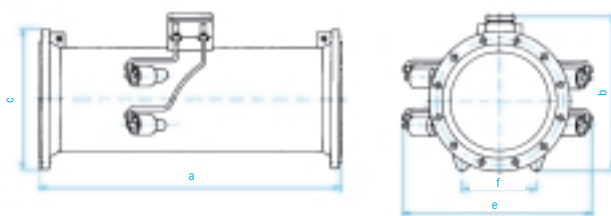


GFC 700 F Signal converter

with wallmounting (rotating design)



GFS 700 F Primary head



Application information

Inlet and outlet runs

<u>Inlet run:</u>	- downstream of a compressor or nozzle	≥ 40 x DN	(DN = meter size)
	- downstream of a fan	≥ 30 x DN	
	- downstream of a fully open control valve	≥ 20 x DN	
	- downstream of a 90° bend (elbow)	≥ 20 x DN	
	- downstream of a reducer ($\alpha/2 < 4^\circ$)	(no additional inlet run required)	
<u>Outlet run:</u>		≥ 10 x DN	

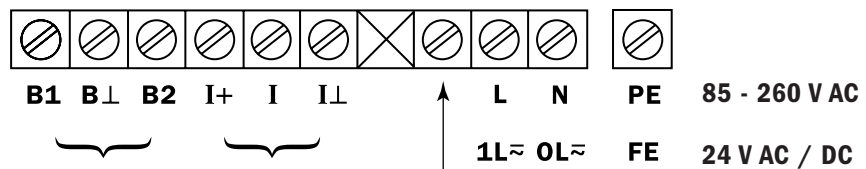
Installation conditions

Select position such that the measuring beam is approximately horizontal. Fit the mating flanges precisely at right angles to the pipeline.

Electrical connection

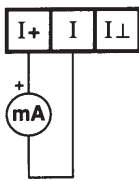
- **Power supply, power consumption and load rating** of outputs: see "Technical data" (pages 4 + 5)
- **Current and pulse outputs (I + P) are galvanically isolated** from all input and output circuits.

Power supply



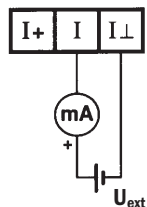
Binary outputs: B1, B⊥, B2; Current output: I+, I, I⊥; for internal use only: L, N; PE = protective conductor; FE = functional ground.

Current output I_{active}



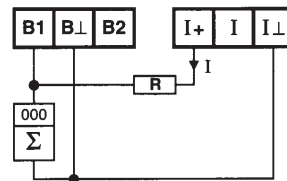
$R_i \leq 680 \Omega$

Current output I_{passive}



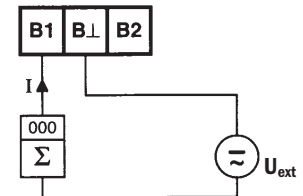
$U_{ext} \leq 18 \text{ V DC}$
 $R_i \leq 680 \Omega$

Pulse output P_{active}
for passive EC with internal voltage from current output



$U_{int} \leq 19 - 32 \text{ V DC}$
 $I \leq 50 \text{ mA}$
 $R \geq 650 \Omega$

Pulse output P_{passive}
with external voltage



EC or EMC
 $U_{ext} \leq 32 \text{ V DC} / \leq 24 \text{ V AC}$
 $I \leq 150 \text{ mA}$

Background
Flowtubes UFM 500
Clamp-on UFM 600/610
Weld-on UFM 800 W
Open channel UFM 800 C
Gas-flowtube GFM 700
Custody transfer ALTOSONIC V
Calibration
Installation notes
Sizing guide
Ordering guide