KROHNE

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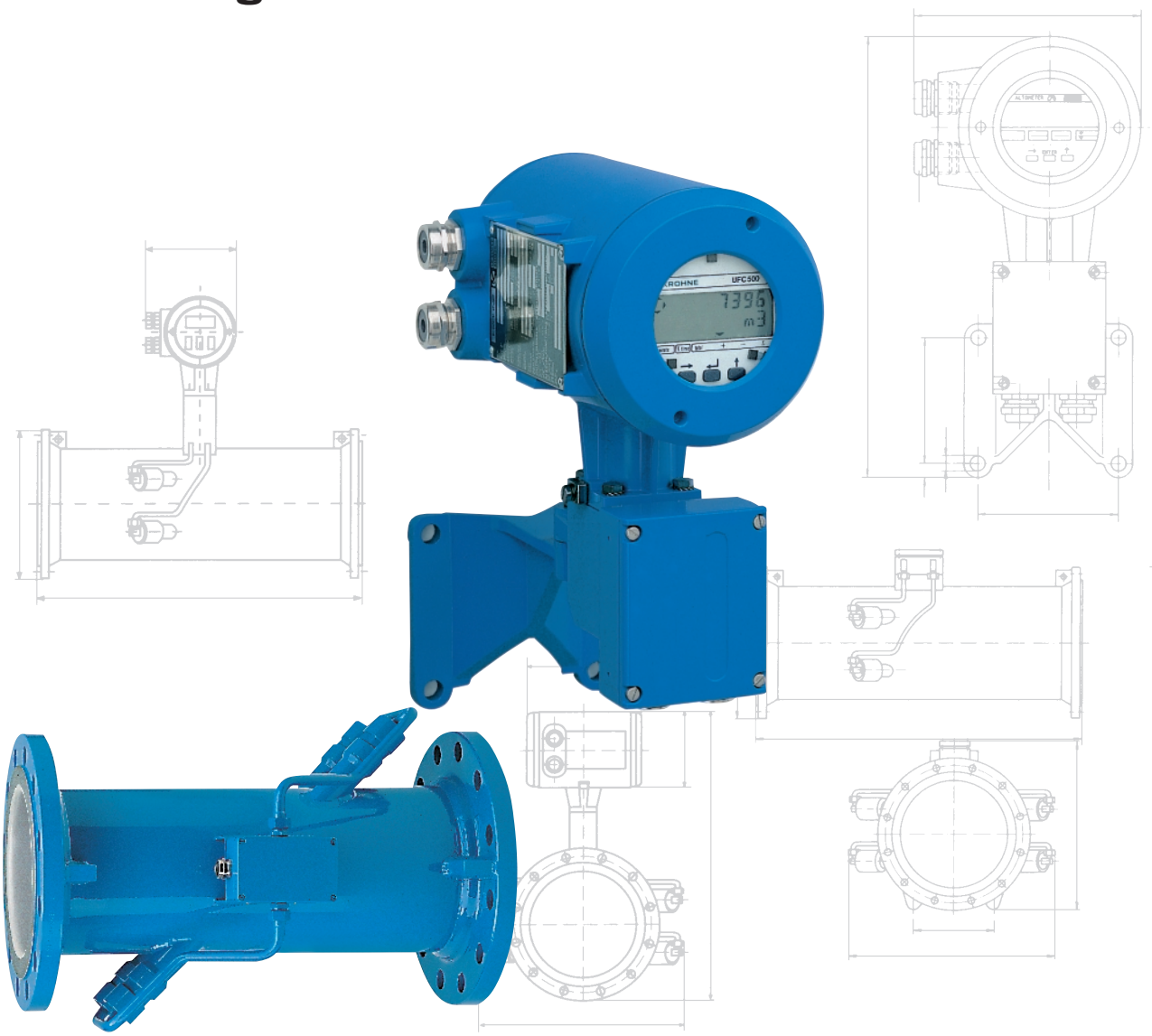
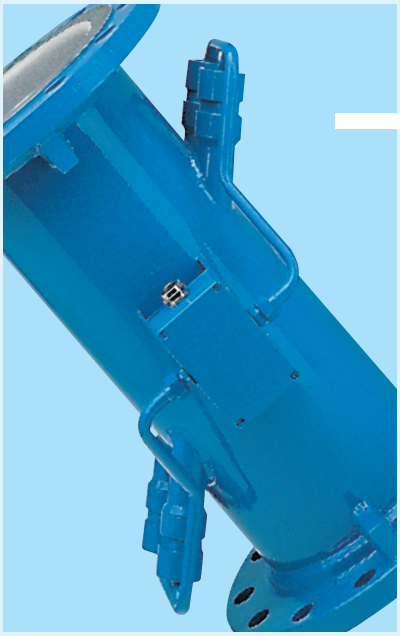
GR/PRINTO

GFM 700
Ultrasonic gas flowmeter



First ultrasonic gas flowmeter with two beams



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 velocitys in m/s or ft/s and the flowrate in m^3/hr or US gal/min can be determinded for each meter size (DN) using the diagram below.

Example: v in m/s	
Nominal pipe size	DN 150
Required measuring range	1000 m^3/hr

For a flow velocity of 1 m/s at DN 150, the table gives a flowrate of 63.617 m^3/hr. For 1000 m^3/hr, the flow velocity v is thus

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

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.

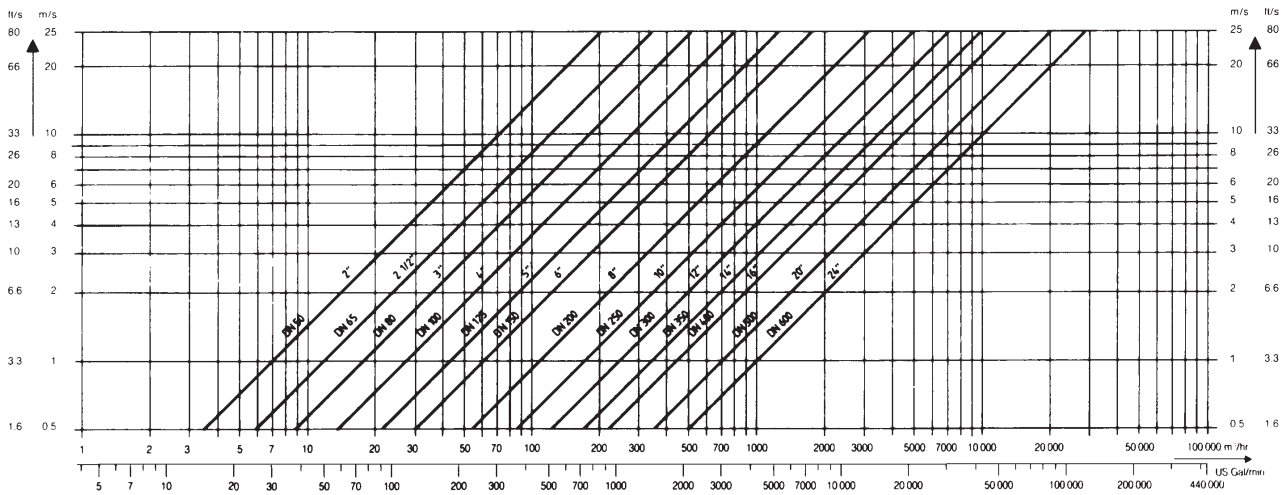
Example: v in ft/s	
Nominal pipe size	6”
Required measuring range	5000 US gal/min

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

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

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 m³/h / 60 – 88000 US Gal/min	2 – 25 m/s / 6.6 – 65 ft/s
Option	14 – 35600 m³/h / 60 – 156000 US Gal/min	2 – 35 m/s / 6.6 – 115 ft/s

Error limits		
Accuracy:	DN ≥ 80 / ≥ 3": v < 2 m/s (6.6 ft/s)	± 0.04 m/s (± 0.13 ft/s)
	v ≥ 2 m/s (6.6 ft/s)	± 2% of measured value
	DN ≤ 65 / ≤ 2½":	± 2% of measured value + 0.04 m/s (± 2% of measured value + 0.13 ft/s)
Repeatability	± 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	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**		
		standard	option	
Integral systems				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	
Remote systems	≤ 180°C / ≤ 356°F	≤ 25 bar / ≤ 360 psig	≤ 40 bar / ≤ 580 psig	
Hazardous-duty versions	≤ 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/m³] **or** [inches] = 0.47 x ρ_{Gas} [lb/ft³] density ρ_{Gas} in kg/m³ **or** in [lb/ft³]

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 load current: I_{max} < 50 mA, operation with status output
Passive mode	connection: electronic or electromechanical counter external voltage: Uext ≤ 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	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
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)

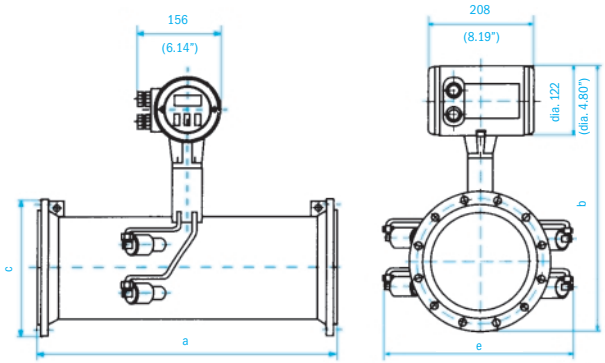
Dimensions and weights

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

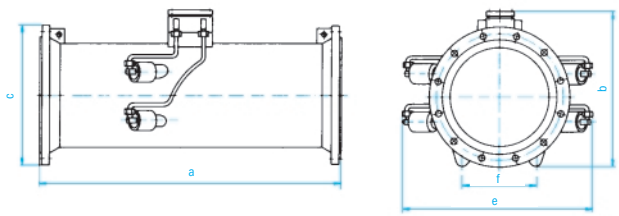
Meter size to ...			**Dimensions** in mm and (inches)						**Weight** **
DIN		**ANSI**							approx.
DN mm	PN	inches	a	b_{DIN} *	b_{ANSI} *	c_{DIN}	c_{ANSI}	e	in kg (lb)
50	40	2	500 (19.69)	198 (7.80)	198 (7.80)	165 (6.50)	165 (6.50)	370 (14.57)	15 (33)
65	16	2 1/2	500 (19.69)	216 (8.50)	212 (8.35)	185 (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)

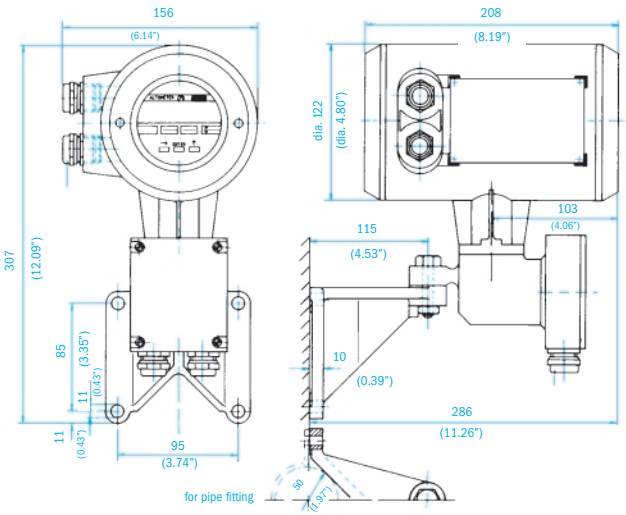
GFM 700 K Integral flowmeter



GFS 700 F Primary head



GFC 700 F Signal converter
with wallmounting (rotating design)



Application information

Inlet and outlet runs

Inlet run:	– 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 ($\alpha/2 < 4°$)	(no additional inlet run required)	
Outlet run:		≥ 10 x DN	

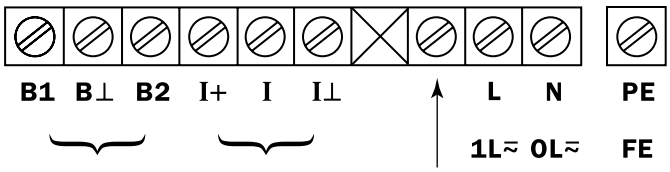
Installation conditions

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

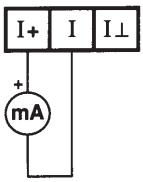


85 - 260 V AC

24 V AC / DC

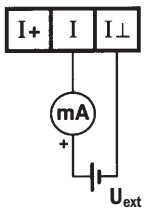
(PE = protective conductor)
(FE = functional ground)

Current output I_{active}



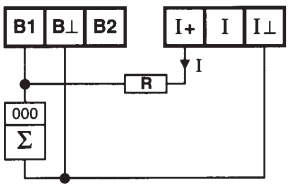
R_i ≤ 680 Ω

Current output $I_{passive}$



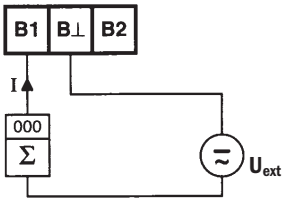
$U_{ext.}$ ≤ 18 V DC
R_i ≤ 680 Ω

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



$U_{int.}$ ≤ 19 – 32 V DC
I ≤ 50 mA
R ≥ 650 Ω

Pulse output $P_{passive}$
with external voltage



EC or EMC
U_{ext} ≤ 32 V DC /
≤ 24 V AC
I ≤ 150 mA