

BUBBLING-THROUGH TRANSDUCER



Type: **E-ADLM-PV**

- NO CONTACT WITH THE MEDIUM
- 4 ... 20 mA AND 0 ... 10 V
- COMBINED ERROR $\pm 1\%$ FS
- IP65 · LCD · RS232



ORDER CODE

Code	Field	Meaning
FEMA	series	bubbling-through pressure transducer with valve
0 · 2 · 0	input, output, supply	positive relative pressure · 4 ... 20 mA and 0 ... 10 V · 24 V DC
0 · 1 · 2 · 3 · A	pressure sensor	0 ... 1000 mbar standard · 0 ... 50 · 0 ... 100 · 0 ... 200 · 0 ... 350 mbar
0	measuring range	please state, see the note below
0 · 3 · 4	interface	RS232 · RS232 and CANopen · RS232 and Profibus
0 · 1 · 2	housing	AluCase 160x90x60 · plastic 162x92x60 · plastic with EMC coating
0 · 1	configuration	factory setting · customer-specific
0 · 1	special model	no · yes, please state

Example: FEMA-020000-000 — standard sensor, RS232, AluCase, factory setting. For the measuring range we need either a pressure value (0 ... 600 mbar, or 3 m water column) or the density of the medium and the filling height (0.8 g/cm³ and 4 m).



OVERVIEW

The level is read as a pressure, and the pressure is read where no medium ever arrives: a valve opens for a few seconds, compressed air is pushed down a tube to the bottom of the tank, and as soon as it bubbles out the pressure in the tube equals the hydrostatic pressure of the column above it — density times height. The sensor sits dry in the housing on the wall and measures that pressure; nothing touches the liquid, so aggressive and abrasive media, foam and deposits are no obstacle, and the tank needs no connection below its bottom. The bubbling point may be up to fifty metres away, and the tube may be of any material. During the bubbling pulse the analogue output holds its last value; between the pulses it follows the level over 4 ... 20 mA and 0 ... 10 V, with a combined error of 1 % FS.

MEASUREMENT AND FUNCTION	ADVANTAGES
• Hydrostatic pressure, measured through a bubbling tube • Standard sensor 0 ... 1000 mbar, that is 0 ... 10 m water column • Options 0 ... 50, 0 ... 100, 0 ... 200 and 0 ... 350 mbar • Combined error $\pm 1\%$ FS, resolution 12 bit • Bubbling point up to 50 m away, tube of any material • Output 4 ... 20 mA and 0 ... 10 V at the same time • RS232 as standard, CANopen or Profibus as an option • Linearisation over 20 calibration points for volume	• No contact between the sensor and the medium • No connection below the tank — the housing sits on the wall • Foam has no influence, unlike an ultrasonic measurement • Aggressive and abrasive media are no problem • Cost-effective compared with radar • Level measurement possible in every liquid • Simple to install and reliable in operation • Aluminium or plastic housing, both IP65



TECHNICAL DATA

MEASUREMENT

Principle	hydrostatic, positive relative pressure
Pressure sensor	0 ... 1000 mbar · 0 ... 10 m water column
Options	0 ... 50 · 0 ... 100 · 0 ... 200 · 0 ... 350 mbar
Burst pressure	3 bar, standard sensor
Resolution	12 bit
Combined error	± 1 % FS
Temperature coefficient	< 50 ppm/K
Bubbling distance	up to 50 m

PROCESS AND CONNECTION

Pressure connection	tube 6 mm O/D
Tube material	nylon · PU · PA · Hytrel
Sealing	O-ring, silicone free
Airing	compensation element, PA6
Terminals	plug-in, lockable, ≤ 2.5 mm ²
Cable entry	2 x M20x1,5
Protection rating	IP65

OUTPUT AND SUPPLY

Analogue output	0 ... 10 V and 4 ... 20 mA, at the same time
Burden, current	< 500 Ω
Load, voltage	> 10 kΩ
Interface	RS232 · option CANopen or Profibus
Supply voltage	24 V DC ± 20 %
Power consumption	approx. 5 W with all options
Residual ripple	200 mV
During the pulse	the analogue output is held

DISPLAY AND ENVIRONMENT

Display	LCD, multifunction
Shown	value · set points · diagnostics
Keys	4, for programming
Tare	key on the board, or external
Linearisation	20 calibration points
Operating temperature	-10 °C ... +60 °C
Storage temperature	-20 °C ... +70 °C

HOW IT WORKS

Break time	a change of the level changes the pressure in the system in proportion, and the analogue output follows it
Pulse time	the valve opens and the analogue output holds the value it had before; the pressure from the reducer is switched to the bubbling outlet, and after a time that depends on tube diameter and distance air escapes at the end of the tube — that is the moment the hydrostatic pressure is reached, density times filling height
End of the pulse	the valve closes, the pressure equalises between bubbling point and sensor, and the analogue output is released again
Factory setting	range as stated · analogue output 0 ... 10 V and 4 ... 20 mA · display 0 ... 100.0 % · no linearisation · pulse 10 s · break 3600 s · external tare active at 24 V
Bubbling tube	cut the end at 45° to get a defined bubbling point



PRESSURE TABLE

Nominal pressure	Reducer output	Maximum · burst pressure
50 mbar	75 mbar	550 mbar · 800 mbar
100 mbar	150 mbar	550 mbar · 800 mbar
200 mbar	300 mbar	1 bar · 1.5 bar
350 mbar	525 mbar	1 bar · 1.5 bar
1 bar	1.5 bar	2 bar · 3 bar

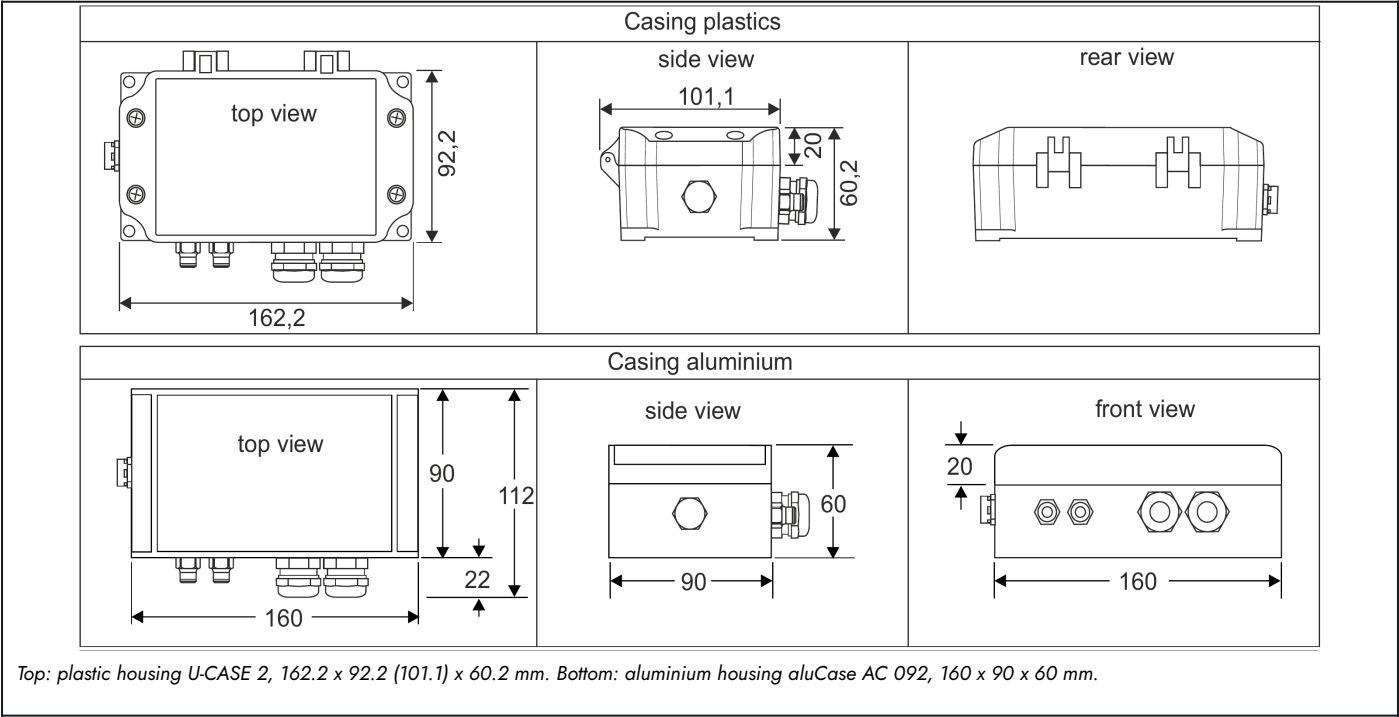
The pressure reducer belongs to the installation and is set to the output value in the middle column. Older versions may carry a 500 mbar or a 2 bar sensor — 500 mbar with a reducer output of 750 mbar, 1 bar maximum and 1.5 bar burst pressure; 2 bar with 3 bar, 4 bar and 6 bar. Neither of the two can be ordered today.

COMPLIANCE

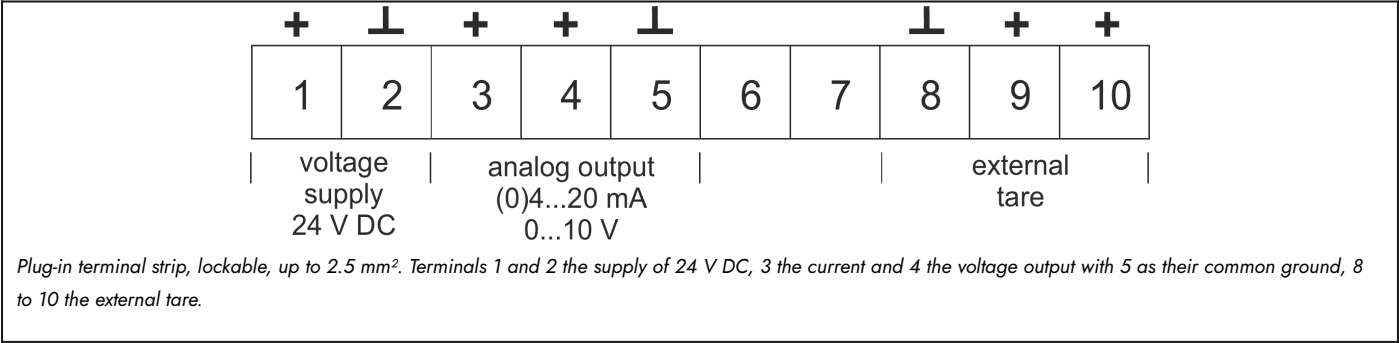
 IP65	Protection rating	IP65; the plastic housing carries a protective insulation to VDE 100
 Aluminum Alloy	Housing	die-cast aluminium alloy, RAL 9006, 1.1 kg — or ASA 757G Luran S, flammability UL94 HB, 0.7 kg, black
 Display	Display and operation	LCD multifunction indicator with four keys; 20 calibration points for volume
 RS232	Interface	RS232 as standard; CANopen or Profibus as an option



DIMENSIONS (mm)



TERMINALS



APPLICATION EXAMPLE

