AMFLO® SONIC UFA 340

Technical datasheet

Robust ultrasonic flow meter for district heating

- Dedicated to thermal energy measurements.
- Approved MID 2014/32/EU Annex VI (MI004).
- Accurate, bidirectional flow measurement



6-290-TD-EN-01

Technical datasheet

The following data is provided for general applications. If you have a specific application, please contact your local sales agency.

Additional information (certificates, special tools, software,...) and comprehensive product documentation can be downloaded free of charge from our website (Download Center).

Measurement system

Feature	Value
Measuring principle	Ultrasonic Signal Transit Time
Application	Hot water flow measurement
Measured primary value	Transit Time
Measured secondary values	Volume flow, mass flow, flow velocity, flow direction, sound velocity, signal amplification degree, signal-to-noise ratio, flow measurement reliability, volume or totalized mass

Design

Feature	Value
Special benefits	3 Fully Welded Ultrasonic Beams
Modular construction	The measuring system consists of a measuring sensor and a measurement converter.
Compact version	AMFLO® Sonic UFA 340
Separate version	AMFLO® Sonic UFA 340 with Measurement Converter
Nominal Diameter	DN25... 2000 / 1...80"
Measurement scale	0.1...10 m/s / 0.33...33 ft/s For more details, see MID Annex MI-004 on page 18

Measurement converter

Feature	Value
Inputs / Outputs	Current output (including HART)® pulses, frequency and/or status, threshold detection and/or control input (depends on I/O version)
Totalizer	Internal totalizers with up to 8 characters (e.g. for volume and/or mass totalization)
Verification and self-diagnostics	Verification, integrated diagnostic functions: flow meter, process, measured values, device configuration, etc.

Display and User Interface

Feature	Value
Graphical display	White LCD Backlit Size: 128x64 pixels (59x31 mm = 2.32"x1.22") 90° Swivel Display
Control elements	4 touch buttons to program the measurement converter without opening the housing
Programming Menu	Parameter visualization on 2 pages for measured values, 1 status reporting page, 1 graph page (measured values and graph page can be set as desired)
Display language	Standard: English, German, French, Dutch, Russian
Measured Parameters - Units	Metric, British and US, freely selectable from lists of units for volume/mass flow and totalization, flow velocity, temperature, pressure
Measured parameters - Values	Volume Flow, Mass Flow, Flow Velocity, Sound Velocity, Signal Amplification Degree, Signal-to-Noise Ratio, Flow Direction, Diagnostics

Diagnostic functions

Function	Description
Standards	VDI / NAMUR NE 107
Status messages	Transmission of status messages via display, current and/or status output
Sensor diagnostics	By sound velocity of the ultrasonic beam, flow velocity, degree of signal amplification, signal-to-noise ratio
Process diagnostics	Empty Tube, Signal Integrity, Wiring, Flow Conditions
Measurement converter diagnostics	Data bus monitoring, I/O connections, electronics temperature, parameter integrity, and data

Measurement accuracy

Parameter	Value
Baseline conditions	
Product to be measured	Water
Temperature	+20°C / +68°F
Pressure	1 bar / 14.5 psi
Straight section upstream	10 DN
Maximum measurement error	
Class 1	±1% (1 + 0.01 qp/q) = with 3.5% limit
Class 2	±2% (2 + 0.02 qp/q) = with 5% limit
Class 3	±3% (3 + 0.03 qp/q) = with 5% limit
Calibration / Verification	
Standard	3-point calibration by direct comparison of volumes

Optional	Verification according to the Directive on Measuring Instruments (MID), Annex VI (MI-004)

MID MI-004 (Directive 2014/32/EU)

Parameter	Value
Directive	2014/32/EU, EC type-certificate according to MID Annex VI (MI-004)
Diameter	DN25... 2000
Straight section upstream (mini)	10 DN
Straight section downstream (mini)	3 DN
Measurement	Outward and return flow (bidirectional)
Orientation	Horizontal, vertical
Report	Up to 100
Maximum working pressure	40 bar - 580 psi at 20°C - 68°F 32 bar - 460 psi at 180°C - 356°F
Environmental class	Electromagnetic: E2 Mechanical: M1

Terms of Service

Parameter	Value
Temperature	
Process Temperature - Compact Version	0...+90°C / 32...+194°F
Process Temperature - Separate Version	0...+180°C / +32...+356°F
Carbon Steel Flanges	EN1092: -10°C / +14°F; ASME: -29°C / -20°F
Room temperature	-25...+55°C / -13...+131°F
Storage Temperature	-50...+70°C / -58...+158°F
Pressure	
EN 1092-1 - DN25... 80	PN 40
EN 1092-1 - DN100... 150	PN 16
EN 1092-1 - DN200... 2000	PN 10
ASME B16.5 - 1... 80"	150 lbs RF / 300 lbs RF
Properties of the product to be measured	
Physical Condition	Liquid, water, hot or cold
Permissible gas content	≤ 2% (volume)
Eligible solid content	≤ 5% (volume)

Note: Protect the inside of the electronic module from self-heating. Protect the transducer from external heat sources (direct solar radiation, high temperatures) – these conditions reduce the service life of all electronic components.

Installation conditions

Straight section upstream: 10 DN minimum.

Straight section downstream: 3 DN.

For more information, refer to the Assembly section and the Dimensions and Weight section.

Materials

Component	Material
Measurement sensor	
Flanges (in contact with the product) DN25... 2000 / 1"... 80"	Carbon steel Optional: stainless steel 1.4404 (AISI 316(L))
Measuring tube (in contact with the product) DN25... 2000 / 1"... 80"	Carbon steel Optional: stainless steel 1.4404 (AISI 316(L))
DN25 Measurement Sensor Housing... 300 / 1"... 12"	Carbon steel Optional: stainless steel 1.4404 (AISI 316(L))
Transducer	
Transducers (in contact with the product)	Stainless steel 1.4404 (AISI 316L)
Transducer mounts (including fairings) DN350... 2000 / 14"... 80"	Stainless steel 1.4404 (AISI 316L)
Transducer cable tube	Stainless steel 1.4404 (AISI 316L)
Junction box and bracket (separate version only)	Standard: die-cast aluminum; polyurethane coating Optional: 316 stainless steel (1.4408)
Coating (Measurement Sensor)	Standard: Polyurethane
Measurement converter	
Enclosure - C and F Versions	Die-cast aluminium Optional: 316 stainless steel (1.4408)
Coating	Standard: Polyurethane

Electrical connections – General

The electrical connection is made in accordance with VDE 0100 "Regulations for installations with a voltage of less than or equal to 1000 volts" or other corresponding national specifications.

All outputs are galvanically isolated from each other and all other circuits.

All operating parameters and outputs are programmable.

Power supply

Parameter	Value
Standard power supply	100... 230 V AC (-15% / +10%), 50/60 Hz
AC Consumption	22 VA
Signal cable (separate version) MR06 (shielded cable with 6 coax strands)	Ø 10.6 mm / 0.4" 5 m / 16 ft (standard) Optional: 10...30 m / 33...98 ft
Standard gland	M20 x 1.5 (8...12 mm)
Optional gland	1/2" NPT, PF 1/2

Current output

Parameter	Value
Output data	Flow Volume, Flow Rate, Flow Velocity, Sound Velocity, Signal Amplification Degree, Signal-to-Noise Ratio, Diagnostics, NAMUR NE107, HART® Communication
Temperature coefficient	Typically ±30 ppm/K
Programming - Without HART®	
Q = 0%	0... 20 mA
Q = 100%	10... 20 mA
Error Identification	3... 22 mA

Operating Characteristics – Current Output

	Basic I/O	Modular I/O
Active	Uint, name = 24 V DC I ≤ 22 mA RL ≤ 1kΩ	Uint, name = 24 V DC I ≤ 22 mA RL ≤ 1kΩ
Passive	Uext ≤ 32 V DC I ≤ 22 mA U0 ≥ 1.8 V RL, max = (Uext - U0)/Imaxi	Uext ≤ 32 V DC I ≤ 22 mA U0 ≥ 1.8 V RL, max = (Uext - U0)/Imaxi

Pulse or frequency output

Parameter	Value
Output data	Flow-volume, flow-mass
Function	Fixed, factory-configured pulse/frequency output according to the control
Pulse rate/frequency	0.01...10000 pulses/s or Hz
Programming Q = 100%	0.01...10000 pulses per second or pulses per unit volume
Pulse width	Automatic, balanced or fixed adjustment (0.05...2000 ms)

Operating characteristics – Pulse/frequency output

	Basic I/O	Modular I/O
Active fmaxi ≤ 100 Hz	–	Unom = 24 V DC I ≤ 20 mA RL, max = 47 kΩ open: I ≤ 0.05 mA closed: U0, nom = 24 V to I = 20 mA
Active 100 Hz < fmmax ≤ 10 kHz	–	I ≤ 20 mA RL ≤ 10 kΩ for f ≤ 1 kHz RL ≤ 1kΩ for f ≤ 10 kHz open: I ≤ 0.05 mA closed: U0, name = 22.5 V to I = 1 mA U0, name = 21.5 V to I = 10 mA U0, name = 19 V to I = 20 mA
Passive fmaxi ≤ 100 Hz	Uext ≤ 32 V DC I ≤ 100 mA RL, max = 47 kΩ RL, max = (Uext - U0)/Immax open: I ≤ 0.05 mA to Uext = 32 V DC closed: U0, max = 0.2 V to I ≤ 10 mA U0, max = 2 V to I ≤ 100 mA	Uext ≤ 32 V DC I ≤ 20 mA RL ≤ 10 kΩ for f ≤ 1 kHz RL ≤ 1kΩ for f ≤ 10 kHz RL, max = (Uext - U0)/Imaxi open: I ≤ 0.05 mA at Uext = 32 V DC closed: U0, max = 1.5 V at I ≤ 1 mA U0, max = 2.5 V at I ≤ 10 mA U0, max = 5.0 V at I ≤ 20 mA
NAMUR	–	Passive according to EN 60947-5-6 open: Inom = 0.6 mA closed: Inom = 3.8 mA

Status Output / Threshold Detector

Function: Programmable for automatic scale switching, indication of flow direction, saturation, errors, threshold. Valve control if active metering function.

Operating Characteristics – Status Output / Threshold Detector

	Basic I/O	Modular I/O
Active	–	Uint = 24 V DC I ≤ 20 mA RL, max = 47 kΩ open: I ≤ 0.05 mA closed: U0, name = 24 V to I = 20 mA
Passive	Uext ≤ 32 V DC I ≤ 100 mA RL, max = 47 kΩ RL, max = (Uext - U0)/Immax open: I ≤ 0.05 mA to Uext = 32 V DC closed: U0, max = 0.2 V to I ≤ 10 mA U0, max = 2 V to I ≤ 100 mA	Uext = 32 V DC I ≤ 100 mA RL, max = 47 kΩ RL, max = (Uext - U0)/Immax open: I ≤ 0.05 mA to Uext = 32 V DC closed: U0, max = 0.2 V to I ≤ 10 mA U0, max = 2 V to I ≤ 100 mA
NAMUR	–	Passive according to EN 60947-5-6 open: Inom = 0.6 mA closed: Inom = 3.8 mA

Order Entry

Parameter	Value
Function	Maintain output values, "zero" output value, totalizer reset, acknowledgement errors, totalizer shutdown, scale switching, zero calibration Start dosing if dosing function is enabled

Operating Characteristics – Control Input

	Basic I/O	Modular I/O
Active	–	Uint = 24 V DC Open Terminals: U0, Nom = 22 V Bridged Terminals: Inom = 4 mA On: U0 ≥ 12 V with Inom = 1.9 mA Off: U0 ≤ 10 V with Inom = 1.9 mA
Passive	Uext ≤ 32 V DC Imaxi = 6.5 mA at Uext ≤ 24 V DC Imaxi = 8.2 mA at Uext ≤ 32 V DC Contact Off (ON): U0 ≥ 8 V with Inom = 2.8 mA Open Contact (Off): U0 ≤ 2.5 V with Inom = 0.4 mA	Uext ≤ 32 V DC Imaxi = 9.5 mA at Uext ≤ 24 V Imaxi = 9.5 mA at Uext ≤ 32 V Closed Contact (ON): U0 ≥ 3 V with Inom = 1.9 mA Open Contact (Off): U0 ≤ 2.5 V with Inom = 1.9 mA
NAMUR	–	Active according to EN 60947-5-6 Open Contact: U0, Name = 8.7 V Closed Contact (ON): Inom = 7.8 mA Open Contact (Off): U0, Name = 6.3 V with Inom = 1.9 mA Open Terminal Identification: U0 ≥ 8.1 V with I ≤ 0.1 mA Shorted Terminal Identification: U0 ≤ 1.2 V with I ≥ 6.7 mA

Approvals and certifications

Homologation / Standard	Detail
EC	Meets the legal requirements of the EU directives. For directives, EU standards and certificates, consult the CE declaration or the manufacturer's website.
NAMUR	NE 21, 43, 53, 80, 107
Directive MID	Directive 2014/32/EU, Annex VI (MI-004)
Zones Ex - ATEX	Zone Ex 1-2 according to European Directive 2014/34/EU (ATEX 100a) Approval number: KIWA 15ATEX0007 X
NEPSI	Registration number: GYJ13.1411X - 12X - 13X
Protection class - Compact converter (C) and weather (F)	IP66/67 (NEMA 4X/6)
Protection class - Measuring sensors	IP67 (NEMA 6)
Impact resistance	IEC 68-2-27: 30 g for 18 ms
Vibration resistance	IEC 68-2-6: 1 g up to 2000 Hz IEC 60721: 10 g

Measuring ranges – Flow rates and lengths per nominal diameter

* Maximum pressure: 40 bar - 580 psi at 20°C - 68°F / 32 bar - 460 psi at 180°C - 356°F

In parentheses ( ): Qs value only valid for accuracy classes 2 & 3

DN	Max. Pressure Rating	Total length [mm] Min.	Total Length [mm] Max.	Flow rate [m³/h] Qs	Flow rate [m³/h] Qp	Flow rate [m³/h] Qi	Note *
25	PN40	250	400	18 (27)	18	0.18	
32	PN40	260	400	29 (44)	29	0.29	
40	PN40	270	400	45 (68)	45	0.45	
50	PN40	300	475	71 (106)	71	0.71	
65	PN40	300	475	180	120	1.2	
80	PN40	300	400	180 (270)	180	1.8	
100	PN40	350	400	280 (430)	280	2.8	Maximum pressure 40 bar
125	PN40	350	400	500	440	4.4	Maximum pressure 40 bar
150	PN40	350	400	630	630	6.3	Maximum pressure 40 bar
200	PN40	400	500	1130	1130	11.3	Maximum pressure 40 bar
250	PN40	400	600	1750	1750	7.5	Maximum pressure 40 bar
300	PN40	500	600	2500	2500	25.0	Maximum pressure 40 bar
350	PN40	500	880	3400	3400	34.0	Maximum pressure 40 bar
400	PN40	600	975	4500	4500	45.0	Maximum pressure 40 bar
450	PN40	600	1000	5750	5750	57.5	Maximum pressure 40 bar
500	PN40	600	1080	7000	7000	70.0	Maximum pressure 40 bar
600	PN40	600	1165	10000	10000	100	Maximum pressure 40 bar
700	PN40	800	1240	14000	14000	140	Maximum pressure 40 bar
800	PN40	800	1240	18000	18000	180	Maximum pressure 40 bar
900	PN40	900	1370	23000	2300	230	Maximum pressure 40 bar

1000	PN40	1000	1370	28000	28000	280	Maximum pressure 40 bar
1200	PN40	1200	1600	40000	40000	400	Maximum pressure 40 bar
1400	PN40	1400	1800	55000	55000	550	Maximum pressure 40 bar
1600	PN40	1600	2000	70000	70000	700	Maximum pressure 40 bar
1800	PN40	1600	2100	90000	90000	900	Maximum pressure 40 bar
2000	PN40	1800	2100	113000	113000	1130	Maximum pressure 40 bar

Dimensions and weight

Dimensions of the Measurement Converter

Separate version: a = 88 mm / 3.5" – b = 139 mm / 5.5" – c = 106 mm / 4.2" – Overall height = H + a

Compact version: a = 155 mm / 6.1" – b = 230 mm / 9.1" – c = 260 mm / 10.2" – Overall height = H + a

Note: The b-value may vary depending on the glands used.

Version	a	b	c	d	e	g	h	Weight
C (compact) [mm]	202	120	155	260	137	–	–	4.2 kg
F (Weather) [mm]	202	120	155	–	–	295,8	277	5.7 kg
C (compact) [inch/lb]	7,75	4,75	6,10	10,20	5,40	–	–	9.30 lbs
F (Weather) [inch/lbs]	7,75	4,75	6,10	–	–	11,60	10,90	12.60 lbs

Sensor dimensions and weight – EN1092-1; standard type - PN40

CS = Carbon Steel / SS = Stainless Steel / Di = Inner Diameter

Other pressure classes (PN25, PN16, PN10 or ASME 150, 300 lbs) are also MI-004 approved. Dimensions and weights available on request. Longer assembly length and diameters: on request.

DN	L [mm]	H [mm]	W [mm]	Di CS [mm]	Di SS [mm]	CS weight [kg]	SS weight [kg]	Notes
25	250	155	115	27	27	8	8	
32	260	156	140	35	35	9	10	

40	270	173	150	39	41	11	14	
50	300	193	165	53	53	14	17	
65	300	203	185	63	63	18	19	
80	300	238	200	78	81	17	18	
100	350	268	235	102	104	24	24	
125	350	297	270	127	130	30	29	
150	400	326	300	154	158	37	37	
200	400	427	375	207	207	63	63	
250	500	492	450	260	260	100	100	
300	500	547	515	308	308	140	140	

Power supply

100...230 V AC (margin of error: -15% / +10%) – Frequency: 50...60 Hz.

The PE protective earth of the power supply must be connected to the separate U-terminal in the connection compartment of the measurement converter.

This device is designed to be permanently connected to the mains. It is necessary to install an external switch or circuit breaker in the vicinity of the device (easily accessible, marked as a shut-off device). The switch or circuit breaker must meet IEC 60947-1/-3 requirements.

The device must be properly grounded to protect personnel from the risk of discharge. 240 V AC + 5% is included in the tolerance range.

No.	Type	Specifications
1	100...230 VAC	(-15% / +10%), 22 VA
2	24 VDC	(-55% / +30%), 12 W
3	24 VAC/DC	AC: -15% / +10%; DC: -25% / +30% – 22 VA or 12 W

Overview of inputs and outputs

Input/Output (I/O) Combinations

Version	Description
Version Basic	1 Current Output, 1 Pulse Output and 2 Status Signal/Threshold Detector Outputs. The pulse output can be programmed as the status/threshold signaling output, and one of the status outputs as the control input.
Modular version	The device can be configured with different output modules, depending on the requirements.

Option Ex	For use in explosive atmospheres, all inlet and outlet versions for Type C and F enclosures are available with a connection compartment of type Ex d (containment) or Ex e (increased safety).

For the connection and use of Ex devices, refer to the separate instructions.

Description of the CG number

Description of abbreviations and CG reference for possible optional modules at terminals A and B:

Abbreviation	Reference N° CG	Description
Ia	A	Active current output
IP	B	Passive current output
Pa/Sa	C	Active pulse output, frequency output, status output or threshold detector (parameterizable)
PP/SP	E	Passive pulse output, frequency output, status output or threshold detector (parameterized)
That	G	Active Order Input
CP	K	Passive command input
–	8	No additional modules installed
–	0	No additional modules possible

Versions: Configurable inputs and outputs

The shaded boxes refer to unassigned or unused connection terminals. The table contains only the last characters of the CG number.

[1] Function change by reconnection – [2] Configurable

N° CG	A+	A	A-	B	B-	C	C-	D	D-
Basic I/O (typical)									
1 0 0	Passive IP + HART®[1]			Sp/Cp Passive[2]		Passive Sp		Passive PP/Sp[2]	
	Ia + HART® active [1]								
Modular I/O (optional)									
4 _ _	2 optional modules for A + B terminals					Ia + HART® active		Pa / Sa active [2]	
8 _ _	2 optional modules for A + B terminals					Passive IP + HART®		Pa / Sa active [2]	