

Q.Sonic[®]plus

Multi-path ultrasonic gas meter
for custody transfer measurement

Applications

- Custody transfer measurement of natural gas
- Gas exploration, transmission and distribution

Brief information

The ultrasonic gas flow meter Q.Sonic^{plus} is a six-path meter covered by an 'enhanced' Elster-Instromet patent, with extended functionality, bringing about new benefits for the end user, along with greater processing power that yields a lower measurement uncertainty.

The patented path configuration – a fully symmetrical layout of four swirl paths with double reflection and two single reflection paths – enables the measurement of both swirl and asymmetry, resulting in hitherto unequalled profile recognition and diagnostic possibilities.

Another innovation of the Q.Sonic^{plus} is that it can be equipped with an internal pressure and temperature measurement function. This means that the device measures both the gas pressure and temperature of the measuring tube. On the one hand, these measurements allow for a more accurate calculation of the Reynolds number for the flow profile analysis and on the other, they can be used to correct the meter body diameter and path geometry. This is useful if the process conditions differ massively from the conditions during the calibration process since both high pressure and high temperatures result in an increase in the tube cross-section and a change in path lengths and angles.

The electronics unit is a completely redeveloped modular hardware and software platform, which will be used in many Elster-Instromet devices in the future. It also provides sufficient computing power reserve to meet future requirements. The real-time operating system used in the device, INTEGRITY from Green Hills Software, is regarded as one of the most secure and reliable systems in the world.

The electronics are located in a flame-proof housing (Ex-d) with a separate connection compartment for field wiring. Thanks to its modular hardware design with a free slot, the device is also prepared to tackle future requirements. For user operation the system is equipped with a graphical user interface with touch screen functionality.

The Q.Sonic^{plus} is supplied with SonicExplorer, an all-new PC software package for configuration, diagnostics and health care.

One of the unique features of SonicExplorer is the "Create Customer Service Pack" function. SonicExplorer collects a short log of the entire state of the ultrasonic flow meter including the device configuration, a present diagnostic snapshot, a pass/fail report, all diagnostic values as well as analyses of all acoustic signals and the noise spectrum. This information is sent to the Elster-Instromet support team for detailed investigation so that the on-site service engineer can be given efficient support.



Main features

- 6-path reflective technology
- Sizes 3" to 56" (DN 80 to DN 1400)
- Pressure ratings ANSI class 150 to 900 PN on request
- All-metal-encapsulated intrinsically safe transducers
- Flow profile detection with swirl and asymmetry measurement
- No moving parts
- No pressure drop
- Bi-directional measurement
- SonicExplorer[®] PC software for configuration, diagnostics and health care
- OIML R137-1 compliant
- AGA 9 compliant
- MID approved

Options

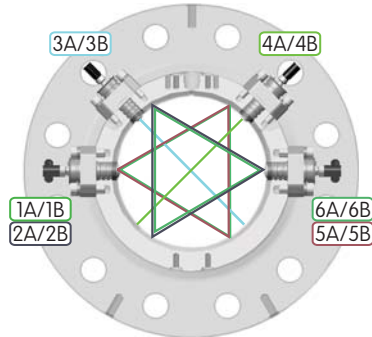
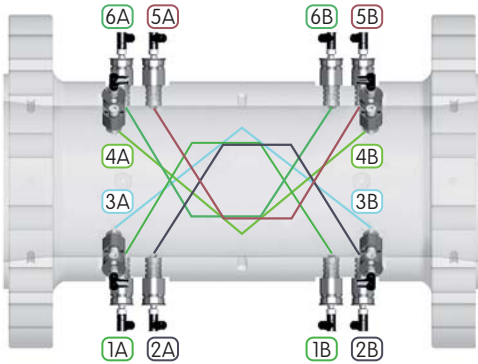
- VDSL modem for high-speed communication (TCP/IP)
- Pressure and temperature sensors
- Retraction tool for transducer exchange 'under pressure'

Path configuration

The Q.Sonic^{plus} uses two pairs of double and two single reflection paths.

Taking the mean value of both pairs will result in a symmetrically weighted measurement.

The subtraction of the paired paths provides an indication of asymmetric flow along the mirror plane of the paths as an additional diagnostic feature.



Transducer path

Path No.	Path type
1A / 1B	Swirl path (B1-CW *)
2A / 2B	Swirl path (B1-CCW**)
3A / 3B	Axial path (A1)
4A / 4B	Axial path (A2)
5A / 5B	Swirl path (B2-CW)
6A / 6B	Swirl path (B2-CCW)

* clockwise

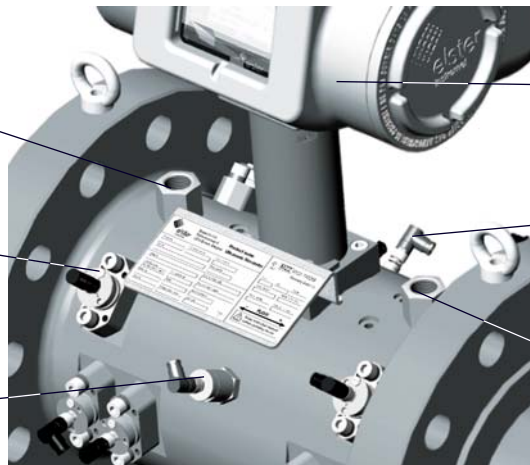
** counter-clockwise

Components on the meter body

Pressure connection point for external transmitter

Transducer with mounting plate, prepared for retraction under pressure

Optional pressure sensor for geometry correction and line density estimation (profile correction)



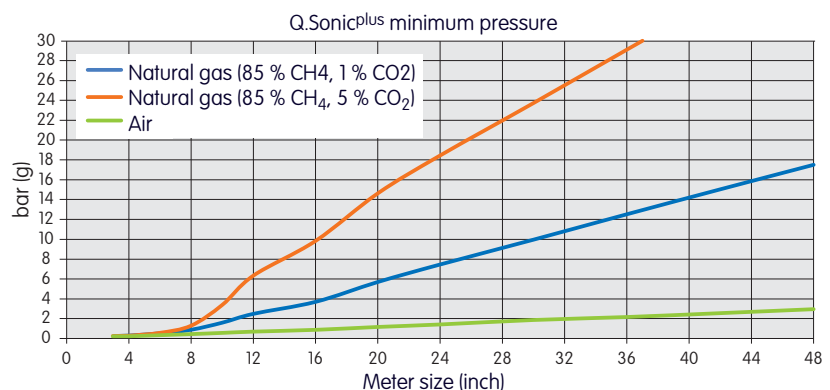
Signal processing unit (SPU)

Optional temperature sensor for meter body temperature

Second pressure connection point

Ultrasonic transducers model NG

The transducers are all-metal encapsulated with titanium, which offers a smooth surface to minimize contamination. The ultrasonic frequency of 200 kHz ensures a good balance between resolution and attenuation/propagation of the signal.



Signal processing unit (SPU) series 6

The SPU electronic resides in a flame-proof cast aluminium alloy housing with a separate compartment for the terminal connections. The boards are mounted in a card cage with one free slot for future extensions.

A colour graphic screen with 7 touch-sensitive sections allows easy operation by using a menu structure to access the data. Thanks to the built-in web server, this can

also be done remotely when a network connection is available.

The heart of the system is the EnCore with up to 16 GB of data memory.

Diagnostic and self-checking functions in conjunction with a flexible, user-configurable data archive and an event list allow a detailed analysis of the meter's performance and the metering situation at any time.



Flow ranges											
Type	Size		Flange connection		Spool diameter		Internal diameter [mm]	Flow [m ³ /h]			Turndown
	[Inch]	DN	ANSI schedule	DIN	ANSI flange max ID [mm]	DIN flange max ID [mm]		Q _{min}	Q _I	Q _{max}	
Reduced bore Fixed inner diameter	3	80	STD - XS XS - 100	2633 - 2635	77.90 74.00	82.50	73 70	11 10	70 65	700 650	64 65
	4	100	STD - XS XS - 100	2633 - 2635	102.30 97.00	107.10	97 90	13 11	110 100	1100 1000	85 91
	6	150	STD - XS XS - 120	2633 - 2635	154.10 146.30	159.30	146 139	18 16	225 200	2250 2000	125 125
	8	200	STD - XS XS - 120	2632 - 2635	206.40 195.00	207.30	190 180	30 27	400 350	4000 3500	133 130
	10	250	STD - 80 80 - 120	2632 - 2635	260.30 243.00	260.40	240 230	48 44	590 540	5900 5400	123 123
	12	300	30 - 60 60 - 100	2632 - 2635	307.00 295.00	309.70	295 280	73 66	860 780	8600 7800	118 118
	14	350	30 - 60 60 - 100	2632 - 2635	336.50 325.00	341.40	325 305	85 75	1000 900	10000 9000	118 120
	16	400	30 - 60 60 - 100	2632 - 2635	387.50 373.00	392.20	370 350	115 100	1300 1150	13000 11500	113 115
Full bore Customized	18	450	STD 120	n/a			max. 441 min. 387	165 120	1800 1350	18000 13500	109 113
	20	500	STD 120	2632 2635			max. 489 min. 432	200 160	2100 1600	21000 16000	105 100
	24	600	STD 120	2632 2634			max. 591 min. 532	295 240	3000 2400	30000 24000	102 100
	26	650	STD 120	n/a			max. 622 min. 572	330 275	3300 2750	33000 27500	100 100
	30	750	STD 120	n/a			max. 737 min. 660	460 370	4600 3700	46000 37000	100 100
	36	900	STD 120	2632 2634			max. 889 min. 787	670 525	6700 5250	67000 52500	100 100
	42	1050	STD 120	n/a			max. 1041 min. 940	920 750	8300 6750	83000 67500	90 90
	48	1200	STD 120	2632 2633			max. 1194 min. 1092	1200 1000	11000 9100	110000 91000	92 91
	56	1400	STD 120	2632 2633			max. 1397 min. 1372	1650 1600	15000 14300	150000 143000	91 89

For MID approved sizes and flow ranges, please also refer to the latest EC Type- examination Certificate T10335

SonicExplorer®

Windows-based software package for the Q.Sonicplus for on-site and remote use. SonicExplorer is a tool that allows the health and performance of the device to be determined in situ so that informed decisions can be made in respect of maintenance or other tasks related to the ultrasonic flow meter.

Function overview:

- Meter data base
- Configuration, setting and documentation
- Diagnostics
- Health care reporting
- Customer service pack (automated collection of relevant data for off-site analysis)



Technical data	
Measurement principle	Ultrasonic transit time measurement
Sizes	3" to 56" (DN 80 to DN 1400)
Pressure range	1 barg to 150 barg, min pressure depends on size and gas composition
Process temperature range	Standard: -40 °C to +80 °C Extended: -50 °C to +80 °C MID: -40 °C to +55 °C
Ambient temperature range	Standard: -40 °C to +60 °C Extended: -50 °C to +60 °C MID: -40 °C to +55 °C
Repeatability	0.05% ¹⁾
Typical uncertainty	0.5% of reading after dry calibration ²⁾ 0.2% of reading after flow calibration ²⁾ 0.1% of reading after flow calibration and linearization ²⁾
Body materials	Low-temperature carbon steel ≤ 12": ASTM A350-LF2 Cl.1 ≥ 14": ASTM A333 grade 6 / ASTM A350-LF2 Cl.1 Stainless steel ≤ 12": ASTM A182-F316 ≥ 14": ASTM A312-TP316L / ASTM A182-F316L
Material certificate	3.1
Body construction details	≤ 16": reduced bore, tapering angle 7° ≥ 18": full bore
Pressure reference points	½" NPT (G½ on request)
Electronic enclosure material	Cast aluminium alloy. Optional stainless steel.
Power supply	Nominal 24 V DC (18 – 30 V DC), 10 – 20 W (depending on installed optional cards)
Local display	GUI, 4.3" (10.9 cm) widescreen graphical colour display with 7 capacitive soft keys (touch), LEDs for power and status
Interfaces	- 2 serial ports (RS 232/485 configurable) - 1 Ethernet port / high speed VDSL (VDSL option replaces Ethernet port) - 2 frequency outputs, 0 to 3 kHz - 2 digital outputs ³⁾ - 2 analogue outputs ³⁾ - 1 USB port (device)
Communications protocol	- Modbus (ASCII, RTU, TCP/IP) - UNIFORM - UNIFORM Series IV 4-path compatibility mode - MMS (Manufacturing Message Specification) - Built-in web server
Metrological approval	MID T10335 (optional)
MID Accuracy Class	Class 1.0
Hazardous area approvals	ATEX: Ex d ia [ia] IIB+H2 T6 Gb IECEx: Ex d ia [ia] IIB+H2 T6 Gb FM: Class I, Division 1, Group A to D T6 (pending) CSA: Class I, Division 1, Group B to D T6 / Ex d [ia] IIC T6 (pending)
Ingress protection	IP 66 / NEMA 4X

¹⁾ Q_t to Q_{max}

²⁾ Q_t to Q_{max} with straight inlet/outlet spool of 10D/3D

³⁾ Analogue outputs and digital outputs sharing the terminal clamps

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QSonicsPlus EN02

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