Evaluation Certificate

Number **TC8388** revision 22
Project number 3469548

Issued by: NMi Certin B.V.

In accordance with:
- WELMEC 8.8, 2017 "Guide on the General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments";
- WELMEC 7.2, 2015: Software Guide;
- European Standard EN 12405-1:2005+A2:2010 "Gas meters – Conversion devices – Part 1: volume conversion".

Producer:
ABB B.V.
Achtseweg Zuid 151A
5651 GW Eindhoven
The Netherlands

Part: A **calculating and indicating device**, intended to be used as part of an electronic gas-volume conversion device (EVCD).

Producers Mark	:	ABB
Type	:	Flow-X/M Flow-X/P Flow-X/S Flow-X/R Flow-X/K
Conversion principle	:	PTZ
Device type		2 (separate transmitters)
Ambient temperature range	:	see § 1.1 of the description
Designed for	:	non-condensing humidity
Environment classes	:	M2 / E2

The intended location for the instrument is closed.

Further properties and test results are described in the annexes:
- Description TC8388 revision 22;
- Documentation folder TC8388-10.

Initial issued: 29 April 2013

Remark:
- This revision replaces the previous revision.
- The documentation folder is not changed.

Issuing Authority: **NMi Certin B.V., Notified Body number 0122**
8 December 2023

Certification Board

NMi Certin B.V.
Thijsseweg 11
2629 JA Delft
The Netherlands
T +31 88 636 2332
certin@nmi.nl
www.nmi.nl

Description

1 General information on the calculating and indicating device

All properties of the calculating and indicating device, whether mentioned or not, shall not be in conflict with the legislation.

This Evaluation Certificate is the positive result of the applied voluntary, modular approach, for a component of a measuring instrument, as described in WELMEC 8.8, 2017.

The complete measuring instrument must be covered by relevant metrological certification that is valid in the country where the instrument is put into use.

The device is a so-called type 2 device, with external separate transducers for pressure and temperature (PTZ), and optional gas compositions.

The Flow-X series of flow computers is based on a modular concept where Flow-X/M module is used for connecting one or two meters per stream. These modules can be installed in a number of different enclosures. Each module has its own LCD display.

Flow-X/M

The Flow-X/P is a Panel mounted enclosure that can contain up to four Flow-X/M flow modules and additional station module with a 7" multi -lingual colour touch-screen and additional serial (3x) and Ethernet interfaces (2x). This Flow-X/P enclosure can be used in both horizontal and vertical position. Field connections are available in standard 37 -pin and 9 -pin D -Sub type connectors at the rear.

Description

Flow-X/P

The Flow-X/S is a DIN rail mountable enclosure that can contain one Flow-X/M flow module. Field connections are available in direct screw terminals. Interfaces include dual Ethernet with built -in web server via RJ45 connectors. The measured and calculated data is available on the graphical LCD display of the Flow-X/M flow module. The Flow-X/S may be mounted in 3 ways: Horizontally on Din -rail, vertically on Din –rail or Wall mounted.

Flow-X/S

The Flow-X/R is a 19" rack mountable enclosure that can accommodate up to eight Flow-X/M flow modules. For each module it provides a 24 Vdc power supply connector and two 37-pin D-Sub type connectors at the top and 2 Ethernet ports at the bottom. The measured and calculated data of each Flow-X/M flow module is available on its graphic LCD display.

Description

Flow-X/R

The Flow-X/K is a compact DIN rail mountable enclosure that can contain one Flow-X/M flow module.
The enclosure has a 24 VDC power supply connection and 2 Ethernet ports at the bottom and two 37-pin D-sub type connectors at the top. The measured and calculated data of the Flow-X/M module is available on its graphical LCD display.

Flow-X/K

1.1 Essential parts

1.1.1 Flow-X/M

Part	Part number	Documentation	Ambient temperature range
Digital board	6557-0700-1206	8388/0-04	+5 °C / +55 °C
	6557-0700-1207	8388/0-05	
	6557-0700-1208	8388/0-06	
	6557-0700-1209	8388/0-06	
	6557-0700-1210	8388/2-02	
	6557-0700-1211	8388/2-02	
	xx-211-006	8388/10-01; 8388/15-01	
	xx-211-007	8388/16-03; 8388/16-04	-25 °C / +55 °C
	xx-211-008	8388/18-03; 8388/18-04	
Analog board	6557-0700-1305	8388/0-01	+5 °C / +55 °C
	6557-0700-1308	8388/0-02	
	6557-0700-1309	8388/0-03	
	6557-0700-1310	8388/2-01	
	xx-212-004 xx-212-003	8388/10-03; 8388/15-02	
	xx-212-005	8388/16-01; 8388/16-02	-25 °C / +55 °C
	xx-212-006	8388/18-01; 8388/18-02 8388/21-01	
Power board	6557-0800-8202	8388/0-08	+5 °C / +55 °C
	6557-0800-8203	8388/0-09	
	6557-0800-8204	8388/2-03	
	xx-213-003	8388/10-05; 8388/15-03	
	xx-213-004	8388/16-07; 8388/16-08	-25 °C / +55 °C
Display board	6557-0800-6504	8388/0-07	+5 °C / +55 °C
	xx-214-003	8388/10-07; 8388/15-04	
	6557-0800-6505	8388/11-01; 8388/15-05	
	xx-214-004	8388/16-05; 8388/16-06	-25 °C / +55 °C
SD Card Adapter board (optional)	6557-1500-0000	8388/7-01	+5 °C / +55 °C
	6557-1500-0001	8388/8-01	

In the part number x can represent any character.
The Flow X/M with Part Number starting with '6557-' may contain a normal SD card or the SD Card Adapter board with micro SD card.

1.1.2 Flow-X/P

Part	Part number	Documentation	Ambient temperature range
Backplane panel	6557-0800-2904	8388/0-13	+5 °C / +55 °C
	6557-0800-2905	8388/0-14	
	xx-215-003	8388/10-09; 8388/15-06	-25 °C / +55 °C
Connector panel	6557-0800-2803	8388/0-15	+5 °C / +55 °C
	6557-0800-2804	8388/0-16	
	xx-217-004	8388/10-11; 8388/15-07	
	xx-217-005	8388/16-11; 8388/16-12	-25 °C / +55 °C

Part	Part number	Documentation	Ambient temperature range
Flow-X/P type 1: GUI module Touchscreen controller	6557-0700-1402	8388/0-10	+5 °C / +55 °C
	6557-0700-1407	8388/0-11	
	6557-0700-1408	8388/0-12	
	6557-0700-1409	8388/2-04	
	6557-0700-1410	8388/2-04	
Flow-X/P type 2: display interconnection board	xx-219-004	8388/10-13; 8388/15-08	+5 °C / +55 °C
	xx-219-005	8388/16-09; 8388/16-10	-25 °C / +55 °C
Flow-X/P type 2: GUI board *)	xx-221-006	8388/16-13; 8388/16-14 8388/16-15	+5 °C / +55 °C
Digital board	xx-211-006	8388/10-01; 8388/15-01	+5 °C / +55 °C
	xx-211-007	8388/16-03; 8388/16-04	-25 °C / +55 °C
	xx-211-008	8388/18-03; 8388/18-04	
7" touch screen display	ST070WSBE	8388/16-16; 8388/18-05	-25 °C / +55 °C
Power board	6557-0800-8202	8388/0-08	+5 °C / +55 °C
	6557-0800-8203	8388/0-09	
	6557-0800-8204	8388/2-03	
	xx-213-003	8388/10-05; 8388/15-03	
	xx-213-004	8388/16-07; 8388/16-08	-25 °C / +55 °C
SD Card Adapter board (optional)	6557-1500-0000	8388/7-01	+5 °C / +55 °C
	6557-1500-0001	8388/8-01	

In the part number x can represent any character.
*) Flow-X/P may contain a GUI board or a digital board.
The Flow-X/P enclosure may contain up to four Flow-X/M flow modules. Also the Flow X/P with Part Number starting with '6557-' may contain a normal SD card or the SD Card Adapter board with micro SD card.

1.1.3 Flow-X/S

Part	Part number	Documentation	Ambient temperature range
Back plane	6557-0800-4901	8388/0-17	+5 °C / +55 °C
	6557-0800-4902	8388/0-18	
	xx-225-001	8388/18-06; 8388/18-07	-25 °C / +55 °C

The Flow-X/S enclosure contains one Flow-X/M flow module.

1.1.4 Flow-X/R

Part	Part number	Documentation	Ambient temperature range
Back plane	6557-0800-8401	8388/0-19	+5 °C / +55 °C

The Flow-X/R enclosure may contain up to eight Flow-X/M flow modules.

1.1.5 Flow-X/K

Part	Part number	Documentation	Ambient temperature range
Back plane	xx-226-000	8388/18-08; 8388/18-09	+5 °C / +55 °C
	xx-226-001	8388/18-10; 8388/18-11	-25 °C / +55 °C

The Flow-X/K enclosure contains one Flow-X/M flow module.

1.2 Essential characteristics

1.2.1 Calculation of volumetric and / or mass flow totals from volume impulses and / or mass impulses and / or serial data (RS232, RS485 or Ethernet).
The calculation and indication of cumulative gross volume, meter volume, corrected volume, base volume and / or mass, for station and each run, and for both forward and reverse streams, are under legal control. The correction of the meter errors is under legal control.

1.2.2 The validity of serial communication is always checked by determining and comparing the CRC of received messages and in some cases additionally by checking if the received value is between valid limits.
The validity of Modbus messages is checked by comparing the received checksum with the calculated checksum of received bytes.

Modbus ASCII mode and RTU mode use different methods to determine the checksum.
Modbus ASCII uses LRC (Longitudinal Redundancy Check) to generate the checksum.
Modbus RTU uses CRC (Cyclic Redundancy Check) to generate the checksum.
The checksum of HART messages is the result of the XOR function of all bytes in the message.

1.2.3 Software specification (refer to WELMEC 7.2):

- Software type P;
- Risk Class C;
- Extension L, T, S and I;
  Extension D is not applicable.

Software part	Software version	Software checksum	Remarks
Firmware	Software checksum acts as software version indication.	B4A0633E	Core calculation, reporting and communication engine
		7E40F17AE	
		5B6AEFE1	
		63CBC842	
		A58377C1	
		4581A774	
		651B2653	
		A3DDC66F	
		5ADFEAA2	
		C587C032	
		2F494636	
		11143FE8	
		1AAD4807	
	1.9.0.7041	47E8CD2F	
	2.1.1.9285	712C1E6B	
	2.1.2.10217	0B29E8A2	
	2.1.3.10452	0B29E8A2	

Software part	Software version	Software checksum	Remarks
	2.1.4.12541	0B29E8A2	
	3.0.0.10988	A9B2B7D9	
	3.1.1.12149	13D0B0C5	
	3.1.3.12952	13D0B0C5	
	3.2.0.13638	2555BE9D	
	3.2.1.13738	2555BE9D	
	3.2.3.14630	2555BE9D	
	3.2.4.14771	2555BE9D	
	3.2.6.16452	37B727D5	
	3.2.8.1790	37B727D5	
FPGA	1357-22-1-2009		Field-Programmable Gate Array for X/M
	1422-21-2-2012		
	1350-29-10-2009		
	0879.914A.E820.BBF1	20D4.7372.2349.0DFB	
	0879.914A.E820.BBF1	6B1A.43BD.C7C8.F1D5	
	0000.0000.9367.6641	0000.0000.707E.0117	
	0000.0000.4486.EE18	0000.0000.5AF4.9B91	
	0000.0000.4486.EE18	0000.0000.354A.32F1	
	0000.0000.2244.331C	0000.0000.00E4.231B	
	0000.0000.2244.331C	0000.0000.8F26.C78C	
	0000.0000.2244.331C	0000.0000.BE45.0762	
	0000.0000.2244.331C	0000.0000.38D2.DDE6	
Add-on Programs	1.0.0.3		Boot loader and other auxiliary programs
	1.0.0.1107		
	1.0.0.1108		
	1.0.0.1127		
	1.0.0.1151		
	1.0.0.1157		
	1.0.0.1166		
	1.0.0.1167		
	1.0.0.1169		
	1.0.0.1170		
	1.1.1.6855		
	1.1.2.7027		Boot loader and other auxiliary programs
	2.0.0.8200		
	2.3.0.11844 Label: Oct 07 2019 16:24:57		
	2.4.0.12900 Label: Apr 14 2020 13:03:41		
Operating system	16.53 (First release)		Real-time operating system
	1.55		
	2.57		
	4.60		
	6.62		
	9.66		
	9.68		
	10.70		
	14.74		
	17.77		

Software part	Software version	Software checksum	Remarks
	17.78		
	19.81		
	20.82		
	21.83		
	1.1 (release 20160425)		-> Version with new hardware and new OS.
	1.1 (release 20180327)		
	1.1 (release 20190625)		
	2.0 3175		
	2.0 3186		
	2.0 3423		
	2.0 3753		
	2.0 4121		
	2.0 4616		
Gas application	1.0.4	9D263BD87	
	1.0.5	AB6CD0813	
	1.0.6	B8105CA80	
	1.2.2	72F8463D2	
	1.2.3	93D121AC0	
	1.2.3a	9413483E1	
	1.2.3b	959D32A00	
	1.3.0	93D121AC0	
	1.3.2	CE1F76217	
Gas application	1.3.2a	CFEB87157	
	1.4.0	D1723F20B	
	1.4.1	DFD489449	
	1.4.3	ECDD94451	
	2.0.0	FE51F482B	
	2.1.0	10B99759D0	
	2.1.0.x	10B99759D0	
	2.2.0.x	FDCF1662D	
	2.3.0.x	E33FB1F61 D2850CA21 215D6456A8	
	3.0.0.x	139A69A4FE	
	3.0.0.x	181F09C1D7	
	3.0.0.x	210A06EE73	

Remarks:
The 'x' in the software version is legally not relevant and can be any number.
The electronic gas-volume conversion device may be equipped with an application that allows connection of two pressure transmitters, for calculating and presenting the average value of the two measured pressure values (versions 1.2.3a, 1.2.3b and 1.3.2a).
The maximum allowed deviation between the two measured pressure values is preset.
If the deviation is larger than the preset value, in version 1.2.3a the keypad pressure value is used, whereas in versions 1.2.3b and 1.3.2a the measured value of transmitter 1 is used.

The electronic gas-volume conversion device may be equipped with an application that allows connection of two temperature transmitters, for calculating and presenting the average value of the two measured temperature values (software versions 1.2.3a, 1.2.3b and 1.3.2a).

The maximum allowed deviation between the two measured temperature values is preset. If the deviation is larger than the preset value, in version 1.2.3a the keypad temperature value is used, whereas in versions 1.2.3b and 1.3.2a the measured value of transmitter 1 is used.

The version number and identification can be inspected on the local display by selecting display 'Metrological', 'Software version' or 'Metrological/version'.

1.2.4 Conversion

The conversion is performed according to the following formula as stated below:

$$V_b = V \times \frac{p_{abs}}{p_b} \times \frac{273{,}15 + t_b}{273{,}15 + t} \times \frac{Z_b}{Z}$$

Symbol	Represented quantity	Unity
V_b	volume at base conditions	m^3
V_c	volume corrected for meter factor	m^3
p_{abs}	absolute pressure at measurement conditions	bar
p_b	absolute pressure at base conditions	bar
t	gas temperature at measurement conditions	°C
t_b	temperature at base conditions	°C
Z_b	compression factor at base conditions	-
Z	compression factor at measurement conditions	-

1.2.5 Compression

The compression factor Z_b/Z can be programmed in the EVCD as a fixed value or it can be calculated on the basis of the following algorithms:

- SGERG91 (ISO12213-3) (known parameters are mol%N2, mol%H2, Hs and d), with correction factors for Hs and d for combustion temperatures other than 25 °C and reference temperatures other than 0 °C;
- AGA8 (ISO12213-2) (complete gas analyses).
- AGA NX-19 1962 (mol%N2, mol%CO2 and specific gravity d);
- AGA NX-19 MOD – BR.KORR.3H (PTB G9 correction for higher calorific gases).
  The calculation of compressibility factor Z using NX-19 MOD + PTB G9 correction (BR.KORR.3H) compression method is valid for the following boundary conditions:
  - P_{abs} = 0 to 80 BarA;
  - T = 0 to 30 °C;
  - d = 0.554 to 0.691;
  - H_s = 39.8 to 46.2 MJ/m3;
  - Mol%N_2 = 0 to 7 %;
  - Mol%CO_2 = 0 to 2.5 %.

  Beyond the above stated boundary conditions, the NX-19 MOD + PTB G9 correction (BR.KORR.3H) compression method results in higher uncertainties.
  A 'Compressibility calculation out of range' alarm is generated by the Flow X/C in case if values beyond above stated limits are used, except for when heating values lower than 39.8 MJ/m^3 are used. For heating values lower than 39.8 MJ/m^3 the compressibility is calculated according to NX-19 MOD without the PTB G9 correction.

A gas composition can be read from an optional gas chromatograph or Calorific Value Determining Device (CVDD) or can be manually input.
In case the communication to the gas chromatograph or CVDD fails, the last good composition

before failure or a manually input override composition is used. The electronic gas-volume conversion device can be connected to 2 gas chromatographs or CVDD's. In case of a failure in one chromatograph or CVDD, the composition and the values issued from the other chromatograph or CVDD are used.

1.2.6 Gas temperature range
The temperature range is: -30 °C ≤ t ≤ +80 °C; apart from that the temperature range has to be within the working range of the algorithm used for correcting the deviation from the ideal gas law.

1.2.7 Presentation of legal data on the Flow-X/M calculating and indicating device
The legal data is presented via a special menu by pressing the arrows keys on the front panel.
The legal data is presented via a special menu 'Metrological' accessible on the touch screen (Flow-X/P) and the LCD display (Flow-X/S, Flow-X/R and Flow X/K).
The menu structure, keyboard, display and (alarm) indicators are described in the Gas metric application user manual. See documentation 8388/10-15.

1.2.8 Presentation of legal data on the front panel display of the Flow-X/P calculating and indicating device.
The legal data is presented via a special menu 'Metrological' accessible on the touch screen (Flow-X/P) and the LCD display (Flow-X/S, Flow-X/R and Flow-X/K).

The menu structure, keyboard, display and (alarm) indicators are described in the Gas metric application user manual. See documentation 8388/10-15.

1.2.9 Programming
Change of metrological parameters is protected by a programming switch (tamper switch).
For information on and the programming of the parameters see documentation T8388/10-15.
All metrological parameters are at security level 750 or higher. All parameters on security level 750 or higher are locked by the tamper switch. The definition of the security levels is under the metrological checksum.

1.2.10 Accountable alarms
The device has to be programmed such that accountable alarms will be generated if extreme values are measured by the device or if a defect is detected. Accountable alarms cause the registration of the volume at base conditions to be stopped.

Additional to the registration in the main totalizer, if there's no accountable alarm the volume at measurement conditions will be registered in the accountable totalizer, while during the alarm the volume at measurement conditions will be registered in the non-accountable totalizer.

An accountable alarm is raised if a remote transmitter is frozen.

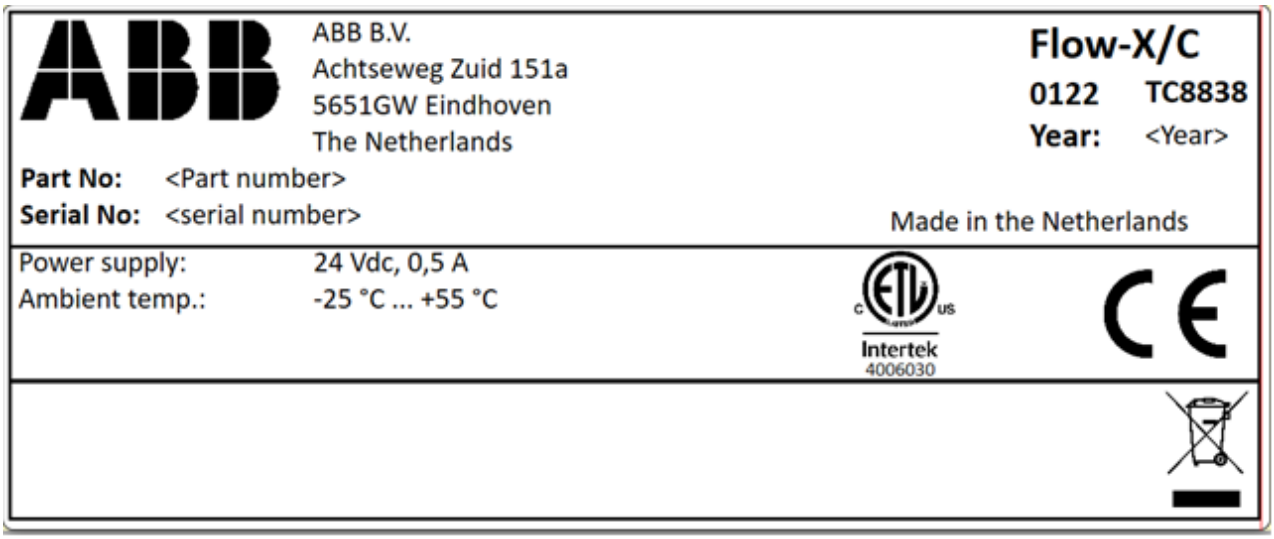
The alarm indication can be acknowledged using the "Acknowledge" button on the alarms display. However, it is not possible to clear an alarm as long as the cause of the alarm is still present.

1.3 Essential shapes

1.3.1 The name plate should bear at least the following information:
- Evaluation Certificate number TC8388;
- trademark or name of the producer;
- part number;
- serial number of the meter and year of manufacture;
- ambient temperature range;
- the volume conversion calculation formula.

The following information is mentioned on the nameplate or on the display:
- the gas temperature range;
- the gas pressure range;
- the base pressure;
- the base temperature;
- the compression algorithm; (if applicable)
- the gas properties; (if applicable)
- the parameters for gas meter error correction curve. (if applicable)

The following information is mentioned on the name plate or in the manual:
- mechanical environment class;
- electromagnetic environment class.



example of a name plate.

1.3.2 Sealing: see chapter 2A

1.3.3 An external uninterruptible power supply must be used.

1.4 Conditional parts

1.4.1 Housing
See the General Information in this Evaluation Certificate.
Metrological important parts are only accessible after breaking one or more seals.

1.5 Conditional characteristics

1.5.1 Maximum impulse input frequency
Dual impulse train: 5 kHz or 10 kHz.
Single impulse train: 10 kHz or 20 kHz.

1.5.2 Ethernet interfaces, the ethernet cable length if connected to the device should be less than 10 meters long.

1.5.3 Temperature transducer
Any temperature transducer may be used provided the following conditions are met:

- For the temperature transducer a Parts certificate has been issued by a Notified Body responsible for type examination.
- The output signal is according to the HART-protocol, it uses a standard 4-20 mA signal or the sensor is a Pt100.
- The temperature range is according to the appertaining Parts certificate; however, the temperature t must not exceed: -30 °C ≤ t ≤ +80 °C.

The temperature range must be within the working range of the algorithm used for correcting the deviation from the ideal gas law.
The electronic gas-volume conversion device may be equipped with an application that allows connection of two temperature transmitters per stream, for calculating and presenting the average value of the two measured temperature values.
In case one of the temperature transmitters fails, the calculated average temperature value is replaced by the measured temperature value of the good temperature transmitter.
One of the transmitters can be manually taken out of service for calibration purposes. In that case the measured temperature of the other transmitter is used.
If the deviation is larger than the preset deviation limit value, the flow computer can be configured to use either the value from transmitter 1, the value from transmitter 2, or the average value. Of course, the checks on the selected transmitter value(s) (not out of service, not defective, etc.) apply. Alternatively, the flow computer can be configured to regard a transmitter deviation alarm as a transmitter failure, upon which the configured transmitter fallback mode (last good value, fallback value or override value) will be used.

1.5.4 Pressure transducer
Any pressure transducer may be used provided the following conditions are met:

- For the pressure transducer a Parts certificate has been issued by a Notified Body responsible for type examination.
- The output signal must be according to a standard 4-20 mA signal or HART protocol.
- The pressure range is according to the appertaining Parts certificate; apart from that the following restrictions are valid.
- Maximum pressure does not exceed 120 bar.
- The pressure range must be within the working range of the algorithm used for correcting the deviation from the ideal gas law. On top of that the Flow-X optionally also raises an accountable alarm if the pressure drops below a configurable minimum

accountable pressure PTmin.
Note: if a gauge pressure transducer is used the constant value for the atmospheric pressure is stated on the main menu – MID page.

A gauge pressure transducer may be used if its minimum operating absolute pressure is equal to or greater than 21 bar. The electronic gas-volume conversion device may be equipped with an application that allows connection of two pressure transmitters per stream, for calculating and presenting the average value of the two measured pressure values.
In case one of the pressure transmitters fails, the calculated average pressure value is replaced by the measured pressure value of the good pressure transmitter.
One of the transmitters can be manually taken out of service for calibration purposes. In that case the measured pressure of the other transmitter is used.
If the deviation is larger than the preset deviation limit value, the flow computer can be configured to use either the value from transmitter 1, the value from transmitter 2, or the average value. Of course, the checks on the selected transmitter value(s) (not out of service, not defective, etc.) apply.
Alternatively, the flow computer can be configured to regard a transmitter deviation alarm as a transmitter failure, upon which the configured transmitter fallback mode (last good value, fallback value or override value) will be used.1.5.2.

1.5.5 Use of a gas chromatograph or Calorific Value Determining Device (optionally)
Any gas chromatograph or CVDD may be used provided the following conditions are met:

- For the gas chromatograph or CVDD a part certificate has been issued by a Notified Body responsible for type examination;
- the communication between the EVCD and the gas chromatograph or CVDD takes place through an RS232, RS485 or Ethernet interface;
- when the connection between the EVCD and gas chromatograph or CVDD is broken or when the gas chromatograph or CVDD is defective an accountable alarm is raised.

The user shall account for all Weights & Measures parameter settings. For detailed parameter information see the Gas Metric Application user manual documentation 8388/10-15.

Menu	**Parameter**	**Value**
Common settings		
Configuration, Overall setup, Common settings	Disable totals if meter is inactive	No
	MID compliance	Enabled
	Calculation out of range alarms	Enabled
Constants		
Configuration, Overall setup, Constants	Atmospheric pressure	1)
	Molar mass of air	1)
	Base density of air	1)
	Reference pressure	1)
	Reference temperature	1)
Metrological		
Configuration, Metrological	Minimum accountable flow rate	1)
	Maximum accountable flow rate	1)
	Low flow accountable alarm delay	1)
	Minimum accountable temperature	1)
	Maximum accountable temperature	1)
	Minimum accountable pressure	1)
	Maximum accountable pressure	1)

Menu	Parameter	Value
Run setup		
Configuration, Run, Run setup	Meter device type	1)
	Single or dual meter temperature transmitter(s)	1)
	Single or dual meter pressure transmitter(s)	1)
	Observed density input type	1)
	Density temperature input type	1)
	Density pressure input type	1)
	Base density input type	1)
	Specific gravity input type	1)
	Relative density input type	1)
	Gas composition input type	1)
Pulse input		
Configuration, Run, Flow meter, Pulse input (if applicable)	Type of pulse input (single or dual pulse)	1)
	Pulse input quantity type	1)
	Dual pulse fidelity level	1)
	Meter active threshold frequency	1)
Smart meter		
Configuration, Run, Flow meter, Smart meter (if applicable)	Smart meter input type	1)
	Smart meter internal device number	1)
	Use flow rate or total	1)
	Pulse is primary	1)
	Fallback to secondary flow signal	1)
	Meter active threshold flow rate	1)
Meter K-factor		
Configuration, Run, Flow meter, Meter K-factor (if applicable)	K-factor curve enabled	1)
	Curve extrapolation allowed	1)
	Fwd nominal K-factor	1)
	Rev nominal K-factor	1)
	Fwd K-factor curve (max. 12 points)	1)
	Rev K-factor curve (max. 12 points)	1)
Meter factor		
Configuration, Run, Flow meter, Meter factor	Type of input value (meter factor or meter error)	1)
	Meter factor / error curve enabled	1)
	Curve extrapolation allowed	1)
	Fwd nominal meter factor / error	1)
	Rev nominal meter factor / error	1)
	Fwd meter factor curve (max. 12 points)	1)
	Rev meter factor / error curve (max. 12 points)	1)
Data valid input		
Configuration, Run, Flow meter, Data valid input	Data valid input type	1)
	Data valid digital input module	1)
	Data valid digital input channel	1)

Menu	Parameter	Value
Meter body correction		
Configuration, Run, Flow meter, Meter body correction (if applicable)	Meter body correction enabled	1)
	Body correction reference temperature	1)
	Body correction reference pressure	1)
	Cubical temperature expansion coefficient	1)
	Cubical pressure expansion coefficient	1)
Temperature		
Configuration, Run / Station, Temperature (for each individual temperature transmitter)	Temperature input type	1)
	Analog / PT100 input module	1)
	Analog / PT100 input channel	1)
	HART internal device number	1)
	HART variable	1)
	HART to analog fallback	1)
	Fallback type	1)
	Fallback value	1)
	Dual transmitter mode	1)
	Dual transmitter deviation limit	1)
	Dual transmitter deviation fallback mode	1)
Pressure		
Configuration, Run / Station, Pressure (for each individual pressure transmitter)	Pressure input type	1)
	Pressure input units (gauge or absolute)	1)
	Analog input module	1)
	Analog input channel	1)
	HART internal device number	1)
	HART variable	1)
	HART to analog fallback	1)
	Fallback type	1)
	Fallback value	1)
	Dual transmitter mode	1)
	Dual transmitter deviation limit	1)
	Dual transmitter deviation fallback mode	1)
Observed density		
Configuration, Run / Station, Density, Observed density (if applicable)	Observed density input type	1)
	Analog input module	1)
	Analog input channel	1)
	HART internal device number	1)
	HART variable	1)
	HART to analog fallback	1)
Base density		
Configuration, Run / Station, Density, Base density (if applicable)	Fallback type	1)
	Fallback value	1)

Menu	Parameter	Value
Densitometer setup		
Configuration, Run / Station, Density, Densitometer setup (if applicable; for each individual densitometer)	Densitometer type	1)
	Time period input module	1)
	Time period input number	1)
	Density correction factor	1)
Densitometer constants		
Configuration, Run / Station, Density, Densitometer constants. (if applicable; for each individual densitometer)	Densitometer constants as given on the appertaining calibration certificate (Solartron / Sarasota / UGC)	1)
Gas composition		
Configuration, Run / Station, Gas properties, Gas composition	Composition fallback type	1)
	Composition fail on limit alarm	1)
	Neo-Pentane mode	1)
	Live composition split mode	1)
	Live composition split percentages	1)
	Override composition split mode	1)
	Override composition split percentage	1)
Calculation setup		
Configuration, Run / Station, Gas properties, Calculation setup	Compressibility calculation method	1)
	Meter compressibility override value	1)
	Density compressibility override value	1)
	Base compressibility calculation method	1)
	Base compressibility override value	1)
	Molar mass calculation method	1)
	Molar mass override value	1)
	SGERG input method	1)
	SGERG reference conditions	1)
	ISO6976-1995 reference conditions	1)
	ISO6976-1995 molar mass calculation method	1)
	ISO6976-1983 metering reference temp.	1)
	ISO6976-1983 combustion ref. temp.	1)
CO2 input		
Configuration, Run / Station, Gas properties, CO2 input (SGERG only)	Input type	1)
	Analog input module	1)
	Analog input channel	1)
	HART internal device number	1)
	HART variable	1)
	HART to analog fallback	1)
	Fallback type	1)
	Fallback value	1)

Menu	Parameter	Value
N2 input		
Configuration, Run / Station, Gas properties, N2 input (SGERG only)	Input type	1)
	Analog input module	1)
	Analog input channel	1)
	HART internal device number	1)
	HART variable	1)
	HART to analog fallback	1)
	Fallback type	1)
	Fallback value	1)
H2 input		
Configuration, Run / Station, Gas properties, H2 input (SGERG only)	Input type	1)
	Analog input module	1)
	Analog input channel	1)
	HART internal device number	1)
	HART variable	1)
	HART to analog fallback	1)
	Fallback type	1)
	Fallback value	1)
Analog inputs		
IO, Module, Configuration, Analog inputs (for each individual analog input)	Input type	1)
	Averaging method	1)
	Full scale	1)
	Zero scale	1)
	High fail limit	1)
	Low fail limit	1)
PT100 inputs		
IO, Module, Configuration, PT100 inputs (for each individual PT100 input)	Input type	1)
	High fail limit	1)
	Low fail limit	1)
Pulse input		
IO, Module, Configuration, Pulse input	Pulse input A channel	1)
	Pulse input B channel	1)
	Dual pulse fidelity level	1)
	Fall back to secondary pulse	1)
	Error pulses limit	1)
	Good pulses reset limit	1)
	Error rate limit	1)
	Dual pulse fidelity threshold	1)
Time period inputs		
IO, Module, Configuration, Time period inputs (for each individual time period input)	Time period input channel	1)

Menu	Parameter	Value
Calibration		
IO, Module, Calibration, Analog inputs	Selected analog input	None
	Freeze all analog and PT100 inputs	Disabled
IO, Module, Calibration, PT100 inputs	Selected PT100 input	None
	Freeze all analog and PT100 inputs	Disabled
Calibration, HART inputs	HART freeze mode	Off
	HART value offsets	Correct values
Forces		
IO, Module, Force IO, Analog inputs (for each individual analog input)	Force mode	Disabled
IO, Module, Force IO, PT100 inputs (for each individual PT100 input)	Force mode	Disabled
IO, Module, Force IO, Digital IO (for each individual digital IO)	Force mode	Normal
IO, Module, Force IO, Pulse input	Force mode	Disabled
IO, Module, Force IO, Time period inputs (for each individual time period input)	Force mode	Disabled
Communication, HART transmitters (for each individual HART transmitter)	Force mode	Disabled
Communication, flow meter	Force mode	Disabled
Maintenance mode		
Maintenance mode	Maintenance mode	Disabled

1.6 Non-essential characteristics

1.6.1 Output lines (not applicable to all versions).
1.6.2 Impulse outputs; for version 2 products only.
1.6.3 4 … 20 mA output

1.6.4 Totalizers
For station and each run and for both forward and reverse streams the calculating and indicating device supports the following totalizers.

Cumulative totalizers
- Cumulative number of impulses (does not apply to station totalizers)
- Cumulative number of error impulses (does not apply to station totalizers)
- Cumulative energy
- Cumulative accountable energy
- Cumulative non-accountable indicated (volume or mass, does not apply to station totalizers)
- Cumulative non-accountable gross volume
- Cumulative non- accountable base volume
- Cumulative non-accountable mass
- Cumulative non-accountable energy

Period totalizers
- Current [xxx] indicated (volume or mass, does not apply to station totalizers)
- Current [xxx] number of impulses (does not apply to station totalizers)
- Current [xxx] number of error impulses (does not apply to station totalizers)
- Current [xxx] gross volume
- Current [xxx] base volume
- Current [xxx] mass
- Current [xxx] energy
- Current [xxx] accountable indicated (volume or mass, does not apply to station totalizers)
- Current [xxx] accountable gross volume
- Current [xxx] accountable base volume
- Current [xxx] accountable mass
- Current [xxx] accountable energy
- Current [xxx] non-accountable indicated (volume or mass, does not apply to station totalizers)
- Current [xxx] non-accountable gross volume
- Current [xxx] non-accountable base volume
- Current [xxx] non-accountable mass
- Current [xxx] non-accountable energy
- Previous [xxx] indicated (volume or mass, does not apply to station totalizers)
- Previous [xxx] number of impulses (does not apply to station totalizers)
- Previous [xxx] number of error impulses (does not apply to station totalizers)
- Previous [xxx] gross volume
- Previous [xxx] base volume
- Previous [xxx] mass
- Previous [xxx] energy
- Previous [xxx] accountable indicated (volume or mass, does not apply to station totalizers)
- Previous [xxx] accountable gross volume
- Previous [xxx] accountable base volume
- Previous [xxx] accountable mass

- Previous [xxx] accountable energy
- Previous [xxx] non-accountable indicated (volume or mass, does not apply to station totalizers)
- Previous [xxx] non-accountable gross volume
- Previous [xxx] non-accountable base volume
- Previous [xxx] non-accountable mass
- Previous [xxx] non-accountable energy

With [xxx] either 'hour', 'hour open', 'day', 'day open', 'period A', 'period A open', 'period B', or 'period B open'.

"Current" totalizers register during the applicable time period. At the start of the applicable time period, the respective "current" totalizers are reset to zero. "Previous" totalizers show the previous applicable time period. Totalizers indicated with the word "open" show the value of the cumulative totalizers at the start of the applicable time period.

2 Seals

The following items are sealed:

- Each Flow-X/M flow module must be locked by operating the tampering switch (push button) and the tampering switch must be sealed if the access to the tamper switch is not protected by a sealed bar;

- All enclosures have the option of locking the flow computer with a seal by an authorized body, to prevent access to the tamper switch of the individual modules (see above). In a Flow-X/P (Panel) and a Flow-X/R, one bar is used to seal all installed modules with one seal;

- Removal without destroying the nameplate shall not be possible; otherwise, the nameplate shall be sealed to the housing.

Remark: If the tamper switch is unlocked while MID compliance is enabled an alarm is raised.

3 Conditions for conformity assessment

- Other parties may use this Evaluation Certificate only with the written permission of the producer.

4 Reports

An overview of the performed tests is given in Evaluation Report ER8388 issued together with this Evaluation Certificate.