



Type examination certificate

No. CH-MI002-11008-01

Bauartprüfzertifikat

Applicant:
Auftraggeber:

I.G.S. DATAFLOW S.r.l.
via Giuseppe di Vittorio, 337
20099 Sesto San Giovanni (MI)
Italy

Requirements:
Anforderungen:

Directive 2004/22/EC of the European Parliament and Council of March 31, 2004 on measuring instruments (MID) with instrument specific annex MI-002
Richtlinie 2004/22/EG des Europäischen Parlaments und des Rates vom 31. März 2004 über Messgeräte (MID) mit Messgeräte-kategorie MI-002

Type of instrument:
Geräteart:

Volume conversion device for gas
Type 2 (separate components)

Type designation:
Typenbezeichnung:

FLOWTI-702-1 / FLOWTI-702-2

Characteristics:
Kenndaten:

p_{\min} : 0.9 bar
 T_{\min} : -10 °C
 $T_{\text{amb, min}}$: -10 °C

p_{\max} : 120 bar
 T_{\max} : 60 °C
 $T_{\text{amb, max}}$: 40 °C

Certificate valid until:
Zertifikat gültig bis:

6 April 2021

CH-3003 Bern-Wabern, March 19, 2012

Notified body:
Benannte Stelle:

Certificate authority METAS-Cert
No. 1259

For the test:
Für die Prüfung:

Martin Tschannen

Gulian Couvreur, Head of METAS-Cert



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1. Harmonised standards or standardisation documents applied

EN 12405-1:2005+A2:2010

Further rules in application:

EN 61326-1:2006

IEC 60068-2-64:2008

EN 55011:2007+A2:2007

EN 55014-1:2006

EN 61000-6-3:2007

EN 61000-3-2:2006

EN 61000-3-3:2008

EN 61000-4-2/6:2009

EN 61000-4-3/5:2006+A1:2008

EN 61000-4-4/11:2004

WELMEC 7.2 Software Guide (Measuring Instruments Directive 2004/22/EC), May 2009

(Type: P, Risk Class C, Extensions D)

2. Type designation

Volume conversion device FLOWTI-702-**X**.

X	Description
1	Model with one measuring line
2	Model with two measuring lines

3. Description of the Type

According to MID, the volume conversion device FLOWTI-702 is classified as a sub-assembly. In operation, the device must be connected to a gas meter. The FLOWTI-702 converts the volume measured by the gas meter at measurement conditions into the volume at base conditions.

3.1 Design

The volume conversion device FLOWTI-702 is made up of two processor boards, a case, a LC display, control keys and two external sensors for each measuring line (temperature, pressure) connected to the device. The power is supplied either by an external power supply or an internal battery (by a failure of the external power supply). The access to the metrological parameters is protected by a sealed key switch and/or a password.

In accordance with the specific National Metrological Requirements key switch protection can be disabled for some function.



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3.2 Transducer

Any temperature transducer with part or evaluation certification of a notified body, who fulfills the requirements of range for the FLOWT-702, can be connected and used with the FLOWTI-702. The output signal has to be a standard (4...20) mA.

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Additionally, the following temperature transducer can be connected and used:

Manufacturer	Type
Rosemount, Emerson Process Management GmbH	248HA11N0Q4

Any absolute pressure transducer with part or evaluation certification of a notified body, who fulfills the requirements of range for the FLOWT-702, can be connected and used with the FLOWTI-702. The output signal has to be a standard (4...20) mA.

The cable length for all transducers is limited to a maximum length of 50m.

Additionally, the following pressure transducer can be connected and used:

Manufacturer	Type	Maximal pressure limit
Rosemount, Emerson Process Management GmbH	3051TA series	80 bar

In addition, the volume conversion device receives information from a gas meter. The volume conversion device FLOWT-702 uses the pulses provided by the gas meter to compute the volume.

It is also possible to combine the volume conversion device with a gas chromatograph.

3.3 Processing of measured value

The CPU of internal computer is equipped with a pair of microprocessors of the type Atmet AT-Mega2561 (master and stream).

The software is programmed in such a way that the computer operates as a volume conversion device.

3.4 Display of measured values

The conversion device is equipped with a backlight LC display (4 rows, 20 columns). The main screen is divided into four sections:

FLOWTI 702-1	NORMALE
LINEA 1 Vb 000000000 m3	Vm 000000000 m3
PDR:0000000000000000	01/01/70 00:02:12

- 1- Software identification
- 2- Operating mode
- 3- Current values of the basic counter(s) and volume at measurement conditions counter(s).
- 4- Point of delivery (PDR), date and time

With the aid of press buttons, it is possible to display other parameters such as current pressure, temperature, compressibility factor and general purpose parameters.



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3.5 Optional devices and functions subjected to MID requirements

The compressibility factors permit to take into account the deviations from the ideal gas law. The following method is used for the calculation of the K-factor (inverted compressibility factor ratio):

1) ISO12213-3: SGERG-88

The admissibility of the K-factor calculation method depends on the composition of the gas to be measured as well as the ranges of the expected operation pressure and temperature. See chapter 4.1.3 for more details.

The computer continually checks itself and the incoming measurement values. In the event of a discrepancy, the computer sets off an alarm and displays the type of error in the "EVENTS BUFFER". The occurrence of alarms is signalled by the appearance of a LED signal on the front panel. The billing indexes are stopped in the event of an alarm. In such a case, the disturbance registers take over.

The type and time of the alarm are recorded in the system event logbook. All events with metrological relevance are also logged in a legal logbook.

Following events are always logged up in the legal buffer:

- | | |
|------------------------------|-----------------------------------|
| - Memory reset | - Meas. flow rate out of limit |
| - Main power fault | - Working mode changed |
| - Battery low | - Gas analyzer error |
| - Legal buffer full | - Measurement board error |
| - Legal buffer reset | - New firmware configured |
| - Calculation error | - Programming error |
| - Pressure out of limit | - New firmware activated |
| - Pressure out of range | - Legal data CRC error |
| - Temperature out of limit | - User data CRC error |
| - Temperature out of range | - System data CRC error |
| - Pulse emitter disconnected | - Meas. module firmware CRC error |
| - Calculated data reset | |

For any logged event, the following information is recorded:

- Event time stamp (date / time)
- Event type
- Progressive event number (absolute from device restart / last reset)
- Event code / id of user who generated the event (if applicable)
- Old / new value of modified parameter (if applicable)
- Absolute Vb index upon event detection

The configuration of the FLOWTI 702 can be changed by local user interface. Before any change the user must be identified. The FLOWTI 702 can identify up to five profiles and ten user id for each profile. Default only profile 0, user 0 is active.



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The following functions are protected by the front panel key switch and a password, when the dip switch no. 8 is in OFF position:

- modification of metrological parameter grouped under the legal data submenu of the FLOWTI 702 user interface,
- gas analyzer configuration,
- legal buffer reset,
- converted totalizer preset, can be programmed once after EVC reset,
- measurement board: calibration of the analogical input.

The protection of the following functions by the front panel key switch and a password is disabled, when the dip switch no. 8 is in ON position:

- modification of metrological parameters, grouped under the legal data submenu of the FLOWTI 702 user interface.

This option must be selected in accordance with the specific National Metrological Regulation.

If the logbook reaches 90 % of its capacity, an alarm is generated. When the logbook reaches maximum capacity a different alarm is generated, and from that moment any new event will overwrite the last entry. Additionally, no metrological parameters can be modified until the logbook is cleared. The seal of the key switch on the front panel has to be broken for the clearing of the logbook.

The calibration and configuration parameters are saved on a non-volatile memory.

3.6 Technical documentation

Designation	Date	Document
FLOWTI-702-1 User manual	29.03.2011	FLOWTI-702-1 Manuale_IT_0101
FLOWTI-702-2 User manual	29.03.2011	FLOWTI-702-2 Manuale_IT_0101
Pressure transducers Rosemount 3051TA, general specifications	11.2010	Rosemount catalog: 00813-0100-4001
Pressure transducer Rosemount 3051TA, seal plan	04.04.2010	I_0238 Sheet 1
Identification labels, definitions	20.03.2010	I_0233 Sheet 1 and 2
Device seal plan	04.04.2010	I_0236 Sheet 1+2

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Designation	Date	Document
FLOWTI-702-1 User manual	15.03.2012	FLOWTI-702-1 Manuale_IT_0102
FLOWTI-702-2 User manual	15.03.2012	FLOWTI-702-1 Manuale_IT_0102
Temperature transducers Rosemount 248H, general specifications	02.2011	Rosemount catalog: 00825-0100-4825
Temperature transducers Rosemount 248H, seal plan	15.03.2012	I_237 Sheet 1

3.7 Integrated devices and functions which are not subjected to MID

A data logger is integrated in the FLOWTI-702. A separate type examination certificate may be required for this function by some national regulations.



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4. Technical data

4.1 Rated operating conditions

4.1.1 Measuring principle

The volume conversion device calculates the volume (m^3) at base conditions by using the measured volume by the gas meter and the measured pressure and temperature from the gas.

4.1.2 Measuring range

Pressure transducers

The pressure transducers have to be approved for the following pressure ranges:

$p_{\max} \leq$	9.0	50.0	80.0	120.0	bar
$p_{\min} \geq$	0.9	5.0	8.0	12.0	bar

The ratio p_{\max} / p_{\min} has to be greater than 2.

Temperature sensor

The temperature sensor has to be approved for temperature measurements in the range from -10 °C to +60 °C.

4.1.3 Rated operating conditions

In determining the actual permissible measurement range for the pressure and temperature of the gas, it is important to consider the conversion method.

In effect, the alarm limits T_{\min} , T_{\max} , P_{\min} and P_{\max} can lie outside of the measurement range by up to +/- 2 % for pressure and temperature. On reaching or exceeding the alarm limits, an alarm is triggered and counting starts to take place in the disturbance registers.

The following correction method is available:

The FLOWTI 702 calculates the compressibility factor of natural gas in accordance with the ISO12213-3:1997 (SGERG88) standard, in the following operating limits:

absolute pressure	0 MPa	\leq	p	\leq	12 MPa
temperature	263.15K	\leq	T	\leq	333.15K
mole fraction of carbon dioxide	0	\leq	x_{CO_2}	\leq	0.30
mole fraction of hydrogen	0	\leq	x_{H_2}	\leq	0.10
superior calorific value	20MJ/m ³	\leq	H_s	\leq	48MJ/m ³
relative density	0.55	\leq	d	\leq	0.9

ISO 12213-3: SGERG-88

This method is suitable for natural gases and their mixtures

- 1.) at temperatures between -10°C and +60°C and for absolute pressures up to 26 bar
- 2.) at temperatures between -10°C and +60°C, and for absolute pressures above 26 bar, when the following conditions are fulfilled:

- The amount of substance of the propane x_{C_3} [in mol%] must lie within the limits given by the following equation in relationship to the amount of substance of the ethane x_{C_2} [in mol%].

$$0,3 x_{C_2} - 1,0 < x_{C_3} < 0,3 x_{C_2} + 1,0$$

- The sum of the amounts of substance of n-butane, isobutene and higher hydrocarbons x_{C_4+} [in mol%] must lie within the limits given by the following equation in relationship to the amount of substance of the ethane x_{C_2} [in mol%].

$$0,1 x_{C_2} - 0,3 < x_{C_4+} < 0,1 x_{C_2} + 0,3$$



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- 3.) for other gas compositions (e.g. processed biogas), temperature ranges and pressure ranges if given – a comparative calculation based on the AGA8-DC92 method shall be carried out in the permissible measurement range from the FLOWTI-702 (i.e. with compliance for the pressure and temperature limits). For such a calculation, the K factor must not deviate by more than 0.1% of the value computed with AGA8-DC92.

4.1.4 Environmental conditions / influence quantities

- climatic factors:

Lower temperature limit: -10 °C

Upper temperature limit: +40 °C

These temperatures refer to the place of installation of the volume conversion device and must be differentiated from the measuring range of the connected thermometer.

The volume conversion devices may be used only indoors. Condensing humidity may occur in operation.

- mechanical factors

M2 class

- electromagnetic factors

E2 class

4.1.5 Other operating conditions

none

5. Interfaces and compatibility conditions

The FLOWTI-702 is equipped with the following interfaces:

5.1 LF gas meter pulses input

The FLOWTI-702 has one low frequencies gas meter pulses input for each measuring line. The cable to the gas meter contains two wires. A pulse is generated by the temporary closure of a switch between two wires. This is usually done by a pulse generator in the gas meter. The maximum pulse frequency which can be analysed by the LF gas meter pulses input is 2 Hz.

5.2 HF gas meter pulses input

The FLOWTI-702 has one high frequencies gas meter pulses input for each measuring line. The cable to the gas meter contains two wires. The HF signal must be an open collector/free contact signal. The maximum pulse frequency which can be analysed by the HF gas meter pulses input is 5 kHz.

5.3 Interfaces with fixed connection

LOCAL PORT

- Function

Local port on front panel to be used for communication with portable devices

- Interface

RS-232 9 (DCE) nine pin female

COM-1 PORT

- Function

Port to be used for remote communication via GSM / PSTN modem

- Interface

RS-232 9 (DTE) nine pin male



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COM-2 PORT

- Function Communication port to connect a gas analyzer with MODBUS ASCII/RTU programmable communication protocol
- Interface RS-232 / RS-422 / RS485 (selectable) 9 pin male

COM-3 PORT

- Function Communication port to be used only for maintenance configuration
- Interface RS-232 / RS-422 / RS485 (selectable) 9 pin male

In the event of parameter modifications via the interfaces mentioned above, the parameters are protected according to the approach described in 3.5.

5.4 Analogical inputs

- Signal type Analogical 4-20 mA – with two wires
- Accuracy $\pm 0,025$ % f.s.
- Transmitter power supply 24 Vdc with barrier [EEExia]
- Number of input Four (P channel 1, T channel 1, P channel 2, T channel 2)
- Signal type Temperature measurement RTD – with four wires
- Accuracy $\pm 0,05$ °C input range -10 / 60 °C
- Thermo element power supply with barrier [EEExia]
- Number of input Two (T channel 1, T channel 2)

5.5 Analogical outputs

- Signal type Analogical 4-20 mA – two wire configuration
- Accuracy $\pm 0,025$ % f.s.
- Power supply 24 Vdc isolated
- Number of output Eight (four output standard + four output on add. board)

5.6 Digital inputs

- Signal type counter input with barrier [EEExia]
- Maximum frequency HF = 5 kHz / BF = 2 Hz selection with jumper
- Number of input Two (channel 1 volume, channel 2 volume)
- Signal type Contact ON/OFF anti fraud with barrier [EEExia]
- Number of input Two (channel 1 Counter, channel 2 Counter)

5.7 Digital outputs

- Signal type Programmable - Alarm / Counter (ON/OFF opto-isolated)
- Maximum applied voltage 50 V dc
- Maximum applied current 100 mA
- Maximum pulse frequency Fix frequency 2 Hz dc=50%
- Number of output 16 (8 output standard + 8 output on additional board)



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6. Notes for the checking of devices in operation

6.1 Calibration documentation

For the testing of the volume conversion device, the operator of the device must use the instruction manual and the configuration data sheet. The seal plan (Section 3.6) is included in the instruction manual of the corresponding device.

6.2 Testing facilities

The testing of volume conversion devices can be carried out at the location of the installation. The measuring instruments used for this purpose must display an uncertainty lower than 0.2 °C or 0.1 % of the absolute pressure.

6.3 Identification

The identity of the volume conversion device must be stated on the inscriptions on the front plate. The software version number and the software check sum can be found in the menu "STATION ARCHIVE -> SYSTEM IDENTIFICATION". The devices must display the following version numbers and check sums:

Acquisition		
software version number	software check sum	TEC
002.00	B75A7FE1	CH-MI002-11008-00
002.01	8B645E43	CH-MI002-11008-01

Keyboard		
software version number	software check sum	TEC
001.01	B9D14224	CH-MI002-11008-00
001.03	82F585A5	CH-MI002-11008-01

Loader		
software version number	software check sum	TEC
001.00	6821C77C	CH-MI002-11008-00

6.4 Metrological test

In the event of a device test, the protections are checked according to Section 7 and the software version according to Section 6.3. Furthermore, the parameterization corresponding to the type of the connected gas meter is also verified.

In the event data log, it must be checked whether this logbook contains entries. If entries have been made, it is necessary to verify if the parameter modification were admissible.

The metrological test can be carried out as operating point test depending on national regulations.

A new adjustment is required when the corresponding parameters deviate more than 0.5° C or 0.5 % of the absolute pressure.



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7. Security measures

The document "Device seal plan" (see Section 3.6) shows the location of the seals. The following items must be sealed.

7.1 Calculator

- Identification sticker placed on the front panel (*)
 - The front panel key switch.
 - The access to the electronic boards (**)
 - The connections between the calculator and the safety barriers.
 - All connections between the safety barriers (inside the box) and the transducers.
- See drawings I_0236, sheet 1 and 2, for an example of the sealing.

(*) Removal without destroying the identification sticker is not being possible.

(**) This seal can only be placed by the manufacturer. This seal is applied in factory and can't be removed by unauthorized personal.

7.2 Pressure transducer

The seal plan for the sealing of the pressure transducer and the connection to the external pressure transducer is mentioned in section 3.6 in this document.

The following seal must be placed when a pressure transducer Rosemount type 3051TA is connected to the FLOWTI 702:

- Identification sticker placed on the housing (*)
- The access to the security jumper, which, during normal operation, has to be in the write protect position.

If any other pressure transducer with MID certification is connected to the FLOWTI 702, follow the seal plan of the transducer according to the MID certificate.

In any case, the connection to the field has to be sealed in accordance to the seal plan (see drawing I_0236 sheet 2).

(*) Removal without destroying the identification sticker is not possible.

7.3 Temperature sensor

The seal plan for the sealing of the temperature transducer Rosemount 248H is mentioned in section 3.6 (see drawing I_237 Sheet 1).

If any other temperature transducer with a part or evaluation certificate is connected to the FLOWTI 702, follow the seal plan of the transducer according to corresponding part or evaluation certificate.

In any case, the connection to the field has to be sealed in accordance to the seal plan (see drawing I_0236 sheet 2).

7.4 Manufacturer's symbol

The manufacturer's Logo is printed on the front of FLOWTI-702:



Metrological plumb seal will show the following manufacturer's symbol with logo on one side and ID of metrological operator on the other side.





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8. Terms of placing on the market

The following inscriptions must appear on the identification label or at another perfectly visible place on the front plate:

- reference or name of the manufacturer
- indications concerning the accuracy of measurement
- identification, comprising the type designation in accordance with section 2
- number of this CE type examination certificate
- the CE mark and the additional metrology mark
- serial number and year of manufacture
- the extreme values of the ambient temperature $T_{amb,min}$ and $T_{amb,max}$

For the following data, it is sufficient if they appear on the electronic display:

- the base conditions for the temperature T_b and the pressure p_b
- the measuring range and alarm limits for the gas temperature
- the measuring range and alarm limits for the gas pressure

The following figure exemplifies the identification label of the FLOWTI-702:

I.G.S. DATAFLOW S.r.l.			
Via Giuseppe di Vittorio n° 337 - Sesto San Giovanni (MI) - ITALY			
Electronic Volume Converter	Model	702-	
Serial n.	Year		
Gas type: Natural Gas - Zb/Z: ISO 12213-3:1997 (SGERG-88) - MPE 0,5 %			
$t_{gas,min} = 263.15 \text{ K}$ $t_{gas,max} = 333.15 \text{ K}$ $f_{max} : 2 \text{ Hz (BF)}/5 \text{ kHz (HF)}$			
$t_{amb,min} = -10 \text{ °C}$ $t_{amb,max} = 40 \text{ °C}$ M2, E2			
Marking: EN 12405-1		CH-MI002-11008-00	
According: Direttive 2004/22/CE (MID) of the European Parliament			


9. History of certificate

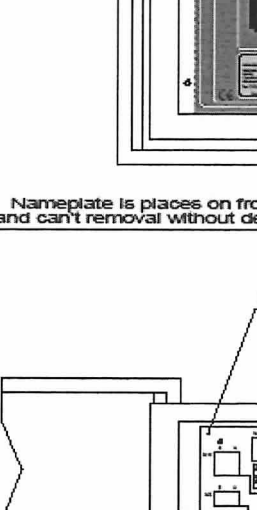
Edition	Date	Description
CH-MI002-11008-00	06 April 2011	First type examination certificate
CH-MI002-11008-01	19 March 2012	Temperature transducer (chapter 3.2) Technical documentation (chapter 3.6) software version and checksum (chapter 6.3)

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Appendix

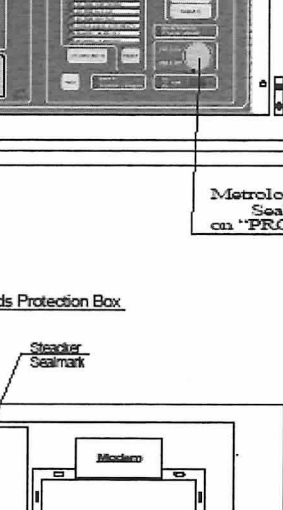
Device sealing plans

 I.G.S. DATAFLOW <small>DOCUMENTO RISERVATO A TERMINI DI LEGGE</small>	FLOWTI - 702-x Piombatura Metrologica Calcolatore <i>Calculator Metrological Seals</i>				REV. 0 Dis.N. I_0236
					FOGLIO 1 SHEET
	SOSTITUISCE IL	SOSTITUITO DAL	Dis. Boerio	Visto	DATA DATE: 04/04/2010



Nameplate is places on front panel and can't removal without destroyin it

Metrological security key Sealed by plumb on "PROG OFF" position



Electronic Boards Protection Box

Steadier Sealmark

Protection Box for Metrological Signals Terminal Block

Pressure, Temperature, Pulse & Security Flow Meter

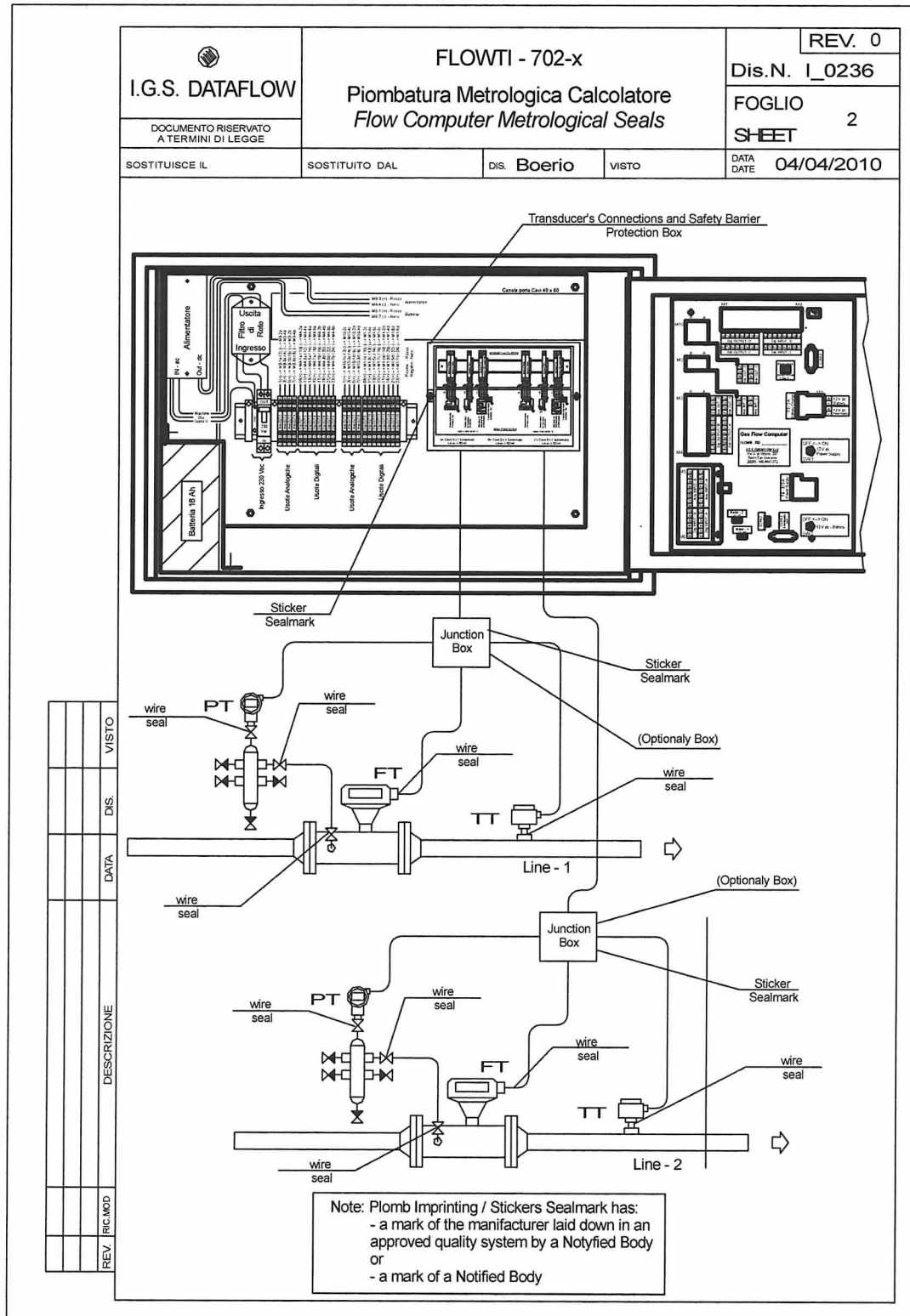
Steadier Sealmark

Note: Plomb Imprinting / Steadher Sealmark has:
 - a mark of the manufacturer laid down in an approved quality system by a Notified Body or
 - a mark of a Notified Body

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 I.G.S. DATAFLOW DOCUMENTO RISERVATO A TERMINI DI LEGGE		FLOWTI - 702-x		REV. 0
		Piombatura Metrologica Trasm. Pressione <i>Pressure Transmitter Metrological Seals</i>		Dis.N. I_0238
				FOGLIO 1
				SHEET
SOSTITUISCE IL		SOSTITUITO DAL	DIS. Boerio	VISTO
				DATA DATE 04/04/2010

TRASMETTITORE DI PRESSIONE - ROSEMOUNT 3051TA
PRESSURE TRANSMITTER - ROSEMOUNT 3051TA

Vano Elettronica
Electronic Box

Vano Morsettiere
Field Terminals

Security Jumper Location

ETICHETTA Costruttore
Manufacturer NAMEPLATE

Steackers Sealmark

Versione senza DISPLAY
Without DISPLAY version

In condizione di lavoro il Jumper di Sicurezza deve essere in Posizione ON
On working, the Security Jumper must be placed in the ON Position

ETICHETTA Metrologica
Metrological NAMEPLATE

Steackers Sealmark

L'etichetta non può essere rimossa senza essere distrutta
Nameplate can't be removal without destroyin it

Versione con DISPLAY
With DISPLAY version

In condizione di lavoro il Jumper di Sicurezza deve essere in Posizione ON
On working, the Security Jumper must be placed in the ON Position

Note: Plomb Imprinting / Stickers Sealmark has:

- a mark of the manufacturer laid down in an approved quality system by a Notified Body or
- a mark of a Notified Body

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	FLOWTI - 702-x		REV. 1
	Piombatura Metrologica Trasduttore Temp. <i>Temperature Transducer Metrological Seals</i>		Dis.N. I_0237
DOCUMENTO RISERVATO A TERMINI DI LEGGE			FOGLIO 1
		SHEET	
SOSTITUISCE IL	SOSTITUITO DAL	D/S Boerio	VISTO
		DATA DATE	15/03/2012

TRASDUTTORE DI TEMPERATURA - Pt100
TEMPERATURE TRANSDUCER- Pt100

The diagram shows a cylindrical Pt100 temperature transducer with a label and a threaded probe. Key dimensions include:

- Total length: 105 mm
- Probe length: 80 mm
- Label height: 75 mm
- Distance from top of probe to bottom of label: 110 mm
- Threaded section: 1/2" NPT or 3/4" NPT
- Probe diameter: 12 mm to 21 mm
- Probe length A: 100 mm to 300 mm

Labels and markings include:

- ETICHETTA Metrologica / Metrological NAMEPLATE**: Contains PT-100, MASTER S.r.l. - T-182-A, Rosemount 248HA1N0Q4, Campo Temp. / Temp. Range -10 °C / +60 °C, and Matricola / Serial Number xxxxxxxxxx.
- Steacker Sealmark**: Located on the top of the transducer body.

Note: L'etichetta non può essere rimossa senza essere distrutta / Nameplate can't be removal without destroyin it

Note: Plomb Imprinting / Stickers Sealmark has:
 - a mark of the manufacturer laid down in an approved quality system by a Notified Body or
 - a mark of a Notified Body

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