

# Evaluation Certificate

Number : **TC7570** revision 6  
Project number : SO14204098  
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Issued by NMI Certin B.V.

In accordance with – WELMEC guide 8.8 “General and Administrative Aspects of the Voluntary System of Modular Evaluation of Measuring instruments under the MID”.  
– OIML R117-1 Edition 2007 (E) “Dynamic measuring systems for liquids other than water.

Producer Spirit IT B.V.  
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5613 AM Eindhoven  
The Netherlands

Part An **electronic calculating and indicating device**, intended for use as part of a liquid measuring installation  
Manufacturer : Spirit IT  
Designation : Flow X/P, Flow X/R and Flow X/S  
Software version : See the description.  
Accuracy class : 0.3  
Environmental class : E2 / M2  
Ambient temperature range : +5 °C .. +55 °C

Further properties and test results are described in the annexes:  
- Description number TC7570 revision 6;  
- Documentation folder number TC7570-2.

Remarks This revision 6 replaces the previous revision 5.  
The documentation folder is not changed.

Issuing Authority **NMI Certin B.V.**  
17 October 2014

  
C. Oosterman  
Head Certification Board

## 1. General information on the electronic calculating and indicating device.

Properties of the electronic 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 guide 8.8, issue 1.

The complete measuring instrument must be covered by an EC-type Examination Certificate.

The Flow-X series of flow computers is based on a single stream modular concept where one Flow-X/M module is used for each meter 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 flow computer that can contain up to four Flow X/M flow modules (one for each stream), an additional station module with a 7" multi-lingual color touch-screen and additional serial (3x) and Ethernet interfaces (2x). This flow computer 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. Optionally an i-button is available for convenient and controlled operator login.

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Flow X/P

The Flow X/S is a Single stream, DIN rail mountable enclosure with direct screw terminals for field connections. Interfaces include dual Ethernet with built-in web server via RJ45 connectors. Graphical LCD display with 4 lines for local display of measured & calculated data. The Flow -X/S may be mounted in 3 ways: Horizontally on Din -rail, vertically on Din -rail and Wall mounted.

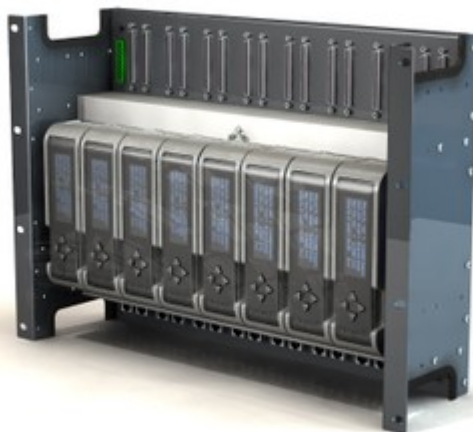


Flow X/S

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The Flow X/R is a 19" rack mountable enclosure that can accommodate up to eight Flow-X/M modules (i.e. 8 metering streams). 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.



Flow X/R

### 1.1 Essential parts

#### 1.1.1 Flow X/M

Part	Part number	Documentation
Analog board	6557-0700-1305	7570/1-01
	6557-0700-1308	7570/1-02
	6557-0700-1309	7570/1-03
	6557-0700-1310	7570/1-03
Digital board	6557-0700-1206	7570/1-04
	6557-0700-1207	7570/1-05
	6557-0700-1208	7570/1-06
	6557-0700-1209	7570/1-06
	6557-0700-1210	7570/1-06
	6557-0700-1211	7570/1-06
Indicating device	6557-0800-6504	7570/1-07
Power supply	6557-0800-8202	7570/1-08
	6557-0800-8203	7570/1-09
	6557-0800-8204	7570/1-09



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### 1.1.2 Flow X/P

Part	Part number	Documentation
GUI module Touchscreen controller	6557-0700-1402	7570/1-10
	6557-0700-1407	7570/1-11
	6557-0700-1408	7570/1-12
	6557-0700-1409	7570/1-12
	6557-0700-1410	7570/1-12
Backplane PCB	6557-0800-2904	7570/1-13
	6557-0800-2905	7570/1-14
Connector panel	6557-0800-2803	7570/1-15
	6557-0800-2804	7570/1-16

The Flow-X/P enclosure may contain up to four Flow-X/M modules.

### 1.1.3 Flow X/S

Part	Part number	Documentation
Back plane	6557-0800-4901	7570/1-17
	6557-0800-4902	7570/1-18

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

### 1.1.4 Flow X/R

Part	Part number	Documentation
Back plane	6557-0800-8401	7570/1-19

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

## 1.2 Essential characteristics

### 1.2.1 Software specification (see WELMEC guide 7.2):

- Software type P;
- Risk Class C;
- Extensions L, T, S.



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Extension D is not applicable because software download is disabled when the tamper switch is enabled and sealed.

The I-extension 5 is not applicable, because software identification is not imprinted.

Software part	Software version	Remarks
Firmware	B4A0633E	Core calculation, reporting and communication engine
	7E40F17AE	
	5B6AEFE1	
	63CBC842	
	A58377C1	
	4581A774	
	651B2653	
	A3DDC66F	
	5ADFEAA2	
	C587C032	
	2F494636	
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	
FPGA	1357-22-1-2009	Field-Programmable Gate Array for X/M
	1422-21-2-2012	Field-Programmable Gate Array for X/M
	1350-29-10-2009	Field-Programmable Gate Array for X/P
Operating system	16.53	Real-time operating system
	1.55	
	2.57	
	4.60	
	6.62	
	9.66	
	9.68	
	10.70	

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Software part	Software version	checksum	Remarks
Liquid application	1.0.5	9B8787B4C	
	1.0.6	BD3588EB1	
	1.0.6a	75D0D16D2	
	1.0.6b	9E9346FB7	
	1.0.6c	9E5FE73A3	
	1.0.7	820C4EEF6	
	1.1.0	73DB658CE	
	1.3.0	68E1D69EF	
	1.3.1	90B40510D	
	1.3.3	CEFAF4BBC	
	1.4.0	CEFAF4BBC	
	1.4.1	CE37D25F3	
	2.0.1	D8AE10682	
	2.0.2	EDD57D8F7	

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

### 1.2.2 Legal software functions:

- 1.2.2.1 Monitoring and protection of volume and / or mass impulse input from meters, from analog temperature inputs, from analog pressure, from analog density input and from digital inputs, for instance from HART devices.
- 1.2.2.2 Meter factor curve is available for a maximum of 16 different products. Each meter factor curve is coupled to a product. Selecting a product automatically selects the appertaining meter factor curve.
- 1.2.2.3 Registering of volume(s), mass and other measured values and parameters.

For each run and for both forward and reverse flow direction the calculating and indication device supports the following totalizers.

- cumulative accountable indicated (volume or mass depending on the meter type)
  - cumulative accountable gross volume
  - cumulative accountable gross standard volume
  - cumulative accountable net standard volume
  - cumulative accountable mass
- 1.2.2.4 The calculating and indicating 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 (starting from application version 2.0.1). In case the deviation between the temperature transmitters is larger than a preset value, the following options are available:
  - The temperature indications of both transmitters are still used.
  - The indication of temperature transmitter A is used.
  - The indication of temperature transmitter B is used.



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- The deviation is considered as a transmitter failure; depending of the fallback type setting the calculating and indicating device either shows the last good value or the keypad value or the fallback value.

Of course the checks on that temperature transmitter value (not out of service, not defective, etc.) apply.

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.

- 1.2.2.5 The calculating and indicating 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 (starting from application version 2.0.1). In case the deviation between the pressure transmitters is larger than a preset value, the following options are available:

- The pressure indications of both transmitters are still used.
- The indication of pressure transmitter A is used.
- The indication of pressure transmitter B is used.
- The deviation is considered as a transmitter failure; depending of the fallback type setting the calculating and indicating device either shows the last good value or the keypad value or the fallback value.

Of course the checks on that pressure transmitter value (not out of service, not defective, etc.) apply.

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.

- 1.2.2.6 In case no product density temperature transmitter is configured the measured product temperature at the meter is used as the product density temperature.  
The meter density is assumed to be equal to the measured density.
- 1.2.2.7 In case no product density pressure transmitter is configured the measured product pressure at the meter is used as the product density pressure.  
The meter density is assumed to be equal to the measured density.
- 1.2.2.8 Option to use pressure and temperature from a smart meter as meter pressure and temperature.
- 1.2.2.9 Option to disable totalizers of one meter when two meters are in serial configuration.
- 1.2.2.10 Check on communications.
- 1.2.2.11 The Weights and Measures part of the program that contains the test routines for memory, transmissions and calculation.

### 1.2.3 Conversions

The Flow X series can perform conversion calculations according to the following methods:

- API Manual of Petroleum Measurements Standards API-2540, Chapter 11.1; 1980 tables (ASTM D1250-80) tables 53A and/or 54A (crude oil), 53B and/or 54B (refined petroleum products), table 54C, table 53D and/or 54D (lube oils);
- API Manual of Petroleum Measurements Standards API MPMS, Chapter 11.1; 2004 tables (ASTM D1250-04) tables 53A and/or 54A (crude oil), 53B and/or 54B (refined petroleum products), table 54C, table 53D and/or 54D (lube oils);
- GPA-27 table 53E and/or 54E (light products);
- API MPMS 11.2.1M and 11.2.2M (pressure correction).





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## 1.3 Essential shapes

1.3.1 Indications.  
 Flow-X/M indication.  
 Flow-X/P.

1.3.2 Inscriptions  
 The Evaluation certificate number: TC7570;  
 name or trade mark of the manufacturer;  
 type;  
 serial number.

Parts of the inscriptions (except for the Evaluation Certificate number and the serial number) may be stated on a separate Data Sheet.

## 1.4 Conditional characteristics

For information on and the programming of the parameters see the Flow-X Liquid Metric Application Manual, chapters 3 and 4.

The below mentioned parameters shall be set to the belonging values and in the secure mode "read only".

menu	parameter	value
meter K-factor (if applicable) per product, for a maximum of 16 products	product name	1)
	nominal K-factor	1)
	curve enabled	1)
	extrapolation allowed	1)
	pulse frequency calibration points	1)
	meter K-factor for each calibration point	1)
meter factor (if applicable)	nominal meter factor	1)
	curve enabled	1)
	extrapolation allowed	1)
	flow rate calibration points	1)
	meter factor for each calibration point	1)
analog inputs (parameters apply to each individual input)	input type	1)
	averaging	1)
	low scale	1)
	high scale	1)

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menu	parameter	value
pulse input (parameters apply to each individual input; always use dual pulse input)	A channel number	1)
	B channel number	1)
	error pulses limit	1)
	good pulses reset limit	1)
	error rate limit	1)
	minimum batch	1)
Time period inputs	Channel (parameter applies to each individual input)	1)
PRT inputs (parameter applies to each individual input)	input type channel	1)
Meter setup (parameters apply to each individual meter)	meter device type	1)
	standard density input type	1)
	observed density input type	1)
	pulse input quantity type	1)
	meter active threshold frequency	1)
	single of dual pulse input	dual
Smart meter (parameters apply to each individual meter)	pulse fidelity level A	1)
	Smart meter input type	1)
	use flowrate or total	1)
	communications device index	1)
	analog input quantity type	1)
	analog input module	1)
	analog input channel	1)
	meter active threshold	1)
Meter body correction (parameters apply to each individual meter)	pulse primary	1)
	meter body correction	1)
	linear temperature expansion coefficient	1)
	body correction reference temperature	1)
	linear pressure expansion coefficient	1)
viscosity correction (parameters apply to each individual meter)	body correction reference pressure	1)
	viscosity correction	1)
	meter type	1)
	viscosity coefficients A ... F	1)



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menu	parameter	value
setting up the temperature (parameters apply to each individual temperature input)	input type	1)
	input module	1)
	input channel	1)
	HART device	1)
	HART variable index	1)
	fallback type	1)
	fallback value	1)
	set value	1)
	Maximum allowed deviation between two temperature transmitter indications.	1)
	Action when the deviation between two temperature transmitters is larger than the allowed maximum value.	1)
setting up the pressure (parameters apply to each individual pressure input)	input type	1)
	input module	1)
	input channel	1)
	HART device	1)
	HART variable index	1)
	fallback type	1)
	fallback value	1)
	set value	1)
	Maximum allowed deviation between two pressure transmitter indications.	1)
	Action when the deviation between two pressure transmitters is larger larger than the allowed maximum value.	1)
setting up the density (parameters apply to each individual density input)	density input type	1)
	standard density fallback type	1)
	base density fallback value	1)
	meter density fallback type	1)
	meter density fallback value	1)
densitometer setup	densitometer A	1)
	densitometer A type	1)
	densitometer A factor	1)
	densitometer B	1)
	densitometer B type	1)
	densitometer B factor	1)
	densitometer select mode	1)
Solartron / Sarasota / UGC densitometer setup	densitometer constants as given on the appertaining calibration certificate (parameters apply to each individual densitometer)	1)



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menu	parameter	value
Time period setup	input module	1)
	input channel	1)
	fallback type	1)
	fallback value	1)
density input (process input) (parameters apply to each individual density input)	input type	1)
	input module	1)
	input channel	1)
	HART device	1)
	HART variable index	1)
	fallback type	1)
	fallback value	1)
	set value	1)
	delay on density failure	Default = off. 1)
	use average of last densitometer values of up to 20 cycles	Default = off. 1)
standard density input (process input) (parameters apply to each individual density input) product definition (parameters apply to each individual meter)	input module	1)
	input channel	1)
	HART device	1)
	HART variable index	1)
	fallback type	1)
	fallback value	1)
	set value	1)
	density conversion table	1)
	standard density set value	1)
	equilibrium pressure method	1)
	equilibrium pressure set value	1)
	compressibility override	1)
	compressibility override value	1)
	TP15 P100 correlation	1)
	equilibrium pressure at 100F	1)
BS&W	input type	0 = do not use
Viscosity	input type	1)
	input module	1)
	input channel	1)
	HART device	1)
	HART variable index	1)
	fallback type	1)
	fallback value	1)
	set value	1)



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menu	parameter	value
Miscellaneous settings	atmospheric pressure	1)
	CTL rounding	1)
	CPL rounding	1)
	API 2004 rounding	1)
Overall setup / common settings	disable totalizers if meter is inactive	Default value of this parameter is "disabled", so the totalizers are always active.
Calibration / HART inputs	HART freeze option for process inputs	Disabled when the flow computer is sealed.
Communication / HART	Force HART transmitter values	Disabled when the flow computer is sealed.
Calibration / HART inputs	HART input offset for HART transmitter calibration	Correct offset value.
maintenance mode	enabled or disabled	disabled during normal operation
	Period A and period B settings	One of the possible period settings.
Neutralization enable / disable	<p>If neutralization is enabled, flow range, temperature range, pressure range and standard density range accountable alarms are delayed until a neutralization quantity is reached.</p> <p>If neutralization is enabled, each time an accountable defect appears a neutralization counter (indicated volume or mass depending on meter quantity type) is started.</p> <p>The accountable totalizers are running, until the counter reaches the neutralization quantity, the accountable alarm is set, and the non accountable totalizers start running.</p> <p>When there is no more pending defect, the non-accountable totalizers stop running and the accountable totalizers start running again. The neutralization counter is reset after the neutralization reset quantity is reached without any accountable alarm.</p>	
Neutralization counter	Setting depends on the minimum measured quantity of the liquid measuring installation.	

1) These values should be specified and motivated by the producer or the owner of the flow computer. Prior to Weights & Measures verification a list with the parameters settings and a motivation of these setting should be present at the flow computer location.



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### 1.5 Non essential characteristics

Additional to the totalizers that are specified in paragraph 1.2.2.3, the following totalizers are available.

For the station:

- cumulative accountable gross volume
- cumulative accountable gross standard volume
- cumulative accountable net standard volume
- cumulative accountable mass

Furthermore, for station, run 1, run 2, run 3 and run 4, and for both forward and reverse flow direction the calculation and indication device supports the following totalizers:

- cumulative non-accountable indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- cumulative non-accountable gross volume
- cumulative non-accountable gross standard volume
- cumulative non-accountable net standard volume
- cumulative non-accountable mass
- cumulative indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- cumulative gross volume
- cumulative gross standard volume
- cumulative net standard volume
- cumulative mass
- cumulative number of impulses (does not apply to station totalizers)
- cumulative number of error impulses (does not apply to station totalizers)
- current [xxx] indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- current [xxx] gross volume
- current [xxx] gross standard volume
- current [xxx] net standard volume
- current [xxx] mass
- 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] accountable indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- current [xxx] accountable gross volume
- current [xxx] accountable gross standard volume
- current [xxx] accountable net standard volume
- current [xxx] accountable mass
- current [xxx] non accountable indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- current [xxx] non accountable gross volume
- current [xxx] non accountable gross standard volume
- current [xxx] non accountable net standard volume
- current [xxx] non accountable mass
- previous [xxx] indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- previous [xxx] gross volume
- previous [xxx] gross standard volume
- previous [xxx] net standard volume
- previous [xxx] mass



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- 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] accountable indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- previous [xxx] accountable gross volume
- previous [xxx] accountable gross standard volume
- previous [xxx] accountable net standard volume
- previous [xxx] accountable mass
- previous [xxx] non accountable indicated (volume or mass depending on the meter type; does not apply to station totalizers)
- previous [xxx] non accountable gross volume
- previous [xxx] non accountable gross standard volume
- previous [xxx] non accountable net standard volume
- previous [xxx] non accountable mass

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

"Current" totalizers register during the batch or during the applicable time period. At the start of the batch or applicable time period, the respective "current" totalizer values are zero.

"Previous" totalizers show the totals of the previous batch or previous applicable time period. Totalizers indicated with the word "open" show the value of the cumulative totalizers at the start of the batch or applicable time period.

Finally cumulative and current batch open gross volume totalizers per product are available for run 1, run 2, run 3, run 4 and station.

## 2. Conditions for Conformity Assessment

- The electronic calculating and indicating device must be constructed in accordance with this Evaluation Certificate and the appertaining documentation.
- Other parties may use this Evaluation Certificate only with the written permission of Spirit IT.

### 3. Seals

The following items are sealed:

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



- Removal without destroying the nameplate shall not be possible; otherwise the nameplate shall be sealed to the housing.
- The tampering switch must be sealed if the access is not protected by a bar.



### 4. Test reports

An overview of the performed tests is given in the test reports:

- CPC/809516/1, issued by NMI Certin B.V.
- NMI-13200142-1, issued by NMI Certin B.V.