FP-3011N
FP-3011

Flow and Energy Computer for Steam, Liquids and Gases with advanced data recording

- **Handles up to 2 independent installations**
- **5 inputs for process data**
- **User configurable data presentation on color TFT display**
- **Math functions – sum, difference, ratio**
- **Advanced data recording for process values and totalisers**
- **USB port for data transfer**
- **Alarm & control functions, 4 output relays**
- **RS485 communication port, ASCII and Modbus RTU protocols**
- **Ethernet port, Modbus TCP and server WWW**
- **GSM module (option)**
- **Analog 4-20mA output (option)**
- **Software for configuration and recorded data presentation**

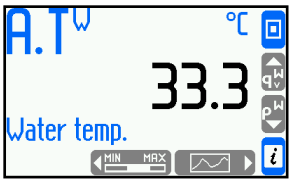
APPLICATION:

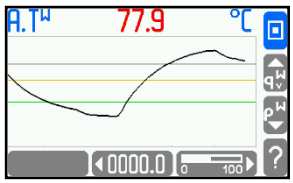
- **Measurement of steam and water in various industrial installations**
- **Measurements of industrial gases and typical or special liquids (like glycol, supercooled water, oils) in heat exchange systems with possibility of local alarming or simple control implementation**
- **Application in distributed control systems with local measurement and data display**
- **Systems with precise data logging for audit trials**

APPLICATIONS FOR STEAM, LIQUIDS AND TECHNICAL GASES

Process values and calculations relevant to a single installation application are grouped in one system named main application. FP-3011 flow computer can handle up to two independent main applications A and B. A configuration wizard helps to setup one of possible applications:

- the flow and heat of a liquid medium,
- the flow and delta heat of a liquid medium in a closed supply-return installation,
- the flow and delta heat of a liquid medium in an installation with different supply and return flow rates,
- the flow and heat of a steam,
- the flow and delta heat in a closed steam-condensate installation,
- the flow and delta heat in a steam-condensate installation with different steam and condensate flow rates,
- the flow and delta heat in a steam-generating installation with the supplied water flow rate measured,
- the flow of a gas.





APPLICATION SCOPE FOR STEAM MEASUREMENTS

The flow computer performs flow and heat measurement of superheated or saturated steam or water according to IAPWS-IF97 recommendations in the operating range of temperature 0…800 ºC and absolute pressure 0,05…16,52 MPa. Flow and energy measurements of liquids other than water are performed in the range of tabular values entered by user – density and enthalpy as function of temperature.

FLOW RATE MEASUREMENT

The flow computer can use:

- mass flowmeters,
- volume flowmeters,
- differential pressure devices with approximation by square root curve,
- differential pressure devices (orifices and nozzles) according to iteration algorithm according to PN-EN ISO 5167 standard (only for water and steam).

INPUTS

In the device there are five measuring inputs enabling connection of sensors and transmitters of various type:

- **2x RTD/I** - two inputs designed for direct connection of resistive temperature sensors (Pt-100, Pt-200, Pt-500, Pt-1000 or Ni-100, Ni-200,Ni-1000) or 0/4-20 mA current loop transmitters,
- **1 x I** – one input enable connection of 0/4-20 mA current loop transmitter,
- **2 x I/PULS** - two inputs enable flow rate measurement from a pulse transmitter (0,001 Hz to 10 kHz) or 0/4-20mA current loop transmitter.

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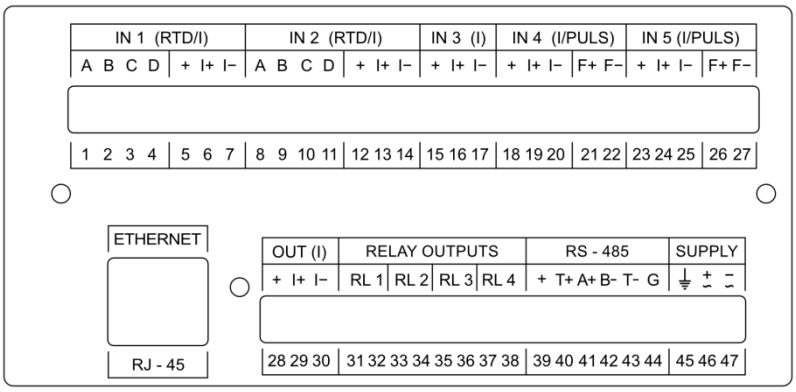


ADDITIONAL MEASUREMENTS AND CALCULATIONS

Additional measured or calculated values can be displayed besides the main application values. Up to 8 auxiliary channels may be set.

ALARMS & CONTROL, OUTPUT RELAYS

The flow computer is equipped with four solid state relay outputs 0,1 A / 60 V. Relays can react to the various events:

- alarm/control threshold over crossing,
- saturation of superheated steam,
- 0/4-20mA transmitter or RTD sensor failure or disconnection,
- close or open of binary input.

DATA RECORDING

2 GB of internal flash memory and extended functions of events and process values recording make it possible to perform analysis of technological processes and emergency conditions.

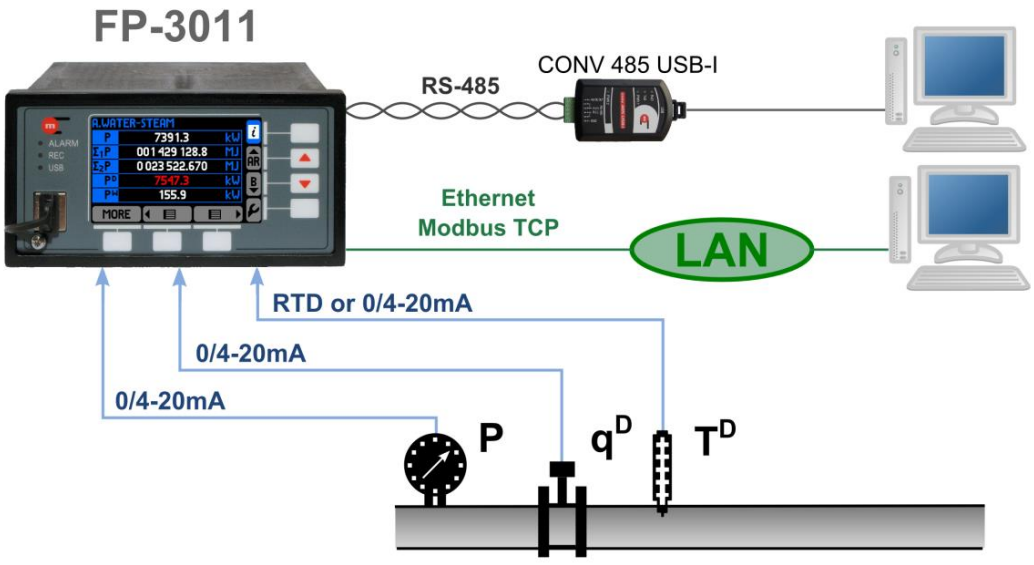
COMMUNICATION

- **RS485 port** (Modbus RTU or ASCII protocol).
- **Ethernet port** (Modbus TCP protocol and server WWW).
- **GSM module** (option), text messages to transfer information about selected alarms, failures, measurement values and totalisers.

VERSIONS

FP-3011	(N)	- x	- y	
				panel mount version
	N			wall mount version
		- 0		basic option with one main application A
		- 1		extended option with A and B applications
			- 0	option without analog 4-20mA output
			- 1	option with analog 4-20mA output

APPLICATION EXAMPLE



Device version FP-3011 v1.29 / Datasheet version: 2016-07-15

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TECHNICAL DATA

User interface, front panel	
Display type	LCD TFT color, 272 x 480 pixels
Readout field size	43.8 mm x 77.4 mm
LED indication	3 tri-color LEDs, red-orange-green
Keyboard	FP-3011: 7 membrane buttons FP-3011N: 19 membrane buttons
Inputs organization	
FP-3011, FP-3011N	2 x RTD / I: IN1, IN2 1 x I: IN3 2 x I / PULS: IN4, IN5
RTD type analog inputs	
Sensor type	Pt-100 x K, Ni-100 x K (K = 1..11) K – multiplier, e.g..: for Pt-200 K = 2
Measuring range	-200 .. +850 °C for Pt100 x K -60 .. +150 °C for Ni100 x K
Sensor connection	2- or 4-wires
Wire resistance compensation	Constant within range -99.99 Ω - +99.99 Ω
Maximum resistance of connecting wires	50 Ω
A/D converter resolution	18 bits
Accuracy (for T_a = +20 °C)	± 0,5 °C (typical ± 0,3 °C)
Temperature drift	Max ± 0,02 °C / °C
Galvanic isolation between inputs	No, common potential GND for all inputs
Galvanic isolation of supply voltage	400 VAC
Wire connection	FP-3011: two 4-pin screw type terminal blocks, max. cable diameter 1.5 mm^2 FP-3011N: spring type terminal block, cable diameter 0.2 mm^2 – 1.5 mm^2
0/4-20mA type analog inputs	
Signal type	0-20mA or 4-20mA
Transmitter connection	passive (supplied from measuring loop) or active converter
Input resistance	100 Ω ±10%
Transmitters supply	24 V DC / max 22 mA
A/D converter resolution	18 bits
Accuracy (T_a = 20 °C)	±0,1% of the range (typical ±0,05% of the range)
Temperature drift	Max ±50 ppm / °C
Galvanic isolation between inputs	No, common potential GND for all inputs
Galvanic isolation to supply voltage	400 VAC
Wire connection	FP-3011: five 3-pin screw type terminal blocks, max. cable diameter 1.5 mm^2 FP-3011N: spring type terminal block, cable diameter 0.2 mm^2 – 1.5 mm^2
PULSE type inputs	
Maximum input voltage	±28 VDC
Galvanic isolation between inputs	No, common potential GND for all inputs
Galvanic isolation to supply voltage	400 VAC
Functions	State detection Pulse counting Frequency measurement
Measuring range	0,001 Hz ÷ 10 kHz (0,001 Hz ÷ 1 kHz with filtrating capacitor)
Minimum impulse width	20 µs 0.5 ms, with filtrating capacitor
Accuracy (for T_a = 20 °C)	0,02%
Wire connection	FP-3011: two 2-pin screw type terminal blocks, max. cable diameter 1.5 mm^2 FP-3011N: spring type terminal block, cable diameter 0,2 mm^2 – 1,5 mm^2

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Configuration: OC / contact (default)	
Voltage(OC)	12 V
Current (contact)	12 mA
On / off threshold	2,7 V / 2,4 V
Configuration: voltage input	
Input resistance	>10 kΩ
On / off threshold	2,7 V / 2,4 V
Voltage (open)	12 V
Configuration: NAMUR	
High impedance state	0,4 mA – 1 mA
Low impedance state	2,2 mA – 6,5 mA
Compensated flow and heat energy measurement	
Accuracy of compensated steam, water, other liquid or technical gas flow	< 2% (typical < 0,5%)
Frequency of measurement and calculation results	1 s
4-20mA analog output (optional)	
Output signal	4-20mA (3,6 – 22 mA)
Maximum voltage between I+ and I-	28 VDC
Loop resistance (for U_{cc} = 24 V)	0 .. 500 Ω
Converter resolution D/A	16 bits
Accuracy	0,5%
Current loop supply	External or from internal unit supply 24 V DC / 22 mA
Galvanic isolation from supply voltage	400 VAC
Wire connection	FP-3011: 3-pin screw type terminal block, max. cable diameter 1,5 mm^2 FP-3011N: spring type terminal block, cable diameter 0,2 mm^2 – 1,5 mm^2
Binary outputs	
Number of outputs	4, mutually separated
Type of outputs	Semiconductor relays
Maximum load current	100 mA DC/AC
Maximum voltage	60 V DC/AC
Galvanic isolation	400 VAC
Wire connection	FP-3011: two 8-pin screw type terminal blocks, max. cable diameter 1,5 mm^2 FP-3011N: spring type terminal block, cable diameter 0,2 mm^2 – 1,5 mm^2
RS485 serial port	
Maximum load	32 receivers / transmitters
Maximum line length	1200 m
Maximum differential voltage A(+) – B(-)	±14 V
Maximum total voltage A(+) – „ground" or B(-) – „ground"	-7 .. +12 V
Minimal output signal from transmitter	1,5 V (at R_0 = 54 Ω)
Minimum receiver sensitivity	200 mV / R_{WE} = 12 kΩ
Minimum impedance of data transmission line	27 Ω
Internal terminating resistor	Yes, activated by short-circuit pins on terminal block
Short-circuit / thermal protection	Yes
Transmission protocol	ASCII Modbus RTU
Baud rate	1.2, 2.4, 4.8, 9.6 ,19.2, 38.4, 57.6, 115.2 kbps
Parity control	Even, Odd, None
Frame	1 start bit, 8 data bits, 1stop bit
Galvanic isolation	No
Wire connection	FP-3011: 6-pin screw type terminal blocks, max. cable diameter 1,5 mm^2 FP-3011N: spring type terminal block, cable diameter 0,2 mm^2 – 1,5 mm^2
Ethernet port	
Transmission protocol	Modbus TCP, ICMP (ping), DHCP server, http server

Interface	10BaseT Ethernet
Data buffer	300 B
Number of opened connections (simultaneously)	4
Connection type	RJ-45
LED signaling	2 (build in RJ-45 socked)
USB port	
Socket type	A type, according to USB standard
Version	USB 1.1
Socket protection class	IP-54
Recording format	FAT16 (within a limited scope)
Recording indication	Green-red USB LED on the front panel
Internal data memory	
Capacity	2 GB
Data format	Text, FAT16
Recording indication	Green-red REC LED on front panel
FP-3011 and FP-3011N power supply	
Supply voltage	24 VAC (+5% / -10%) or 24 VDC (15 .. 30 VDC)
Maximum power consumption	6 VA / 6 W
Wire connection	FP-30x1: 3-pin screw type terminal block, max. cable diameter 1,5 mm^2 FP-30x1N: spring type terminal block, cable diameter 0,2 mm^2 – 1,5 mm^2
FP-3011N power supply	
Supply voltage	100-240VAC 50/60 Hz
Maximum power consumption	16 VA
Wire connection	screw type terminal blocks, cable diameter 0,2 mm^2 – 1,5 mm^2
FP-3011 casing - dimensions	
Casing type	For panel mount, nonflammable plastic material „Noryl”
Dimensions (height x width x depth)	72 mm x 144 mm x 130 mm
Housing depth with terminals (without extra space for cables)	approx. 140 mm
Panel cut-out dimensions	138 +1 mm X 68 +0,7 mm
Panel maximum thickness	5 mm
Weight	approx. 0,5 kg
Protection class from the front panel	IP-54
Protection class from the rear panel	IP-30
FP-3011N casing - dimensions	
Casing type	Wall mounting, ABS material
Dimensions (height x width x depth)	217 mm X 257 mm X 125 mm (without cable glands) 247 mm X 257 mm X 125 mm (with cable glands)
Weight	approx. 2,1 kg
Protection class	IP54
Climate conditions	
Ambient temperature	0 .. +50 °C
Relative humidity	0 .. 75% (without steam condensation)
Storage temperature	-20 .. +80 °C
Overvoltage category	OVII
Pollution degree	PD2
LVD (safety)	EN 61010-1
EMC	EMC Directive 2014/30/UE EN 61326-1:2013 Tabela 2 (Immunity) EN 55011:2009+A1:2010 Class A (Radiated and conducted missions)
Installation location	Indoor use only

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