



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
- RS-485 communication port, ASCII and Modbus RTU protocols
- Ethernet port, Modbus TCP and server WWW
- 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

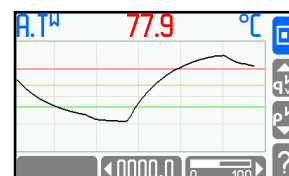
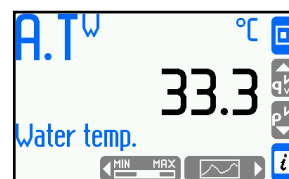
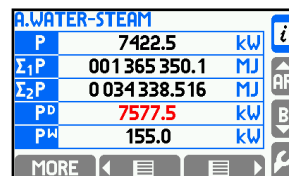
APPLICATION SCOPE FOR STEAM MEASUREMENTS

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 °C 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)



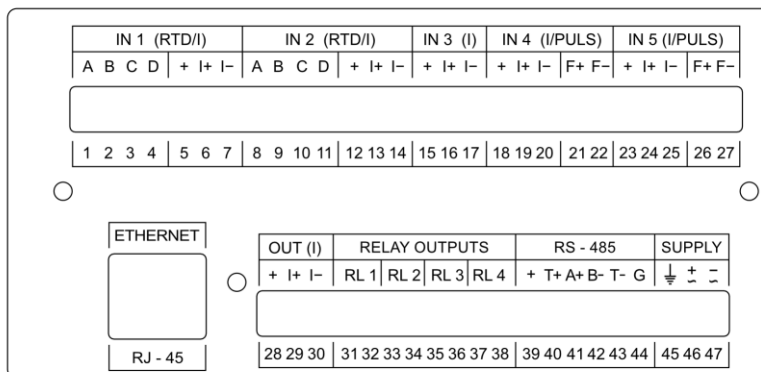


INPUTS

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 0/4-20 mA current loop transmitter.

Within the framework of five measuring inputs available up to two different measurement systems A and B can be set.



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 PORTS

The flow computer has two communication ports:

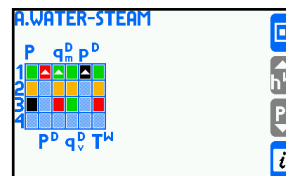
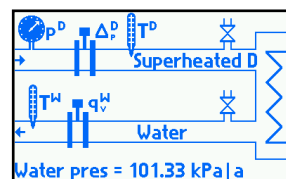
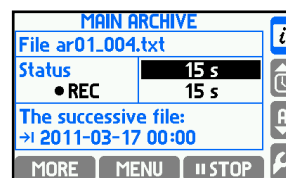
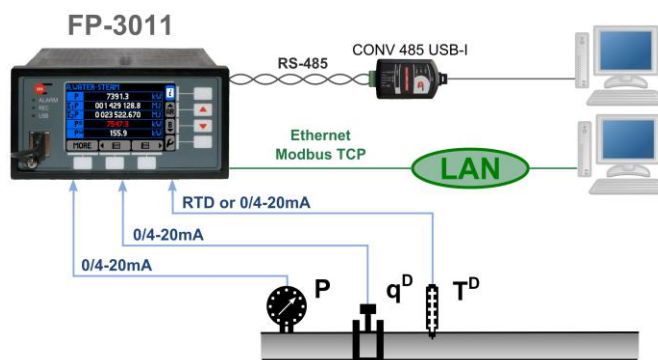
- **RS-485 port** (Modbus RTU or ASCII protocol),
- **Ethernet port** (Modbus TCP protocol or server WWW).

HOUSING AND POWER SUPPLY

There are two housing options available:

- FP-3011 – front panel version in standard dimension of 72 x 144 mm, with 24 V AC/DC supply voltage,
- FP-3011N – wall mounting version, with 230 VAC supply voltage.

APPLICATION EXAMPLE





TECHNICAL DATA

User interface, front panel	
Display	Graphic LCD TFT 240x300 points, backlight LED white, readout field 42 mm x 70 mm
LED signal diodes	3 two-colour, green-red
Keyboard	FP-3011: 7 membrane buttons FP-3031, FP-3031N, FP-3011N: 19 membrane buttons
Inputs organization	
FP-3031, FP-3031N	3x RTD / I: IN1, IN2, IN3
	4x I: IN4, IN5, IN6, IN7
	3x I / PULS: IN8, IN9, IN10
FP-3011, FP-3011N	2x RTD / I: IN1, IN2
	1x I: IN3
	2x 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
Leads resistance compensation	Constant within range -99.99 Ω - +99.99 Ω
Maximum resistance of connecting leads	50 Ω
A/C 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 to supply voltage	400 VAC
0/4-20 mA type analog inputs	
Signal type	0-20mA (0 – 22 mA) or 4-20mA (3,6 – 22 mA)
Transmitter connection	passive (supplied from FP-30x1) active converter (current source)
Input resistance	100 Ω ±10%
Transmitters supply	24 V DC / max 22 mA (each)
A/C 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
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
Frequency measurement	
Measurement range	0,001 Hz to 10 kHz (0,001 Hz to 1 kHz with connected filtering capacitor)
Minimum pulse width	20 μ s (0,5 ms with connected filtering capacitor)
Accuracy ($T_a = 20\text{ }^{\circ}\text{C}$)	0,02%
Configuration: OC or passive contact (default configuration)	Jumper in OC position
Open contact voltage	12 V
Short circuit current	12 mA
Switching threshold	2,7 V / 2,4 V
Configuration: voltage input	Jumper in OC position
Input resistance	>10 k Ω
Switching threshold	2,7 V / 2,4 V
Open contact voltage	12 V
Configuration: NAMUR	Jumper in NR position
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%)
Measurement and values computation interval	1 s
4-20 mA analog output(s) - option	
Number of outputs	FP-3031, FP-3031N: 1 or 2 FP-3011, FP-3011N: 1
Output signal	4-20mA (3,6 – 22 mA)
Maximum voltage between I+ and I-	28 VDC
Loop resistance (for $U_{cc} = 24\text{ V}$)	0 .. 500 Ω
Converter resolution C/A	16 bits
Accuracy	0,1% of the range
Current loop supply	External or from internal unit supply 24 V DC / 22 mA
Galvanic isolation to supply voltage	400 VAC
Relay outputs	
Number of outputs	4
Outputs type	Solid state relay
Maximum load current	100 mA DC/AC
Maximum voltage	60 V DC/AC
Galvanic isolation	400 VAC
RS-485 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
Transmitter minimum output signal	1,5 V (at $R_0 = 27 \Omega$)
Receiver minimum sensitivity	200 mV / $R_{WE} = 12 k\Omega$
Data transmission line minimum impedance	27 Ω
Termination resistors internal system	yes, activated with external jumpers
Short circuit/ thermal overload protection	yes
Transmission protocol	Modbus RTU (current readout and totalisers) ASCII
Transmission speed	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, 1 stop bit
Galvanic isolation	400 VAC
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
Connector type	RJ-45
LED signaling	2 (build in RJ-45 socket)
USB port	
Socket type	A, on front panel
Version	USB 1.1 (Host for USB Flash Memory)
Socket protection class	IP-54
Data format	FAT16
Read/write signaling	Red/green/yellow LED on front panel
Archiving, internal data memory	
Memory capacity	2 GB (nonvolatile memory)
Data format	FAT16
Recording signaling	Red/green LED on front panel
FP-3031, FP-3011 Power Supply	
Supply voltage	24 VAC (15 .. 26,5 VAC) or 24 VDC (15 .. 35 VDC)
Power consumption	Max 9 VA / 9 W
FP-3031N, FP-3011N Power Supply	
Supply voltage	230 VAC (+5% / -10%)
Power consumption	Max 10 VA
Dimensions – housing for FP-3031, FP-3011	
Housing type	For panel surface, nonflammable plastic material „Noryl”





Dimensions (height x width x depth)	FP-3031: 96 mm x 192 mm x 63,5 mm FP-3011: 72 mm x 144 mm x 130 mm
Housing depth with terminals (without extra space for cables)	FP-3031: approx. 72 mm FP-3011: approx. 140 mm
Panel cut-out dimensions	FP-3031: 186 ^{+1,1} mm X 92 ^{+0,6} mm FP-3011: 138 ⁺¹ mm X 68 ^{+0,7} mm
Panel maximum thickness	5 mm
Weight	FP-3000: ca. 0,7 kg FP-3010: ca. 0,5 kg
Protection class from the front panel	IP-54
Protection class from the rear panel	IP-30
Dimensions – housing for FP-3031N, FP-3011N	
Housing type	Wall mounting, ABS
Dimensions (height x width x depth)	216 mm X 260 mm X 125 mm (without cable glands) 246 mm X 260 mm X 125 mm (with cable glands)
Weight	ca. 2,1 kg
Protection class from the front panel	IP-54
Climate conditions	
Ambient temperature	0 .. +50 °C
Relative humidity	0 .. 75% (without steam condensation)
Storage temperature	-20 .. +80 °C

Device version FP-3011 v2.06 / Datasheet version: 2011-11-03

