



## FP-3021N

## FP-3021

**Flow and Energy Computer  
for Steam, Liquids and Gases  
with advanced data recording for  
HART or RS-485/MODBUS RTU  
sensors**

- Handles up to 2 independent installations
- 5 channels for HART / Modbus RTU sensors
- 2 digital channels
- Alarm & control functions, 4 output relays
- Analog 4-20mA output (option)
- Advanced data recording for process values and totalisers
- User configurable data presentation on color TFT display
- RS-485 communication port, ASCII and Modbus RTU protocols
- Ethernet port, Modbus TCP and server WWW
- 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-3021 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.

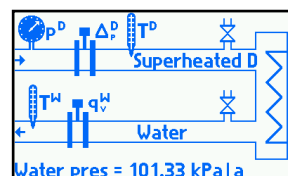
### FLOW RATE MEASUREMENT

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).

A.WATER-STEAM		
P	7422.5	kW
Σ1P	001365350.1	MJ
Σ2P	0034338.516	MJ
P <sup>D</sup>	7577.5	kW
P <sup>W</sup>	155.0	kW
MORE		

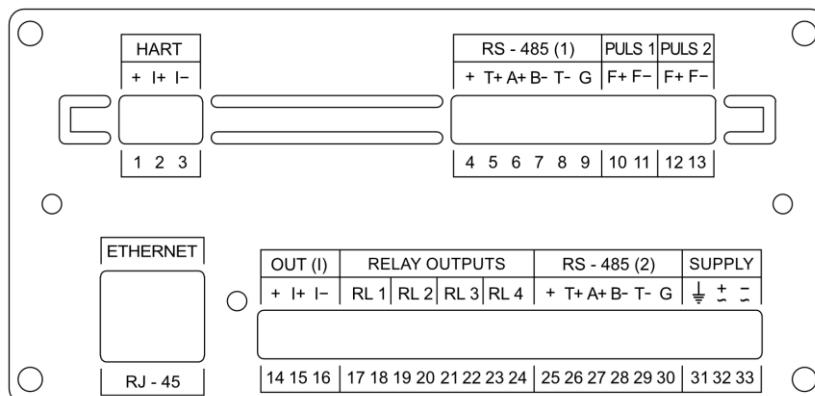
MAIN ARCHIVE	
File ar01_004.txt	
Status	15 s
• REC	15 s
The successive file:	
→ 2011-03-17 00:00	
MORE MENU STOP	





## 7 CHANNEL FOR MEASURED PROCESS VALUES

- 5 channels designed to read data from sensors and instruments with digital protocol (HART or Modbus RTU).
- 2 digital inputs (PULS) for state, pulse or frequency measurements; OC, voltage or NAMUR configuration.



## HART

- HART port with power supply for sensors (24 VDC /60 mA), sensors in multidrop configuration.
- Supported rev.4., rev.5., rev.6. Possible configuration as Primary or Secondary Master.
- Read variables: PV - primary variable, SV – secondary variable, TV -third variable, FV - fourth variable.

## MODBUS RTU

- Sensors or instruments connected in parallel to one twisted pair of wires.
- Baud rate from 1200 bps to 115200 bps.
- Available functions: 03 (Read Holding Register) and 04 (Read Input Register), registers in the range 0 ... 65535.
- Data format: unsigned integer, integer, unsigned long, unsigned long swapped, long, long swapped, floating point, floating point swapped.

## 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-3021 – front panel version in standard dimension of 72 x 144 mm, with 24 V AC/DC supply voltage,
- FP-3021N – wall mounting version, with 230 VAC supply voltage.

Device version FP-3021 v2.06 / Datasheet version: 2011-11-04





## 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-3021: 7 membrane buttons FP-3021N: 19 membrane buttons
RS-485 SERIAL PORT (1)	
Transmission protocol:	Modbus RTU
Frequency of reading:	3 s, 4 s, 5 s, 6 s, 10 s, 12 s, 15 s, 30 s, 1 min,
Transmission rate:	1.2, 2.4, 4.8, 9.6, 19.2, 38.4, 57.6, 115.2 kbps
Address space of transducers:	1 ... 247
Maximum load:	32 receivers / transmitters
Maximum length of line:	1200 m
Galvanic separation:	Yes, 250 VAC / 300 VDC
Maximum differential voltage A(+) – B(-):	-8 V ... +13 V
Maximum total voltage A(+) – "ground" or B(-) – "ground":	-7 V ... +12 V
Minimum output signal of transmitter:	1,5 V (przy $R_0 = 54 \Omega$ )
Minimum sensitivity of receiver:	200 mV / $R_{WE} = 12 \text{ k}\Omega$
Minimum impedance of data transmission line:	27 $\Omega$
Short-circuit / thermal protection:	Yes
Internal terminating resistor:	Yes
Signals output on terminal block:	A(+), B(-), GND RS, +3,3 V RS (max 10mA), T(+), T(-)
HART	
Transmission protocol:	Master type rev. 4, rev 5, rev.6.
Functions:	Reading variables: PV, SV, TV, FV Retrieve long address Change of short address
Multidrop mode:	Yes, up to 15 devices
Loop Power:	24 VDC (max 60 mA)
Analog readout line 4-20mA:	No
PULSE type inputs	
Maximum input voltage:	$\pm 28 \text{ VDC}$
Galvanic isolation between inputs:	No, common potential GND for all inputs
Galvanic isolation to supply voltage:	400 VAC
<b>Frequency measurement</b>	
Measurement range:	0,001 Hz to 10 kHz (0,001 Hz to 1 kHz with connected filtering capacitor)
Minimum pulse width:	20 $\mu\text{s}$ (0,5 ms with connected filtering capacitor)
Accuracy ( $T_a = 20^\circ\text{C}$ ):	0,02%
<b>Configuration: OC or passive contact</b> (default configuration)	
Open contact voltage:	12 V
Short circuit current:	12 mA
Switching threshold:	2,7 V / 2,4 V
<b>Configuration: voltage input</b>	
Input resistance:	$> 10 \text{ k}\Omega$
Switching threshold:	2,7 V / 2,4 V
Open contact voltage:	12 V
<b>Configuration: NAMUR</b>	
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-3021, FP-3021N: 1
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 $\Omega$
Converter resolution C/A:	16 bits
Accuracy:	0,5%
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 (2)	
Maximum load:	32 receivers / transmitters
Maximum length of line:	1200 m
Maximum differential voltage A(+) – B(-):	$\pm 14$ V
Maximum total voltage A(+) – "ground" or B(-) – "ground":	-7 .. +12 V
Minimum output signal of transmitter:	1,5 V (przy $R_0 = 27 \Omega$ )
Minimum sensitivity of receiver:	200 mV / $R_{WE} = 12 k\Omega$
Minimum impedance of data transmission line:	27 $\Omega$
Short-circuit / thermal protection:	Yes
Internal terminating resistor:	Yes
Transmission protocol:	ASCII Modbus RTU
Transmission 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, 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 open 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
Data format:	FAT16
Recording signaling:	Red/green LED on front panel
FP-3021 Power Supply	
Supply voltage:	24 VAC (15 .. 26,5 VAC) or 24 VDC (15 .. 35 VDC)
Power consumption:	Max 9 VA / 9 W
FP-3021N Power Supply	
Supply voltage:	230 VAC (+5% / -10%)





Power consumption:	Max 10 VA
<b>Dimensions – housing for FP-3021</b>	
Housing type:	For panel surface, nonflammable plastic material „Noryl”
Dimensions (height x width x depth):	FP-3021: 72 mm x 144 mm x 130 mm
Housing depth with terminals (without extra space for cables):	FP-3021: ok. 140 mm
Panel cut-out dimensions:	FP-3021: 138 <sup>+1</sup> mm X 68 <sup>+0,7</sup> mm
Panel maximum thickness:	5 mm
Weight:	FP-3021: ca. 0,5 kg
Protection class from the front panel:	IP-54
Protection class from the rear panel:	IP-30
<b>Dimensions – housing for FP-3021N</b>	
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
<b>Climate conditions</b>	
Ambient temperature:	0 .. +50 °C
Relative humidity:	0 .. 75% (without steam condensation)
Storage temperature:	-20 .. +80 °C

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