

# Application FP03

## Petroleum & Other Fluid Groups

### Flow Computer

for Quadrature Volumetric Frequency Flowmeters



### Features

- Volume correction for petroleum products, gasohol blends, ethanol mixtures with water, general and user-defined fluids
- Can accept temperature and/or density inputs for volume correction
- Allows quadrature flow input for ISO 6551 level B pulse security
- Selection of Detail or Basic main menu to suit operator and application
- Selection of second language and user tags
- RTC logging with over 1000 entries
- Programmable pulse width and scaling of pulse output
- 4-20mA retransmission
- RS232 and RS485 or Ethernet (optional) serial ports
- Modbus RTU, Printer and other serial port protocols

### Overview

The 515 FP03 application caters for custody transfer measurement of petroleum products. The frequency flow inputs can accept a quadrature signal for ISO 6551 level B pulse security. An analog temperature and/or density inputs allow for volume correction to reference conditions.

This instrument is compatible with a wide range of flowmeter frequency outputs, including millivolt signals, reed switches, Namur proximity switches and pulse trains via its smart front-panel program selection.

The flow computer can be used to measure a range of crude and refined petroleum fluids including gasoline, jet fuels, heating oils, diesels, lube oils and LPGs. Volume correction is also available for gasohol, ethanol and other general and user-defined fluids.

### Calculations

The volume total and flowrate are derived from accurately measured frequency and the number of received pulses.

$$\text{gross volume} = \text{pulses} / k\text{-factor}$$

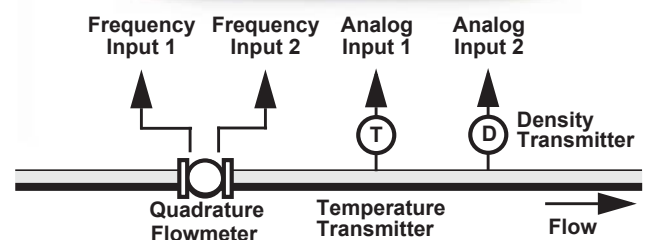
$$\text{gross volume flow} = \text{frequency} / k\text{-factor}$$

The volume correction calculations are based on the ASTM D1250-04 and API Table 54, MPMS 11.3.4-2019, ABNT NBR 15639-2016 standards for the following products:

- Crude Oils
- Lube Oils
- Refined Products
- Special Applications
- Light Hydrocarbon Liquids (LPG)
- Gasohol Blends
- Ethanol Mixtures with Water

Volume correction for other fluids can be calculated by the following means:

- General Coefficient of Expansion
- Preprogrammed User Table



## Displayed Information

The front panel display shows the current values of the input variables and the results of the calculations. A list of the variables for this application and their type (total or rate) is shown at the end of this document.

The instrument can be supplied with a real-time clock for data logging of over 1000 entries of the variables as displayed on the main menu.

## Communications

There are two communication ports available as follows:

- COM-1 RS-232 port
- COM-2 RS-485 port (optional) or Ethernet (optional)

All types of ports can be used for remote data reading, while RS-232 and RS-485 serial ports can be used for printouts and for uploading and downloading of the application software to the instrument.

## Isolated Outputs

The opto-isolated outputs can re-transmit any main menu variable. The type of output is determined by the nature of the assigned variable. Totals are output as pulses and rates are output as 4-20mA signals. One output is standard, a second output is available as an option.

## Relay Outputs

The relay alarms can be assigned to any of the main menu variables of a rate type. The alarms can be fully configured including hysteresis. Two relays are standard with two additional relays available as an option.

## Software Configuration

The instrument can be programmed to suit the particular application needs and the flexible I/O can be assigned as required. Program settings can be changed either via the front panel (depending on assigned access levels) or via the 500 Series Program Manager (500-PM software).

The instrument stores all set-up parameters, totals and logged data in non-volatile memory with at least 30 years retention.

## Dimension Drawings

### Part Number

515.XXXXXX-FP03  
see **Product Codes** to select required features

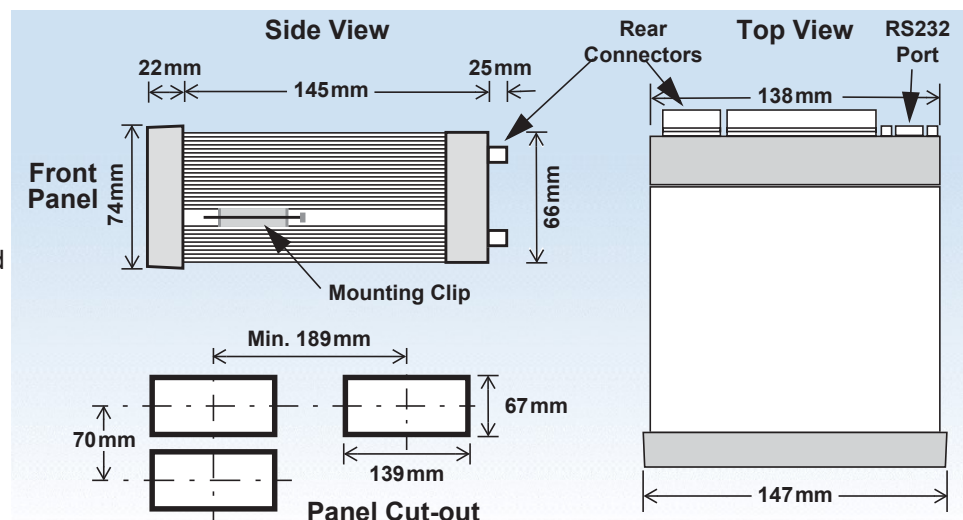
Default Application software:  
515-FP03-000000

## Analog Input Types

Any analog input can be set to accept a 4-20mA, 0-5V or 1-5V signal, while any inputs assigned to a temperature sensor can also be set to accept a PT100 or PT500 signal.

## Terminal Designations

Terminal Label	Designation	Comment
1	FINP 1+	Frequency Input 1+
2	FINP 2+	Frequency Input 2+
3	SG -	Signal ground
5	EXC V 2+	Excitation Term 2+
		For AINP1 RTD Input
7	AINP1 +	Analog Input ch 1 (+)
8	-	Analog Input ch 1 (-)
		Temperature Input
9	AINP2 +	Analog Input ch 2 (+)
10	-	Analog Input ch 2 (-)
		Density Input
15	Vo +	8-24 volts DC output
16	G -	DC Ground
17	Vi +	DC power input
18	SH E	Shield terminal
		Overload protected
19	RS485 +	RS485 (+)
20	COM-2 -	RS485 (-)
21	port G	RS485 ground
		Optional RS485 port may be replaced by Ethernet port.
22		1+ Switch 1
23		2+ Switch 2
24	LOGIC INPUTS	3+ Switch 3
25		4+ Switch 4
26		C- Signal ground
		Remote Reset CAL Switch – In field access protection
27	OUT1 +	Output ch 1 (+)
28	-	Output ch 1 (-)
29	OUT2 +	Output ch 2 (+)
30	-	Output ch 2 (-)
31	RC	Relay Common 1-2
		<i>Term 31 - Common 1-4 on legacy option card</i>
32	R1	Relay 1
33	R2	Relay 2
34	R3	Relay 3
35	R4	Relay 4
36	RC	Relay common 3-4
		<i>Term 36 only available on new style option card</i>
E	AC MAINS	E Mains ground
N		N Mains neutral
A		A Mains active
		AC power in 100-240VAC
RS232 COM-1 port		9-pin serial port



# Specifications

## Operating Environment

<b>Temperature</b>	+5°C to +40°C (standard - no coating) -20°C to +60°C (with conformal coating) -30°C to +60°C (ExD housing with heater)
<b>Humidity</b>	0 to 95% non condensing (conformal coating) 5% to 85% non condensing (no coating)
<b>Power Supply</b>	100-240 V AC (+/-10%) 50-60 Hz (+/-10%) or 12-28 V DC
<b>Consumption</b>	10W (max) Overvoltage category II
<b>Protection</b>	Sealed to IP65 (Nema 4X) when panel mounted
<b>Dimensions (panel option)</b>	147mm (5.8") width 74mm (2.9") height 170mm (6.6") depth (behind the panel)

## Display

<b>Type</b>	Backlit LCD with 7-digit numeric display and 11-character alphanumeric display
<b>Digits</b>	15.5mm (0.6") high
<b>Characters</b>	6mm (0.24") high
<b>LCD Backup</b>	Last data visible for 15min after power down
<b>Update Rate</b>	0.3 second

## Non-volatile Memory

<b>Retention</b>	> 30 years
<b>Data Stored</b>	Setup, Totals and Logs

## Approvals

<b>Electrical &amp; Interference</b>	UKCA, CE, CSA compliance
<b>Enclosure</b>	Ex d Enclosure - ATEX & IECEx available for hazardous area (CSA Pending). Field Mount Enclosure - UKCA, CE, CSA safe area weather proof enclosure. Other - RoHS compliant

## Real Time Clock (Optional)

<b>Battery Type</b>	3 volts Lithium button cell - For Issue 7 option card, type CR2450N manufactured by Renata only - For conformal coated 'C' version, type BR2032 manufactured by Panasonic only - For non-conformal coated versions, type BR2032 and CR2032 manufactured by Panasonic or Sony
<b>Battery Life</b>	5 years (typical)

## Frequency Input (General)

<b>Range</b>	0 to 10kHz for Pulse input type 0 to 5 kHz for Coil & NPS input types (3kHz for pulse security)
<b>Overvoltage</b>	30V maximum
<b>Update Time</b>	0.3 sec
<b>Cutoff frequency</b>	Programmable
<b>Configuration</b>	Pulse, coil or NPS input
<b>Non-linearity</b>	Up to 10 correction points

## Pulse

<b>Signal Type</b>	CMOS, TTL, open collector, reed switch
<b>Threshold</b>	Signals switch below 1.3 & above 2 volts

## Coil

<b>Signal Type</b>	Turbine and sine wave
<b>Sensitivity</b>	15mV minimum amplitude (typical)

## NPS

<b>Signal Type</b>	NPS sensor to Namur standard
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## Analog Input (General)

<b>Overcurrent</b>	100mA absolute maximum rating (30mA for 4-20mA inputs)
<b>Update Time</b>	< 1.0 sec
<b>Configuration</b>	RTD, 4-20mA, 0-5V and 1-5V input
<b>Non-linearity</b>	Up to 20 correction points (some inputs)

## RTD Input

<b>Sensor Type</b>	PT100 & PT500 to IEC 751
<b>Connection</b>	Four Wire
<b>Range</b>	-200°C to 350°C -200°C to 800°C (PT100 extended range)
<b>Accuracy</b>	0.1°C typical 0.2°C typical (PT100 extended range)

## 4-20mA Input

<b>Impedance</b>	100 Ohms (to common signal ground)
<b>Accuracy</b>	0.05% full scale (20°C) 0.1% (full temperature range, typical)

## 0-5 or 1-5 Volts Input

<b>Impedance</b>	10MOhms (to common signal ground)
<b>Accuracy</b>	0.05% full scale (20°C) 0.1% (full temperature range, typical)

## Logic Inputs

<b>Signal Type</b>	CMOS, TTL, open collector, reed switch
<b>Overvoltage</b>	30V maximum

## Relay Output

<b>No. of Outputs</b>	2 relays plus 2 optional relays
<b>Voltage</b>	250 volts AC, 30 volts DC maximum (solid state relays use AC only)
<b>Current</b>	3A maximum - mechanical relays 1.5A maximum - solid state relays

## Communication Ports

<b>Ports</b>	COM-1 RS-232 port COM-2 RS-485 or Ethernet port (optional)
<b>Baud Rate</b>	2400 to 19200 baud
<b>Parity</b>	Odd, even or none
<b>Stop Bits</b>	1 or 2
<b>Data Bits</b>	8
<b>Protocols</b>	ASCII, Modbus RTU, Modbus TCP/IP (Ethernet Port), Printer

## Transducer Supply

<b>Voltage</b>	8 to 24 volts DC, programmable
<b>Current</b>	70mA @ 24V, 120mA @ 12V maximum
<b>Protection</b>	Power limited output

## Isolated Output

<b>No. of Outputs</b>	2 configurable outputs
<b>Configuration</b>	Pulse/Digital or 4-20mA output

## Pulse/Digital Output

<b>Signal Type</b>	Open collector
<b>Switching</b>	200mA, 30 volts DC maximum
<b>Saturation</b>	0.8 volts maximum
<b>Pulse Width</b>	Programmable: 10, 20, 50, 100, 200 or 500ms

## 4-20mA Output

<b>Supply</b>	9 to 30 volts DC external
<b>Resolution</b>	0.05% full scale
<b>Accuracy</b>	0.05% full scale (20°C) 0.1% (full temperature range, typical)

*Important: Specifications are subject to change without notice.*

# Ordering Information

## Product Codes

Model	Supplementary Code	Description
515	- FP03	
Enclosure	1	Panel mount enclosure
	2/7	Field mount enclosure (NEMA 4X / IP66) (7 specifies heater included)
	3/5	Explosion proof Ex d (IECEX/ATEX), metric glands (5 specifies heater included)
	4/6	Explosion proof Ex d (CSA), NPT glands (6 specifies heater included)
Output Options	0	4 logic inputs, 1 isolated output, 2 relays (only relay type 1 is available), RS232 (DB9) communication port
	1	4 logic inputs, 2 isolated outputs, 4 relays, real-time clock data logging, RS232 (DB9) and RS485 communication ports
	2	4 logic inputs, 2 isolated outputs, 4 relays, real-time clock data logging, RS232 (DB9) & Ethernet communication ports
Relay Type	1	Electromechanical relays only
	2	2 electromechanical relays (1-2) and 2 solid state relays (3-4)
	3	Solid state relays only
Power Supply	U	Inputs for 12-28VDC and 100-240 VAC, 50-60Hz (Previous Models: A = 110/120 VAC, E = 220/240 VAC)
	D	Input for 12-28VDC power only
Display Panel Option	S	Standard option (now with backlight & LCD backup) (original Full option: F, with Infra-Red comms, no longer available)
PCB Protection	C	<b>Conformal coating</b> - required for maximum environmental operating range. Recommended to avoid damage from moisture and corrosion.
	N	<b>None</b> - suitable for IEC standard 654-1 Climatic Conditions up to Class B2 (Heated and/or cooled enclosed locations)
Application Pack Number	FP03	Defines the application software to be loaded into the instrument

Example full product part number is 515.111USC-FP03 (this is the number used for placing orders).

## Main Menu Variables

Main Menu Variables	Default Units	Preferred Units	Variable Type
Net Volume	m <sup>3</sup>		Total
Net Flowrate	m <sup>3</sup> /min		Rate
Gross Volume	m <sup>3</sup>		Total
Gross Flowrate	m <sup>3</sup> /min		Rate
Mass	kg		Total
Mass Flowrate	kg/min		Rate
Temperature	Deg C		Rate
Density	kg/m <sup>3</sup>		Rate



Example of 500 Series in BZC Ex d enclosure

[www.contrec.co.uk](http://www.contrec.co.uk)



**Contrec Limited**  
Riverside, Canal Road  
Sowerby Bridge, West Yorkshire  
HX6 2AY United Kingdom  
Tel: +44 1422 829944  
Email: sales@contrec.co.uk

**Contrec - USA, LLC**  
916 Belcher Drive  
Pelham, Alabama  
AL 35124 United States  
Tel: +1 (205) 685 3000  
Email: contrec@contrec-usa.com

**Contrec Systems Pty Ltd**  
5 Norfolk Avenue  
Ringwood, Victoria 3134  
Melbourne Australia  
Tel: +61 413 505 114  
Email: info@contrec.com.au