Application AI01

Additive Injection Controller

for Volumetric Frequency Flowmeters & Positive Displacement Dosing Pumps

Features

- Suited for injection ratios from 10 to 10000 PPM
- Programmable pump stroke volumes and maximum stroke rates to cater for wide range of dosing pumps
- Adjustable sampling method deals with the inherent problems of measurement and control of pulsating injections
- Continual calculation of main flow and required dosing rates
- Permissive input allows system to settle without raising exceptions
- Warnings provided for: No Additive Flow, Excess Additive Flow and Sample Deviation Exceeded
- Warning of external alarms and main flow too high for dosing pump
- Allows for non-linear correction
- Selection of second language and user tags
- RTC logging with over 1000 entries
- Selectable protocols on serial ports including Modbus RTU and Printer output
- Backlit display with LCD backup

CE

Overview

The 515 AI01 application is designed to control the injection of additive chemicals with respect to a main flow. Tailored for volumetric frequency flowmeters it will operate with positive displacement dosing pumps controlling the dosing rate via either an output pulse or 4-20mA signal.

The instrument will calculate a Target Stroke Rate and the intervals of main volume at which a Stroke Output Pulse will be generated based on the dosing pump parameters and the process ratio set point, programmed in PPM (parts per million).

The additive flow is monitored and measured along with the main flow to continuously calculate the overall Process Ratio and the Sample Ratio that provides a faster “real time” PPM value of the dosing chemical. There are flow and deviation exceptions, alarms and a permissive that can be used to help maintain control and integrity of an additive injection system.

Calculations

The Sample Ratio (in ppm) is an average value based on the internal sample totals for the additive and main volumes captured during a sliding period of the programmable “Sample Strokes”.

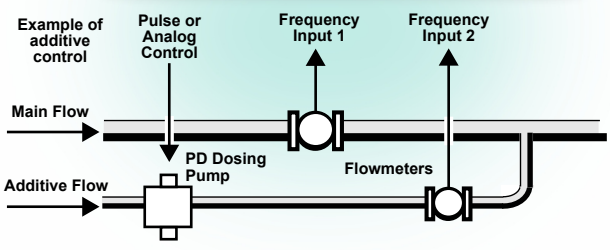
$$SampleRatio = \frac{Additive_{sample}}{Main_{sample}} \times 10^6$$

The Process Ratio (in ppm) is based on the actual Additive Volume and main volume since the last reset.

$$ProcessRatio = \frac{Additive_{volume}}{Main_{volume}} \times 10^6$$

The Target Stroke Rate (in SPM, strokes per minute) can be a key visual or automation aid for the dosing operations.

$$SPM = \frac{\left(\frac{Setpoint_{ppm}}{10^6} \times Main_{flowrate}\right)}{Stroke_{volume}}$$



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 currently two communication ports available as follows:

- RS-232 port
- RS-485 port (optional)

The ports are available for remote data reading, printouts and for initial application loading of 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 4-20 mA signals. By default, output 1 has been assigned to the Stroke Count to provide a pulse signal and output 2 is assigned to the Target Stroke Rate to provide a 4-20mA output.

Relay Outputs

All four alarm relays can be freely assigned. As well as assigning a particular rate variable as a high or low alarm, a relay can be assigned to the unit's exceptions/warnings to drive external sounders, beacons or other master control devices.

Software Configuration

The instrument can be further tailored to suit specific application needs including units of measurement, custom tags, second language or access levels. A distributor can configure these requirements before delivery.

Instrument parameters including units of measurement can be programmed in the field, according to the user access levels assigned to parameters by the distributor.

All set-up parameters, totals and logged data are stored in non-volatile memory with at least 30 years retention.

Terminal Designations

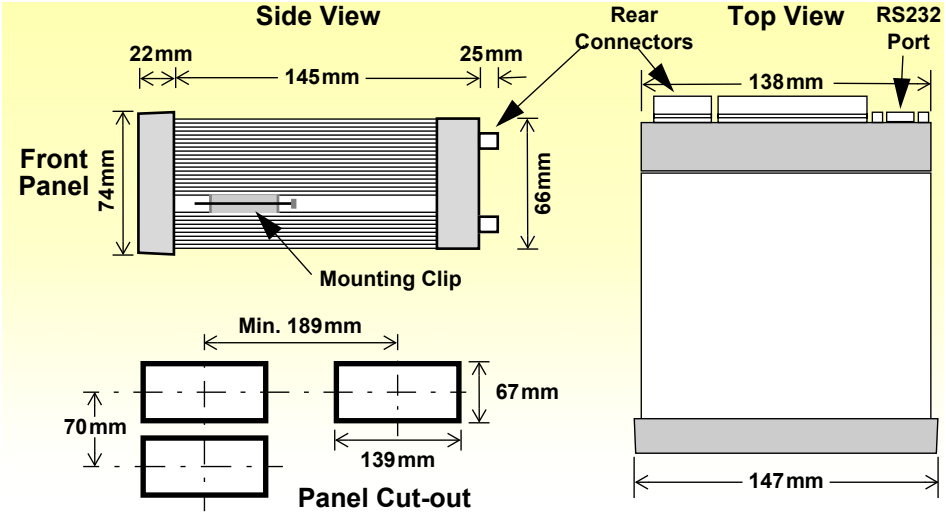
Terminal Label			Designation	Comment
1	FINP	1+	Frequency Input 1+	Main line flow
2	FINP	2+	Frequency Input 2+	Additive line flow
3	SG	-	Signal ground	
15	Vo	+	8-24 volts DC output	Overload protected
16	G	-	DC Ground	
17	Vi	+	DC power input	DC power in 12-28V
18	SH	E	Shield terminal	
19		+	RS485 (+)	
20	RS485	-	RS485 (-)	Optional RS485 port
21		G	RS485 ground	
22		1+	Switch 1	External Alarm Signal
23		2+	Switch 2	Remote Display
24	LOGIC INPUTS	3+	Switch 3	Remote Reset
25		4+	Switch 4	Permissive Input
26		C-	Signal ground	
27	OUT1	+	Output ch 1 (+)	Stroke Pulse output
28		-	Output ch 1 (-)	
29	OUT2	+	Output ch 2 (+)	Target Stroke Rate output
30		-	Output ch 2 (-)	
31		RC	Relay common	
32		R1	Relay 1	
33	RELAYS	R2	Relay 2	
34		R3	Relay 3	
35		R4	Relay 4	
E		E	Mains ground	
N	AC MAINS	N	Mains neutral	AC power in 95-135V or 190-260V
A		A	Mains active	
RS232 port			9-pin serial port	

Dimension Drawings

Part Number

515.XXXXXX-AI01
see **Product Codes** to select required features

Default Application software:
515-AI01-000000



Specifications

Operating Environment

Temperature	-20°C to +60°C (conformal coating) +5°C to +40°C (no coating)
Humidity	0 to 95% non condensing (conformal coating) 5% to 85% non condensing (no coating)
Power Supply	95...135 V AC or 190...260 V AC or 12...28 V DC
Consumption	6W (typical)
Protection	Sealed to IP65 (Nema 4X) when panel mounted
Dimensions	147mm (5.8") width 74mm (2.9") height 167mm (6.6") depth

Display

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

Non-volatile Memory

Retention	> 30 years
Data Stored	Setup, Totals and Logs

Approvals

Interference	CE compliance
Enclosure	ATEX, FM, CSA and SAA approved enclosures available for hazardous areas

Real Time Clock (Optional)

Battery Type	3 volts Lithium button cell (CR2032)
Battery Life	5 years (typical)

Frequency Input (General)

Range	0 to 10kHz
Overvoltage	30V maximum
Update Time	0.3 sec
Cutoff frequency	Programmable
Configuration	Pulse, coil or NPS input
Non-linearity	Up to 10 correction points

Pulse

Signal Type	CMOS, TTL, open collector, reed switch
Threshold	1.3 volts

Coil

Signal Type	Turbine and sine wave
Sensitivity	15mV p-p minimum

NPS

Signal Type	NPS sensor to Namur standard

Logic Inputs

Signal Type	CMOS, TTL, open collector, reed switch
Overvoltage	30V maximum

Relay Output

No. of Outputs	2 relays plus 2 optional relays
Voltage	250 volts AC, 30 volts DC maximum (solid state relays use AC only)
Current	3A maximum

Communication Ports

Ports	RS-232 port RS-485 port (optional)
Baud Rate	2400 to 19200 baud
Parity	Odd, even or none
Stop Bits	1 or 2
Data Bits	8
Protocols	ASCII, Modbus RTU, Printer*

Transducer Supply

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

Isolated Output

No. of Outputs	configurable output
Configuration	Pulse/Digital or 4-20mA output

Pulse/Digital Output

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

4-20mA Output

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

Important: Specifications are subject to change without notice.
Printer protocol is available only if RTC option is installed.

Ordering Information

Product Codes

Model	Supplementary Code							Description
515 .						-	AI01	
Enclosure	1							Panel mount enclosure
	2							Field mount enclosure (not yet available)
	3/5							Explosion proof Ex410 with metric glands (5 specifies heater version)
	4/6							Explosion proof Ex410 with NPT glands (6 specifies heater version)
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
		2/3						4 logic inputs, 2 isolated outputs, 4 relays, real-time clock data logging, RS232 (DB9) and Ethernet/RF communication ports (not yet available)
Relay Type			1					Electromechanical relays only
			2					2 electromechanical and 2 solid state relays
			3					Solid state relays only (not yet available)
Power Supply				E				For 220/240 VAC
				A				For 110/120 VAC
				D				For DC power only 12-28 VDC
Display Panel Option					F			Fully optioned (with backlight & LCD backup)
PCB Protection						C		**Conformal coating** - required for maximum environmental operating range. Recommended to avoid damage from moisture and corrosion.
						N		**None** - suitable for IEC standard 654-1 Climatic Conditions up to Class B2 (Heated and/or cooled enclosed locations)
Application Pack Number							AI01	Defines the application software to be loaded into the instrument

Example full product part number is 515.112EFC-AI01 (this is the number used for placing orders).

Main Menu Variables

Main Menu Variables	Default Units	Preferred Units	Variable Type
Main Line Volume	m3		Total
Main Line Flowrate	m3/min		Rate
Additive Line Volume	L		Total
Additive Sample Flowrate	L/min		Rate
Stroke Output Count	Count		Total
Target Stroke Rate	STK/M		Rate
Sample Ratio	ppm		Rate
Process Ratio	ppm		Rate

500 Series in Ex410 Enclosure

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