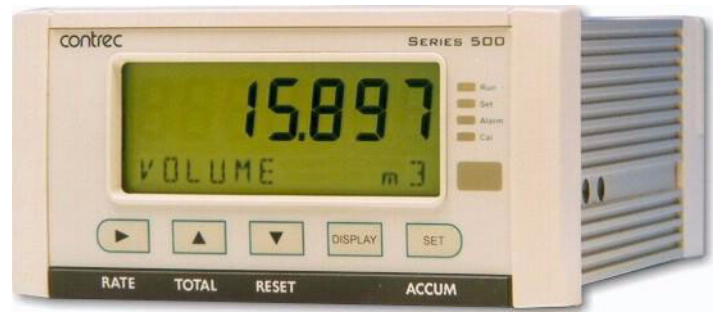


# Application GN02

## Natural Gas (AGA-8 Detailed) Flow Computer for Analog Flowmeter



### Features

- Tailored for volumetric analog flow input such as vortex flowmeters
- Allows for stacked flow inputs
- AGA-8 Natural Gas Detail Characterization Method calculations for gas compositions with up to 21 components
- Gross heating values calculated to ISO 6976:1995 and GPA Standard 2172-96
- Allows for non-linear correction
- Selection of second language and user tags
- RTC logging with over 1000 entries
- Infra-red communications port on front panel
- Pulse width and scaling of pulse output
- 4-20mA retransmission
- Selectable protocols on serial ports including Modbus RTU and Printer output
- Front panel adjustment of 8-24V DC output voltage
- Backlit display
- LCD backup



### Overview

The 515 GN02 application measures the volume, mass and gross heat content of natural gas by using analog volume flow, temperature and pressure inputs.

The flowmeter input signal can be selected as either 0-5V, 1-5V or 4-20 mA. Minimum and maximum points are programmed and non-linear correction points can be used to better reflect the flowmeter's behaviour.

The AGA-8 Detail Characterization Method is used to obtain accurate values of density and compressibility factors for the flow calculations.

### Calculations

The gas density and compressibility factor calculations are based on the AGA-8 equations. The calculations are valid for the region:

$$-130^{\circ}\text{C} < t < 400^{\circ}\text{C} \quad P < 280\text{MPa}$$

$$-200^{\circ}\text{F} < t < 760^{\circ}\text{F} \quad P < 40000\text{psia}$$

### Formulas

$$M_{flow} = \text{Volume}_{flow} \cdot \rho_{flow}$$

$$\text{Corrected flow} = M_{flow} / \rho_{ref}$$

$$\text{Heat flow} = M_{flow} \cdot H_m$$

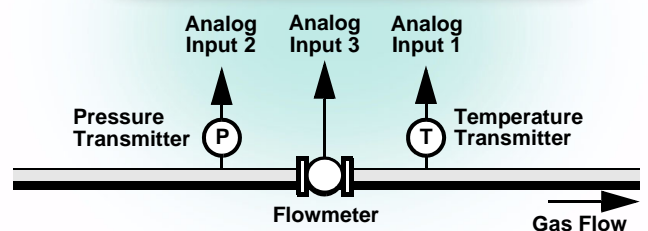
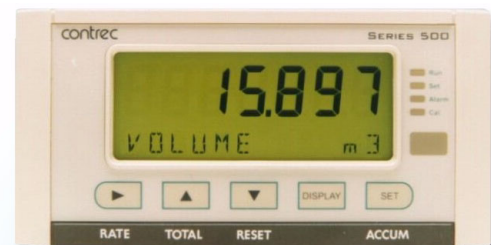
where:

$$M_{flow} = \text{mass flow}$$

$$\rho_{flow} = \text{density at flow conditions}$$

$$\rho_{ref} = \text{density at reference conditions}$$

$$H_m = \text{mass gross heating value}$$



## Displayed Outputs

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 along with the available units of measure.

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 three communication ports available as follows:

- RS-232 port (standard)
- RS-485 port (advanced option)
- Infra-red port (on front panel)

The ports are available for remote data reading, printouts and for initial application loading of the instrument.

## Isolated Outputs

The opto-isolated outputs can retransmit 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 an additional two available in the advanced option.

## Software Configuration

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

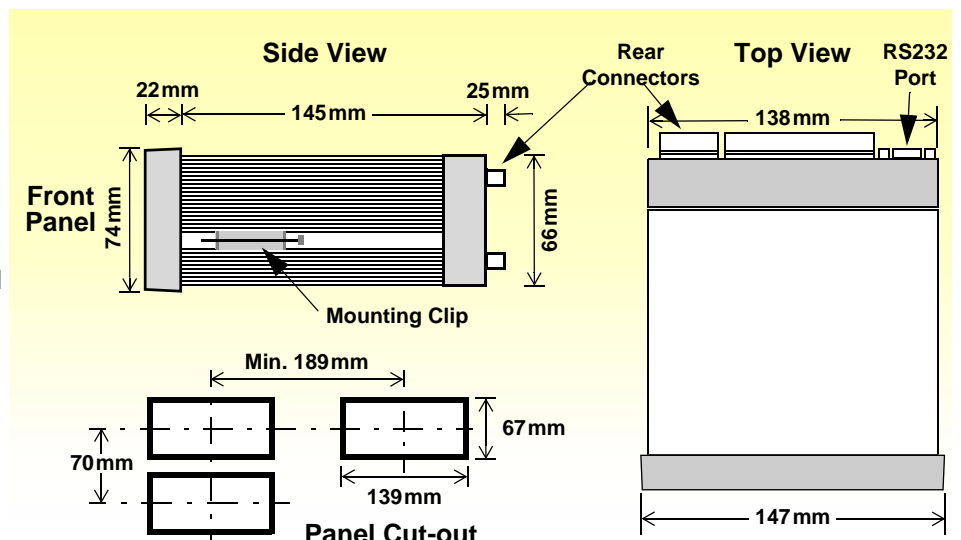
Most other parameters can be programmed in the field, according to the user-access levels assigned to the parameters by the distributor.

## Dimension Drawings

### Part Number

515-XXXXXX-GN02  
see **Product Codes** to select required features

Default Application software:  
515-GN02-000000



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

## Temperature and Pressure Input Types

Temperature sensor input can be either PT100, 4-20 mA, 0-5V or 1-5V signals. Pressure sensor input can be either 4-20 mA, 0-5V or 1-5V signals.

## Terminal Designations

Terminal Label	Designation	Comment
3	SG -	Signal ground
5	EXC V 2+	Excitation Term 2+
7	AINP1 +	Analog input ch 1 (+)
8	-	Analog input ch 1 (-)
9	AINP2 +	Analog input ch 2 (+)
10	-	Analog input ch 2 (-)
11	AINP3 +	Analog input ch 3 (+)
12	-	Analog input ch 3 (-)
13	AINP4 +	Analog input ch 4 (+)
14	-	Analog input ch 4 (-)
15	Vo +	8-24 volts DC output
16	G -	DC Ground
17	Vi +	DC power input
18	SH E	Shield terminal
19		
20	RS485 +	RS485 (+)
21	-	RS485 (-)
	G	RS485 ground
22	1+	Switch 1
23	2+	Switch 2
24	3+	Switch 3
25	4+	Switch 4
26	C-	Signal ground
27	OUT 1 +	Output ch 1 (+)
28	-	Output ch 1 (-)
29	OUT 2 +	Output ch 2 (+)
30	-	Output ch 2 (-)
31	RC	Relay common
32	R1	Relay 1
33	R2	Relay 2
34	R3	Relay 3
35	R4	Relay 4
E		Mains ground
N		Mains neutral
A		Mains active
RS232 port		9-pin serial port

# Specifications

## General

### Operating Environment

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

### 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>Interference</b>	CE compliance
<b>Enclosure</b>	CENELEC, FM, CSA and SAA approved enclosures available for hazardous areas

### Real Time Clock (Optional)

<b>Battery Type</b>	3 volts Lithium button cell (CR2032)
<b>Battery Life</b>	5 years (typical)

### Gas Properties Calculations (AGA- 8)

<b>Update Rate</b>	1 sec - gas composition unchanged 2 sec - when changed, 10 components 4 sec - when changed, 21 components
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## Inputs

### Analog Input (General)

<b>Overcurrent</b>	100mA absolute maximum rating
<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 (flow inputs)

### RTD Input

<b>Sensor Type</b>	PT100 to IEC 751
<b>Connection</b>	Four Wire
<b>Range</b>	-100°C to 300°C
<b>Accuracy</b>	0.1°C typical

### 4-20mA Input

<b>Impedance</b>	100ohms (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

## Outputs

### Relay Output

<b>No. of Outputs</b>	2 relays plus 2 optional relays
<b>Voltage</b>	250 volts AC, 30 volts DC maximum
<b>Current</b>	3A maximum

### Communication Ports

<b>Ports</b>	RS-232 port RS-485 port (optional) Infra-red port
<b>Baud Rate</b>	2400 to 19200 baud
<b>Parity</b>	Odd, even or none
<b>Stop Bits</b>	1 or 2
<b>Protocols</b>	Modbus RTU, ASCII, Printer (RS232)

### 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>	1 configurable output (plus 1 optional)
<b>Configuration</b>	Pulse or 4-20mA output

### Pulse Output

<b>Signal Type</b>	Open collector
<b>Switching</b>	200mA, 30 volts DC maximum
<b>Saturation</b>	0.8 volts maximum
<b>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

Customer: .....

Purchase Order Ref: .....

If you require custom units of measure, please circle your selections in the table below. Include this form with your purchase order and specify "Custom Unit Selection Attached" on your purchase order.

## Product Codes

Model	Supplementary Code	Description
515	- GN02	
Enclosure	1	Panel mount enclosure
	2	Field mount enclosure (not yet available)
	3	Explosion proof Ex410 with metric glands
	4	Explosion proof Ex410 with NPT glands
Output Options	0	<b>Basic</b> – 9 way DB RS232 serial port, 2 relays, 1 isolated 4-20 or pulse output and 4 logic inputs
	1	<b>Advanced</b> - also includes RS485 port, 2 extra relays, 1 extra isolated output and Real-time clock for printer output and logging
CPU Type	0	<b>Original</b> - no ASCII or printer protocol, basic logging (100 logs)
	1	<b>Standard</b> - ASCII and printer protocol, extra logging (1000+ logs)
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 and Infra-Red comms port)
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	GN02	Defines the application software to be loaded into the instrument

Example full product part number is 515.111EFC-GN02 (This is the number used for placing orders).

## Units of Measure

Main Menu Variables	Default Units	Other available units of measure	Variable Type
Volume	m <sup>3</sup>	m <sup>3</sup> , Ltr, Gal, ft <sup>3</sup> , kft <sup>3</sup> , Mft <sup>3</sup>	Total
Volume Flowrate	m <sup>3</sup> /min	m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h, m <sup>3</sup> /D, L/s, L/min, L/h, Gal/s, Gal/min, Gal/h, ft <sup>3</sup> /s, ft <sup>3</sup> /min, ft <sup>3</sup> /h, Mft <sup>3</sup> /D	Rate
Corrected Volume	m <sup>3</sup>	m <sup>3</sup> , Ltr, Gal, ft <sup>3</sup> , kft <sup>3</sup> , Mft <sup>3</sup>	Total
Corrected Flowrate	m <sup>3</sup> /min	m <sup>3</sup> /s, m <sup>3</sup> /min, m <sup>3</sup> /h, m <sup>3</sup> /D, L/s, L/min, L/h, Gal/s, Gal/min, Gal/h, ft <sup>3</sup> /s, ft <sup>3</sup> /min, ft <sup>3</sup> /h, Mft <sup>3</sup> /D	Rate
Heat	GJ	kJ, MJ, GJ, kWh, MWh, kBTU, Ton.h, therm, cal, kcal, Mcal	Total
Heat Flowrate	GJ/h	kJ/h, MJ/h, GJ/h, kW, MW, kBTU/min, kBTU/h, Ton, therm/min, therm/h, kcal/h, Mcal/h	Rate
Mass	kg	kg, g, Ton, lb	Total
Mass Flowrate	kg/min	kg/s, kg/min, kg/h, g/s, g/min, g/h, Ton/min, Ton/h, Ton/D, lb/s, lb/min, lb/h	Rate
Temperature	Deg C	Deg K, Deg C, Deg F, Deg R	Rate
Pressure	MPa	Pa, kg/m <sup>2</sup> , kg/cm <sup>2</sup> , kPa, MPa, mbar, bar, psi, Atm, inH <sub>2</sub> O, mmH <sub>2</sub> O	Rate
Compressibility Factor	- - -	Unitless factor	Rate

[www.contrec.com.au](http://www.contrec.com.au)

### Contrec Pty Ltd

22 Hall Street Hawthorn East  
Victoria 3123 AUSTRALIA  
Tel: +61 3 9804 4200 Fax: +61 3 9822 8329  
Email: sales@contrec.com.au

### Contrec Europe Limited

PO Box 436 Sowerby Bridge,  
West Yorkshire HX6 3YA, UK  
Tel: +44 1422 829 940 Fax +44 1422 829 941  
Email: sales@contrec.co.uk

### Contrec - USA, LLC

916 Belcher Drive, Pelham AL 35124 USA  
Tel: (205) 685 3000 Fax: (205) 685 3001  
Email: contrec@contrec-usa.com

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