

# General Specifications

## Liquid Flow Calculation Portfolio



### GS 34P02P33-01E

#### ■ GENERAL

This general specification document describes the Liquid Flow Calculation Portfolio on FCN-500 and FCN-RTU autonomous controllers. Using this portfolio, liquid flow is calculated on robust STARDOM FCN-500 and FCN-RTU controllers which are certified for hazardous area while control logic is running.

#### Notation in this document:

- The term “FCN” refers to the module consisting type autonomous controllers.
- The term “FCN-500” refers to the autonomous controllers with NF501/NF502 CPU module.
- The term “FCN-RTU” refers to the low power autonomous controllers with NF050 CPU module.

For details of the Application Portfolios for FCN/FCJ, refer to Application Portfolios for FCN/FCJ, GS 34P02P20-02E.

#### ■ FEATURES

##### ● 64bit high accurate calculation

Double-precision floating point (64bit) calculation provides highly accurate results.

##### ● Control with Flow Calculation

Control logics, programmed with IEC61131-3, run with flow calculation.

Valve closing, shutdown sequence are easily implemented together with flow calculation. (\*1)

##### ● Support of the various communication protocols for the upper systems

Thanks to the communication capability of STARDOM autonomous controllers, calculated results can be sent to the SCADA system using variety of the communication protocols (DNP3, Modbus RTU/TCP and native protocol) using wired and wireless (GSM and others).

#### ■ LIQUID FLOW CALCULATION POU

##### ● Compliant standard

This portfolio supports the basic flow calculation.

Table Supported Liquid Calculation

Report Title	Year	Abbr.	Note
Manual of Petroleum Measurement Standards Chapter 11-Physical Properties Data Section 1 – Temperature and Pressure Volume Correction Factors for Generalized Crude Oils, Refined Products, and Lubricating Oils	First edition 2004 Addendum 2007	API MPMS11.1	Sub routines for unit conversion and rounding are also available
Manual of Petroleum Measurement Standards Chapter 20 – Allocation Measurement Section 1 – Allocation Measurement	First edition 1993 Reaffirmed 2011	API MPMS 20.1	Produced water density calculation
Manual of Petroleum Measurement Standards Chapter 9.3 Standard Test Method for Density, Relative and API Gravity of Crude Petroleum and Liquid Petroleum Products by Thermohydrometer method	Third edition 2012	API MPMS 9.3	Hydrometer calculation
Directive 017: Measurement Requirements for Oil and Gas Operations	First edition 2013		NOC Calculation
AGA Report 3 PART4 Orifice Metering Natural Gas and Other Related Hydrocarbon Fluids	Third edition 1992	AGA 3 API 14.3	
ISO 5167-4 Measurement of fluid flow by means of pressure differential devices inserted in circular cross-section conduits running full- Part 4 :Venturi tubes	First edition 2003	ISO5167-4	

## ● POU Lists

Table POU Lists

Category	Name	Description	Type
Utility Functions	SD_API_z_DC_TO_DF	Convert degree Celsius to degree Fahrenheit	Function
	SD_API_z_DF_TO_DC	Convert degree Fahrenheit to degree Celsius	Function
	SD_API_z_CONV_KPA	Convert pressure from selected unit to kPa	Function
	SD_API_z_CONV_PSI	Convert pressure from selected unit to psi	Function
	SD_API_z_DENANY_TO_KGM3	Convert density unit from selected unit to kg/m3	Function
	SD_API_z_KGM3_TO_DENANY	Convert density unit from kg/m3 to selected unit	Function
Oil Density and Volume Calculation	SD_API_MPMS11_161_04	API MPMS 11.1 11.1.6.1 Method to Correct a Measured Volume to Base Conditions and Density from Base Conditions to an Alternate Temperature and Pressure for Customary units	Function Block
	SD_API_MPMS11_162_04	API MPMS 11.1 11.1.6.2 Method to Correct Volume and Density from Observed Conditions to Customary Base Conditions	Function Block
	SD_API_MPMS11_163_04	API MPMS 11.1 11.1.6.3 Method to Correct Volume and Density from Observed Conditions to Alternate Conditions	Function Block
	SD_API_MPMS11_171_04	API MPMS 11.1 11.1.7.1 Method to Correct a Measured Volume to Metric Base Conditions and Density from Metric Base Conditions to an Alternate Temperature and Pressure	Function Block
	SD_API_MPMS11_172_04	API MPMS 11.1 11.1.7.2 Method to Correct Volume and Density from Metric Observed Conditions to Metric Base Conditions	Function Block
	SD_API_MPMS11_173_04	API MPMS 11.1 11.1.7.3 Method to Correct Volume and Density from Observed Metric Conditions to Alternate Metric Conditions	Function Block
Produced Water Density Calculation	SD_API_MPMS201_RHO_93	API MPMS 20.1 Produced water density calculation from density at base temperature	Function Block
	SD_API_MPMS201_B_93	API MPMS 20.1 Produced water density calculation from salinity at base temperature	Function Block
Hydrometer Calculation	SD_API_MPMS9_12	API MPMS 9.3 Thermohydrometer correction	Function Block
NOC Calculation	SD_API_NOC_CALC	Net Oil Calculation	Function Block
	SD_API_NOC_VOL	NOC Volume Calculation	Function Block
Volume Calculation	SD_API_AGA3_92	AGA 3 Orifice measurement	Function Block
	SD_API_ISO5167_4_03	ISO5167-4 Venturi measurement	Function Block

## ■ OPERATING ENVIRONMENT

### ● Autonomous Controller FCN-500

Table Hardware

Hardware	Description
Model (CPU)	NFCP501-W□□/NFCP502-W□□
Style (CPU)	S1 or later

Table Software

Software	Description
Basic Software	FCN/FCJ basic software
Revision	R4.10.01 or later

### ● Autonomous Controller FCN-RTU

Table Hardware

Hardware	Description
Model (CPU)	NFCP050-S1□
Style (CPU)	S1 or later

Table Software

Software	Description
Basic Software	FCN/FCJ basic software
Revision	R4.10.01 or later

## ■ STYLE OF SOFTWARE SUPPLY

### ● Media

Programs and Help for Liquid Flow Calculation Portfolio are supplied with FCN/FCJ Application Portfolio Media (Model: NT205AJ).

## ■ ORDERING INFORMATIONS

Specify the model and suffix codes when ordering.

## ■ TRADEMARKS

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