General Specifications

STARDOM
HART Communication
Functions

STARDOM™
FCN

GS 34P02Q53-01E

■ GENERAL

This general specifications (GS) document describes the HART Communication Function that can be implemented in the Autonomous Controller FCN.

The Autonomous Controller FCN can communicate with HART field devices.

● What is HART Communication?

HART communication is a communication protocol in which digital communication is superimposed on 4 to 20 mA analog signals to enable various types of data communications. In addition to analog signals, HART communication allows for communications involving process value data, device information, and diagnosis information.

In HART communication, process value data called the HART variable are handled. There are four types of HART variable: Primary Variable (PV), Secondary Variable (SV), Third Variable (TV), and Fourth Variable (FV), and one device can assign up to four types of HART variable.

■ HARDWARE CONFIGURATION

● Configuration of HART Communication System

A HART device needs to be connected to an analog I/O module (with HART Communication Function) of FCN.

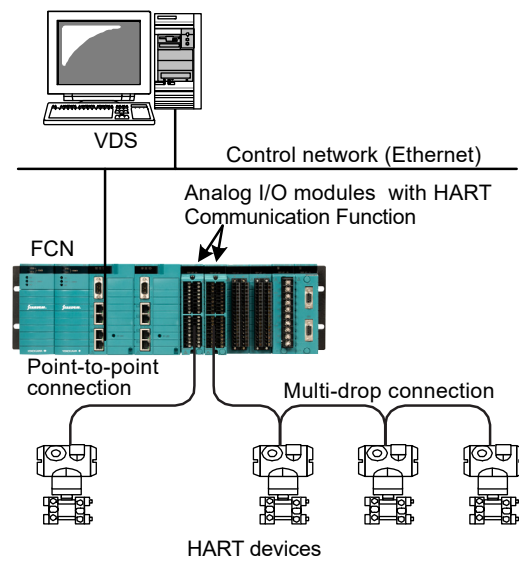A HART device can be connected to FCN by point-to-point connection and multi-drop connection.

Figure Configuration of HART Communication System

● **Analog I/O Module (with HART Communication Function)**

The table below lists analog I/O modules with the HART Communication Function.

For details of the functions of the analog I/O modules, refer to "Analog I/O Modules (GS 34P02Q31-01E)."

Table Analog I/O Modules (with HART Communication Function)

Model name	Model	Function	Reference
Analog Input Module (Current Input)	NFAI141-H	16-channel, 4 to 20 mA non-isolated	With HART Communication Function
Analog I/O Module (Current I/O)	NFAI841-H	8-channel input/8-channel output, 4 to 20 mA non-isolated	With HART Communication Function
Analog Input Module (Current Input)	NFAI135-H	8-channel, 4 to 20 mA isolated channels	With HART Communication Function
Analog I/O Module (Current I/O)	NFAI835-H	4-channel input/4-channel output, 4 to 20 mA isolated channels	With HART Communication Function
Analog Input Module (Current Input)	NFAI143-H	16-channel, 4 to 20 mA isolated	With HART Communication Function
Analog Output Module (Current Output)	NFAI543-H	16-channel, 4 to 20 mA isolated	With HART Communication Function

● **HART Communication Specifications for Analog I/O Modules (with HART Communication Function)**

The table below lists the HART Communication Specifications for analog I/O modules.

Table HART Communication Specifications for Analog I/O Modules

Function	Specification	Reference
Number of HART devices	Max. 16 devices per module	
HART variable	Max. 32 points per module	Input only.
HART multi-drop connection	Max. 5 devices per channel	(*1)
Data updating time of HART variable	1 sec. per field device	(*2)

*1: The multi-drop connection is available not for output devices such as valve positioners, but for input devices such as transmitters. Also, the HART multi-drop connection does not support analog inputs (4 to 20 mA inputs).

*2: The data updating time of the HART variable depends on the number of HART devices connected to one I/O module (17 seconds when the maximum 16 devices are connected).

● HART Communication Specifications

Table HART Communication Specifications

Function	Description
Communication mode	Serial half duplex, start-stop synchronization 1 start/8 bits/odd parity/1 stop
Applicable standard	HART Protocol Revision 5.7 (*1)
Transmission speed	1200 ± 2 bps
Modulation technique	Binary phase-continuous FSK 1: 1200 Hz ± 1%, 0: 2200 Hz ± 1%
Frame length	5 to 267 bytes Contents of max. 267 bytes: 　　Delimiter: 1 　　Address: 5 　　Extended byte: 3 　　Command: 1 　　Data length: 1 　　Data: 255 (includes two bytes of response code) 　　Check byte: 1
Frame detection	3-byte header byte-count carrier (ON/OFF) Preamble: 5 to 20 bytes
Error detection coding	Longitudinal/vertical parity
Response time	Max. 28 characters (256.7 ms)
No response timer	33 characters (305 ms) for primary, 41 characters (380 ms) for secondary
Bus monitor	8 characters (75 ms)
Response window	20 ms

*1:　The HART 5, HART 6 and HART 7 devices can be connected but applying only the HART protocol 5.7 function.

■ FUNCTIONAL SPECIFICATIONS

An analog I/O module with the HART Communication Function acquires process value data, device information, and diagnosis information from a HART device.

The process value data, device information, and diagnosis information acquired from the HART device are used by the control application of FCN, as well as by the status display function of VDS.
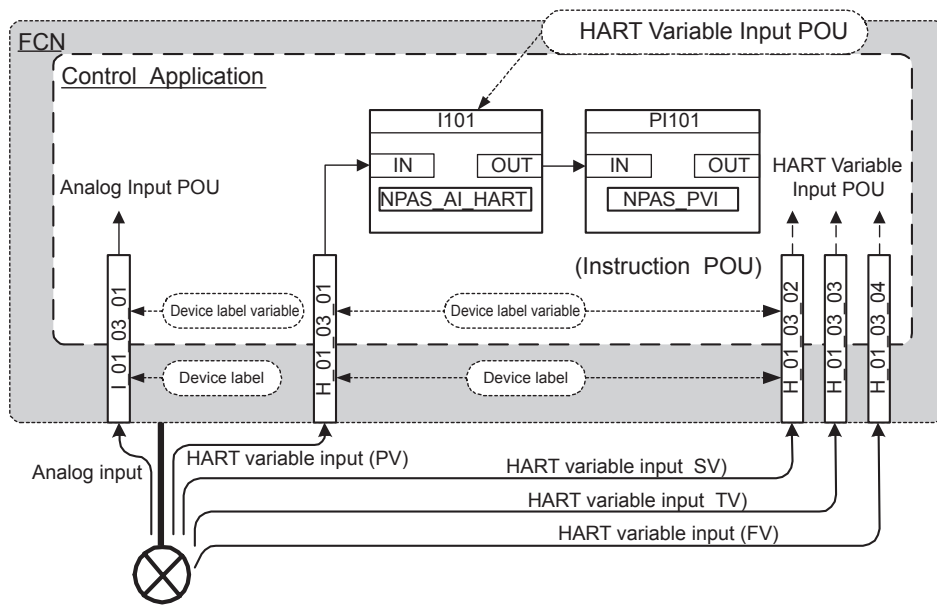
● Connection with Control Application

Connection between a HART device and the control application uses an analog signal input and HART variable inputs.

The analog input (4 to 20 mA input) (*1) is connected to the control application via the device label.

A HART variable input is associated with the HART input device label using the resource configurator and is connected with the control application using the HART Variable Input POU.

    *1:   HART devices include not only input devices such as transmitters, but also output devices such as valve positioners. Connection between an output device and the control application is handled in the same way as normal analog outputs. In that situation, a HART variable input can be connected with the control application.
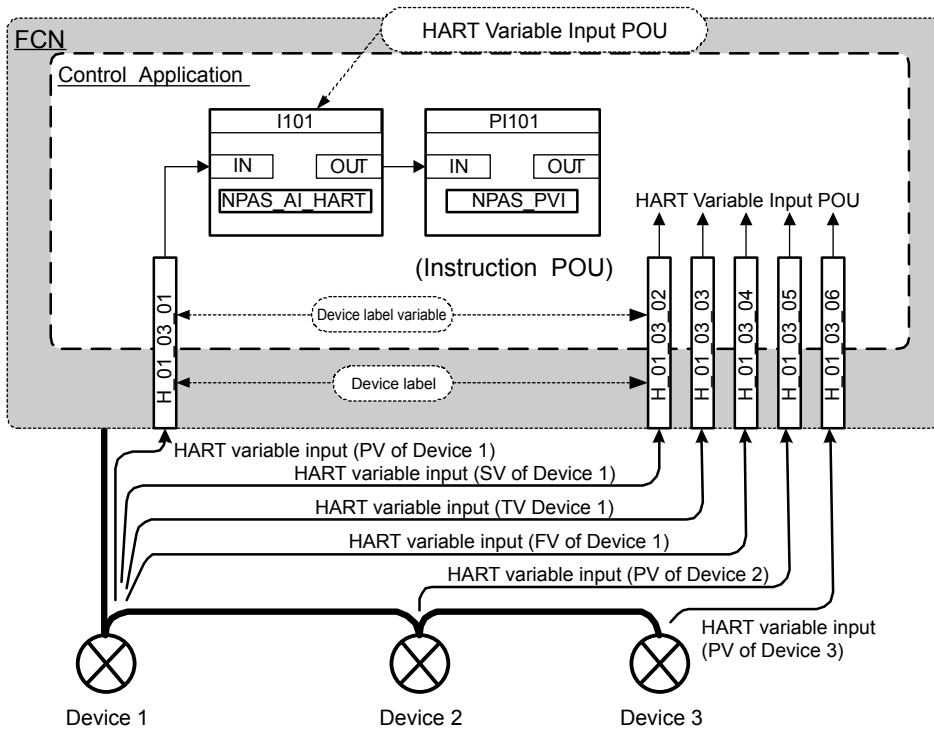

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**Figure Example Connection between HART Device and Control Application
(Point-to-point Connection with Input Device)**
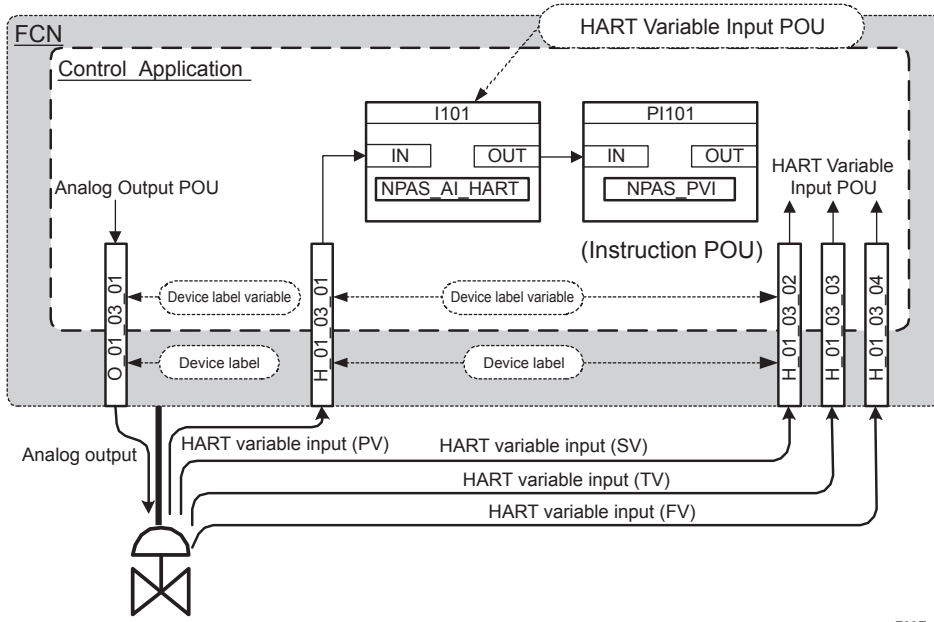
**Figure Example Connection between HART Device and Control Application
(Point-to-point Connection with Output Device)**

**Figure Example Connection between HART Device and Control Application
(Multi-drop Connection with Input Device)**

● **HART Variable Input POU**

The HART Variable Input POU is offered as a POU of the PAS portfolio.

Table HART Variable Input POU

NPAS POU name	Function
NPAS_AI_HART	HART variable input

● **Status Display by VDS**

FCN informs VDS of the status of I/O modules with the HART Communication Function and HART devices. VDS displays their status as follows.

• FCN Operation Status Display:
  Displays the status of I/O modules with the HART Communication Function
• Alarm Summary Display/Historical Display:
  Displays the status of I/O modules with the HART Communication Function or HART devices

● **Access from Plant Resource Manager**

A HART device can be accessed from the Plant Resource Manager (PRM) via FCN. In that case, an analog I/O module with the HART Communication Function relays communication commands exchanged between the Plant Resource Manager and the HART device.

● **HART Device Setting**

The software of FCN cannot be used to configure the settings for HART devices. To configure their settings, use a HART Handheld Terminal available on the market.

■ **LICENSE**

To use the HART Variable Input POU, no license is required. To use the NPAS_PVI POU as shown in the example, the PAS Portfolio license is required. (*1)
   *1:   The license cannot be added to the NFCP501/ NFCP502 standard model.

■ **RELATED DOCUMENTS**

Application Portfolios (FCN-500/FCN-RTU)
GS 34P02P20-02E
FCN-RTU Low Power Autonomous Controller Functions
GS 34P02Q02-01E
FCN Autonomous Controller Functions (FCN-500)
GS 34P02Q03-01E
FCN-RTU Low Power Autonomous Controller Hardware
GS 34P02Q13-01E
FCN Autonomous Controller Hardware (FCN-500)
GS 34P02Q14-01E
Analog I/O Modules   GS 34P02Q31-01E
Logic Designer   GS 34P02Q75-01E

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