

GS 12Y03A03-01E

■ Overview

The InfraSpec NR800 achieves high-resolution, high S/N (signal-to-noise) ratio, and wide wavelength scanning range measurement with its newly developed interferometer and detector. The NR800 also offers exceptional stability, vibration resistance, and durability, inheriting features from earlier successful models. It includes improved usability features such as measurement channel and output configuration as well.

The NR800 allows online, real-time, continuous, multiple, and simultaneous measurement for properties and component concentration of various processes.



NR800

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■ Features

● Newly developed interferometer and detector

Can be used for a variety of applications, ranging from over to combination tone.

- High resolution: Up to 4 cm^{-1} , user selectable setting
- High S/N ratio: 2250:1 (RMS, 4 cm^{-1} resolution, 4100 to 4200 cm^{-1} , 1 sec.)
- Wide wavelengths scanning range 900 to 2500 nm (11,000 to 4000 cm^{-1})
- Wavelength reproducibility: 0.007 cm^{-1}
- Wavelength accuracy: 0.04 cm^{-1}

● Enhanced environmental resistance, durability, and reliability

- Provides high vibration resistance by a unique design free of sliding parts
- Features a multichannel measurement optical system free of moving parts
- Eliminates the need for a PC for continuous operation. A PC is now only necessary for generating the calibration model and loading data.

● Outstanding wavelength accuracy allows calibration model transport between NR800s

● Outlier detection and self-diagnostic features come as standard function

● Various standard features and available options for optimal system configuration

- Dust-proof and drip-proof: IP53 equivalent
- Optional Explosion-proof Enclosure: JIS Expd II B+H₂ T5
- Length of fiber-optic cable: Up to 300 m
- Non-moving multichannel measurement: Expandable to 4 channels
- Up to 12 items can be measured per stream: limited to 64 items/unit
- The optional I/O unit offers a variety of inputs/outputs: analog output (up to 40 points), analog input, and contact input/output
- Communication output: RS422 (Modbus), 2 channels
- Fast Ethernet communication between Engineering PC and the analyzer
- Optional remote maintenance support

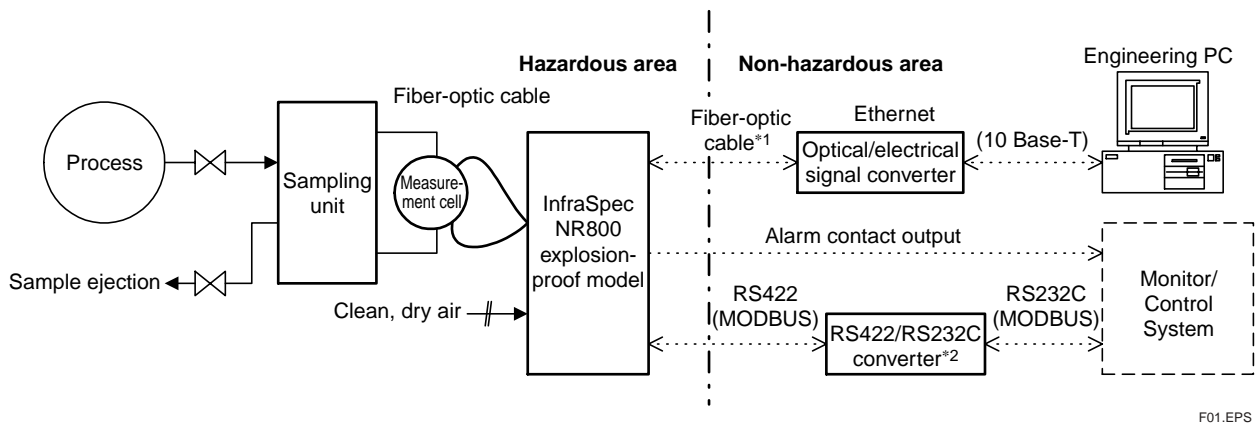
■ Related Equipment

NR801JL Near-infrared spectroscopic analyzer for laboratory use (GS 12Y3A3-02E)

1. System Configuration

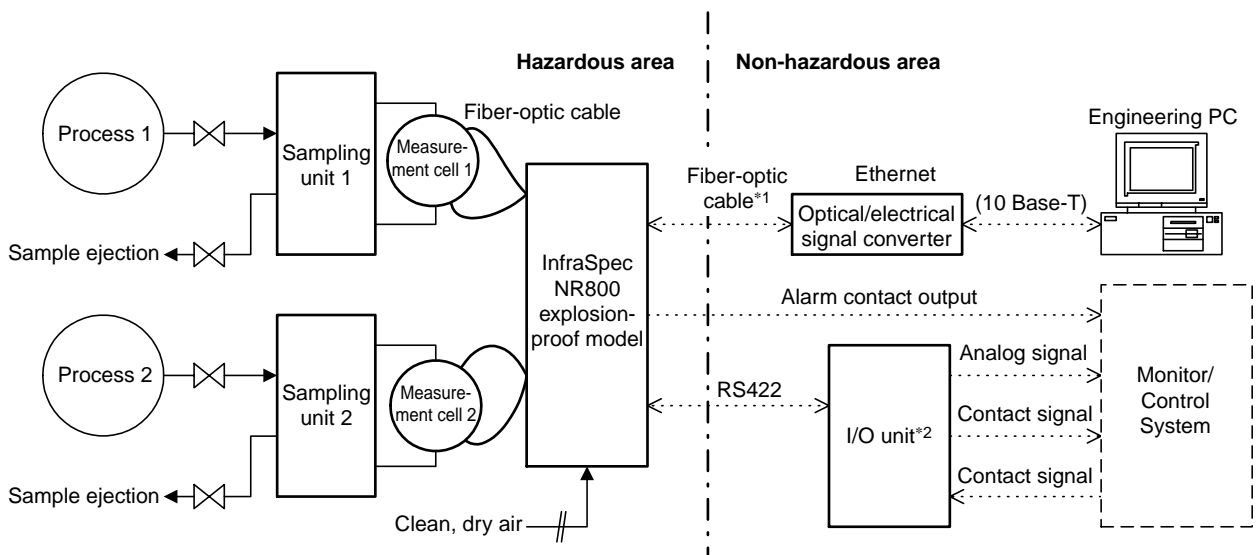
1.1 Configuration Examples

● Modbus Output with Sampling Unit (explosion-proof, 1 measuring channel)



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● Analog Output with Sampling Unit (explosion-proof, 2 measuring channels)



Notes (Common to the above 2 examples)

- *1: Always use a fiber-optic cable for an explosion-proof model, an electric cable cannot be used. For a general purpose model, the type of cable depends on the length.
 - Cable length less than 40 m: Either an electric or fiber-optic cable can be used.
 - Cable length of 40 m or longer: Use a fiber-optic cable. An electric cable cannot be used.
- *2: Only use the RS422 output of an explosion-proof model in combination with an I/O unit (see section 2.2) or RS422/RS232C converter (see section 2.5). These units will block the communication signal upon receiving a Purge failure signal from the Analyzer, thus ensuring the explosion-proof integrity of the Analyzer.

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1.2 Components, Software, and Calibration Model Generation

Item		Requirement*1	Model	Description	Reference
1)	InfraSpec NR800 analyzer	✓	NR801JG	General Purpose model	2.1
			NR805JG	Explosion-proof model	2.1
2)	I/O unit	□	NR893JG	Provides hardwired Interface (A I/O, D I/O). Also blocks the communication signal upon receiving a Purge failure signal from an Analyzer, thus ensuring the explosion-proof integrity.	2.2
3)	Measurement cell	✓	NR510	Flow through cell	2.3.1
			NR512	Flow through cell with constant temperature water tube	2.3.2
			—	In-situ probe	2.3.3
4)	Fiber-optic cable	✓	NR821	Applicable wavelength range: 900 to 2100 nm, Cable length: 300 m max., single	2.4.1
			NR822	Applicable wavelength range: 900 to 2100 nm, Cable length: 300 m max., dual	2.4.1
			NR823	Applicable wavelength range: 900 to 2500 nm, Cable length: 20 m max., single	2.4.2
			NR824	Applicable wavelength range: 900 to 2500 nm, Cable length: 20 m max., dual	2.4.2
5)	RS422/RS232C converter	□	—	Converts the RS422 signal from the Analyzer into RS232C. Also blocks the communication signal upon receiving a Purge failure signal from an Analyzer, thus ensuring the explosion-proof integrity.	2.5
6)	Ethernet cable*2	□	NR895	Fiber-optic cable*3	2.6
		□	—	Electric cable, provided by user	2.7
7)	Software	✓	NR831	SpectLand 2 for data management and maintenance	2.8
		□	NR530	Chemometrics software	2.9
8)	Sampling unit	□	J439	Yokogawa will propose an optimum unit based on sample pressure, temperature, properties, and measurement items.	2.10
9)	On-site guidance of calibration model generation	□	J964	Hands-on practice and guidance for model generation on site.	5.1
10)	Calibration model generation	□	J965	Calibration model generation by Yokogawa based on user-provided sample with laboratory analysis results	5.2
11)	Engineering PC	✓	—	Provided by user. See recommended specifications.	6
12)	Optical/electrical signal converter for Ethernet	□	—	Converts optical signals for an Ethernet output into electrical signals for Engineering PC Interface. Provided by user.	7
13)	Customer inspection	□	J962	Customer inspection of an Analyzer system without the sampling unit conducted at a Yokogawa factory.	—
		□	J443	Customer inspection of an Analyzer system with the sampling unit conducted at a Yokogawa factory.	—
14)	Equipment start-up	□	—	Start-up work for analyzers and sampling units.	—

Notes

*1: ✓ : Required, □ : optional

*2: An Ethernet cable is required. Choose either a fiber-optic cable or electric cable depending on the following conditions:
 Only use a fiber-optic cable for an explosion-proof model, an electric cable cannot be used. For a general purpose model, the type of cable depends on the length of cable:
 • Cable length less than 40 m: Either an electric or fiber-optic cable can be used.
 • Cable length of 40 m or longer: Use a fiber-optic cable. An electric cable cannot be used.

*3: For a total cable distance of 20 m or longer, an additional fiber-optic cable (fitted with ST connectors) shall be provided by the user. In this case, specify the /JB (junction box) option for connection between an NR895 fiber-optic cable and the additional cable.

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2. Component Specifications (including options)

2.1 NR800 Fourier Transform Near-Infrared Analyzers

2.1.1 Hardware Specifications

- Principle: Fourier-transform remote measurement via fiber-optic cable
- Measurement method: Optical transmission absorption
- Measured sample: Liquid
- Beam source: Halogen lamp (recommended replacement interval for continuous operation: 5000 hours)
- Detector: InGaAs (indium gallium arsenide), effective wavelength range: 900 to 2500 nm
- Number of measuring channels: 1 to 4 (non-moving)
- Housing structure:
 - a. General Purpose: Field suitable, with full, hinged front door, dust-proof and drip-proof equivalent to IP53
 - b. Optional Explosion-proof: Pressurized enclosure for explosion-proof applications (JIS Expd II B+H₂T5)
- Air connection for purge: Rc1/4 or 1/4 NPT
- Fiber-optic cable connectors:
 - a. Measurement: FC
 - b. Ethernet: ST
- Electric cable connector:
 - a. General Purpose: Cable gland
 - b. Explosion-proof: Pressure-proof packing cable gland or conduit seal fitting
- Display: LED
- Keyboard: Covered with water-proof sheeting
- Operating location requirements: See chapter 4.
- Grounding type: Class D
- Insulation resistance: 10 MΩ or more, 500 V DC
- Withstand voltage: 1500 V AC for 1 min.
- Weight:
 - a. General Purpose: Approx. 50 kg
 - b. Explosion-proof: Approx. 65 kg

2.1.2 Performance

- Wavelength scanning range: 900 to 2500 nm (11,000 to 4000 cm⁻¹)
- Wavelength resolution: 4, 8, 16, 32, and 64 cm⁻¹ (user selectable)
- Wavelength reproducibility: 0.007 cm⁻¹
- Wavelength accuracy: 0.04 cm⁻¹
- S/N ratio: 500:1 (peak to peak, 4100 to 4200 cm⁻¹, 1 sec.)

2.1.3 Inputs/Outputs (see also section 2.2)

- **Communication Interface:**
 - a. Engineering PC: 1 channel (Ethernet)
 - b. DCS, I/O unit: 2 channels (RS422, Modbus):
 - 1 channel for DCS and another for I/O unit; or
 - 2 channels for I/O unit
- **Contact outputs:**
 - a. Purge failure: 1 point (explosion-proof model)
 - Specification: NC/NO selectable
 - Rating: 0.5 A, 30 V DC or less
 - Action:
 - On: When the analyzer is powered and the housing internal pressure is within predefined level or more after the purging period elapses.

Off: When the analyzer is not powered or Analyzer is powered but the internal pressure is lower than the Predefined level or until the purging period elapses after the internal pressure recovers to a predefined level.

- b. Analyzer failure: 1 point
 - Specification: NC/NO selectable
 - Rating: 0.5 A, 30 V DC or less
 - Action:
 - On: When the analyzer is powered and an analyzer failure does not occur.
 - Off: When the analyzer is not powered or an analyzer failure occurs.

2.1.4 Operating Modes*1

Basic Operating Mode and Description		Channel Operating Mode	
		No.	Auto/Manual*3
Maintenance*2	Spectrum analysis of a reference sample, equipment maintenance	—	—
Run	On-line measurement (allows spectrum analysis on selected channels)	1	AUTO
			MANUAL
		2	AUTO
			MANUAL
		3	AUTO
			MANUAL
		4	AUTO
			MANUAL

- Notes
- *1: When the power is turned on, the analyzer starts according to a predefined operating mode.
 - *2: Can perform spectrum analysis (not continuous measurement).
 - *3: Auto: Performs continuous measurement; Manual: Can perform spectrum analysis (not continuous measurement).

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2.1.5 Changing and Setting Operating Mode

Some operations are prohibited depending on the user level.

User Level	Abbreviation	Description	Changing/Setting Mode
User B	(UB)	For equipment supervisor.	Authorized
User C	(UC)	For maintenance.	Authorized

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- DCS can perform UB level operations.
- A user level can be switched on the front console panel of the analyzer or from SpectLand 2 screen of an Engineering PC.
- A password is required to switch levels from UA to UB and switch from UA or UB to UC.

2.1.6 Sample Measurement

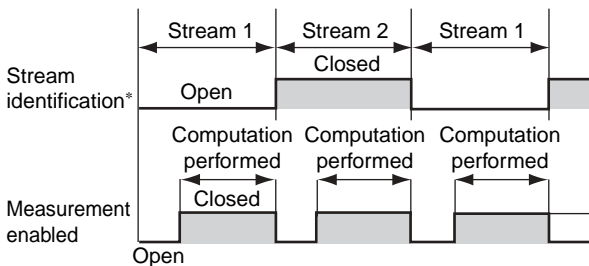
● Continuous measurement

- a. Number of measuring channels: 1 to 4
- b. Data updating period: 4 seconds or longer (depending on the number of averaging and measuring channels, as well as measurement items)
- c. Number of measurement items: Up to 12 per channel (48 max. per analyzer)
- d. Number of outlier detection items: Up to 12 per channel (48 max. per analyzer)
- e. Separate maintenance is available for each channel (except for common hardware).

● Stream switching by contact input

Calibration model set for the each channel can be changed by external contact inputs. This function is used for multi-stream application or multi sample application.

- a. Stream switching
 - Number of streams to switch: Up to 16 using 8 contact inputs coded by contact status (open or close)
 - Switching patterns: See table 1 of section 2.1.8.
 - Number of contact inputs and their specifications: See section 2.2.
- b. Data updating period: 8 seconds or longer (depending on the switching pattern, numbers of averaging and measuring channels, and stream configuration)
- c. Number of measurement items: Up to 12 per stream (64 max. per analyzer)
- d. Number of outlier detection items: Up to 12 per stream (64 max. per analyzer)
- e. Separate maintenance is available for each channel (except for common hardware).
- f. Contact input signals and measurement computation sequence
 - Stream identification: Used to identify the selected sample. The analyzer will choose a calibration model set to suite for the relevant stream based on this signal.
 - Measurement enabled (valid sample): When closed, the analyzer performs measurement using the calibration model specified by the sample identification signal above.
 - Schematic timing chart of measurement and computation sequence (e.g. 2 streams)



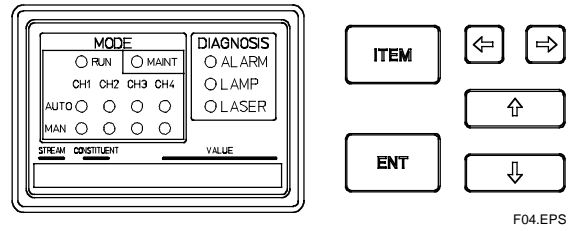
Notes

* A stream number is defined by a combination of open/closed states of an identification contact signal.

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2.1.7 Console Panel

● Display items



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a. Operating mode LEDs (MODE)

The following LEDs indicates the current basic operating mode:

- RUN: Lit when in the Run mode;
- MAINT: Lit when in the Maintenance mode.

The current channel operating modes are displayed by LEDs when in the Run mode. Two LEDs are provided for each channel, amounting to a total of 8 LEDs:

- AUTO: Lit when in the Auto mode;
- MAN: Lit when in the Manual mode.

b. Self-diagnosis LEDs (DIAGNOSIS)

- ALARM: Lit when an alarm occurs.
- LAMP: Lit when a lamp has burned out or after a time period defined by the service life setting elapses.
- LASER: Lit when the laser has burned out or after a time period defined by the service life setting elapses.

c. LED display (16 digits, STREAM/CONSTITUENT/VALUE)

The content depends on the operating status or operation.

d. Operation keys

The following six keys are provided:

- ITEM: Used to change items;
- ENT: Used to confirm the entry;
- Arrow keys: Used to move the cursor or change display.

● Analyzer behavior for each basic operating mode

a. Maintenance mode

- Basic operating mode LEDs: Only MAINT lights up.
- Channel operating mode LEDs: Lit in accordance with each setting.
- Self-diagnosis LEDs: Lit in accordance with the results of self-diagnosis.
- LED display: The display depends on the operating status.

b. Run mode

- Basic operating mode LEDs: Only RUN lights up.
- Channel operating mode LEDs: Lit in accordance with each setting.
- Self-diagnosis LEDs: Lit in accordance with the results of self-diagnosis.
- LED display: The display depends on the operating status.

2.1.8 Other Functions

- a. Baseline compensation: Up to 10 points
- b. On-line measurement spectra saving
- c. Remote maintenance: Requires a dial-up router.

Table 1. Stream Numbers Assignable to Measuring Channels Corresponding to Switching Patterns

Stream Switch		Measuring Channel No.*3				Total Streams	Applicable Channel No.
Case	Pattern No.	1	2	3	4		
None	0	1	2	3	4	4 max.	1 to 4
Stream switching per channel*2	1*1	1 to (17-N)	18-N	19-N	20-N	16 max.	1 to 4
	2	1 to 8	9 to 16			16 max.	1 and 2
	3	1 to 4	5 to 8	9 to 12	13 to 16	16 max.	1 to 4

Notes

*1: N: Maximum number of measuring channels included within the analyzer.

*2: The stream number for a measuring channel that does not switch paths must be the smallest number in the relevant column.

*3: Measuring channel numbers that equal the number of measuring channels included within the analyzer or smaller are valid.

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2.1.9 Model and Suffix Codes, and External Dimensions

● **General Purpose Model**

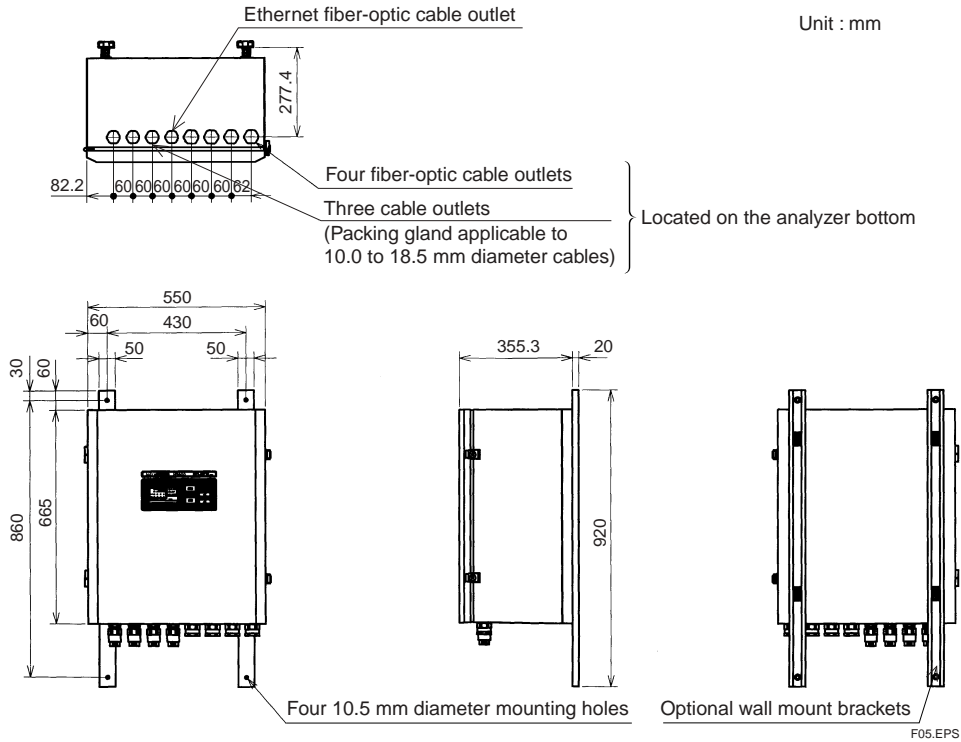
a. Model and Suffix Codes

Model	Suffix Code	Option Code	Description
NR801JG			NR800 FT-NIR Analyzer, General Purpose model
Nameplate	-J		Japanese
	-E		English
Power supply	1		100 V AC ±10%, 50/60 Hz
	2		110 V AC ±10%, 50/60 Hz
	3		115 V AC ±10%, 50/60 Hz
	4		200 V AC ±10%, 50/60 Hz
	5		220 V AC ±10%, 50/60 Hz
	6		230 V AC ±10%, 50/60 Hz
—	-N-N		Always “-N-N”
Number of measuring channels	-S1		1 channel
	-M1		Expandable to 4 channels, comes with 1 channel
	-M2		Expandable to 4 channels, comes with 2 channels
	-M3		Expandable to 4 channels, comes with 3 channels
	-M4		4 channels
Wavelength scanning range	W1		900 to 2100 nm
	W2		900 to 2500 nm
Fiber-optic cable	-1		Single cable
	-2		Dual cable
—	-00		Always “-00”
Ethernet output cable	1		Electric cable, only for general purpose model and less than 40 m
	2		Fiber-optic cable
Mounting	A		Without brackets
	B		With wall-mounting brackets
	C		With free standing rack
	-N-N		Always “-N-N”
	-00		Always “-00”
Option		/SS	With stream switch input function

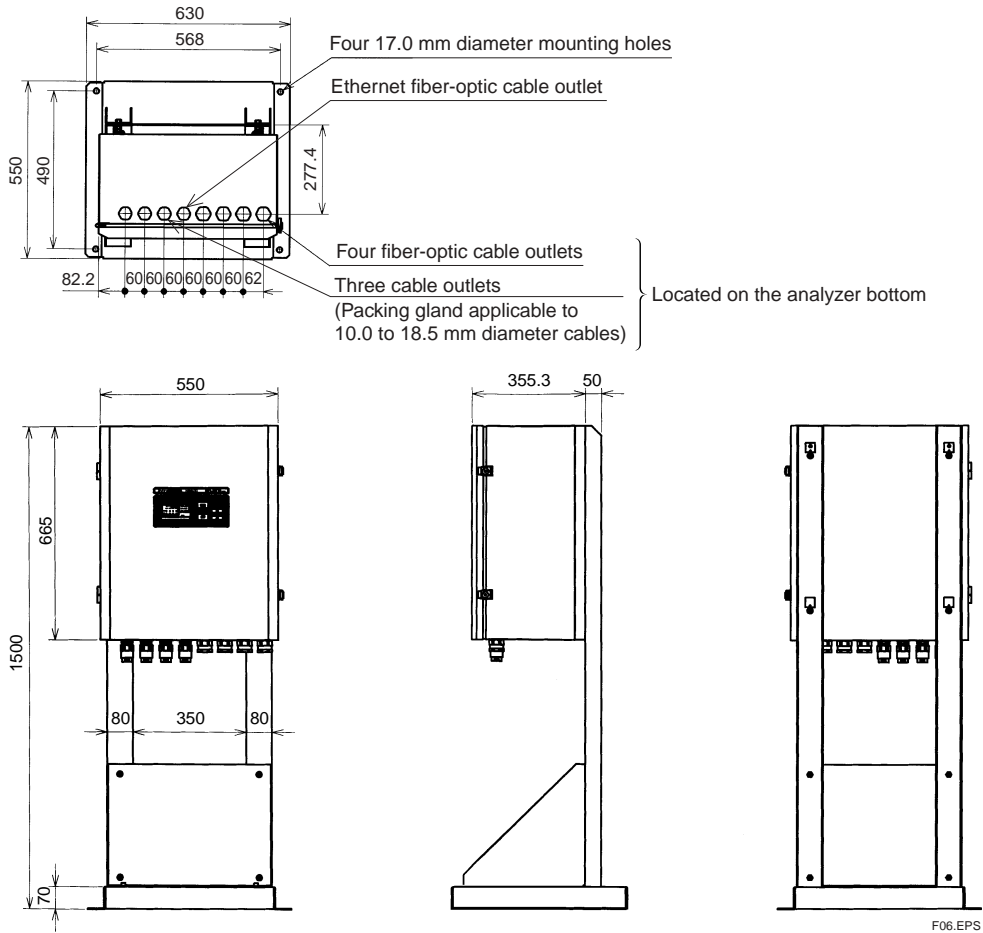
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b. External Dimensions

- Wall-mounting model



- Free standing rack model



● Explosion-proof Model

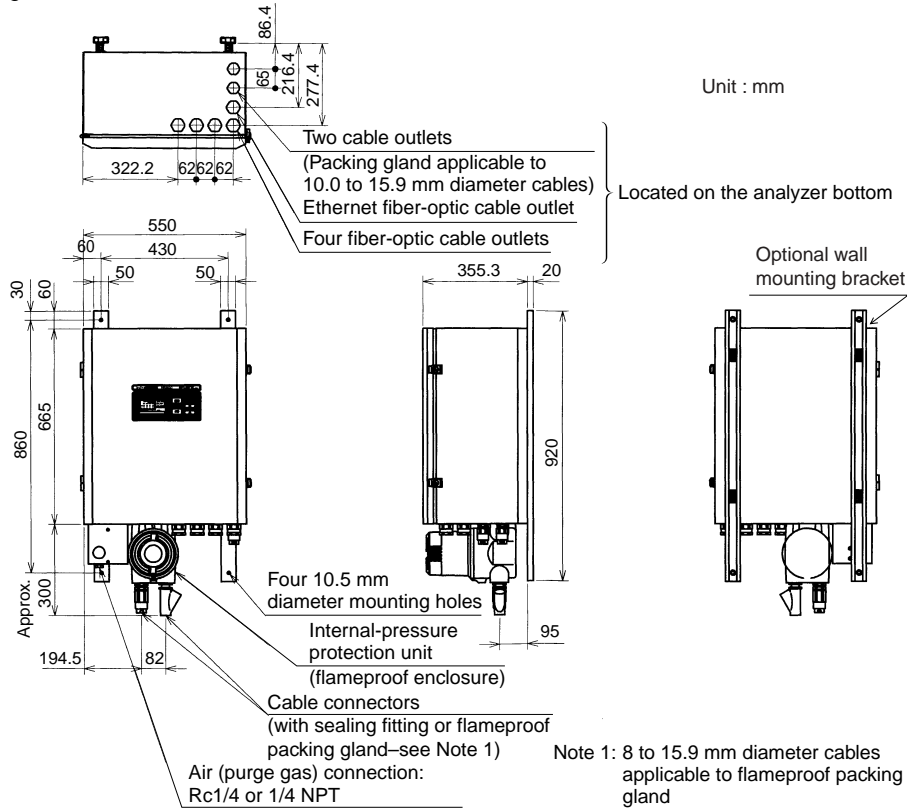
a. Model and Suffix Codes

Model	Suffix Code	Option Code	Description
NR805JG			NR800, FT-NIR Analyzer Explosion-proof model
Nameplate	-J		Japanese
	-E		English
Power supply	1		100 V AC ±10%, 50/60 Hz
	2		110 V AC ±10%, 50/60 Hz
	3		115 V AC ±10%, 50/60 Hz
	4		200 V AC ±10%, 50/60 Hz
	5		220 V AC ±10%, 50/60 Hz
	6		230 V AC ±10%, 50/60 Hz
—	-N-N		Always “-N-N”
Number of measuring channels	-S1		1 channel
	-M1		Expandable to 4 channels, comes with 1 channel
	-M2		Expandable to 4 channels, comes with 2 channels
	-M3		Expandable to 4 channels, comes with 3 channels
	-M4		4 channels
Wavelength scanning range	W1		900 to 2100 nm
	W2		900 to 2500 nm
Fiber-optic cable	-1		Single cable
	-2		Dual cable
—	-00		Always “-00”
Ethernet output cable	2		Fiber-optic cable
Mounting	A		Without brackets
	B		With wall-mounting brackets
	C		With free standing rack
—	-N-N		Always “-N-N”
Cable entrance	-1		Metal conduit (PF)
	-2		Metal conduit (NPF)
	-3		Flameproof packing (PF)
	-4		Flameproof packing (NPT)
Purge air connection	1		Female Rc1/4
	2		Female 1/4 NPT
Option		/SS	With stream switch input function

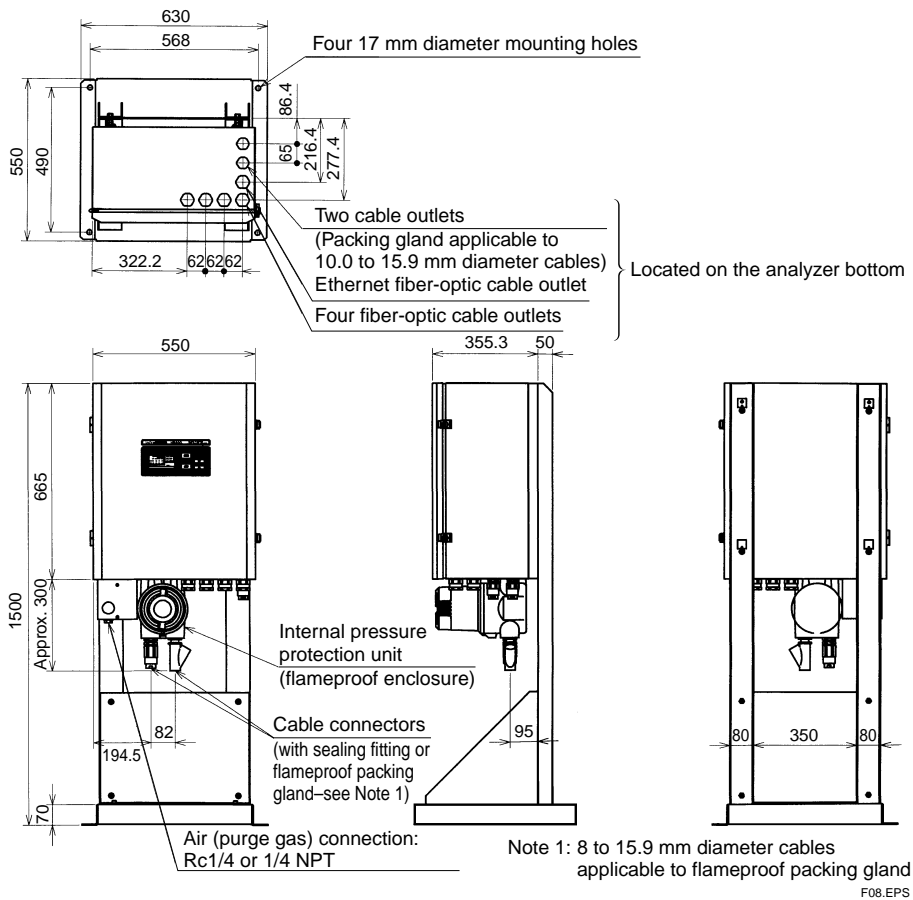
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b. External Dimensions

- Wall-mounting model



- Free standing rack model



2.2 I/O Unit

2.2.1 Overview

The I/O unit is an input/output interface between the analyzer and external monitor/control system such as DCS. Up to two I/O units can be connected to the Analyzer, and one of which can incorporate the contact input for stream switching and analog input for compensation options.

2.2.2 Specifications

- Power supply: See chapter 3.
- Insulation resistance: 5 MΩ or more, 500 V DC
- Withstand voltage: 1500 V AC for 1 min.
- Housing colors: Light cobalt blue (Munsell 6.2PB4.6/8.8 or equivalent), lamp black (Munsell 0.8Y2.5/0.4 or equivalent)
- Analog output:
 - a. Output data: Measurement results (properties and concentration)
 - b. Number of outputs: 0 to 40
 - c. Output specifications

Item	Description
Output range	4 to 20 mA DC (3.0 to 21.0 mA DC, floating-common type)
Isolation method	<ul style="list-style-type: none"> • Between output terminals and internal circuit: photocoupler isolation • Between output terminals: non-isolated, common negative
Withstand voltage	500 V DC for 1 min.
Allowable load resistance	600 Ω or less
12-bit D/A converter resolution	5.7 μA
System accuracy	±0.5% of full scale at 0°C to 55°C

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d. Separate 24V DC power supply required (see chapter 3).

- Contact output:
 - a. Alarms and output quantity:

Alarm	Quantity of outputs	Alarm	Quantity of outputs
General	1	Outlier	4
Communication failure	1	I/O unit failure	1
Operating mode	5		

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b. Output specifications: See table 2.

- Contact input:
 - a. Description:
 - Stream identification for multi-stream sampling unit :
8 points, status signals to identify sample streams that pass through measurement cells.
 - Measurement enabled (stream valid):
4 points, status signals to confirm that samples inside the measurement cells are ready for measurement.

b. Input specifications

Item	Description
Input type	Voltage free contact
Common terminal	Common to 8 points
Isolation method	Transformer isolation
Withstand voltage	Between external connectors collectively and internal circuit: 500 V DC for 1 min.
Off-state open-circuit voltage	5 to 7 V
On-state load current	1 to 3 mA
On-state load resistance	200 Ω or smaller
Off-state load resistance	100 Ω or larger

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- Analog input:
 - a. Input data and number: Analog output compensation signal, 4 points
 - b. Input specifications

Item	Description
Input range (actual)	1 to 5 V DC (-0.25 to 5.25 V DC)
Isolation method	<ul style="list-style-type: none"> • Between input terminals and internal circuit: photocoupler isolation • Between input terminals: non-isolated, negative common
Withstand voltage	500 V DC for 1 min.
Input resistance	1 MΩ
12-bit A/D converter resolution	1 to 5 V DC: 1.4 mV
System accuracy	±0.5% of full scale at 0°C to 40°C

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- Installation requirements: See chapter 4.
- Mounting: Wall mounting
- External connection terminal: M3.5 screw
- External dimensions and weight: Depends on the number of analog outputs installed as follows:

Number of Analog Outputs	Dimensions*	Approximate Weight
12 or less	322 × 88.5 × 100 mm	2.5 kg
13 to 28	439 × 88.5 × 100 mm	3.5 kg
29 to 40	527 × 88.5 × 100 mm	4.5 kg

*: Width × depth × height

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2.2.3 Model and Suffix Codes

Model	Suffix Code	Option Code	Description
NR893JG			I/O unit
Nameplate	-J		Japanese
	-E		English
Analyzer	1		Explosion-proof model ^{*1)}
	2		General Purpose model
Contact input for stream switching	A		Available
	B		None
Analog input for compensation	A		Available
	B		None
Number of analog outputs**	-00		None
	-04		4
	-08		8
	-12		12
	-16		16
	-20		20
	-24		24
	-28		28
	-32		32
	-36		36
-40		40	
—	-N-N		Always -N-N
Option			

* : Always specify 1 for connectors to an explosion-proof model. This blocks the communication signal upon receiving a power-off signal from the Analyzer, thus ensuring the explosion-proof integrity of the main unit.

** : Separate 24V DC power supply required when using an analog output (see chapter 3).

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Table 2. Contact Output Specifications

Item		Description	
I/O unit failure	Rating	24 V DC, 0.3 A	
	Action and number	1 normally open and 1 normally closed (shared common)	
Alarm, operating mode, and outlier detection	Insulation method	Mechanical isolation	
	Rated load voltage	DC	24 V
		AC	100 to 240 V
	Maximum load current	2 Amps/point, 8 Amps/common	
	Servicing life	Mechanical	At least 20 million actions
		Electrical	At least 100 thousand actions
	Surge killer	None	
	Number per common	8 points/common	
External power supply	Not required.		

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2.3 Measurement Cells

2.3.1 Flow through Cell

● **Specifications**

- a. Optical path length: 1, 2, 5, 10, or 20 mm
- b. Fiber-optic connector: FC type
- c. Wetted part material: Viton, Kalrez, 316 S.S., Borosilicate crown glass, or Sapphire
- d. Sample pressure range: Atmospheric pressure up to 1.9 MPa G
- e. Sample temperature range: -5°C to +80°C
- f. Sample connection: Female Rc1/4
- g. Installation angle: Vertical
- h. Installation location requirements: See chapter 4.
- i. Weight: Approx. 3 kg

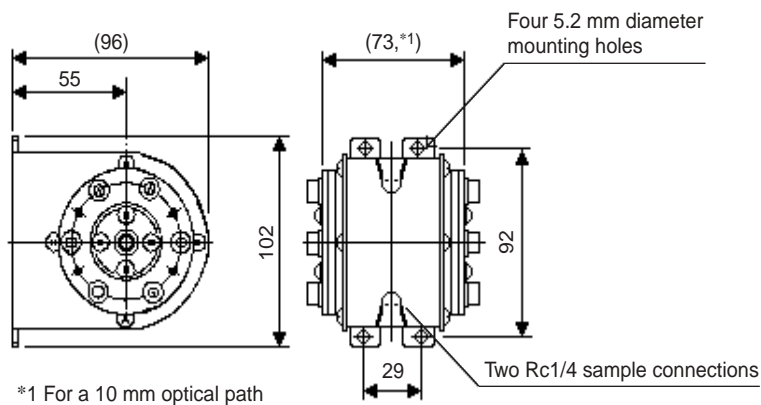
● **Model and Suffix Codes**

Model	Suffix Code	Option Code	Description
NR510			Flow through cell
Window material and optical path length	-B00		Borosilicate crown glass, 10 mm, with variable optical path adapter (1, 2, 5, or 20 mm)
	-B01		Borosilicate crown glass, 1 mm
	-B02		Borosilicate crown glass, 2 mm
	-B05		Borosilicate crown glass, 5 mm
	-B10		Borosilicate crown glass, 10 mm
	-B20		Borosilicate crown glass, 20 mm
	-S00		Sapphire, 10 mm, with variable optical path adapter (1, 2, 5, or 20 mm)
	-S01		Sapphire, 1 mm
	-S02		Sapphire, 2 mm
	-S05		Sapphire, 5 mm
	-S10		Sapphire, 10 mm
	-S20		Sapphire, 20 mm
Body material	SUS		316 S.S.
O-ring material	-B		Viton
	-K		Kalrez
	-N-N		Always -N-N
Option			

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● **External Dimensions**

Unit: mm



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2.3.2 Flow through Cell with Constant Temperature Water Tube

● **Specifications**

- a. Optical path length: 1, 2, 5, 10, or 20 mm
- b. Fiber-optic connector: FC type
- c. Wetted part material: Viton, Kalrez, 316 S.S., Borosilicate crown glass, or Sapphire
- d. Sample pressure range: Atmospheric pressure up to 0.19 MPa
- e. Sample temperature range: +5°C to +80°C
- f. Constant water temperature range: +5°C to +80°C
- g. Sample connection: Female Rc1/4
- h. Connection for water with constant temperature: 6-mm outside diameter, copper tube
- i. Installation angle: Vertical
- j. Installation location requirements: See chapter 4.
- k. Weight: Approx. 3 kg

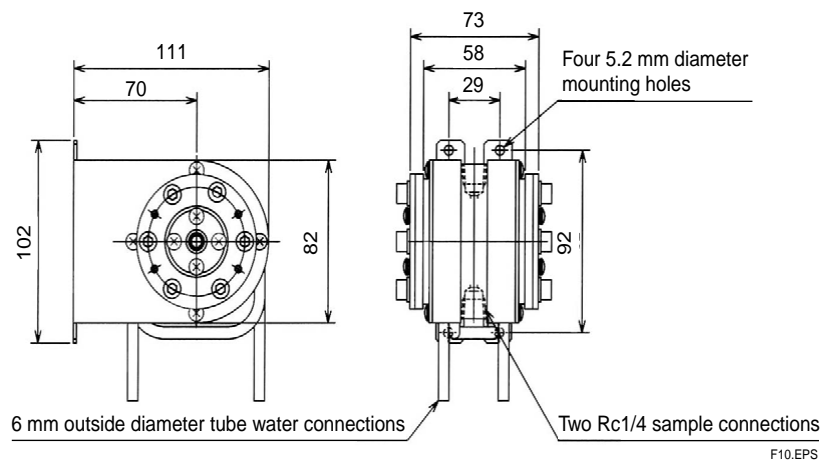
● **Model and Suffix Codes**

Model	Suffix Code	Option Code	Description
NR512			Flow through cell with constant temperature water tube
Window material and optical path length	-B00		Borosilicate crown glass, 10 mm, with variable optical path adapter (1, 2, 5, or 20 mm)
	-B01		Borosilicate crown glass, 1 mm
	-B02		Borosilicate crown glass, 2 mm
	-B05		Borosilicate crown glass, 5 mm
	-B10		Borosilicate crown glass, 10 mm
	-B20		Borosilicate crown glass, 20 mm
	-S00		Sapphire, 10 mm, with variable optical path adapter (1, 2, 5, or 20 mm)
	-S01		Sapphire, 1 mm
	-S02		Sapphire, 2 mm
	-S05		Sapphire, 5 mm
	-S10		Sapphire, 10 mm
	-S20		Sapphire, 20 mm
Body material	SUS		316 S.S.
O-ring material	-B		Viton
	-K		Kalrez
—	-N-N		Always -N-N
Option			

T15.EPS

● **External Dimensions**

Unit: mm



F10.EPS

2.3.3 In-situ probe

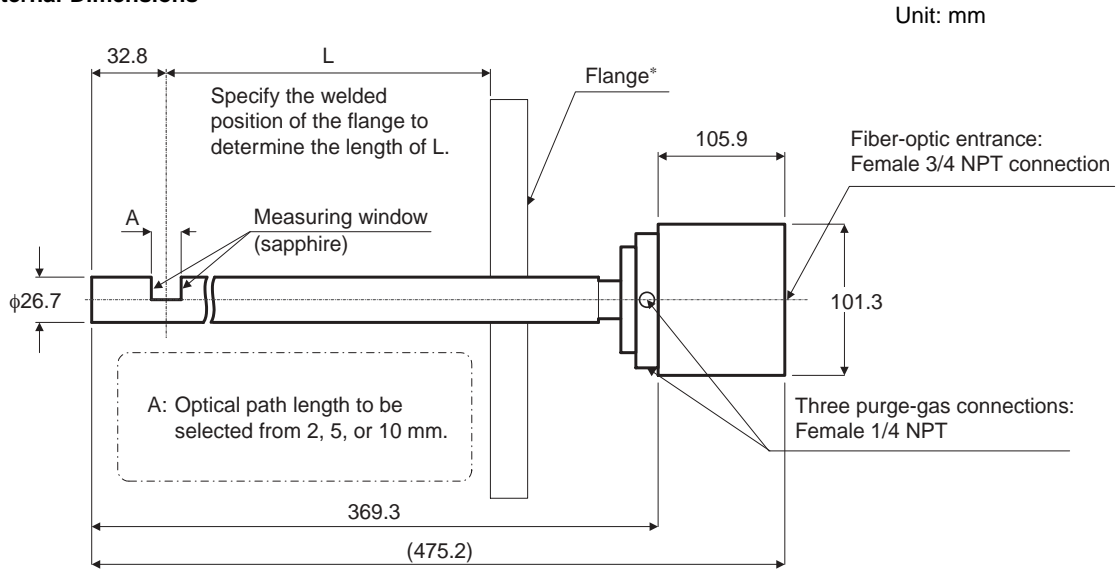
● Specifications

- a. Fiber-optic connector: FC type
- b. Wetted part material: Hastelloy C, Kalrez, 316 S.S., Sapphire
- c. Sample pressure range: Atmospheric pressure to 1.9 MPa
- d. Sample temperature range: -5°C to +80°C
- e. Installation angle: Horizontal
- f. Purge gas connection: Female 1/4 NPT
- g. Installation location requirements: See chapter 4
- h. Weight: Approx. 4 kg (excluding flange)

● Model and Suffix Codes

PARTS=FIR1000=PROBE10

● External Dimensions



* A Hastelloy C flange supplied by user.

F11.EPS

2.4 Fiber-optic Cables

2.4.1 Silica Fiber-optic Cable

● Specifications

- a. Applicable wavelength range: 900 to 2100 nm
- b. Connector: Double-end FC or FC-SMA type
- c. Structure: Dual (for sample and reference) or single (sample), two-core, protected by stainless flexible tube

flexible tube

- d. Minimum bending radius: 100 mm. To reduce optical attenuation, make the radii along the cable as large as possible when laying cables.
- e. Installation location requirements: See chapter 4.
- f. Cabling: Conduit protected cabling is recommended.

● Model and Suffix Codes (Model code to include fibers for Analyzer–Cell(probe)–Analyzer)

a. Single fiber-optic cable

Model	Suffix Code	Option Code	Description
NR821			Single fiber-optic cable for wavelength of 900 to 2100 nm
Connector	-FF		Double-end FC type
	-FS		FC type on analyzer side and SMA type on measurement cell side
Cable length	-L005		5 m
	-L010		10 m
	-L020		20 m
	-L030		30 m
	-L050		50 m
	-L100		100 m
	-L150		150 m
	-L200		200 m
	-L300		300 m
—	-000		Always -000
Option			

T16.EPS

b. Dual fiber-optic cable (includes fiber for Meas. and Ref.)

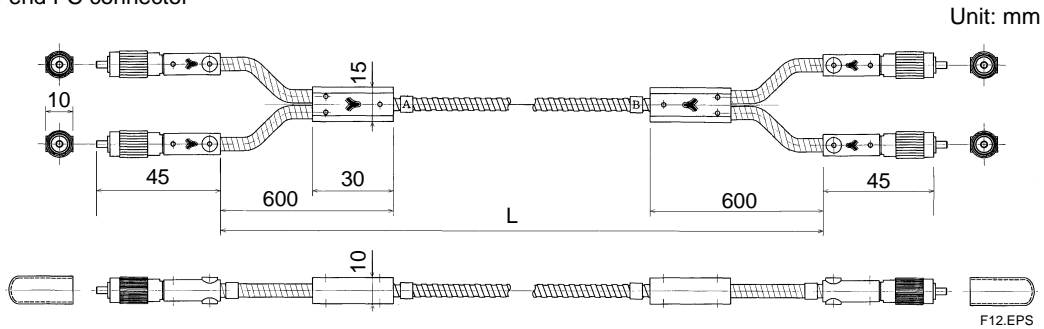
Model	Suffix Code	Option Code	Description
NR822			Dual fiber-optic cable for wavelength of 900 to 2100 nm
Connector	-FF		Double-end FC type
	-FS		FC type on analyzer side and SMA type on measurement cell side
Cable length	-L005		5 m
	-L010		10 m
	-L020		20 m
	-L030		30 m
	-L050		50 m
	-L100		100 m
	-L150		150 m
	-L200		200 m
	-L300		300 m
—	-000		Always -000
Option			

T17.EPS

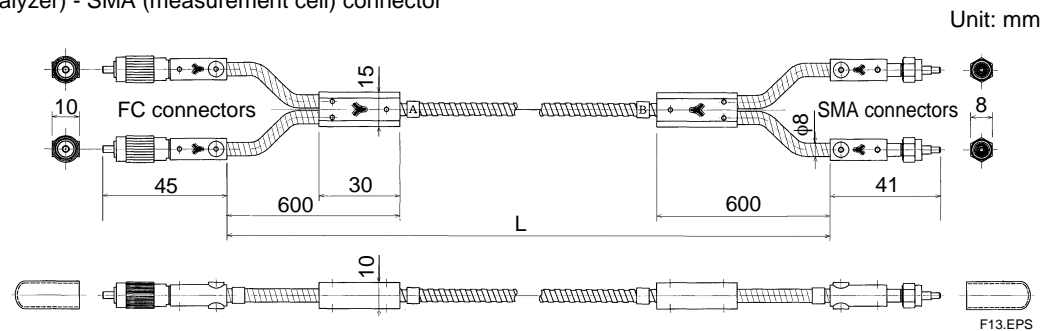
● External Dimensions

A dual fiber-optic cable comprises two single cables. The dimensions for each single cable are the same.

- Double-end FC connector



- FC (analyzer) - SMA (measurement cell) connector



2.4.2 Fluoride Fiber-optic Cable

● **Specifications**

- a. Applicable wavelength range: 900 to 2500 nm
- b. Length: Up to 20 m
- c. Connector: Double-end FC type or FC-SMA type
- d. Structure: Dual (for sample and reference) or single (sample), two-core, protected by stainless

- flexible tube
- e. Minimum bending radius: 120 mm. To reduce optical attenuation, make the radiuses along the cable as large as possible when laying cables.
- f. Installation location requirements: See chapter 4.
- g. Cabling: Conduit protected cabling is recommended.

● **Model and Suffix Codes (Model code to include fibers for Analyzer–Cell(probe)–Analyzer)**

a. Single fiber-optic cable

Model	Suffix Code	Option Code	Description
NR823			Single fiber-optic cable for wavelength of 900 to 2500 nm
Connector	-FF		Double-end FC type
	-FS		FC type on analyzer side and SMA type on measurement cell side
Length	-L005		5 m
	-L010		10 m
	-L020		20 m
—		-000	Always -000
Option			

T18.EPS

b. Dual fiber-optic cable

Model	Suffix Code	Option Code	Description
NR824			Dual fiber-optic cable for wavelength of 900 to 2500 nm
Connector	-FF		Double-end FC type
	-FS		FC type on analyzer side and SMA type on measurement cell side
Length	-L005		5 m
	-L010		10 m
	-L020		20 m
—		-000	Always -000
Option			

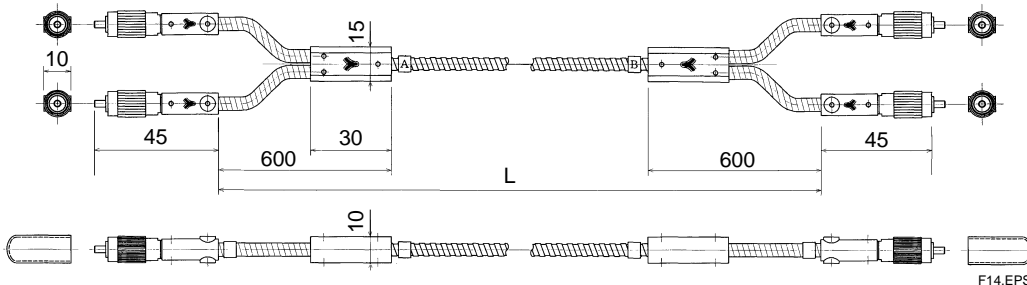
T19.EPS

● **External Dimensions**

A dual fiber-optic cable comprises two single cables. The dimensions for each single cable are the same.

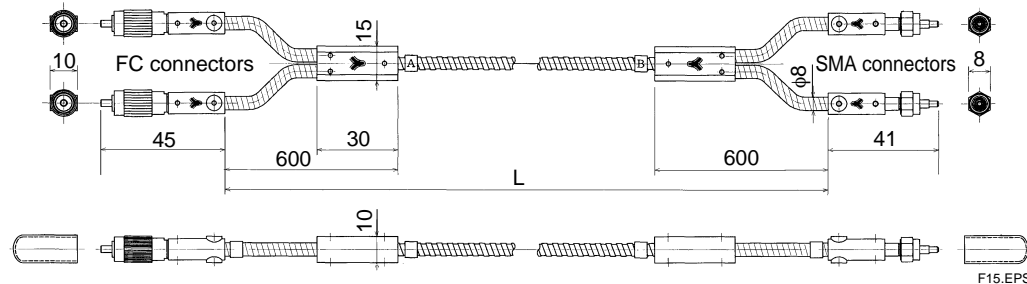
- Double-end FC connector

Unit: mm



- FC (analyzer) - SMA (measurement cell) connector

Unit: mm



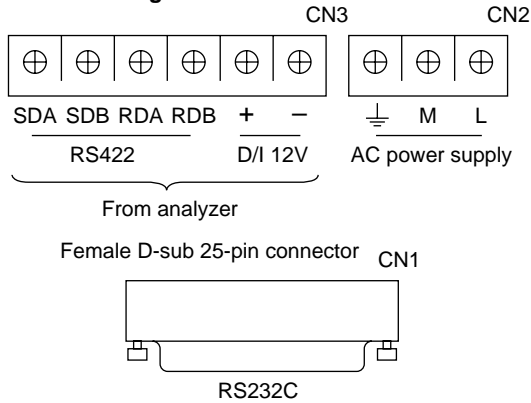
2.5 RS422-to-RS232C Converter (Part Number: K9404LA)

This unit converts output signals of the analyzer main unit from the RS422 format to the RS232C format for personal computer or DCS communication and also blocks communication signals when it receives a power-off signal from the Analyzer, thus ensuring the explosion-proof integrity.

● **Specifications**

- a. Power supply: See chapter 3.
- b. Signal terminals: Analyzer main unit side (RS422): M4, output side (RS232C): Female D-sub 25-pin
- c. Grounding type: Class D
- d. Installation location requirements: See chapter 4.
- e. Housing structure: Desktop
- f. Weight: Approx. 1 kg

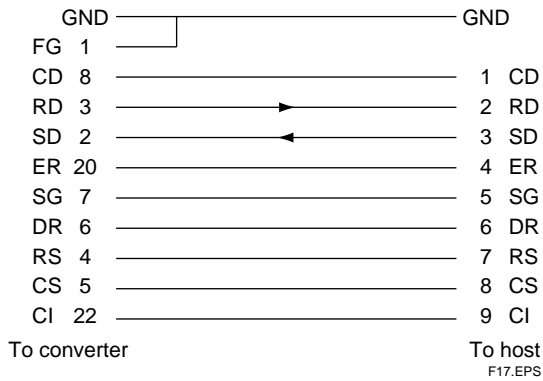
● **Terminal Diagram**



F16.EPS

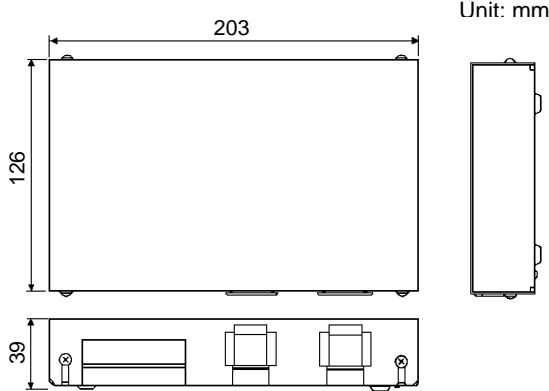
● **RS232C Communication Straight Cable**

Internal connection



F17.EPS

● **External Dimensions**



F18.EPS

2.6 Ethernet Fiber-optic Cable

● **Specifications**

- a. Length: Up to 20 m
- b. Connector: ST type
- c. Structure: Two-core, protected by stainless flexible tube
- d. Installation location requirements: See chapter 4.
- e. Minimum bending radius: 50 mm. To reduce optical attenuation, make the radii along the cable as large as possible when laying cables.

● **Model and Suffix Codes**

Model	Suffix Code	Option Code	Description
NR895			Ethernet fiber-optic cable
Length*	-L003		3 m
	-L005		5 m
	-L010		10 m
	-L020		20 m
	-000		Always -000
Option		/JB	With junction box*

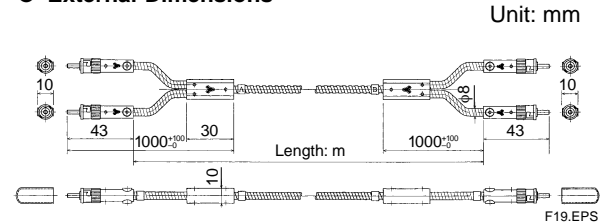
*: For a total cable distance of 20 m or longer, an additional fiber-optic cable (fitted with ST connectors) must be provided by the user. In this case, be sure to specify the /JB (junction box) option for connection between an NR895 fiber-optic cable and the additional cable.

T20.EPS

Requirements for additional cable provided by user

- Material and connector: Silica glass fiber with ST connectors
- Mode: Multi-mode GI
- Number of cores: 2
- Core/Clad diameters: 50/125 μm
- Applicable wavelength: 850 nm
- Length: 1000 m or less in total including an NR895 fiber-optic cable

● **External Dimensions**



F19.EPS

2.7 Ethernet Cable

User furnished a cable that satisfies the following requirements:

- a. Type: 10BaseT, 8-core shielded
- b. Length: Up to 40 m
- c. Finished outer diameter: 5.0 to 7.4 mm

2.8 SpectLand 2 Measurement and Maintenance Software

2.8.1 Overview

SpectLand 2 is an application software that controls NR800 operation and monitoring on a PC. It displays the analyzer status, and instructs measurement and sets parameters for the analyzer. To use SpectLand 2, first install it in the Engineering PC.

Main Features

- Instructs the analyzer to measure spectra, save data and display. The measured spectra can be used to generate calibration models.
- Shows trend graphs of the measurements and saves them to files during a continuous measurement.
- Sets parameters for continuous measurement.
- Displays various data of the analyzer, such as operating modes, alarm status, and maintenance data.
- Instructs the analyzer to perform such tasks as operation mode change, spectra measurement, and setting property information, calibration models, or measurement conditions.

2.8.2 Main Windows

● **Manual Spectrum Window**

Enables the analyzer to measure spectra, which are to be processed by Chemometrics (calibration model generation software). Also allows data to be saved to files and displayed.

● **Auto Spectrum Window**

Allows the user to upload spectra data to the Engineering PC during continuous measurement upon receiving a signal at periodic intervals, outlier detection, or a property value variation failure. This data is displayed for each measuring channel.

● **Power Spectrum Window**

This window is available for UB level (equipment supervisor) users. It displays power spectra.

● **Interferogram Window**

This window is available for UB level users. It displays interferogram data collected.

● **Real-time Trend Windows**

Display measurement values of Nos. 1 to 6 and Nos. 7 to 12 components in two separate trend graph windows for each stream. Up to 10 windows can be open at the same time.

● **Historical Trend Windows**

Display historical trend data saved. Trend data of 24 hours for each stream is saved to a file. Up to 4 windows can be open at the same time.

● **Parameter Window**

Displays the current parameter settings for the analyzer. In addition, UB level users can change the settings.

● **Alarm Status/History Windows**

The Alarm Status window displays the active alarms for the analyzer, while the Alarm History window displays all the past alarms. The alarm history can be deleted with commands.

● **Tab-controlled Maintenance Window**

Displays the A/D reference value and servo-related data of the analyzer. This window is available for UC level users.

● **Tab-controlled Communication Status Window**

Displays the communication status between the personal computer and the analyzer. This window is available for UC level users.

2.8.3 Model and Suffix Codes

Model	Suffix Code	Option Code	Description
NR831			SpectLand 2 measurement and maintenance software
Language	-J		Japanese
	-E		English
—	-N-N		Always -N-N
Option			

T21.EPS

● **Package contents**

- One 3.5-inch floppy disk
- One instruction manual

2.9 Unscrambler Analysis and Calibration Model Generating Software

2.9.1 Specifications

- Calibration model generating technique: Partial least square (PLS) and others
- Package contents
 - Five 3.5-inch floppy disks
 - One instruction manual
 - One set of user registration document

2.9.2 Model and Suffix Codes

Model	Suffix Code	Option Code	Description
NR530			Unscrambler analysis and calibration model generating software
Language	-J		Japanese
	-E		English
—	-N-N		Always -N-N
Option			

T22.EPS

2.10 Sampling Unit

Use of a sampling unit is highly recommended to ensure compatibility of the user's process sample with the measurement cell. In addition, it allows separation of the measurement cell (probe) apart from the analyzer with a fiber-optic cable up to 300 m in length. This enables selection of a measurement location independent of the analyzer. The optimum sampling unit is prepared for individual application requirements. Contact Yokogawa for further information.

● **Example of Sampling System**

The following introduces a conceptual sampling unit for measuring the properties (RON, RVP, Distillation etc.) of gasoline blending in a petroleum refinery. Note that each sampling unit should be designed for each application; designs will vary.

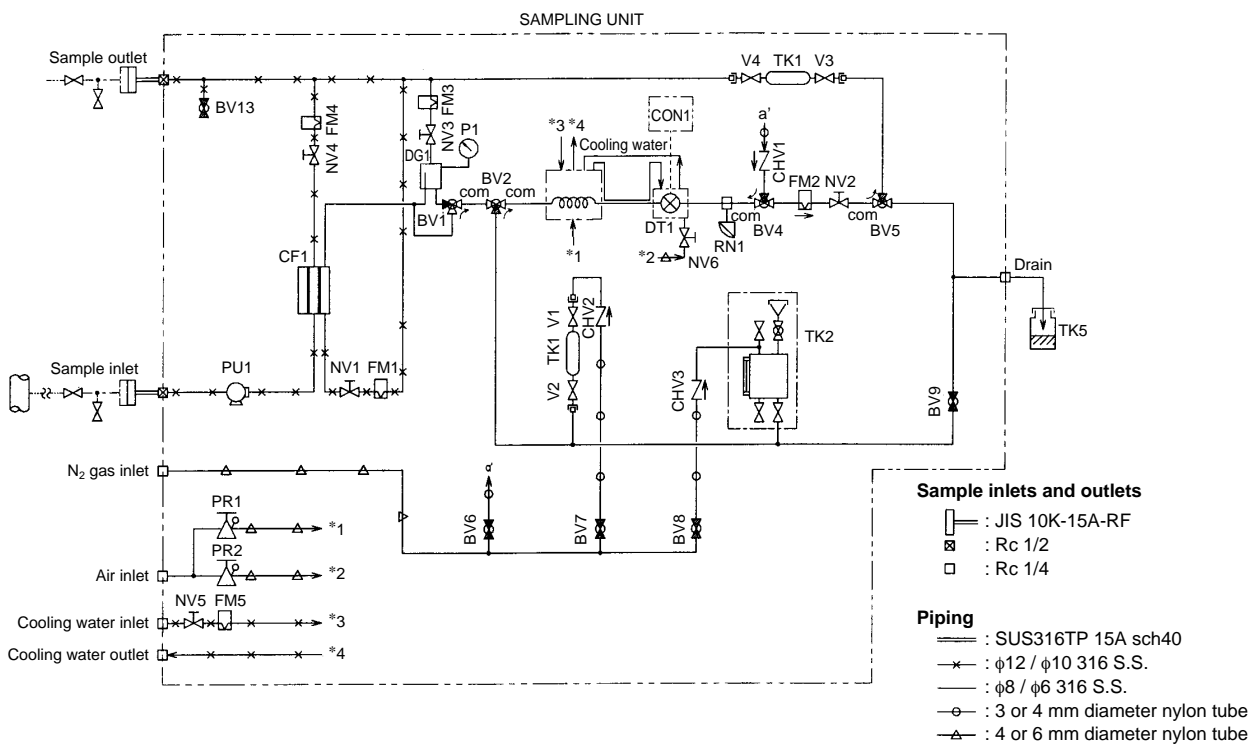
Measurement Sample Conditions

Item		Condition	
a	Fluid to be measured	Gasoline	
b	Sample inlet/ outlet condition	Inlet pressure	0.3 to 0.9 MPa G
		Outlet pressure	0.3 to 0.9 MPa G
		Inlet temperature	0°C to +40°C

Notes

- 1: When samples do not contain free water content, a coalescer is not required.
- 2: When samples do not have bubbles, no degasser is required.
- 3: If the pressure difference between the sample inlet and outlet is greater than 0.3 MPa, no sampling pump is required.

T23.EPS



PU1	PUMP
CHV1, 2, 3	CHECK VALVE
BV6, 7, 8, 9, 13	2-WAY BALL VALVE
CF1	COALESCER FILTER
NV1, 2, 3, 4, 5, 6	NEEDLE VALVE
FM1, 2, 3, 4, 5	FLOW METER
PR1, 2	PRESSURE REGULATOR
DG1	DEGASSER
P1	PRESSURE GAUGE
DT1	DETECTOR
V1, 2, 3, 4	STOP VALVE
BV1, 2, 4, 5	3-WAY BALL VALVE
TK1, 2, 5	TANK
CON1	InfraSpec NR800
RN	RESISTANCE TEMP. SENSOR

F20.EPS

3. Utility Specifications

3.1 Power Supplies

● **NR800 analyzer**

Item	Description
Power supply	100, 110, 115, 200, 220, 230 V AC, single phase, 50/60 Hz*□
Voltage fluctuation	Rating ±10%, 50/60 ±2 Hz
Power consumption	Approx. 250 VA

* : To be specified. See the corresponding model and suffix codes for details. T24.EPS

● **RS422/RS232C converter**

Item	Description
Power supply	100 to 120 V AC ±10% or 200 to 240 V AC ±10%, single phase, 50/60 Hz
Voltage fluctuation	Rating ±10%, 50/60 ±2 Hz
Power consumption	Approx. 15 VA

T25.EPS

● **I/O unit**

Item		Description
AC	Power supply	100 to 230 V AC ±10%, single phase, 50/60 Hz
	Voltage fluctuation	85 to 264 V AC, 50/60 ±3 Hz
	Power consumption	Approx. 100 VA
DC	Power supply	24 V DC
	Voltage fluctuation	24 V DC ±10%
	Power consumption	Approx. 180 mVA / AO 4 points

T26.EPS

3.2 Others

● **Clean, dry air for Analyzer purge (explosion-proof model)**

Item	Description
Temperature	-10°C to +40°C
Pressure	0.3 to 0.9 MPa
Dew point	-20°C or lower (at supplied pressure)
Cleanliness	Must be free from dust, corrosive, and toxic elements.
Volume	Approx. 70 Nl/min.

T27.EPS

● **Water for flow through cell with water tube**

● **Utility for sampling unit (when used)**

4. Installation Location Requirements

Avoid unnecessary physical shock as it may cause damage to the equipment.

● **NR800 analyzer, measurement cell, and fiber-optic cable**

Item	Description
Location	Hazardous/non-hazardous area, indoor/outdoor Avoid direct exposure to wind and rain, sunlight, or radiation heat.
Ambient temperature	-10°C to +40°C
Ambient humidity	5% to 95% RH (no condensation)
Vibration	Install the equipment in a place with minimum vibration (vibration acceleration of 2 m/s ² or less).
Atmosphere	Must not contain corrosive or toxic substances.

T28.EPS

● **RS422/RS232C converter and I/O unit**

Item	Description
Location	Non-hazardous area, indoor
Ambient temperature	+5°C to +35°C
Ambient humidity	5% to 95% RH (no condensation)
Vibration	Install the equipment in a place with minimum vibration (vibration acceleration of 2 m/s ² or less).
Atmosphere	Must not contain corrosive or toxic substances.

T29.EPS

5. Support for Calibration Model Generation

5.1 On-site Guidance of Calibration Model Generation

A Yokogawa engineer will train the user's site personnel in the procedure to generate a calibration model for one measured item using a user-provided sample with its laboratory analysis results.

5.2 Calibration Model Generation

Yokogawa generates a calibration model using the necessary quantity of user-provided samples with laboratory analysis results. A predefined SEP (standard error of prediction) value of 1σ will be used as the measurement target value. The target value, sample quantity, and other details are determined separately for each application.

5.3 Others

Other support options for calibration model generation and maintenance include:

- Sampling test for potential users
- Maintenance contracts
- Sampling/model generation/maintenance consulting service.

Contact a Yokogawa sales representative for further information, and advice on the best solution for your needs.

6. Recommended Specifications for Engineering PC

● PC

- Model: IBM PC-compatible
- CPU: Intel Pentium 500 MHz or superior
- Operating system:
 - Microsoft Windows 2000/NT4.0/98/Me
- Memory: At least 64 MB
- Hard disk: At least 10 GB of free space (program and data storage)
- Ethernet adapter: 10BaseT

● Color Monitor

Resolution: At least 1024 × 768 pixels

● Color printer

● Connection cables and other devices and consumables

7. Optical-to-electrical Signal Converter

Provide a converter and cables compatible with Ethernet 2.0, 10BaseT, and IEEE 802.3 10BaseFL standards, fitted with ST connectors, for multi-mode fiber cables. Contact a Yokogawa sales representative for recommended models with test-proven operation or other information.