General Specifications

Yokogawa Pre-Engineered CEMS Solution

GS

■ GENERAL

The Yokogawa Continuous Emissions Monitoring System (CEMS) is a pre-engineered solution designed for reliable measurement of NOx, CO, CO2, SO2, and O2. It is configured in a conditioned analyzer cabinet, including a built-in sample conditioning panel. This solution is designed to support compliance with EPA 40 CFR parts 60 and 75.

■ FEATURES

- **Up to 5 gas components measurement**
  Simultaneous measurement of gas concentrations of up to five components: NO, SO_2, CO_2, CO, and O_2.
- **Excellent long-term stability**
  A unique optics system minimizes drift particularly due to contamination of measurement cell, ensuring excellent long-term stability.
- **Easy operation**
  Intuitive operation by the color touch panel display. Error display for easy visibility. Error details can be checked on the display.
- **Local and Automatic validation and calibration**
  Validation and calibration can be triggered remotely, locally or automatically at a specified time interval. Automatically distributes the gas used for calibration and records the values at the time of the gas distribution. Examines the condition of the detector and the appropriate maintenance cycle.
- **Built in O2 Correction**
  O2 correction is calculated automatically and can be easily viewed on the local HMI.
- **Liquid Alarm Sensor**
  Built in liquid alarm sensor to ensure the safety and longevity of the analyzer

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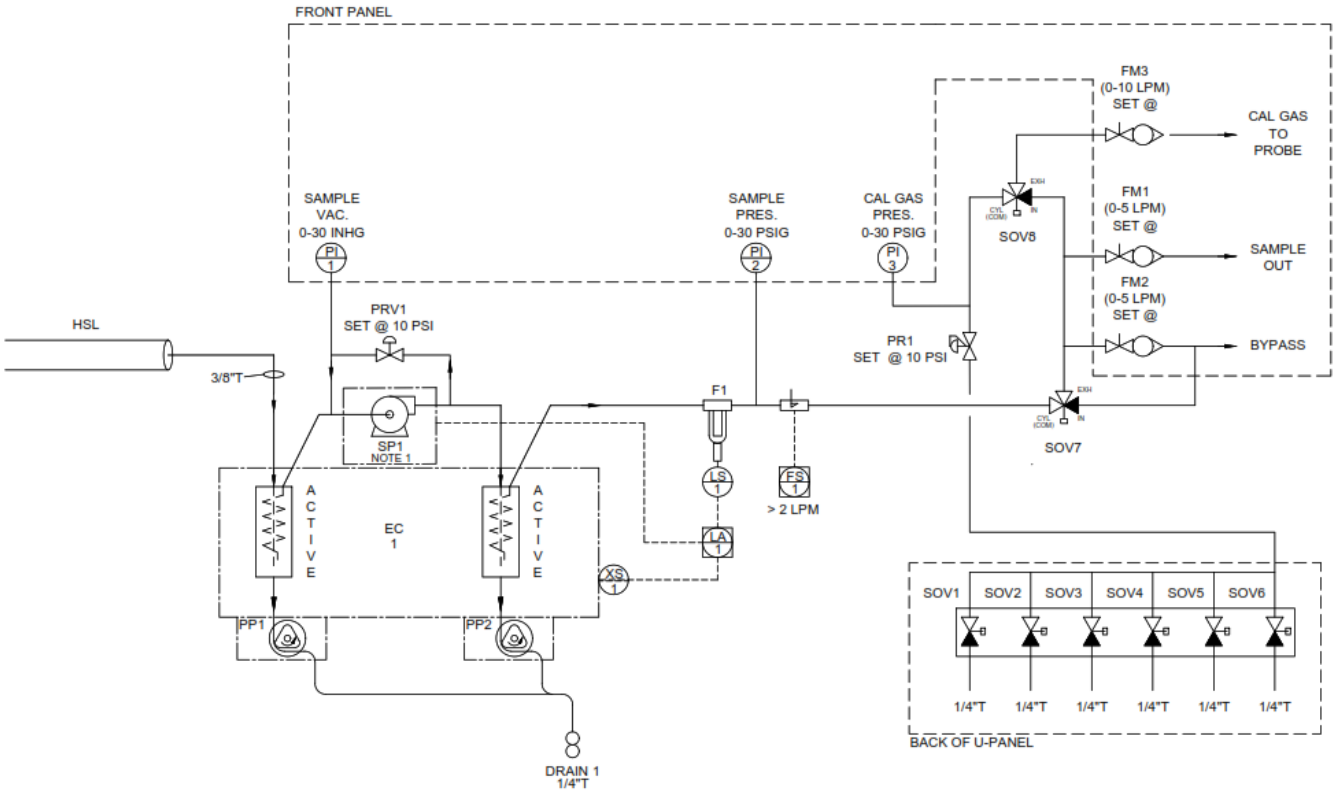
■ Sample Conditioning Panel



Item	Function	Item	Function
EC1	Cooler, Cools sample gas and condenses moisture	PR1	Pressure regulator for cal. gas
PP1 & PP2	Peristaltic Pumps, Removes condensed moisture	PRV1	Vacuum gauge for pulling the sample
SP1	Sample Pump	F1	Filter
LS1	Liquid Sensor	SOV7 & SOV8	Solenoid valves for cal. procedure
LA1	Liquid Alarm Controller	FM1, FM2, & FM3	Flow meter for Cal. gas, sample gas, and bypass
FS1	Flow sensor	SOV1-6	Solenoid valves for calibration gas

■ Standard Specifications

Measurement principle:

NO, SO_2, CO_2, and CO:
Non-dispersive infrared method
Single light source-single beam
O_2: Paramagnetic type (built-in)

Measurable gas components and measurement range:

Table 1 Measurement range

	Range
NO	0-50/0-500 ppm
SO_2	0-50/0-500 ppm
CO	0-50/0-500 ppm
CO_2	0-5/0-25 vol%
O_2	0-5/0-25 vol%

Display: QVGA LCD color touch panel

(Note) Due to the characteristics of the panel, chips, afterimages, and uneven brightness may appear on the display screen, but these are not defects

- 4 Digit Display
- Instantaneous value display for each component
- Instantaneous value after O_2 correction (only in CO, SO_2, NO meters with O_2 measurement)
- Average value after O_2 correction (only in CO, SO_2, NO meters with O_2 measurement)

Analog Output
Isolated output: 4-20 mA DC
Maximum load capacity: 550 Ω
Number of outputs: 4
Output item: NAMUR NE43 burnout
Hold function: available

Contact output:
Contact type; 1a relay contact, 1c relay contact Output points;
1a; 4 points
1c; 8 points
Contact capacity;
250 V AC, 2A (resistance load)
24 V DC, 1A (resistance load)
AC/DC power sources cannot be mixed.
Function; Instrument error, Calibration error, Automatic calibration in progress, Solenoid valve drive CH1 to CH5 for automatic calibration, Range identification CH1 to CH5, Blowback, alarms 1 to 6, Peak alarm output, Maintenance in progress, Power status, Cooler/liquid alarm, Flow alarm, NOx converter fault

Contact input:
Contact type; no-voltage or voltage contact input
Input points; 8 points on IR800G
On/Off;
No-voltage contact input
Resistance value below 200 Ω; closed
Resistance value of 100 kΩ or more; open
Contact capacity: Leakage current 3 mA or less when OFF
Insulation;
Contacts mutual; non-insulating
Internal circuit; transformer isolation
Function;
Remote hold, average value reset, automatic calibration start, auto zero calibration start, automatic validation start, remote range changeover

Digital Communications:
RS-485 (Modbus RTU); 115200/38400/9600 bps
Cable length; Up to 600 m (115200 bps)
Up to 1200 m (28400/9600 bps)
Shield ground

Operating conditions:
Ambient temperature; 0 to 50°C
Ambient humidity; 10 to 90% RH (at 50°C, no condensation)
Storage temperature; -10 to +50 °C
Storage humidity; 35 to 85% R.H. (no condensation)
Power Supply voltage:
Voltage rating; 120VAC
Current; 15A
Sampe Probe and Heated bundle require additional power, to be specified upon application review
Dimensions (W X D X H): 24” x 24” x 72”
Material of gas-contacting parts:
Gas inlet/outlet; 316SS (stainless steel)
Internal tubing; 304SS, 316SS
Fluoropolymer (PTFE, PFA), PP, PPS, Fluoroelastomer, Calcium Fluoride (CaF_2), PEEK, PVDF, Borosilicate Glass, FKM Viton, Acrylic
Gas inlet/outlet; ¼ NPT Internal Thread

Standard Functions

Output signal hold: Measured value output can be held during calibration or operation by automatic or on-screen operation, or by remote execution instructions. The output at hold can be selected from the previous value and the set value.
Range changeover: The output range of measured values can be changed automatically or manually. Range changeover can also be turned off.
Range identification signal: When using the range changeover function, it is possible to output whether the low or high range is being used.
Blowback: Can open/close the contact output for blowback by a scheduled cycle or by an execution command. Blowback can set the blowback time and the gas displacement time after blowback (output hold time).
Auto calibration: Can be calibrated automatically by scheduled cycles or execution commands. If the calibration coefficient is outside the normal range, an alarm is issued. The alarm can be assigned to a contact output.
Auto zero calibration: Separate from the schedule set for Auto calibration, Auto calibration for Zero Point only can be set. If the timing of Auto calibration and the Auto zero calibration are to occur at the same time, the Auto calibration takes precedence.

Auto validation: The automatic validation function flows the calibration gas through the measurement line and records the measured value according to a scheduled cycle or execution command. If the measured value deviates from the set threshold value, an alarm can be issued and the alarm can be assigned to a contact output. This function allows the user to verify the normality of the instrument.

Contact output during auto-calibration/validation: Displays the status of automatic calibration and validation. Status can be assigned to a contact output.

High/low limit alarm: Upper or lower thresholds can be set and alarmed if exceeded. Alarms can be assigned to contact outputs.

Instrument error contact output: If an instrument error occurs, an alarm is issued. The alarm is assigned to a contact output.

Calibration error contact output: If calibration is not performed properly, an alarm is issued. The alarm is assigned to a contact output

Liquid Alarm Sensor: Protects the analyzer from any liquid being introduced into the inlet

Optional Functions

/K: O_2 correction; Instantaneous O_2 correction values and O_2 correction average values of NO, SO_2, and CO can be calculated and output.

Add-on Integrations

Sample Probe: Extractive sample probe designed to deliver representative gas samples while protecting the analyzer system.

Heated Bundle: Temperature-controlled sample transport line that prevent condensation and preserve sample integrity from the extraction point to the CEMS cabinet

Optical/Particulate Monitor: Continuous optical and particulate monitoring solutions to support emissions compliance and environmental reporting requirements

Flow Monitor: Accurate stack gas flow measurement systems that provide critical data for emissions calculations and reporting.

Data Acquisition: Seamless integration with a regulatory reporting systems enabling centralized data collection, storage, validation, alarming, and emissions reporting

Performance

$NO/SO_2/CO/CO_2/CH_4$

Repeatability:	± 1% F.S.
Linearity:	± 1% F.S.
Zero drift:	± 2.0% F.S. / week
Span drift:	± 2.0% F.S. / week
Interference:	± 2.0% F.S.

Built-in paramagnetic oxygen analyzer

Repeatability:	±0.5% F.S.
Linearity:	±1% F.S.
Zero drift:	±2% F.S./week
Span drift:	±2% F.S./week

Response time (90% F.S. response): 30 sec. or less

IR800G Safety, EMC and RoHS conformity standards

Safety conformity standards:

CE, UKCA	EN 61010-1, EN IEC 61010-2-030
UL	UL 61010-1, UL 61010-2-030
CSA	CAN/CSA-C22.2 No.61010-1, 61010-2-030
GB	GB30439

Installation altitude: 2000 m or less

Installation category; (IEC 61010)II (Note 1)

Pollution degree; (IEC 61010); 2 (Note 2)

Note1: Installation category, so called overvoltage category, specifies impulse withstanding voltage. Category II overvoltage applies to equipment intended to be powered from the building wiring.

Note2: Pollution degree indicates the degree of existence of solid, liquid, gas or other inclusions which may reduce dielectric strength. Degree 2 indicates the normal indoor environment.

EMC:

CE, UKCA	EN61326-1 Class A, Table 2 (For use in industrial locations) EN61326-2-3, EN61000-3-2, EN IEC 61000-3-2, EN61000-3-3
RCM	EN61326-1 CLASS A, Table2
KC	Korea Electromagnetic Conformity Standard Class A 한국 전자파적합성 기준

Sample gas conditions

Flow rate:	5 LPM maximum
Temperature:	180°C maximum
Moisture:	Less than 30%

Reference gas conditions

Gas:	Atmosphere, instrument air or N_2
Flow rate:	0.5 to 1.0 L/min
Temperature:	0 to 50°C
Pressure:	100 psig maximum
Dust:	2 µm or less in particle size
Mist:	Unallowable
Moisture:	Below a level where saturation occurs at 5°C (No condensation)

Impurities other than CO_2: 0.1% F.S. or less of minimum measurement range.

Standard gas for calibration

Please refer to your environmental permit for required calibration gases

Installation Requirements

- 0-50°C
- Vibration-free environment
- A clean atmosphere
- For conditioned cabinet options, 70 SCFM air required
- Drain hookup

Gas Cooler

Peltier gas cooler with 2 independent gas paths
316SS Impingers, NPT
Adjustable gas outlet dew point with a stability of < ± 0.1°C
Total cooling capacity of 2 x 90 kJ/h at 25°C

■ Model and Suffix Code

Model	Suffix code	Option code	Specification
YCACEMS	---------- ---------- ----------	-------	Wall and Panel Mount Type Infrared Gas Analyzer
Type	-G -S -O	------- ------- -------	General Purpose Cabinet C1D2 Purged Cabinet Open Architecture
Measuring Components	-A3 -B4 -D1	------- ------- -------	CO $CO+CO_2$ $NO+SO_2+CO+CO_2$
NO Measuring Range	-NN -E1	------- -------	None 0-50/500 ppm
SO_2 Measuring Range	-NN -E1	------- -------	None 0-50/500 ppm
CO Measuring Range	-NN -E1	------- -------	None 0-50/500 ppm
CO_2 Measuring Range	-NN -C5	------- -------	None 0-5/25 %
O_2 Measuring Range	-M1	-------	0-5/25 %
—	-NN	-------	Always "-NN"
Option		-------	O2 Compensation

Spare Parts and Consumables

Description	Qty
IR800G C-type snap ring	1 (*1)
IR800G Plate	1
IR800G Filter	1
Snap ring plier	1
Filter, 2-Micron, Teflon, 75mm	2
Tube/fitting set, SR25, ¼", Novoprene	4
MPF kit, 2-Valve Plates, 2-O-Rings, 1 Bellows	2
Fuse ATMR	6
Fuse ATQR	1
Fuse ATMR	1
Power Supply	1
NO_x Converter Consumables	2
Glass Wool (0.3-0.5g)	2
Joint	4

*1: The minimum purchase quantity is 10 per order.

Optical Unit Parts

Maintenance and replacement of the optical unit are performed by trained service engineers.

Name	Part No.	Qty for 1 unit	Description	Recommended replacement interval (Year)	Applicable model
Packing	K8020QJ	2 (*1)	Packing for Lamp unit	1	All model
Base block	K8020QK	1	Solenoid valve and Capillary mount base	1	All model
Solenoid Valve	A1050MS	2 (*1)	Solenoid Valve for switching sample gas and reference gas	1	All model
Packing	K8020QM	2 (*1)	Packing for Capillary	1	All model
Elbow connector	K8020QB	4 (*1)	Connector for low range Cell	1	Measuring range "-E□"
O-ring	K8020QD	3 (*2)	O-ring for low range cell	1	Measuring range "-E□"
O-ring	K8020QE	2 (*1)	O-ring for low range cell	1	Measuring range "-E□"
O-ring	K8020QF	2 (*1)	O-ring for high range cell	1	Measuring range "-P□"
Elbow connector	K8020QB	2	Connector for high range Cell	1	Measuring range "-P□"
Elbow connector	K8020QH	2 (*1)	Connector for high range Cell	1	Measuring range "-P□"
Spacer	K8020QN	1	Spacer for CO_2 Cell	1	CO_2 measurement included model
Sheet	K8020QQ	1	Sheet for CO_2 Cell	1	CO_2 measurement included model
O-ring	K8020QF	1	O-ring for CO_2 Cell (Lamp side)	1	CO_2 measurement included model
O-ring	K8020QR	1	O-ring for CO_2 Cell (Detector side)	1	CO_2 measurement included model
Packing	K8020QS	2	Packing for CO_2 Cell (Lamp side)	1	CO_2 measurement included model
Packing	K8020QA	1	Packing for CO_2 Cell (Detector side)	1	CO_2 measurement included model
Straight connector (3mm-6mm)	K8020PX	4 or 6 (*3)	3mm-6mm Straight connector	1	All model, Build-in O_2 model requires 2 extra connectors
Metal hose band for 3mm	K8020PY	10 (*4)	Metal Clip for 3mm hose	1	All model
Metal hose band for 6mm	K8020PZ	10 (*4)	Metal Clip for 6mm hose	1	All model
High range Cell	K8020QG	1	Short measuring cell	2	Measuring range "-P□"
Low range Cell	K8020QC	1	Long measuring cell	3	Measuring range "-E□"
CO_2 Cell	A1262UY	1	CO_2 cell for low range	3	CO_2 measuring range "-C1, -C2, -C3, -C4"
CO_2 Cell	A1260UY	1	CO_2 cell for middle range	3	CO_2 measuring range "-C5"
CO_2 Cell	A1261UY	1	CO_2 cell for high range	3	CO_2 measuring range "-C6"
Lamp unit	A1121PE	1	Infrared light source	5	All model
Capillary	K8020QL	2	Capillary for flow control	5	All model
Cell Heater	A1259UY	1	Heater to control cell temperature	5	Measuring range "-E□"

*1: The minimum purchase quantity is 2 per order.
*2: The minimum purchase quantity is 3 per order.
*3: The minimum purchase quantity is 6 per order.
*4: The minimum purchase quantity is 10 per order.

■ Terminal assignment

TM1 (IR800G)

1	DI1	2	DI7
3		4	
5	DI2	6	DI8
7		8	
9	DI3	10	N. C.
11		12	N. C.
13	DI4	14	N. C.
15		16	N. C.
17	DI5	18	N. C.
19		20	N. C.
21	DI6	22	N. C.
23			

TS4

1	AO1
2	
3	AO2
4	
5	AO3
6	
7	AO4
8	
9	FG
10	GND
11	B-
12	A+
13	Term

TS5

1	IR800 Equipment Abnormality	13	Spare
2		14	
3	Calibration Abnormality	15	Spare
4		16	
5	In Calibration	17	Spare
6		18	
7	NOx Converter Fault (*1)	19	Spare
8		20	
9	Cooler/Liquid Alarm	21	Spare
10		22	
11	Flow Alarm	23	Spare
12		24	

*1: Available when Measuring Components is “–D1”

■ Channel assignment

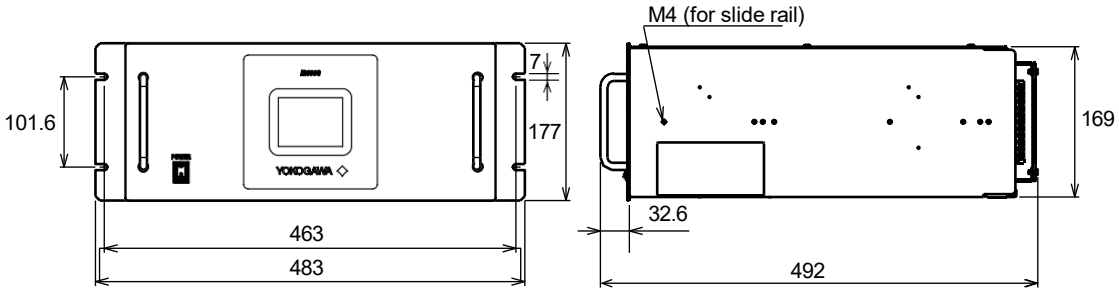
Comps	Option	CH1	CH2	CH3	CH4	CH5	CH6	CH7	CH8	CH9	CH10	CH11	CH12
-A3	N/A	CO	O2										
-B4	N/A	CO	CO2	O2									
-D1	N/A	NO	SO2	CO	CO2	O2							
-A3	/K	CO	O2	Corr. CO	Corr. O2	Corr. CO Avg.	O2 Avg.						
-B4	/K	CO	CO2	O2	Corr. CO	Corr. CO2	Corr. CO Avg.	O2 Avg.					
-D1	/K	NO	SO2	CO	CO2	O2	Corr. NO	Corr. SO2	Corr. CO	Corr. NO Avg.	Corr. SO2 Avg.	Corr. CO Avg.	O2 Avg.

For information on Modbus registers, please reference document TI 11G06A01-01EN

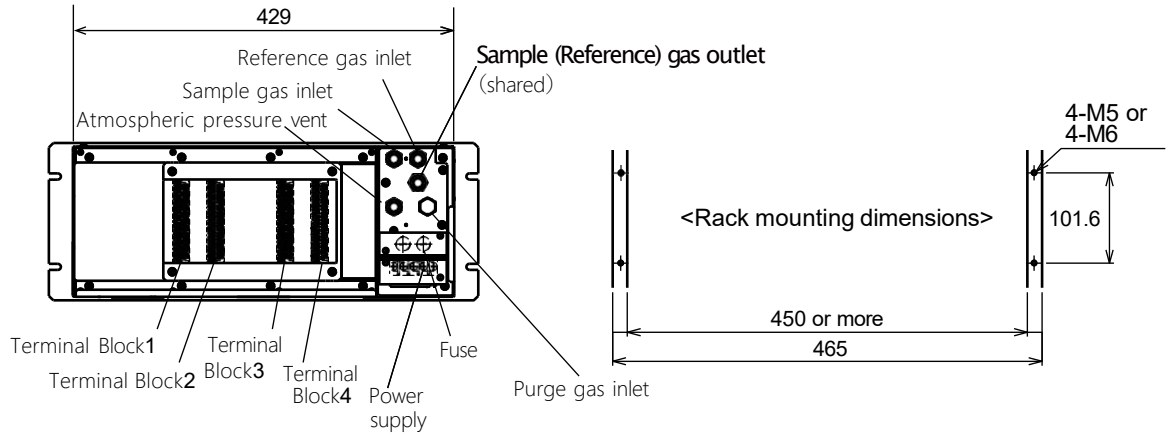
■ External Dimensions

- **IR800G**

Unit: mm

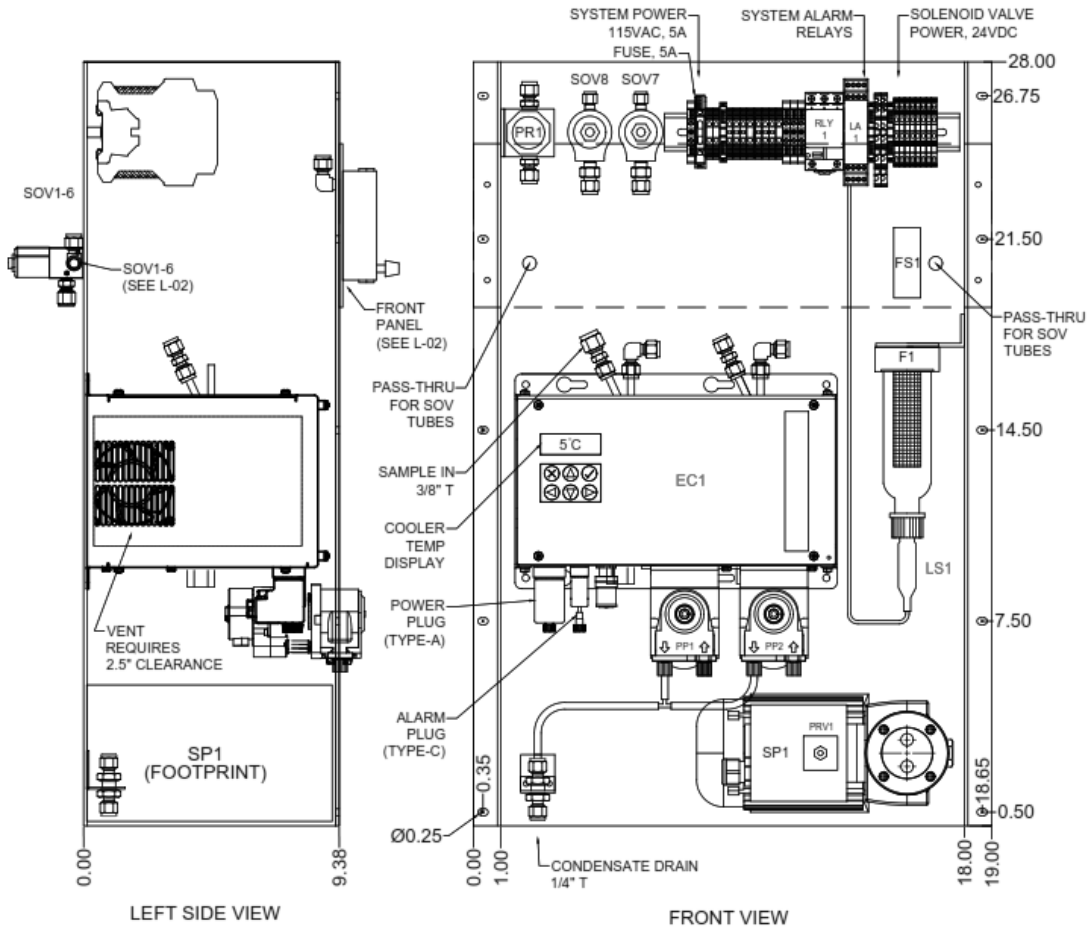


<Rear View>



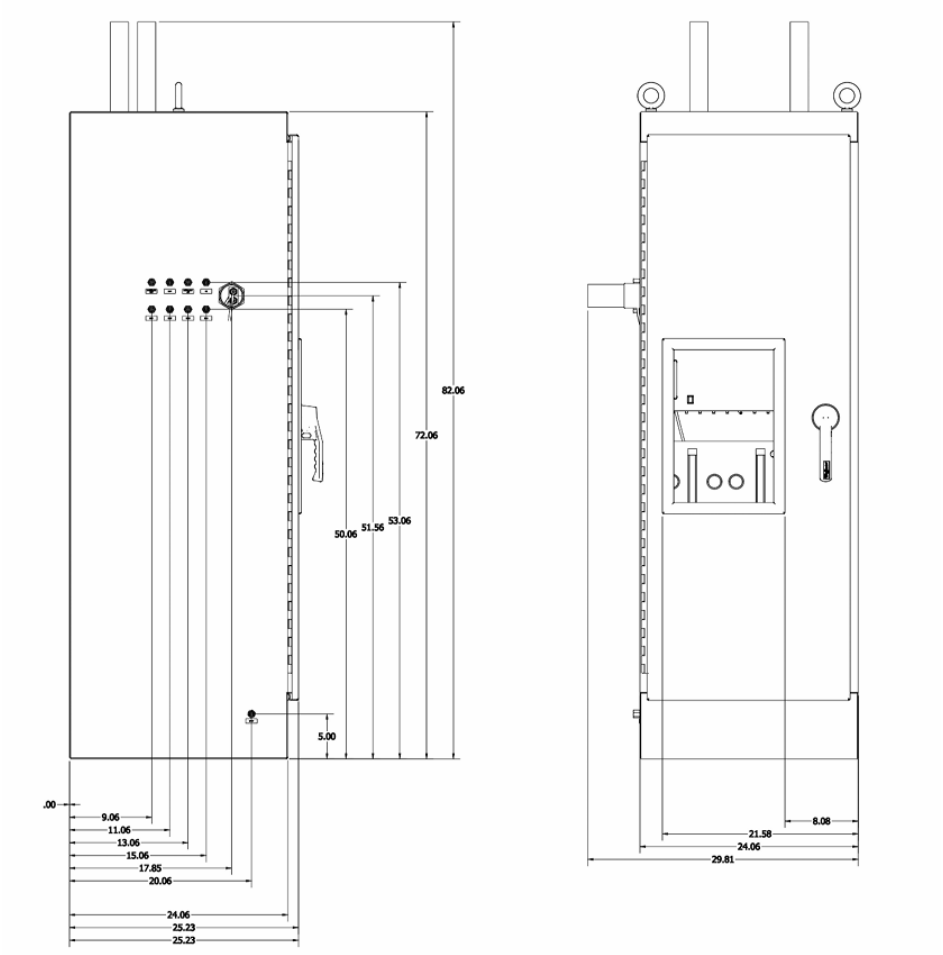
- **Sample Panel**

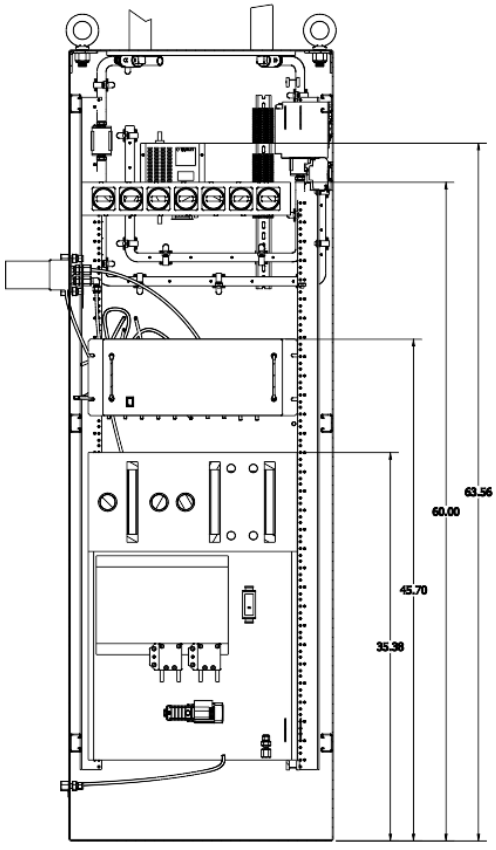
Unit: inches



- **Cabinet**

Unit: inches





For drawings of additional models, please contact Yokogawa