

RESIDUAL CHLORINE ANALYSER (REAGENT TYPE)

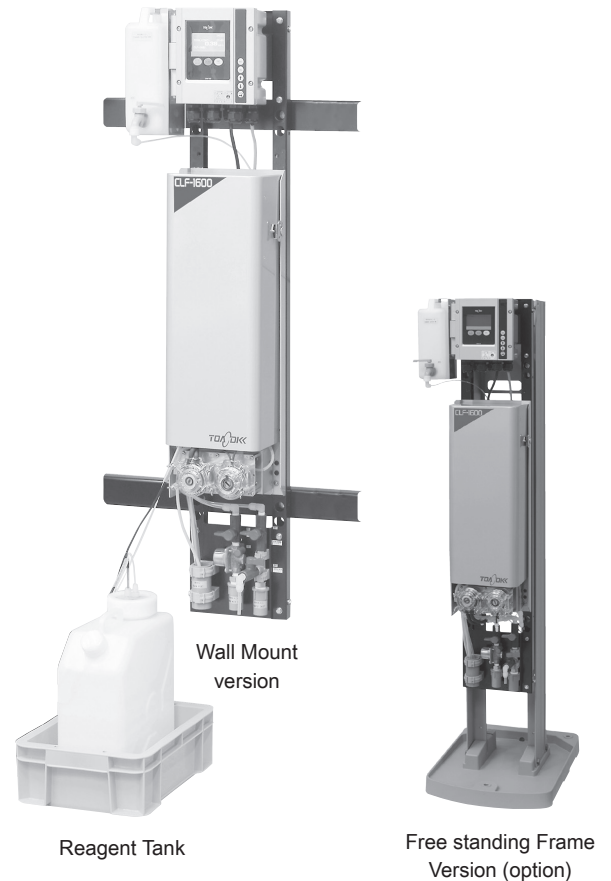
CLF-1600

This instrument provides continuous measurement of residual chlorine. The main applications are for the online measurement of process conditions in municipal water treatment plants and sewage treatment plants. Both Total Chlorine and Free (Residual) Chlorine can be measured by using the appropriate reagents.

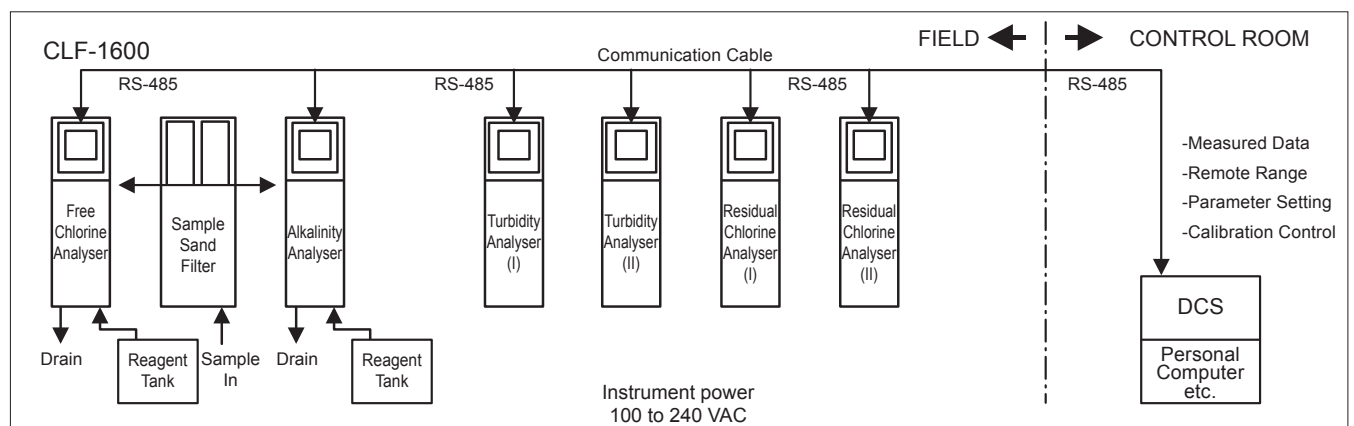
An optional sand filter is available for particularly dirty samples such as raw water before treatment process.

Features

- Field proven with many installations worldwide, contact free, swing rotary polarographic electrode provides accurate and stable measurement. The sensor cell also features a ceramic beads cleaning system to provide longterm measurement reliability.
- New design reduces reagent consumption by 80% in comparison to previous model. This allows the use of a much smaller reagent tank (now only 10L capacity in comparison to previous 50L tank)
- In addition to a 4 to 20mA output signal, this instrument also provides a digital RS-485 interface as a standard feature. This allows advanced digital communication using Modbus protocol including data exchange with control systems such as DCS.
- Compact, lightweight design suitable for wall or rack mounting. All access for pipe and cable connections are from the front minimising installation space requirements. Options are available for indoor free standing rack mounting and for systems installed in weatherproof cabinets etc..
- The instrument can cope with a wide range of sample input pressures from 0.02 to 0.3 MPa allowing direct connection to the process line if required.



Example of MODBUS communication system



Specifications

Product Name : Reagent-type Chlorine Analyser
Model Code : CLF-1600
Measurement Object : Free Chlorine or Total Chlorine in water
Measurement Method : Polarography by using eccentric rotary micro-electrode
Measurement Range : 0 to 10 mg/L (ppm)
Measurement Units : mg/L or ppm
Display : Digital, LCD
Minimum Display : 0.01
Output Range : 0 to 1/0 to 2, 0 to 2/0 to 5, 0 to 3/0 to 6/0 to 5/0 to 10, 0 to 0.5/0 to 1 mg/L (Total Chlorine only) Two ranges, manual or remote range selection
Analogue Output Signal : 4 to 20mA DC, isolated, max load 600 Ω
Contact Switching Outputs : - High concentration/low concentration
 - Under maintenance ... when STAND BY mode is selected
 - Under auto-calibration (option) Under cleaning
 - Analyser fault ... low sample flow, Low reagent, flow error, calibration error, hardware failure
 - Power failure
 - Range indication (open = low range, closed = high range) (contact rating; 30 VDC, 0.1A)
Contact Switching Inputs : - Range selection ... open = low range, closed = high range
 Cleaning command ... starts auto cleaning
 - Calibration command ... starts auto calibration (voltage free contacts, 100 ms or greater width)
Digital Communication System : - Based on RS-485 (isolated)
 - Available Baud rates; 1200, 2400, 4800, 9600, 19200, 38400, 57600
 - Protocol; MODBUS/RTU
 - Data length; 8 bits
 - Parity; select from None, Odd, Even
 - Stop bits; 1 Bit
 - Data order; Big Endian
Analogue Inputs : 4 to 20mA DC input from an external device for transmission via the MODBUS communication interface (scale adjusted to meet MODBUS scale).
Operating Power : 100 to 240 VAC +/- 10%, 50/60 Hz

Performance

Linearity : Within +/- 3% FS
 (+/- 0.03mg/L for 0 to 0.5mg/L range)
Repeatability : Within +/- 2% FS
 (+/- 0.02mg/L for 0 to 0.5mg/L range)
Temperature : 0 to 40 °C
Compensation Range : Zero drift; \pm 1%FS in a month (Ion exchange water)
 Span drift; \pm 5% FS in a month (Chlorine ion standard solution)
Response Time : 90% response within 3 minutes (from introduction of standard solution)

Power Consumption : Approx. 40VA (approx. 60VA with auto cleaning, auto calibration).

Sample Conditions : - No flow stoppage or stagnation
 - Temperature; 0 to 40°C (no freezing)
 - Pressure; 0.02 to 0.3 MPa
 - Sample consumption; 1 to 3 L/min (Sensor flowrate; 20mL/min)
 pH range; pH5.8 to 8.6 with no buffering capacity.

Reagent Solutions : For Free Chlorine Measurement

Reagent	Measurement Range
Potassium Bromide	0 to 10 mg/L
Anhydrous Sodium Acetate	600g/10L
Acetic Acid	200g/10L

For Total Chlorine Measurement

Reagent	0 to 5mg/L	0 to 10mg/L
Potassium Iodide	100g/10L	200g/10L
Anhydrous Sodium Acetate	25g/10L	50g/10L
Acetic Acid	200mL/10L	400mL/10L

Flowrate; A approx. 0.2mL/min

Consumption; Approx 0.3 L/day (10L/month)

Tank capacity; 10L (with level sensor)
 Tank material; Polyethylene (with tray)

Construction : Suitable for indoor installation.
 Requires weather protection if installed outdoors. Transmitter; IP-65. analytical section; IP-52

Mounting : Suitable for wall or rack mounting

Materials : Transmitter; die cast aluminium
 Analytical section; aluminium plate

Surface Finish : Metallic silver

Wetted Materials : PVC, PFA, PP, Acrylic etc..

Piping Connections : Sample inlet; VP16 socket

Drain; VP25 socket

Cleaning water inlet (option); VP16 socket

Electrical Connections : Six cable glands for 6 to 12mm diameter cable, G1/2 threaded connections when gland removed

Ambient Temperature : -5 to 50°C (no freezing)

Ambient Humidity : Max 85% RH (no condensation)

Weight : Approx. 17kg (32kg with optional free standing frame)

Calibration Method

Zero Calibration:

Use ion exchange water or dechlorinated water.

Span Calibration:

Take a grab sample at the inlet to the analyser. Analyse this sample using the DPD colorimetric method. Use the DPD measurement result to calibrate the analyser. Alternatively, use hypochlorous acid instead of sample.

Options

- Auto-Cleaning Unit:** This unit introduces water or water + ozone in the measurement piping at regular intervals in order to automatically clean the flow paths and sensors. Cleaning function is started by internal timer setting or by remote start signal.

Cleaning cycle: 1 to 24 hours (initial factory setting is 12 hours, set to 0 hours to use external signal).

Cleaning duration: Water cleaning 2 minutes (fixed)
Ozone cleaning 8 minutes (fixed).

Cleaning water conditions: Equivalent to city water, approx. 6L per cycle, pressure 0.2 to 0.7 MPa, temperature 2 to 30 °C.
- Auto-Calibration Unit:** This unit filters city water through a zero filter to perform zero calibration. It then

generates a constant quantity of bromine or iodine from reagent solutions using an electrolysis cell to perform the span calibration. This function is started by internal timer setting or by remote start signal.

Calibration cycle: 1 to 31 days (initial factory setting is 10 days, set to 0 days to use external signal).

Calibration duration: Approx 60 minutes (fixed)

Standby time: 0 to 30 minutes (initial factory setting is 20 minutes).

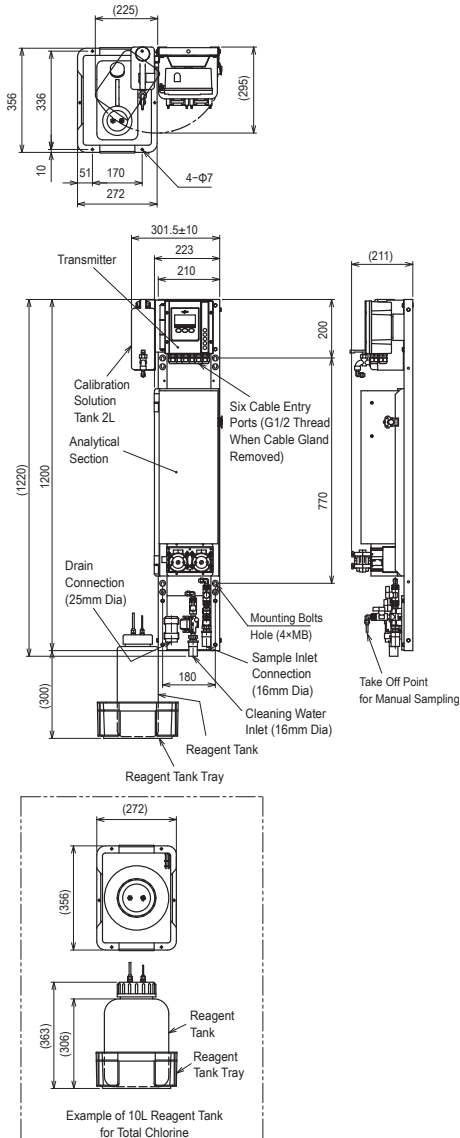
- Free Standing Frame (indoor mounting):**

Analyser system pre assembled on a free standing frame with floor mounting base suitable for fixing with anchor bolts.

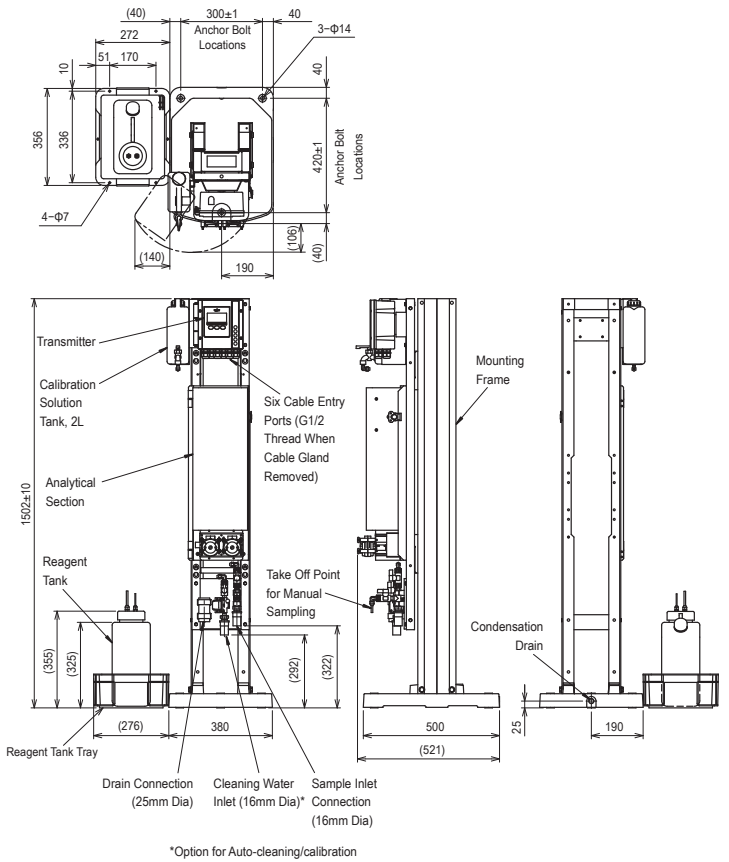
Dimensions

Unit : mm

- Wall or Rack Mounting version**

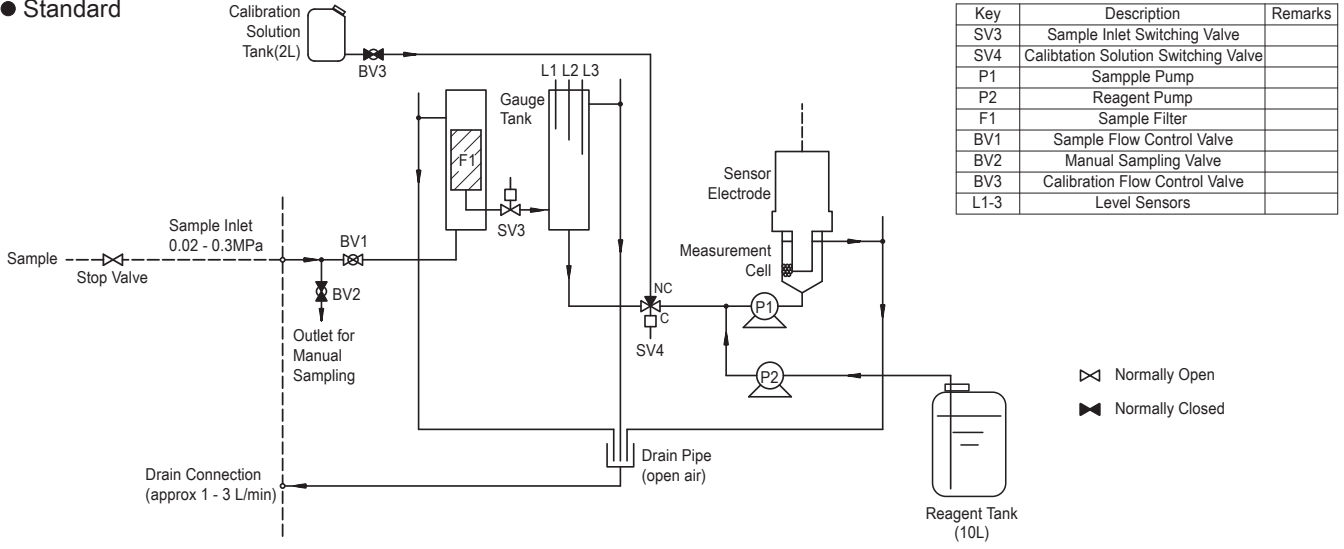


- Free standing Frame Mounted version (Option)**

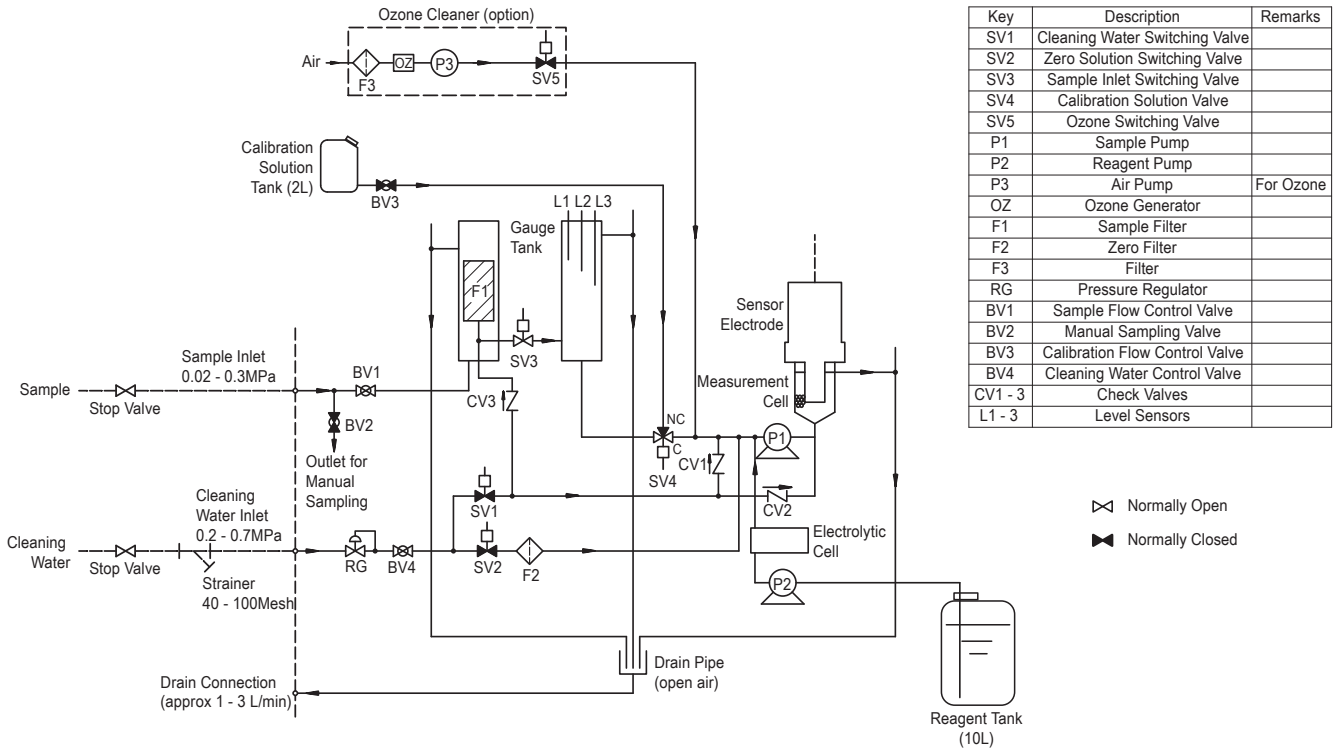


Flow Diagrams

● Standard



● With Auto calibration (Option)



Principle of operation

The sample enters the instrument at process pressure (0.02 to 0.3 MPa). The sample flow rate is regulated to 1 L/min by BV1 and then enters the gauge tank after passing through a filter. The gauge tank maintains constant flowrate of sample and also provides a debubbling function ensuring stable measurement. Surplus sample overflows from the tank and goes to drain. The sample is continuously introduced into the measurement cell by pump P1. (20mL/min). At the same time, reagent is also continuously introduced into the measurement cell by pump P2 (0.2mL/min) .

The sample mixes and reacts with the reagent to

liberate iodine or bromine corresponding to the chlorine concentration in the sample. The liberated iodine or bromine is subjected to electrolytic reduction by the sensing electrode (a negative voltage is applied to this electrode in relation to the counter-electrode) and changed to iodine ions or bromide ions. At this time, the reduction current that flows across the two electrodes is detected and converted into Total Chlorine or Free Chlorine (Polarographic method). The surface of the sensing electrode is continuously polished by ceramic beads ensuring long term stable measurement.

Terminal connections

74	75	76	77	78	79
A	B	C	A	B	C

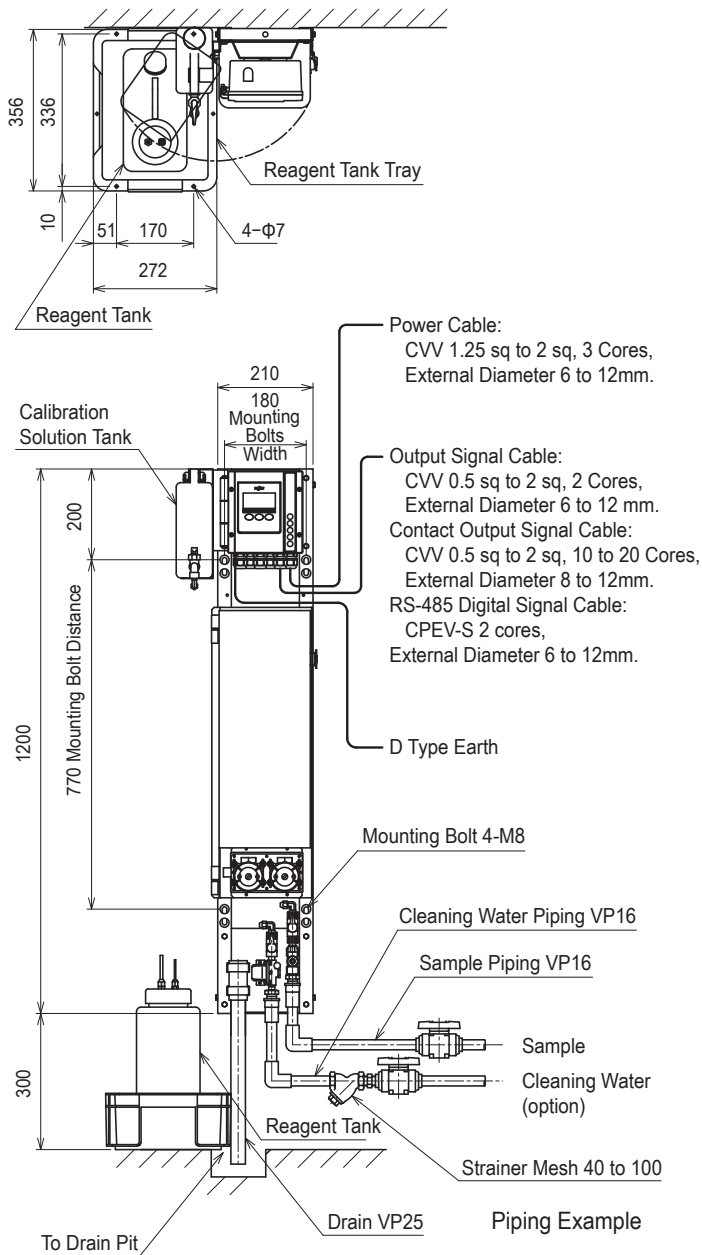
RS485-1 RS48-2
TO OTHER INSTRUMENTS

1	2	70	71	72	73
+	-	+	-	+	-

Input Output1 Output2
4 to 20A/DC

50	51	52	53	54	55	30	31	32	33	34	35	36	37	38	39	40	41	42	43	60	61	62	63	92	93	E2	E1	90	91
PULSE	STATUS	PULSE		NO	C	NC	-	NO (Normally Open)	NO (Normally Open)	NO (Normally Open)	NO (Normally Open)	NO (Normally Open)	NO (Normally Open)	INTERNALWIRING													E	N	L
Auto-Calibration Start Signal (more than 100mSec width)	Range Selection Command Signal (open:low range, Close:high range)	Auto-cleaning Start Signal (more than 100mSec width)		Power Fault Alarm Contact Switching Output				Analyser Fault Alarm Contact Switching Output	Under Maintenance / Auto-calibration/cleaning Contact Switching Output	Low Concentration Alarm Contact Switching Output	High Concentration Alarm Contact Switching Output	Range Indication contact Switching Output Open: Low Range Close: High Range															D Type Earth	100 to 240 VAC, 50/60 Hz	

Installation



1. Analyser Installation Conditions

The instrument should be installed in a location that meets the following conditions:

- Protect from the elements (no wind, rain, direct sunlight).
- Supply a sample that meets the sample conditions specified herein.
- In a location free from vibration
- Away from equipment that is the source of strong electrical noise.
- In a location with adequate maintenance space surrounding the instrument.

2. Installation

The standard configuration instrument is suitable for wall or rack mounting. The instrument requires four M8 size holes. The meter should be mounted vertical. The mounting bolts need to be suitable for the instrument weight of 17kg. Install the reagent tank adjacent to the main instrument (within distance of 1m). Fix the reagent tank using M6 anchor bolts. Connect the cables and tubing to the main instrument.

3. Piping Connections

- Provide a stop valve as shown in the drawing. Provide a union near the instrument to enable easy removal of connecting pipe from the unit. The required flowrate for the instrument is approx 1 to 3L/min.
- We recommend good quality corrosion resistant tubing such as VP16 or PVC pressure resistant tubing for field pipe work.

4. Drain Plumbing

- Provide an open air drain pipe directing the exiting sample into a pit or other open air receiving device etc..
- Corrosion resistant VP25 or PVC pressure resistant tubing are recommended for drainage pipe work.

5. Cleaning Water Tubing (option)

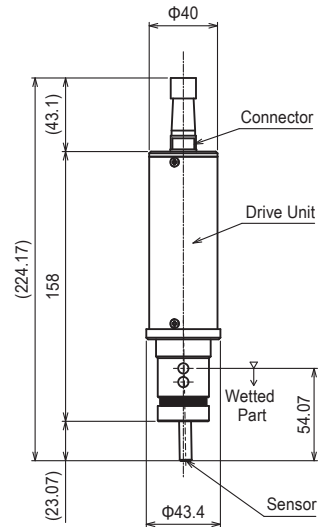
If the instrument includes optional automatic cleaner, provide a tube at the cleaning water inlet with a stop valve and strainer (40 to 100 mesh size). In addition we recommend that a union is inserted close to the instrument to enable easy removal of the tubing. For cleaning water conditions, please refer to the specifications given earlier in this document.

6. Wiring

- Please refer to the drawing showing cable standards
- Please ensure correct earthing of instrument. Earth connection should be D-Type (max resistance 100 Ω) and connect to the Earth connection on the bottom of the transmitter case or to the E terminal on the internal terminal connections.
- Signal cable should be isolated from power cable.
- In the case of using conduit tube, please remove cable ground and connect to G1/2 thread.

Sensor

Model Code : CLR-160
 Measurement Method : Swing Rotary Polarographic Sensor
 Cleaning Method : Continuous sensor rotation together with ceramic beads
 Construction : Working Electrode; Au
 Counter Electrode Pole; Pt
 Temp Compensation Sensor; Pt 1000 Ω
 Sensor Electrode : Model 2132 (replaceable chip)
 Lead Wire : Part No. 118N060, length 55cm



Product code

CLF1600-0-	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	
	A					Measurement Object
	B					FREE Chlorine (Bromine Substitution)
						TOTAL Chlorine (Iodide Substitution)
						Measurement Range (Dual, Manual/Remote Switching)
				1		0 to 0.5/ 1.0 (TOTAL Chlorine only)
				2		0 to 1/2
				3		0 to 2/5
				4		0 to 3/6
				5		0 to 5/10
				8		Custom Spec*1
						Measurement Units
				A		mg/L (Standard)
				B		ppm
						Auto Cleaning & Auto Calibration *2
				0		None
				1		Water Cleaning
				2		Water Cleaning & Ozone Cleaning
				3		Water Cleaning & Auto Zero and Span Calibration
				4		Water Cleaning & Ozone Cleaning & Auto Zero and Span Calibration
						Self Standing Frame Mounting Option *3
				0		None
				1		Equipped
						Instrument Markings
				A		Standard (Japanese Language)
				B		English Language

- *1. Two ranges between 1 to 10 can be selected.
- *2. Auto zero/span calibration can be added after auto cleaning.
- *3. Self standing frame option will be fitted with anchor bolts.
- Note 1. Because reagent tank (10L) is included, don't have to order TK-50L (reagent tank).
- Note 2. In addition to transmission output (4 to 20mA), digital output (RS-485) is equipped, corresponding to new digital instrumentation using Modbus protocol (including data exchange with control systems such as DCS). Please contact us about details of communication specification.
- Note 3. Power supply - 100 to 240VAC 50/60Hz
- Note 4. Please refer to the table below for selecting measurement ranges and options:

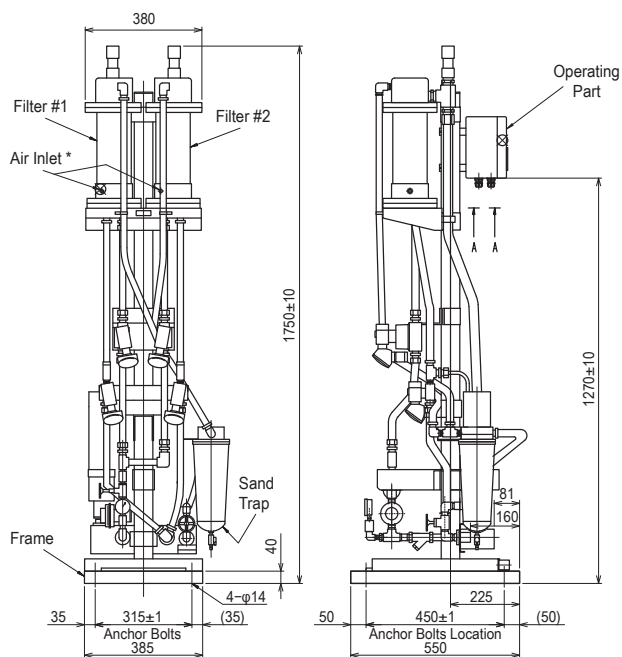
- Note 5. Standard equipment - Equalizing tank for sample water and the feature that when there are not sample water and reagent in tanks solution, it is detected.
- Note 6. Please order FS-3 type when you consider sand filtration equipment.
- Note 7. Water purifier - G-10type (No.134G007) is prepared for adjustment of sample water and reagent solution. Please order if required.
- Note 8. This model is dedicated for city water.
CLF-100 is recommended in final effluent in factory.
CLF-120 is recommended in sewage effluent.

Measurement place	Purification Plant		
	Raw water	Sedimentation basin	distributing reservoir
Measurement objects	Raw water	Sedimentation basin	distributing reservoir
Measurement ranges	0 to 5/10mg/L	0 to 2/5mg/L	0 to 1/2mg/L
Standard specification with no option	—	—	Applicable
Automatic water cleaning	—	Applicable	Recommended
Automatic water cleaning + Ozone cleaning	Applicable	Recommended	—

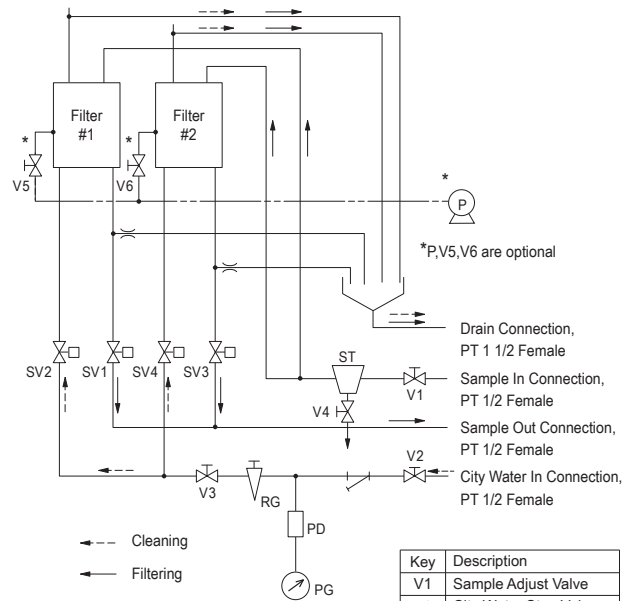
Optional Sand Filter Unit

Model Code : FS-3
 Function : Removal of suspended solids and particulates of water samples prior to introduction into water quality analysers.
 Filtration Method : Dual cartridge, continuous flow, automatic flow reversal.
 Filtration Materials : Sand 0.8 to 1.0mm diameter
 Sample Flow : 1 to 6 L/min (exact flow depends on turbidity of sample).
 Through Filter : 100VAC, 50/60 Hz

External Dimensions

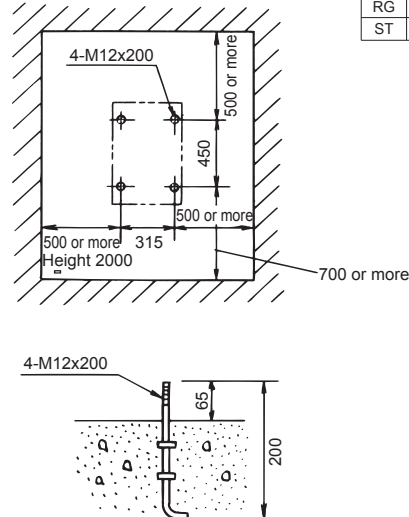


Flow Schematic



Key	Description
V1	Sample Adjust Valve
V2	City Water Stop Valve
V3	City Water Adjust Valve
V4	Drain Valve
p	Gas Pump
v	Manual Valve
sv	Solenoid Valve
PD	Pressure Gauge Connector
PG	0-1 MPa/cm ²
RG	Pressure Regulator
ST	Sand Trap

Maintenance Space



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Please read the operation manual carefully before using products.