

REAGENTLESS FREE CHLORINE ANALYSER

Model: CLF-1610

This instrument provides continuous measurement of residual free chlorine. The main applications are for the online measurement of process conditions in city water treatment plants and also general water treatment facilities. Chlorine is added during the water treatment process as a disinfectant and also to prevent growth of micro-organisms and algae.

Features

- Contact free, swing rotary polarographic electrode provides accurate and stable measurement. The sensor cell also features a ceramic beads cleaning system to provide long-term measurement reliability.
- In addition to a 4~20mA 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 is 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 0.05 to 0.5 MPa allowing direct connection to the process line if required.



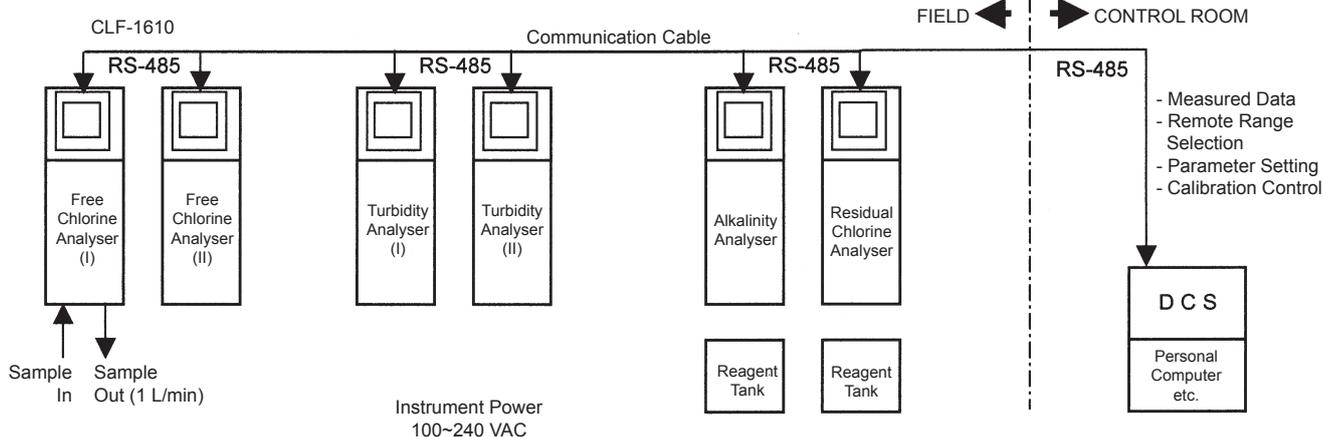
Wall Mount Version



Free Standing Frame Version (Option)

System Configuration

● Example of MODBUS Communication System



Specifications

Product Name:	Reagentless Free Chlorine Analyser	Operating Power:	100~240 VAC +/- 10%, 50/60 Hz
Model Code:	CLF-1610	Power Consumption:	Approx. 15VA (normal), approx. 60VA (max)
Measurement Object:	Free available chlorine in filtered, treated water	Sample Conditions:	- Low sample flow - Temperature: 0~40 degC (no freezing) - Pressure: 0.05~0.5 MPa (when used with pressure regulator valve) - pH: 5.5 ~8.6 (variation within 1 pH) - Conductivity: min 8mS/m (80 µS/cm) - Suspended solids: max turbidity is 20 (for normal operation) - Sample inlet flowrate: 600mL/min (230~260 mL/min across measurement cell)
Measurement Method:	Polarographic eccentric rotary micro-electrode	Sample Consumption:	1~3 L/min (including sample bypass flow)
Measurement Range:	0~3	Construction:	Suitable for indoor installation. Requires weather protection if installed outdoors. Transmitter: IP-65, analytical section: IP-52
Measurement Units:	mg/L or ppm	Mounting:	Suitable for wall or rack mounting
Display:	Digital, LCD	Materials:	Transmitter: die cast aluminium Analytical section: aluminium plate
Minimum Display:	0.01	Surface Finish:	Metallic silver
Output Range:	0~1/0~2, 0~1/0~3 or 0~2/0~3 mg/L Two ranges, manual or remote range selection	Wetted Materials:	PVC, PFA, PP, Acrylic etc.
Analogue Output Signal:	4~20mA DC, isolated, max load 600 Ohm	Piping Connections	Sample inlet: VP16 socket Drain: VP25 socket
Contact Switching Outputs:	- High concentration - Low concentration - Under maintenance....when STAN BY mode is selected - Under auto-calibration (option) - Analyser fault....low sample flow, temperature fault, electrode error, calibration error, hardware failure - Power failure - Range indication (open = low range, closed = high range) (contact rating: 30 VDC, 0.1A)	Electrical Connections:	Six cable glands for 6~12mm diameter cable, G1/2 threaded connections when gland removed
Contact Switching Inputs:	- Range selection....open = low range, closed = high range - Calibration command.....starts auto zero calibration (voltage free contacts, 100 mS or greater width)	Ambient Temperature:	-5~50 degC (no freezing)
Digital Communication System:	- Based on RS-485 (isolated) - Available Baud rates: 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	Ambient Humidity:	Max 85% RH (no condensation)
		Weight:	Approx. 15kg

Performance

Linearity:	Within +/-5% FS
Repeatability:	Within +/-2% FS or +/-0.05 mg/L (whichever greater)
Temperature Compensation Range:	0~40 degC
Response Time:	90% response within 2 minutes
Combined Chlorine Influence:	Approx. 20% of combined chlorine concentration influence on measurement indication

Span Calibration Method

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.

An alternative method is to prepare a sodium hypochlorous acid solution in a calibration tank (available as an option) measure the solution in the tank using the DPD method. Use DPD measurement result as calibration value for the solution in the tank.

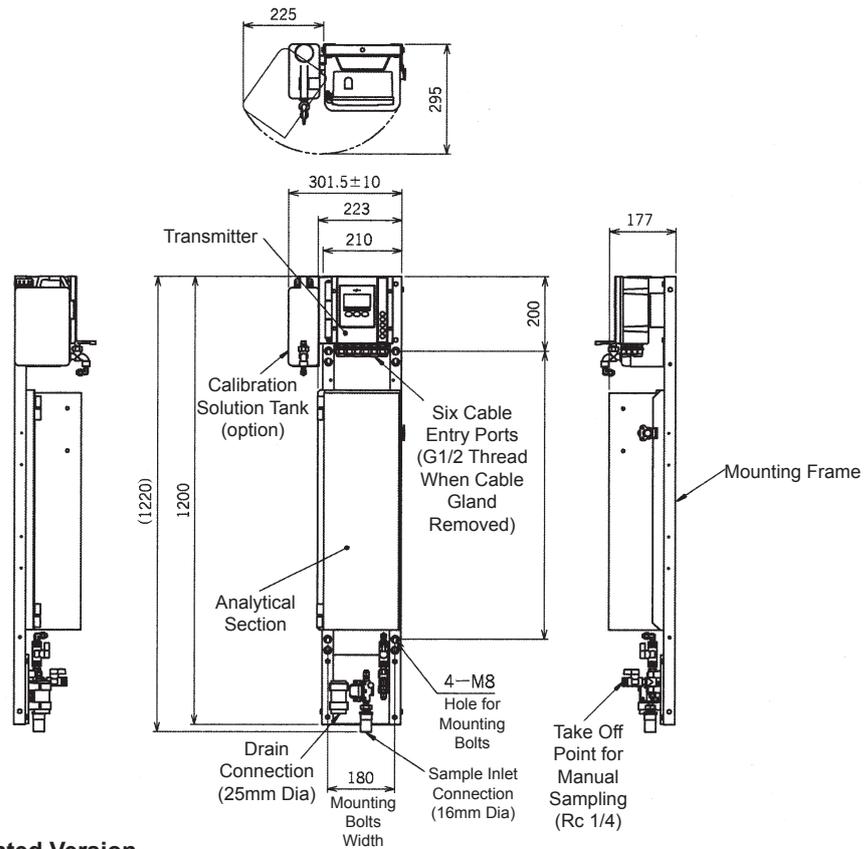
Options

- **Auto-calibration Unit:** This unit consists of a zero filter for auto zero calibration, a span solution tank for manual span calibration and a stream switching unit. The auto zero calibration is controlled by an internal timer or from a remote start signal. The zero calibration solution is made by flowing sample through a zero filter. Auto zero frequency can be set between 0~999 hours (initial factory setting is 240 hours). If frequency is set to 0 hours, the system is available for control by remote signal. Calibration duration: approx. 5 minutes (fixed). Standby time after calibration: 0~30 minutes (initial factory setting is 15 minutes).
- **Unit for Increasing Conductivity, CLZ-2:** This unit is required when measuring low conductivity samples 8mS/m (80µS/cm) or less. The unit increases the conductivity of the water sample by adding salt tablets. This allows stable and reliable measurements even if the sample is close to pure water conditions.
- **Free Standing Frame (indoor mounting):** Analyser system pre assembled on a free standing frame with floor mounting base suitable for fixing with anchor bolts.
- **Cubicle for Outdoor Installation:** Analyser system pre wired and assembled into a compact cubicle. The cubicle is suitable for outdoor, field mounting.

Dimensions

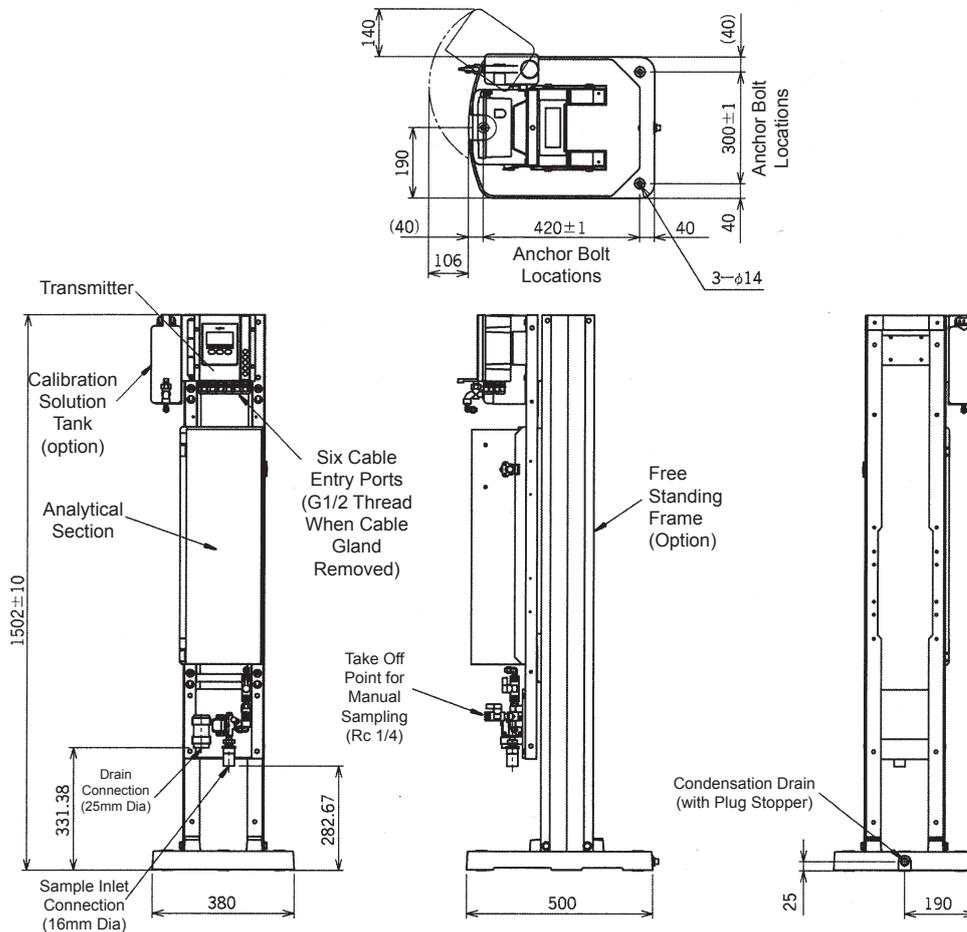
• Wall or Rack Mounting Version

Units: mm



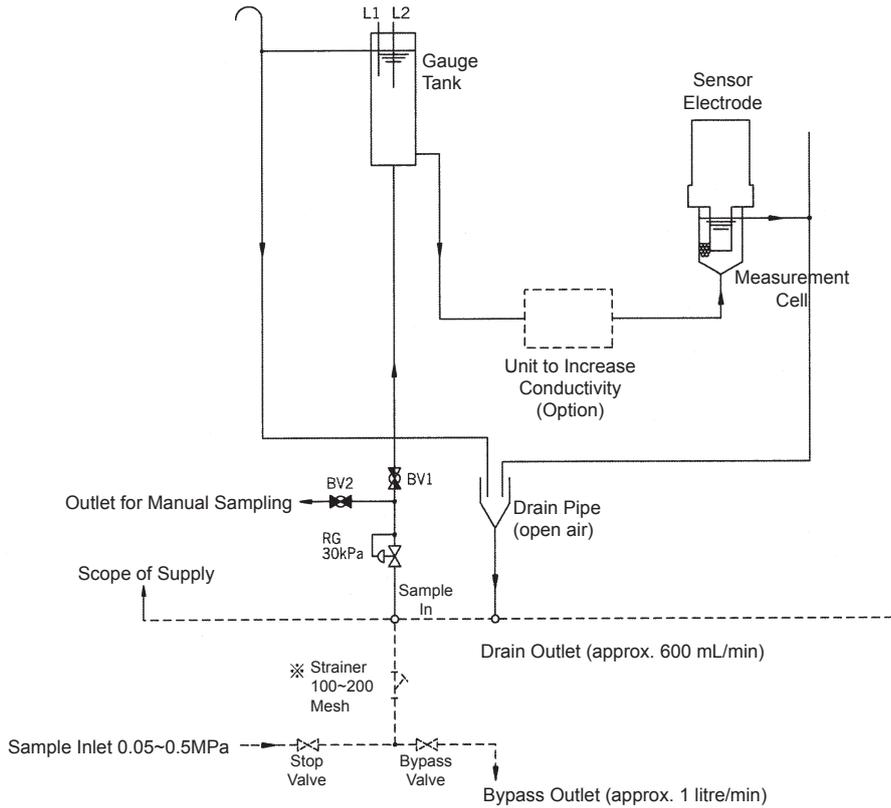
• Free Standing Frame Mounted Version (Option)

Units: mm



Flow Diagrams

● Standard



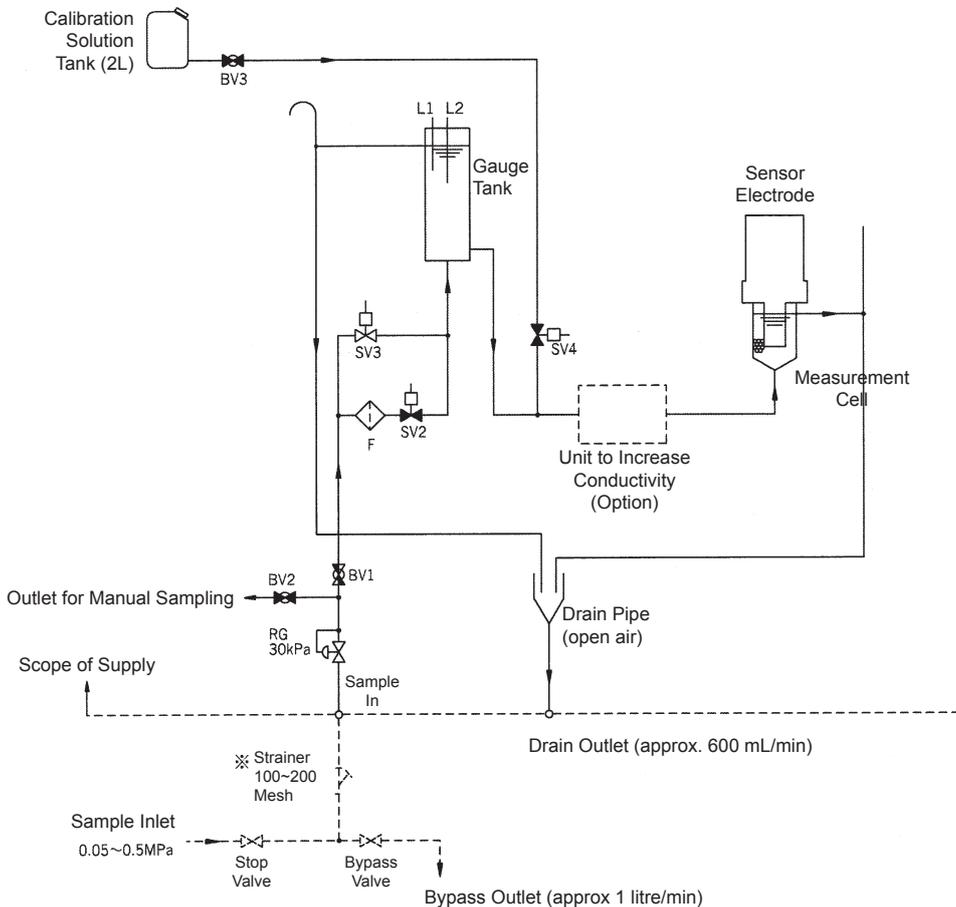
Key	Description	Remarks
RG	Pressure Regulator	Set at 30 kPa
BV1	Sample Flow Controller	
BV2	Manual Sampling Valve	
L1, L2	Level Sensors	For detection of low sample flow

※ May not be required depending on sample quality (SS, etc.)

☒ Normally Open (flow rate may need to be regulated)

☑ Normally Closed

● With Auto Calibration (Option)



Key	Description	Remarks
SV2	Zero Solution Switching Valve	
SV3	Sample Inlet Switching Valve	
SV4	Calibration Solution Switching Valve	
F	Zero Filter	
RG	Pressure Regulator	Set at 30 kPa
BV1	Sample Flow Control Valve	
BV2	Manual Sampling Valve	
BV3	Calibration Flow Control Valve	
L1, L2	Level Sensors	For detection of low sample flow

※ May not be required depending on sample quality (SS, etc.)

☒ Normally Open (flow rate may need to be regulated)

☑ Normally Closed

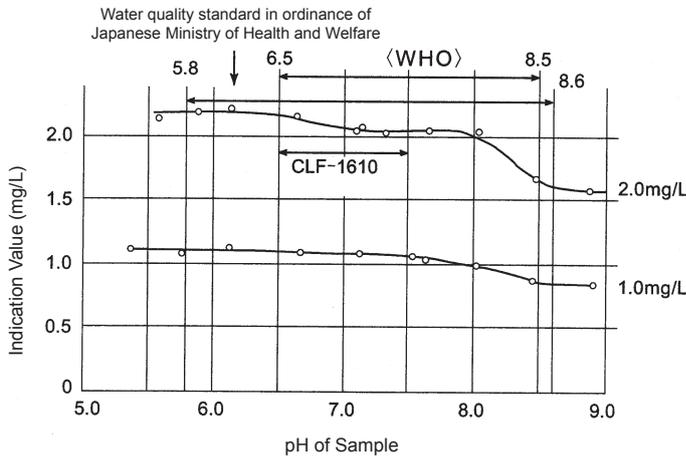
Principle of Operation

The sample enters the instrument at process pressure (0.05~0.5 MPa). A pressure regulator reduces the pressure to 0.03Mpa. The sample flow rate is regulated to 600mL/min by BV1 and then enters the gauge tank. The sample flows into the measurement cell by head pressure from the gauge tank at approx. 250mL/min. Surplus sample overflows from the tank and goes to drain. The gauge tank provides a debubbling function and low sample flow alarm function ensuring stable measurement. In the measurement cell, a fixed voltage is

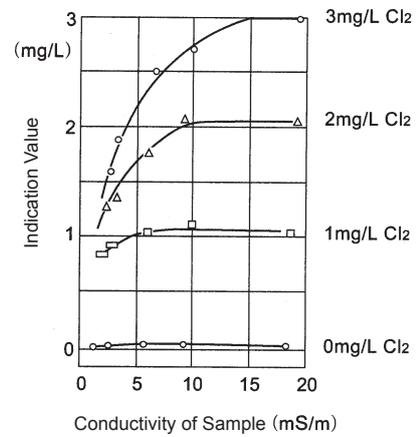
applied between a working electrode and a counter electrode to achieve electrolytic reduction. The reduction current (diffusion current) that flows across the two electrodes is proportional to the free chlorine concentration present between the electrodes. This current is amplified and represents the free chlorine concentration.

pH Characteristics of Sample

- As shown below, the pH change of the sample affects the indication in principal. Almost no problems will occur so long as the pH value is in the range of 6.5 ~ 7.5. In the case of a 1 pH change in the sample, the following will occur:
 pH5.5~pH8: approx. 5% per 1 pH change.
 pH7.6~pH8.6: approx. 20% change.



Conductivity Characteristics of Sample



- Under normal circumstances there is virtually no effect because city water conductivity is usually around 10~20 mS/cm with little variation. However, for measurements in the region below 10 mS/cm, the indicated value will be lower than it should be, causing practical measurement problems for measurements of samples with 1 mg/L or higher concentrations.

Terminal Connections

74	75	76	77	78	79
A	B	C	A	B	C
RS-485 #1			RS-485 #2		

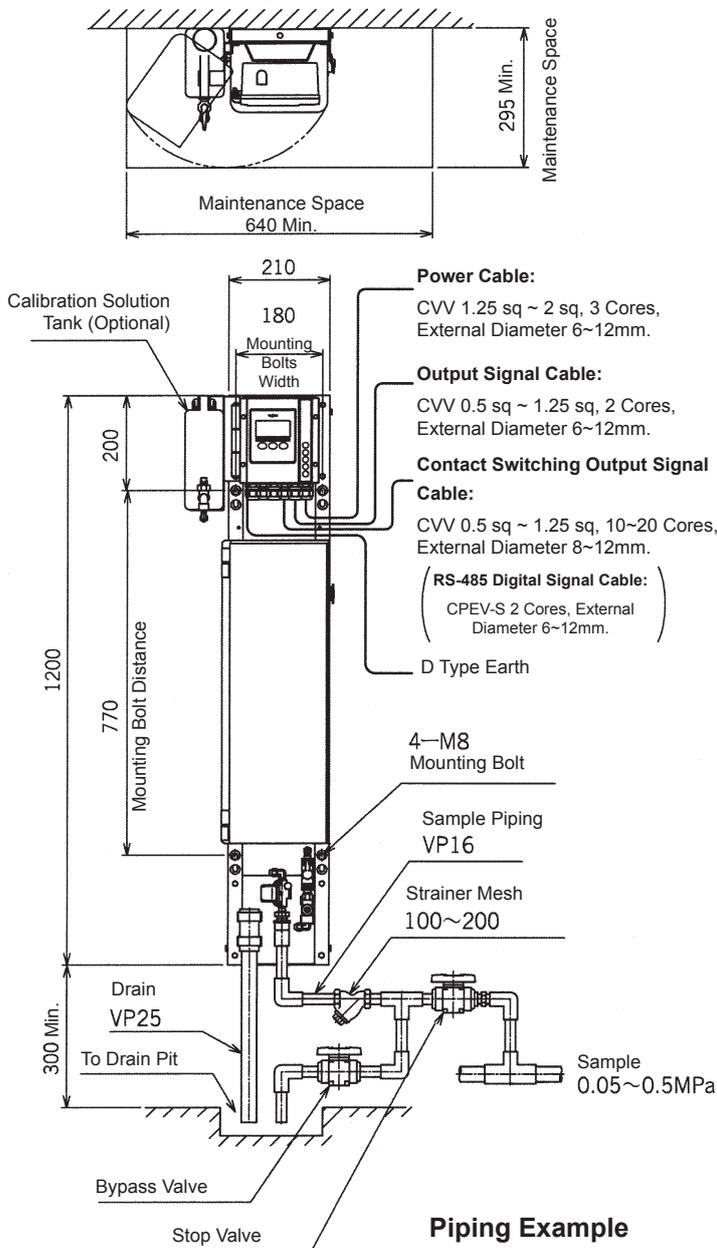
TO OTHER INSTRUMENTS

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

4~20mA

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	SPARE	NO	C	NC	—	a CONTACT	a CONTACT	a CONTACT	a CONTACT	a CONTACT	a CONTACT	a CONTACT	a CONTACT	INTERNAL WIRING	E	N	L												
Auto-zero Calibration Start Signal (more than 500 mSec width)	Range Selection Command Signal (open: low range, Close: high range)					Power Failure Alarm Contact Switching Output				Analyser Fault Alarm Contact Switching Output	Under Maintenance / Auto-calibration Contact Switching Output	Low Concentration Alarm Contact Switching Output	High Concentration Alarm Contact Switching Output	Range Indication Contact Switching Output																

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 vibration free location.
- 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 level. The mounting bolts need to be suitable for the instrument weight of 15kg.

3. Piping Connections

- Provide a stop valve and bypass valve (can be used for flushing) as shown in the drawing. Although the required flow rate of the meter is 600 mL/min, we recommend that a bypass system is provided to allow a flow rate of 1000 mL/min. This allows enough flow rate for the analyser regulation of pressure and flow and ensures fast sample transport time with no stagnation.

CAUTION

In principle we do not recommend using only head pressure of 1~2 meters (for example from external receiver tank etc.). Please consult your local branch office or distributor if you wish to install the instrument in a system that uses only header tank pressure for sample inlet.

- In case of poor quality sample, provide a sample filter (100~200 mesh).
- VP16 or PVC pressure resistant tubing are recommended 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..
- VP25 or PVC pressure resistant tubing are recommended for drainage pipe work.

5. Wiring

- Please refer to the drawing showing cable standards.
- Please ensure correct earthing of instrument. Earth connection should be D-Type (max resistance 100 Ohms) 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.
- When using cable conduit, remove the cable glands and connect directly to the G1/2 threaded connections.

6. Sample Conditions

Temperature: 0~40 deg C

Pressure: 0.05~0.5 Mpa

pH: 5.5~8.6 pH with 1 pH variation

Conductivity: minimum 8mS/m (80 µS/cm)

Turbidity: max 20 NTU

Sample Consumption: approx. 600mL/min plus bypass flow rate (1000 mL/min).

Standard Accessories

No.	Code No.	Description	Diagram	Qty	Remarks
1	—	Instruction Manual		1	
2	—	Factory Test Report		1	
3	104A018	Tubular Fuse 1A		2	For Transmitter and Sensor
4	123G007	Ceramic Beads Ø1.25g		1	
5	6943310K	※1 CLF Calibration Solution Tank Assembly		1	
6	143A203	※2 Sodium Chloride Tablets (500g)		1	

※1 For use with calibration unit and with auto zero calibration.

※2 For use with conductivity increasing unit.

The above list is subject to change without notice.

Annual Spare Parts List

No.	Code No.	Description	Diagram	Annual Spares		Remarks
				Consumables	Spares	
1	123G007	Ceramic Beads Ø1.25g			1	For Electrode
2	104A018	Tubular Fuse, 1A			2	For Transmitter & Sensor
3	116D303	PFA Tube Ø6 x Ø4			3m	
4	116D306	※1 PFA Tube Ø4 x Ø3			3m	
5	EL2132	Electrode Sensor Model 2132		1	1	
6	126A476	※1 2-Way Solenoid Valve (NC)			1	
7	126A460	※1 2-Way Solenoid Valve (NO)			1	SV2, SV4
8	117B402	Ø4 Sleeve (for HZ4-01)			5	SV3
9	117K041	Ø6 Sleeve (for HZ6-01)			5	For Zero Filter
10	136A270	※1 Filter Cartridge		1		
12	143A203	※2 Sodium Chloride Tablets (500g)		6		
13	7130420K	Motor Assembly For Electrode			1	Replace Every 3 Years

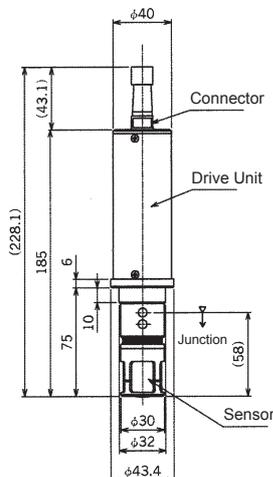
Annual Spare parts are not included as standard accessories. These parts must be purchased separately.

※1 For use with optional auto zero calibration.

※2 For use with optional conductivity increasing unit.

Sensor

Model Code:	CLR-161
Measurement Method:	Swing Rotary Polarographic Sensor
Cleaning Method:	Continuous sensor rotation together with ceramic beads
Construction:	Working Electrode: Au Counter Electrode Pole: Ag-AgCl Temp Compensation Sensor: Pt 1000 Ohms
Sensor Electrode:	Model 2132 (replaceable chip)
Lead Wire:	Model ELW-20, 1m



Product Code

CLF1610-0-

		Measurement Range (2 Ranges, Manual/Remote Selection)	
A	----	0 ~ 1 / 0 ~ 2	
B	----	0 ~ 1 / 0 ~ 3	
C	----	0 ~ 2 / 0 ~ 3	
		Measurement Units	
A	----	mg/L (Standard)	
B	----	ppm	
		Auto Calibration Module	
0	----	Not equipped	
1	----	Equipped (zero water filter and calibration unit are included)	
		Module to Increase Conductivity (CLZ-2)	
0	----	Not equipped	
1	----	Equipped (minimum sample conductivity: 8 mS/m or 80 µS/cm)	
		Free Standing Frame	
0	----	Not equipped	
1	----	Equipped	
		Markings	
A	----	Standard (Japanese)	
B	----	English	

Note 1:
Operating power is 100~240 VAC, 50/60 Hz.

Note 2:
4~20mA analogue output and RS-485 digital output signals are included as standard features.

Note 3:
The overflowing tank for debubbling sample and for observing suspended solids is equipped as a standard feature.

Note 4:
Zero and span calibration methods are described in the table below.

		Auto Calibration Unit	
		Nil	Equipped
Zero Calibration	Open input manual calibration	O	O
	Zero filter manual calibration	X	O
	Zero filter auto calibration	X	O
Span Calibration	Manual calibration, alignment to DPD value of actual sample	O	O
	Manual calibration, alignment to DPD value of calibration solution	X	O



Always read the instruction manual before operation.

Due to continuous product improvement, specifications contained herein are subject to change without notice.

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