



Description

- CM-015-2: A pump controller designed to manage the operation of two pumps in both single-phase and three-phase systems.
- Selectable operation modes: Water Supply (Charging) and Drainage (Discharging).
- LCD Display: Monitors water levels for both the Water Well (source) and the Water Tank (usage).
- Real-time Monitoring: Displays Voltage and Current values while the pumps are in operation.
- Single-Phase Protection: Under and Over Voltage Protection.
- Three-Phase Protection: Under and Over Voltage, Phase Sequence, and Phase Loss protection.
- System Safeguard: Main Output is disabled during voltage abnormalities to prevent pump damage.
- Versatile Level Sensors: Compatible with Electrodes, Float Switches, and Pressure Switches.
- Hour Counter: Tracks pump operating hours and provides maintenance alerts.
- Dry Run Protection: Prevents the pump from running without water.
- Current Relay Output: Automatically shuts down the pump in case of overcurrent.
- Latching Function with Memory: Alternates the operation of two pumps and includes a timer to set the maximum runtime for each.
- Booster Function: Activates both pumps simultaneously if the water level drops significantly.
- Fault Logging: Displays current faults and allows for historical fault review.
- Alarm Relay Output: Triggers alerts for Overflow, Hour, Voltage, Current, and Dry Run conditions.
- Manual / Auto Modes: Selectable operational control.
- Shaft Rust Protection: Periodically activates the pump to prevent shaft seizing during long periods of inactivity.
- Lock Function: Prevents unauthorized changes to the settings.
- Communication: Supports RS-485 MODBUS RTU Protocol for computer connectivity.
- Pump Failure Detection: Monitors current usage; if the Pump Output is active but no current is detected, the system identifies the pump as faulty and automatically isolates it from the system.

Operation

CM-015-2 is a controller designed to manage the alternating operation of two pumps, synchronized with the water levels in both the Water Well (source) and the Water Tank (usage). In addition, it features integrated options for Voltage Protection, Dry Run Protection, and Current Protection to detect system abnormalities that could cause pump damage. These two functional parts work in coordination: the pump will only operate (Relay ON) when the voltage levels, dry run status, and current values are all within normal operating parameters.

1-Phase System

Voltage Protection Relay allows for adjustable under-voltage and over-voltage settings within a range of 50–500 VAC. Users can configure an ON Delay Time from 1 to 3,600 seconds before the system starts operation. Once active, the device continuously monitors the voltage status; if the voltage falls below or rises above the preset thresholds, the relay will trigger an OFF command within a programmable delay of 0–3,600 seconds, allowing for either instantaneous or delayed tripping as required. The specific cause of the fault is displayed on the screen. When the voltage returns to the safe operating range, the relay will automatically switch back to the ON state.

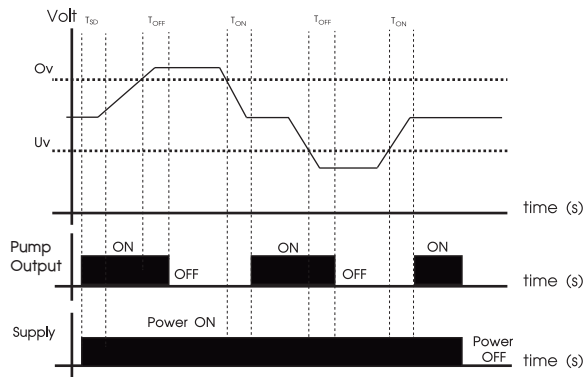
Specification

		CM-015-2-1	CM-015-2-3
Power Supply		230 VAC ±15 % 50-60 Hz	
		115 VAC ±15 % 50-60 Hz	
Power Consumption		7 VA	
Display		LCD Display 320x240 Dot	
Input	Volt	Single Phase	Three Phase
	Voltage Range	50-500 V~	
	%Over Volt	105-120%	
	%Under Volt	80-95%	
	Current	1 CT	2 CT
	Current Range	0.1-5A	
	%Over Current	105-120%	
	%Under Current	80-95%	
	Electrode		
	Probe	7 (3 Float Switch)	
	Input Reset Alarm		
	Input Reset	220 V~ / 24V ~	
Latching Timer Range		0-99.00 hr	
Output		Pump 2 SPDT 5A 250V~	
		Alarm 1 SPST 5A 250V~	
Communication	Protocol	MODBUS RTU	
	Baud Rate	2400, 4800, 9600, 19200, 38400 bps	
	Parity	None, Even, Odd	
	Stop Bits	1, 2	
	Data Bits	8 Bits	
	Support Device Node	247	
Ambient Operation	Temperature	-10 °C to 60 °C	
	Humidity	85 % RH Non-Condensing	
Ambient Storage	Temperature	-10 °C to 60 °C	
	Humidity	85 % RH Non-Condensing	
Protection Degree	Front Protection Rating	IP52	
	Case Protection Rating	IP30	
Installation		Panel Mounting	
Material		ABS-V0	
Size (mm.)		96 x 96 x 76.6 mm.	
Weight		515 g.	

Operation

The system will attempt to restart within the preset ON Delay Time after CM-015-2 has tripped or the Relay is OFF. Users can retrieve and review the specific cause of the Relay OFF status directly from the display. Graph 1 illustrates the operation of the Voltage Protection for a single-phase power system.

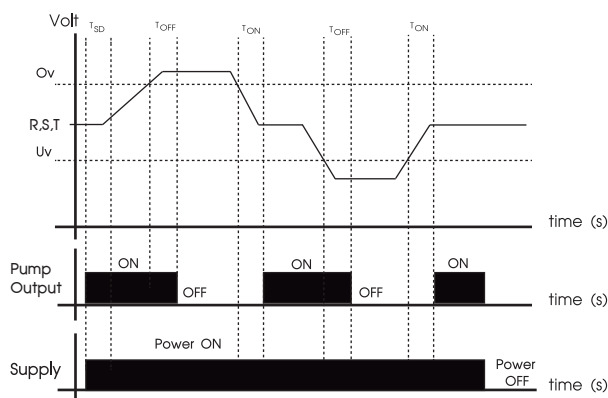
Graph 1: Voltage Protection Relay Operation



3-Phase System

Voltage Protection Relay features adjustable under-voltage and over-voltage settings within a range of 50–500 VAC. Users can configure an ON Delay Time from 1 to 3,600 seconds before operation begins. However, if the Phase Sequence is incorrect, the Pump Output will remain disabled and will not initiate the delay timer. Once the system is running, it continuously monitors the voltage status; if the voltage falls below or rises above the preset thresholds, exceeds the Phase Unbalance (%) limit, or experiences a Phase Loss, the relay will trigger an OFF command within a programmable delay of 0–3,600 seconds. This allows for either instantaneous or delayed tripping based on specific requirements, with the cause of the fault shown on the display. When the voltage returns to the safe operating range, the Pump Output will automatically return to the ON state within the preset ON Delay Time. Following a circuit trip or a Pump Output OFF status, users can retrieve and review the fault cause directly from the display. Graph 2 illustrates the operation of the Voltage Protection for a three-phase power system.

Graph 2: Voltage Protection Relay Operation



Dry Run Protection

Dry Run Protection is a safety function designed to monitor and shut down the pump in the event of running without water, preventing potential damage. For 3-Phase/3-Wire systems, the device utilizes Power Factor ($\cos\phi$) measurement, which significantly fluctuates according to the pump's load. For 1-Phase systems, Current (Amperage) measurement is used instead, as most single-phase systems employ capacitor motors where Power Factor readings can be inconsistent.

Once the pump is in operation, these measured values can be set as the baseline for normal operating conditions. If a dry run occurs (loss of water), the Power Factor or Current value will drop below the normal threshold, causing the CM-015-2 to immediately trip and shut down the pump.

In addition, the system features a Recovery Time (RT) function with a range of 0–9,999 seconds. This allows the CM-015-2 to automatically restart the pump after a Dry Run event has occurred. This feature is particularly useful for groundwater or artesian well pumps; continuous operation may temporarily deplete the underground water source, triggering a Dry Run stop. For example, if the RT is set to 30 minutes (1,800 seconds), the pump will automatically resume operation once the 30-minute countdown is complete.

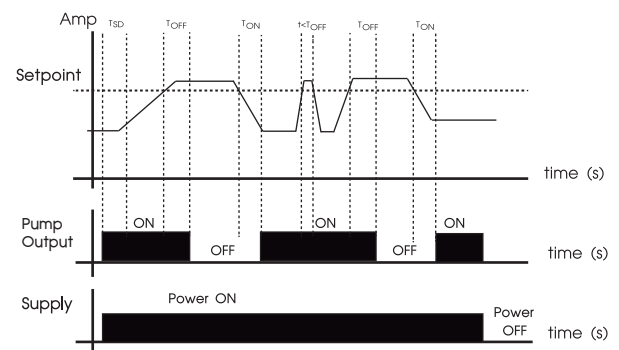
Hour Counter

The system includes an Hour Counter to track the total operating hours of the pump. Users can preset the desired maintenance interval; once the accumulated hours reach this limit, an Alarm will be triggered (ON). The alarm status and the counter can be Reset either via the front panel buttons or through the designated Terminal Input.

Current Relay

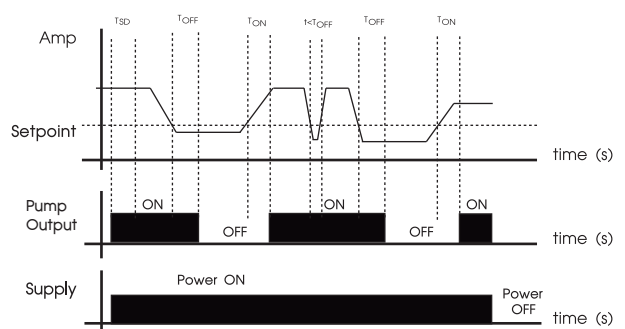
Current Protection Relay features an adjustable current setting range of 0–100%. Users can configure an ON Delay Time from 1 to 3,600 seconds before the system begins operation. Once active, the device continuously monitors the electrical current; if the current exceeds the preset threshold, the Pump Output will trigger an OFF command within a programmable delay of 0–3,600 seconds. This allows for either instantaneous or delayed tripping as required, with the cause of the fault shown on the display. When the current level returns to a value lower than the preset limit, the Pump Output will automatically return to the ON state within 1 to 3,600 seconds. After the CM-015-2 trips or the Pump Output is OFF, the specific cause can be retrieved and reviewed from the display. Furthermore, the relay can operate in a Reverse Function, where the Pump Output will switch to ON only when the current level rises above the preset threshold.

Graph 3: Over Current Protection Relay Operation



Graph 4: Under Current Protection Relay Operation

(Reverse Function)



Manual/Auto

The device offers two selectable operational modes: Manual and Auto. In Manual mode, users can directly command the pump to start or stop, overriding all other functions. In Auto mode, the CM-015-2 operates automatically based on the signals from the Level Sensors and all configured protection functions.

Water Supply System Operation

Normal Operation

When the water level in the Water Tank drops to the Probe M level of Electrode B (or when Float Switch C reaches the ON/Low level, or Pressure Switch C is Normally Closed (NC) due to pressure falling below the set point), the Pump A Output is activated, commanding Pump 1 to start. Once the water level rises to the Probe H level of Electrode B (or when Float Switch C reaches the OFF/High level, or Pressure Switch C is Normally Open (NO) due to pressure exceeding the set point), the Pump A Output will deactivate, stopping the pump.

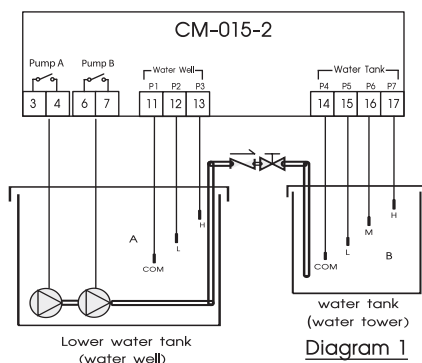
The next time the water level in the Water Tank drops to the Probe M level again, the Latching Function will automatically alternate the operation to Pump B Output, commanding Pump 2 to start. After the water level rises to Probe H, the Pump B Output will deactivate and stop the pump. Both pumps will continue to alternate their operation based on the rising and falling water levels.

Additionally, a Latching Timer can be set from 0 to 99.00 hours for each pump. Once the preset operating time is reached, the system will switch to the other pump to prevent any single pump from running for an excessive duration. In the event that the water level in the Water Well (source) falls below the Probe L level of Electrode A (or Float Switch A reaches the OFF/Low level), both Pump A and Pump B Outputs will be switched OFF immediately to provide dry run protection.

Booster Operation

In the event that one pump is already operating but the water level continues to drop until it reaches Probe L of Electrode B (or when Float Switch B reaches the ON/Low level, or Pressure Switch B is Normally Closed (NC) due to pressure falling below the set point), the system will activate the other Output, commanding both pumps to run simultaneously. Both pumps will continue to operate until the water level in the Water Tank rises to Probe H of Electrode B (or when Float Switch C reaches the OFF/High level, or Pressure Switch C is Normally Open (NO) due to pressure exceeding the set point), at which point the outputs will deactivate and stop the pumps.

Diagram 1. Water Supply System With Electrode Level Switch



Water Supply System Operation (Continued)

Diagram 2. Water Supply System With Float Switch & Electrode Level Switch

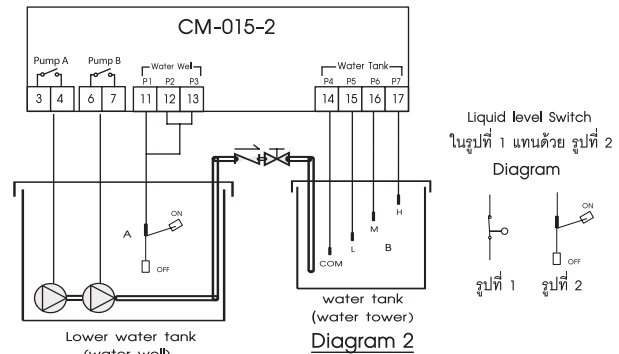


Diagram 3. Water Supply System With Float Switch

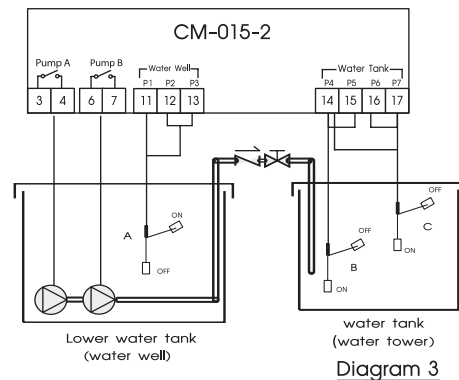


Diagram 4. Water Supply System With Electrode Level Switch & Float Switch

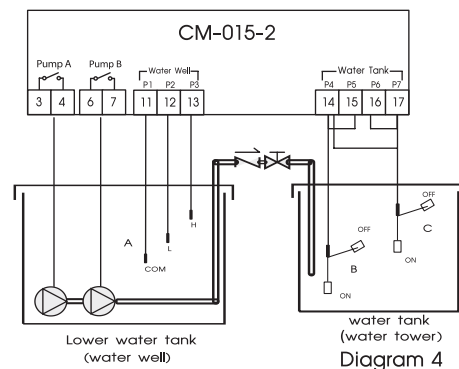
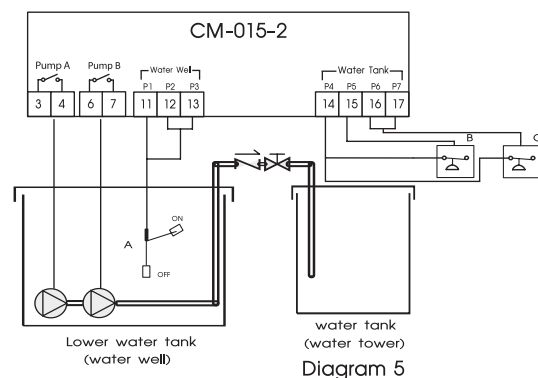
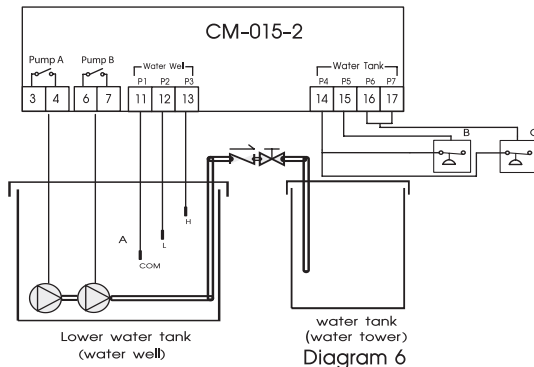


Diagram 5. Water Supply System With Float Switch & Pressure Switch



Water Supply System Operation (Continued)

Diagram 6. Water Supply System With Electrode Level Switch & Pressure Switch



If the user does not wish to monitor the water level in the Water Well (source), this can be achieved by following the wiring diagram shown below.

Diagram 7. Water Supply System No Dry Run Protection With Electrode Level Switch

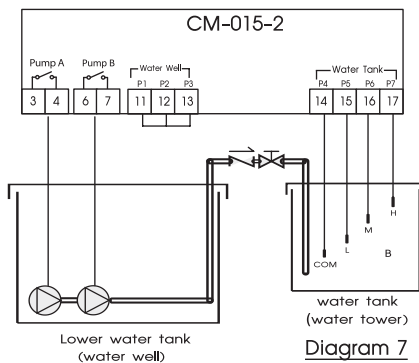
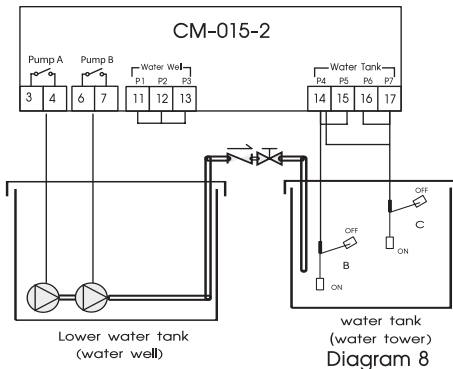


Diagram 8. Water Supply System No Dry Run Protection With Float Switch



Water Drain Operation

Normal Operation

When the water level in the Water Well or Wastewater Well rises to the Probe M level of the Electrode (or when Float Switch A reaches the High Level/ON state), the Pump A Output is activated, commanding Pump 1 to start. After Pump 1 begins operation, the water level in the well will decrease until it reaches the Probe L Level of the Electrode (or when Float Switch A reaches the Low Level/OFF state), causing the Pump A Output to deactivate and stop the pump. When the water level in the Water Well or Wastewater Well rises to the Probe M level again (Float Switch A = High Level/ON state), the system will alternate and activate the Pump B Output, commanding Pump 2 to start.

Once in operation, the water level in the Water Well or Wastewater Well will decrease until it reaches the Probe L level of the Electrode (or when Float Switch A reaches the Low Level/OFF state), causing the Pump B Output to deactivate and stop the pump. Both pumps will continue to alternate their operation continuously based on the rising and falling water levels.

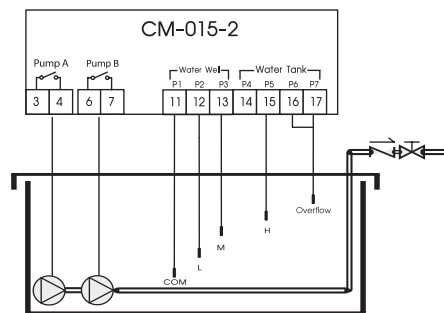
Booster Operation

In the event that one pump is already operating but the water level in the Water Well or Wastewater Well continues to rise until it reaches Probe H of the Electrode (or when Float Switch B reaches the High Level/ON state), the system will activate the other Output, commanding both pumps to run simultaneously. Both pump outputs will then deactivate and stop the pumps only when the water level in the well drops to the Probe L level (or when Float Switch A reaches the Low Level/OFF state).

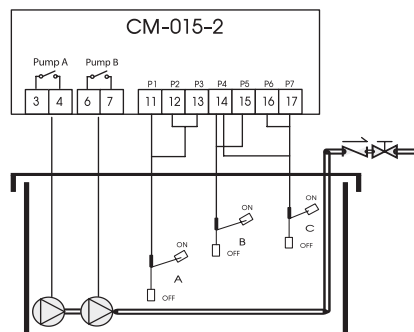
Overflow Operation

In the event that both pumps are operating but the water level in the Water Well or Wastewater Well continues to rise until it reaches the Probe Overflow level of the Electrode (or when Float Switch C reaches the High Level/ON state), the Alarm Output will be activated. The alarm will only deactivate once the water level drops back down to the Probe H level of the Electrode (or when Float Switch B reaches the Low Level/OFF state).

Drain Water System With Electrode Level Switch



Drain Water System With Float Switch



Recommendations

Water Supply System Contact Settings

1. Float Switch (Water Tank): Configured as Normally Closed (NC).
2. Pressure Switch (Water Tank): Configured as Normally Closed (NC).
3. Float Switch (Water Well): Configured as Normally Open (NO).

Water Drainage System Contact Settings

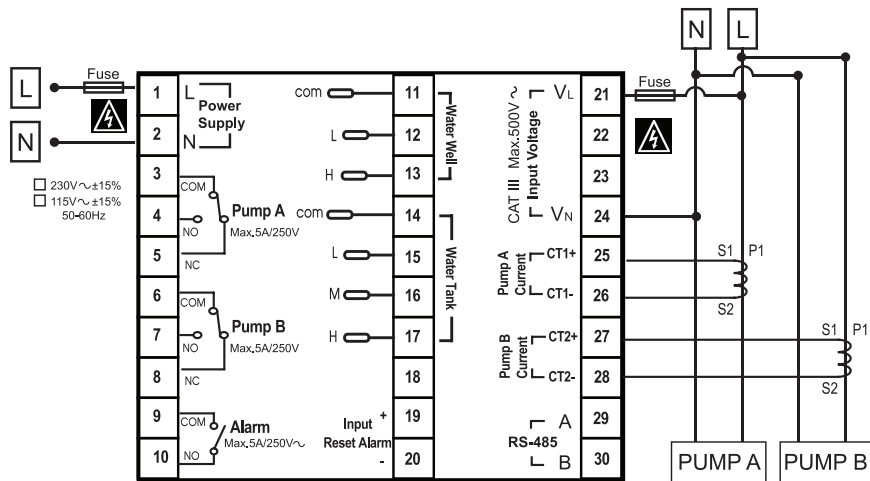
Float Switch: Configured as Normally Open (NO).

Pump operate independently of the Water Tank Level Sensor

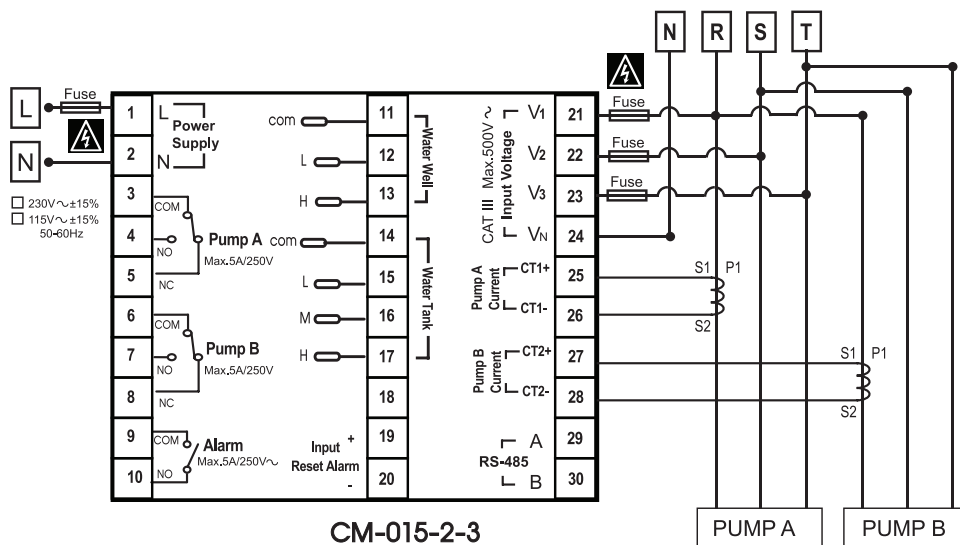
it can be achieved by following these steps:

- Wiring Method: Bridge Probe L and Probe H of Electrode B together, the connect/disconnect them with Probe Com.
- To Stop the Pump: When Probe L+H is connected (Closed) to Probe Com, the pump will stop operating.
- To Start the Pump: When Probe L+H is disconnected (Open) from Probe Com, the pump will start operating.

Wiring Diagram



CM-015-2-1



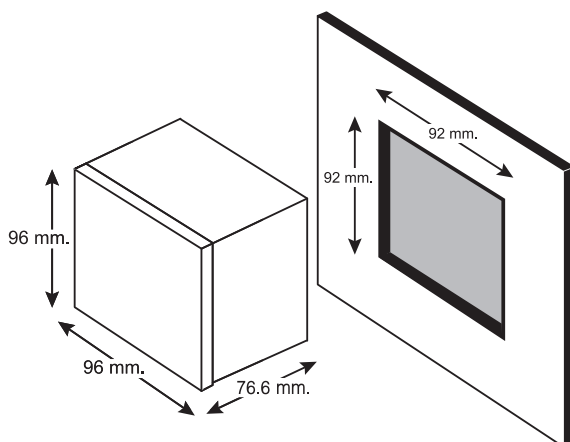
CM-015-2-3

WARNING

- Make sure the correct wiring connection before turning on electricity. Mis-wiring may cause malfunction of the unit and fire.
- Never modify the unit to prevent damage or incident such as malfunction and fire etc.

Size and Dimension

Ordering Code



VOLTAGE PROTECTION OPTION POWER SUPPLY

CM-015-2- - -

VOLTAGE PROTECTION	
1	1 Phase, Over and Under Voltage
3	3 Phase, Over and Under Voltage, Phase Sequence, Phase Loss

CODE	POWER SUPPLY
NONE	230 VAC
115	115 VAC

OPTION	
M	RS-485