

PMC-550D

LV Motor Protection Relay



PMC-550D Motor Protection Relay seamlessly integrates motor protection, control, temperature monitoring, and insulation monitoring with a modular design. Featuring extensive I/O options, including 10xDI, 5xDO, 2xRS-485 ports, 1x Analog Output, and 1x Residual Current Input, the relay offers flexibility and expandability, its modular design allows easy expansion, connecting a standalone HMI module for monitoring and control, a PMC-KT module for additional 6xNTC, 2xDI, and 1xDO for temperature monitoring and I/O control, and a PMC-KR module for ground fault insulation monitoring. The relay supports Modbus RTU/PROFIBUS, with PROFIBUS-DP available as an option. Equipped with a robust power supply, it ensures uninterrupted operation for 30 seconds during power interruptions. These versatile features make the relay suitable for diverse industrial needs.

Motor Start

The PMC-550D offers generic motor control functions like Direct-On-Line, Forward-Reverse and Two-Speed Start control. It also provides advanced motor starting schemes to reduce high starting and surge currents to prevent troublesome voltage dips on the main supply and transient torque effects in mechanical systems. Use the PMC-550D to facilitate the motor ON/OFF sequence control.

Applications

- Direct-On-Line Start
- Forward-Reverse Start
- Two-Speed Start
- Reduce-Voltage Start (including Star-Delta Start, Auto-Transformer Start and Resistance Start)

Motor Protection

Electric motors have distinct electrical and mechanical operation limits. Exceeding these limits may lead to issues such as mechanical vibration, stoppage, thermal damage, and ultimately, motor failure.

Protection Schemes

- **Electric Fault Protection:** Short Circuit, Ground Fault, Residual Current, LOP, Negative Sequence, MTA Failure, Insulation Resistance, Thermal Resistance (PTC or NTC), Overvoltage, Undervoltage, Imbalance, Phase Reversal, etc.
- **Mechanical Protection:** Jam, Long Start, Thermal Overload, Overload, Under Power, Interlock, tE Time, CB Failure, Thermo., Block When Start

Inputs & Outputs

Digital Input

- Standard 10 channels, either externally wetted @ 220VAC/DC or internally wetted @ 24VDC based on the model option selected
- Optional 2 additional channels if PMC-KT module is equipped, dry contact, with 24VDC internally wetted
- Status Input or Control Input

Digital Output

- Standard 5 channels
- Optional one additional channel Form C contact output if the PMC-KT module is connected
- Control and Status Indication

Analog Output

- 4-20 mA programmable analog output to display the proportional DC signal on an external analog meter or DCS system
- Selectable analog quantity such as 3-phase Current, Total kW, IR and 3I0

Optional NTC Input

- 6 channels NTC Thermistor Input via PMC-KT module for critical components, such as switches and contactors inside PDU compartment for long-term operation

Communication Options

- Standard optically isolated 2xRS-485 port
- Optional 1xPROFIBUS DP port via either DB9 terminal or 3 position terminal block and 1xRS-485 port (Modbus RTU)
- Optional 1xPROFIBUS DP port either via DB9 terminal or 3 position terminal block and 1xRS-485 port (either Modbus RTU or PROFIBUS DP)
- Optional 2x10/100BaseT Ethernet port (supporting Modbus TCP, PROFINET and SNTP) and 1xRS-485 port

System Integration

- The PMC-550D is supported by CET's PMC-EasyConfig. In addition, it can be easily integrated into other 3rd party Automation or SCADA system because of its multiple communication ports supporting Modbus RTU and PROFIBUS DP protocol.

Motor Control

PMC-550D is a microprocessor-based device that allows users to program and configure its operation through its HMI module to determine the actions to be done according to the situation.

- **Under-Voltage Restart:** This control mode is designed to restart a motor accordingly after a voltage dip. It may be either a quick restart, delay restart or stop, depending on the characteristics of the voltage dip.
- **Auto-Start:** This function determines the actions to be done after a machine stoppage due to a long Undervoltage period. It may be either a “restart” or “recover to the state before the stoppage”.
- **Local/Remote Control:** The PMC-550D allows the motor control to be done through the local panel or remote control.

Metering and Monitoring

Fundamental Metering

- Line Voltage and Current per Phase and Average
- Phase Angle
- I_A/I_{e^*} ratio (%), I_B/I_{e^*} ratio (%), I_C/I_{e^*} ratio (%) and I_{avg}/I_{e^*} ratio (%)
- I_1 (Positive Sequence), I_2 (Negative Sequence) and Current Unbalance (%)
- $3I_0$ (calculated Neutral Current) or optional I_N (measured Neutral Current)
- Total kW, kvar, kVA and PF
- Cooling Time (s) and Heat Capacity (%)
- Thermal Resistance (Ω)
- IR (Residual Current)
- System Frequency

RMS Metering

- Line Voltage and Current per Phase and Average
- Phase Angle
- I_a/I_{e^*} ratio (%), I_b/I_{e^*} ratio (%), I_c/I_{e^*} ratio (%)
- Total kW, kvar, kVA and PF
- Total kWh Import/Export and Total kvarh Import/Export
- Optional TC1 to TC6 ($^{\circ}\text{C}$) if PMC-KT is connected

Harmonic Metering

- U and I THD, TOHD and TEHD
- U and I Individual Harmonics from 2nd to 31st
- Latest motor operating statistics including Trip Current, Trip Times, Start Current, Start Time, Start Counter, Running Time and Stop Time

* I_{e^*} denotes for Rated Motor Current

HMI Display

U 100.07 V
 I 1.992 A(79.56%)
 Local COM1 COM2
 DI1-DI10:000000000000

Connection: Comm. Succ
 HW Match: Yes
 Temp. Mon.: No Config
 Insul. Mon. Comm. Succ

Motor Start Unblocked

DO1 - DO5: 01000

Metering

DI/DO
 View Para.
 Logs

Setup
 Statistic
 Maint.
 Info.

DO1 Trip Contactor ☐
 DO2 Start A ☒
 DO3 Trip QF ☐
 DO4 Spare ☐

Start I 1.210A
 Start Time 0.12s
 Start Count 22

Motor Monitoring and Event Logs

- 64 time-stamped logs recording DI/DO status changes, Diagnostic logs and Maintenance events
- 64 time-stamped protection logs recording active protection events with characteristic values
- Start Report stores the latest 64 motor start logs recording Start Control Source, Maximum Start Current, Minimum Start Voltage, Start Time, Time Stamp and Start Result
- Stop Report stores the latest 64 motor stop logs recording Stop Control Source, I_A , I_B , I_C and Timestamp
- Waveform Recorder triggered by motor start or protection operated stores max. 16 logs recording of UAB, UBC, UCA, I_A , I_B , I_C and I_N

Insulation Monitoring

- Monitoring insulation resistance against the ground for de-energized motors or active conductors
- Superimposing a measuring voltage @ 500Vdc or 1000Vdc according to the system voltage
- Recording up to 500 insulation test results

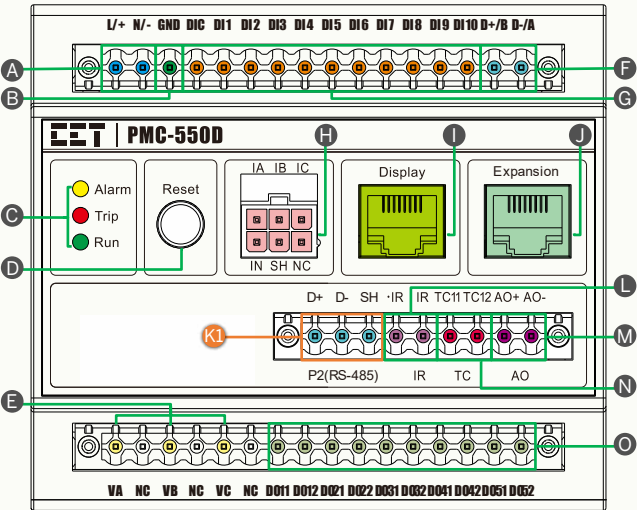
Commission Test

- Communication Test by synchronizing the sample data to the workstation
- Control Logic Test for the relay's DI, DO and Protection Logic without interruption to the running motor

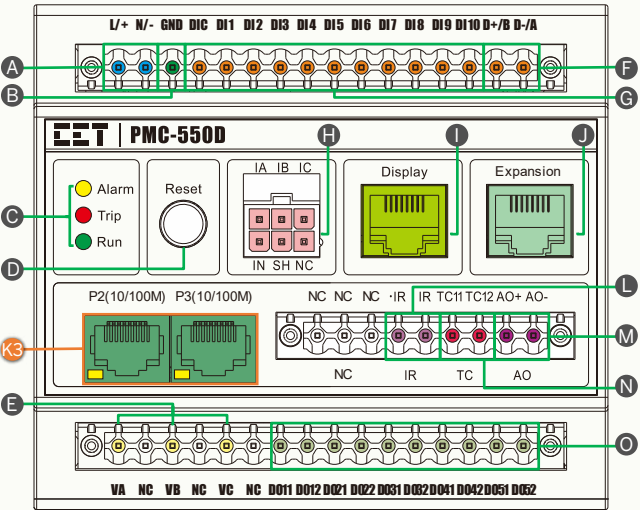
Programmable Logic

- Function Block Diagram (FBD) programming language compliant with IEC 61131-3
- Create Logic control equation with a drag-and-drop text editor via PMC-Designer

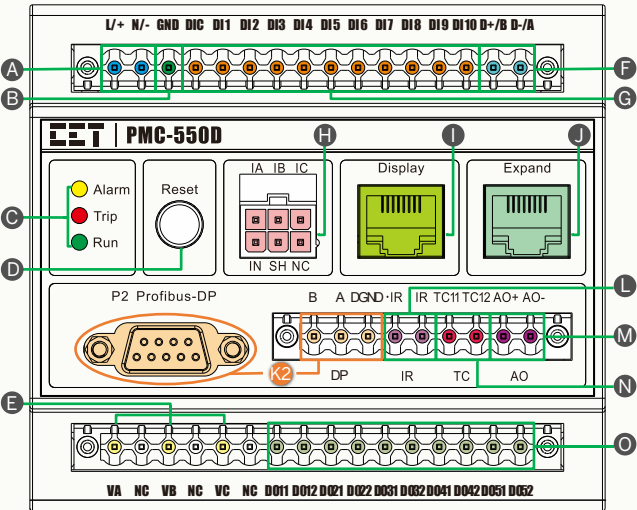
Terminal Diagrams



PMC-550D with 2xRS-485



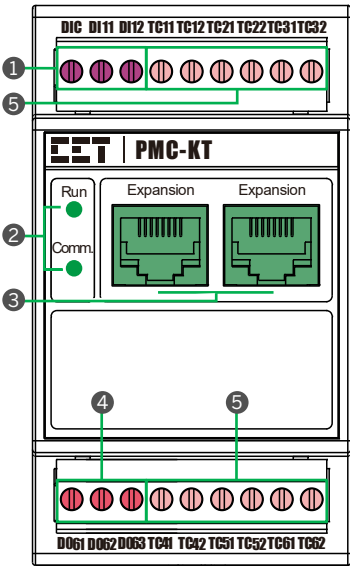
PMC-550D with 2x10/100BaseT Ethernet Port



PMC-550D with 1xPROFIBUS DP + 1xRS-485 (or 2xPROFIBUS DP)

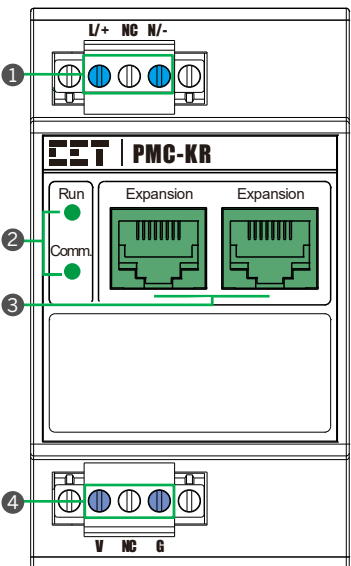
A	Power Supply	H	Current Input
B	Chassis Ground	I	RJ45 connector for remote Display Module (PoE)
C	LED Indicators	J	RJ45 connector for Expansion Module (PoE) PMC-KT or PMC-KR (external power source)
D	Reset Button	L	Residual Current Input
E	Voltage Input	M	Analog Output
F	RS-485 Port	N	Temperature Input
G	Digital Input	O	Digital Output

K1	RS-485 Port	K3	10/100BaseT Ethernet Port
K2	PROFIBUS DP (either DB9 terminal or 3 position terminal block)		



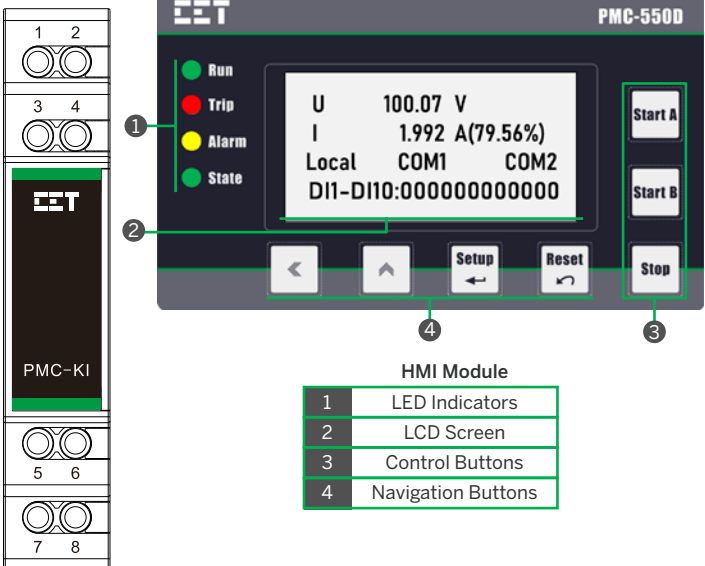
PMC-KT Module

1	Digital Inputs
2	LED Indicators
3	Expansion Ports for connection with relay and PMC-KR
4	Form C Mechanical Relay PMC-KR
5	TC Input



PMC-KR Module

1	Power Supply
2	LED Indicators
3	Expansion Ports for connection with relay and PMC-KT
4	DC Voltage Output



PMC-KI Module

1, 3	Voltage Input channel #1
2, 4	Voltage Input Channel #2
5, 7	Output Channel #1
6, 8	Output Channel #2

HMI Module	
1	LED Indicators
2	LCD Screen
3	Control Buttons
4	Navigation Buttons

Accuracy

Parameters	Accuracy	Resolution
Voltage (U)	±0.5%	0.001V
IA, IB, IC	±0.5%	0.001A
IR	20mA to 1200mA: ±1.0% 1200mA to 5000mA: ±3.0%	1mA
kW, kvar, kVA	±1.0%	0.001k
kWh	±1.0%	0.01kWh
kvarh	+2.0%	0.01kvarh
Power Factor	±1.0%	0.001
Frequency	±0.02Hz	0.001Hz
Analog Output	±2.0%	--
Harmonics	IEC 61000-4-7 Class II	0.01%
Insulation Resistance	±0.5%	0.1MΩ
Thermal Resistance	1% or 10Ω	0.01Ω
NTC Input	0 °C to 80 °C: ±1.0°C 80 °C to 150 °C: ±2.0°C	0.1°C

Technical Specifications

PMC-550D Main Unit

Voltage Inputs (VA, VB, VC)		
Standard (Vn)	240VLN/415VLL	
Range (VLL)	10V to 828V	
Overload	1.2xVn continuous, 2.0xVn for 10s	
Burden	<0.75VA per phase	
Measurement Category	CAT III 300VLL	
Frequency	50Hz/60Hz	
Current Inputs via Plug-in Current Sensor PMC-MTAs (IA, IB, IC, IN)		
Ie, Rated Motor Current	1A/5A/25A/100A/300A/400A/800A	
Range	5% to 120% Ie	
Overload	2xIe continuous, 10xIe for 10s, 40xIe for 1s	
Burden	<0.05VA per phase @ 5A Input	
Residual Current Sensor PMC-MIR (-IR, IR)		
Primary (In)	1A	
Secondary	1V	
I _{max}	2In continually	
Power Supply (L/+, N/-)		
Standard	95-250VAC/DC with Enhanced power supply (ride-through capability)	
Burden	<6W	
Overvoltage Category	OVC III 300VLN	
Digital Inputs (DIC, DI1, DI2, DI3, DI4, DI5, DI6, DI7, DI8, DI9, DI10)		
Standard	Internally wetted (dry contact) with 24VDC	
Optional	Externally wetted with 220VAC/DC	
Debounce Time	20-9999ms programmable	
Relay Outputs (DO11, DO12, DO21, DO22, DO31, DO32, DO41, DO42, DO51, DO52)		
Type	DO1 Form B (NC), DO2 Form A (NO) or Form B (NC), DO3 to DO5 Form A (NO)	
-	DO1 to DO4	DO5
Contact Rating	250VAC/24VDC, 8A	250VAC/30VDC, 5A
Max. Switching Voltage	400VAC/30VDC	277VAC/30VDC
Max. Carrying Current	10A	5A
Max. Switching Power	2000VA/192W	1250VA/150W
Operate Time	<10ms	<10ms
Release Time	<5ms	<10ms
Service Life	Mechanical	>20,000,000 cycles
	Electrical (at rated load)	>100,000 cycles
Internal Clearance/Creepage (Safety Insulation < 25VAC)	>8mm (EN 61810-1, Pollution Degree 3)	>6mm (EN 61810-1, Pollution Degree 2)
Analog Output (AO+, AO-)		
Load	750 ohms	
Range	4mA to 20mA	

Thermal Resistance Input (TC11, TC12)	
Load	PTC or NTC
Range	0.03kΩ to 32.00kΩ
Terminals Max. Torque	
Power Supply, DI, DO, IR, TC, AO, DP, RS-485	5 kgf.cm/M3 (4.3 lb-in)

PMC-550D-HMI Module

Display (Power and Communications)	
Power	Max. 60mA, 5VDC
Interface	RJ45
Data Transmission	RS-232

Optional PMC-KT Expansion Module

Expansion (Power and Communications)	
Power	Max. 70mA, 5VDC
Interface	RJ45
Data Transmission	RS-485
Digital Input (DIC, DI1, DI2)	
Standard	Dry contact, internally wetted with 24VDC
Debounce Time	20-9999ms programmable
TC Input (TC11, TC12, TC21, TC22, TC31, TC32, TC41, TC42, TC51, TC52, TC61, TC62)	
Type	NTC
Range	0 to 150 °C
Digital Output (DO61, DO62, DO63)	
Type	Form C Mechanical Relay
Contact Rating	250VAC/30VDC, 5A
Max. Switching Voltage	277VAC/30VDC
Max. Carrying Current	5A
Max. Switching Power	1250VA/150W
Operate Time	<10ms
Release Time	<10ms
Service Life	>5,000,000 cycles (Mechanical)
	>100,000 cycles (Electrical at rated load)
Internal Clearance/Creepage	>6mm (EN61810-1, Pollution Degree 2)

Optional PMC-KR Expansion Module

Power Supply (L/+, N/-)	
Standard	95-250VAC/DC
Burden	<3W
Insulation Resistance Test (V, G)	
Test Voltage	550VDC/1000VDC
Resistance Range	100kΩ to 100MΩ
Expansion	
Data Transmission	RS-485

Optional PMC-KI Converter Module

Voltage Input (1, 2, 3, 4)	
Rated Voltage	110VAC/DC or 220VAC/DC
Rated Current	0.45mA (for 110VAC/DC Input) or 0.21mA (for 220VAC/DC Input)
Output (5, 6, 7, 8)	
Max. Forward Voltage	40V
Max. Forward Current	50mA
Environmental Conditions	
Operating Temperature	-25°C to 55°C
Storage Temperature	-25°C to 70°C
Humidity	5% to 95% non-condensing
Atmospheric Pressure	70kPa to 106kPa
Mechanical Characteristics	
HMI Panel Cutout	54.0x103.0 mm
Unit Dimensions	108.0x95.0x122.5 mm
IP Rating	40

EMC Compatibility

CE EMC Directive 2014/30/EU (EN 61326: 2021)

Immunity Test	
Electrostatic Discharge	IEC 61000-4-2: 2009 Level IV
Radiated Fields	IEC 61000-4-3: 2006 +A1: 2008 +A2: 2010 Level III
Fast Transients	IEC 61000-4-4: 2012 Level IV
Surges	IEC 61000-4-5: 2014 +A1: 2017 Level IV
Conducted Disturbances	IEC 61000-4-6: 2014 Level III
Power Frequency Magnetic Fields	IEC 61000-4-8: 2010 Level V
Pulsed Magnetic Fields	IEC 61000-4-9: 2016 Level V
Damped Oscillatory Magnetic Fields	IEC 61000-4-10: 2016 Level V
Voltage Dips and Interruptions	IEC 61000-4-11: 2004 +A1: 2017 Level III
Ripple on DC Input Power Port	IEC 61000-4-17: 2009 Level IV
Damped Oscillatory Wave	IEC 61000-4-18: 2019 Level III
Power Frequency Immunity on Binary Inputs	IEC 60255-26: 2013 Class A
Gradual Shut Down/Start-up Tests	IEC 60255-26: 2013

Emission Test (EN 50081-2)

Limits and Methods of Measurement of Electromagnetic Disturbance Characteristics of Industrial, Scientific and Medical (ISM) Radio-Frequency Equipment	EN 55011: 2016 +A1: 2017 +A2: 2021
Limits and Methods of Measurement of Radio Disturbance Characteristics of Information Technology Equipment	EN 55032: 2015 +AC: 2016 +A11: 2020
Limits for Harmonic Current Emissions for Equipment with Rated Current ≤ 16 A	EN IEC 61000-3-2: 2019 +A1: 2021
Limitation of Voltage Fluctuations and Flicker in Low-Voltage Supply Systems for Equipment with Rated Current ≤ 16 A	EN 61000-3-3: 2013 +A1: 2019 +A2: 2021
Emission Standard for Industrial Environments	EN IEC 61000-6-4: 2019

Mechanical Test

Vibration Test (Response/Endurance)	IEC 60255-21-1: 1988 Level I
Shock Test (Response/Endurance)	IEC 60255-21-2 Level III
Bump Test (Response Endurance)	IEC 60255-21-2 Level I

Ordering Information

Product Code		Description	
PMC-550D		LV Motor Protection Relay with a Remote Display module, 1xResidual Current Input and 1XNTC/PTC Input (for Thermo Resistance Calculation)	
Language	E		English
Input Voltage	6		240VLN/415VLL
Power Supply	A		95-250V AC/DC ±10%, with 30 seconds of ride through
System Frequency	5		50Hz
	6		60Hz
DI/DO	A-		10xDI (Dry Contact), 5xDO
	B		10xDI (220VAC/DC), 5xDO
AO	A		1xAnalog Output (4-20mA DC)
	B		2xRS-485 Port
	C*		1XPROFIBUS DP Port (Either DB9 terminal or 3 Position Terminal Block) +1xRS-485 Port (Modbus RTU)
	D*		1XPROFIBUS DP Port (Either DB9 terminal or 3 Position Terminal Block) +1xRS-485 Port (Either Modbus RTU or PROFIBUS DP)
	E*		2x10/100BaseT Ethernet Port +1xRS-485 Port
	F*		2xPROFINET over Ethernet Port +1xRS-485 Port
DO2 Type	A		Normally Open
	B		Normally Closed
PMC-550D	- E 6 A 5 A A B A		PMC-550D-E6A5AABA (Standard Model)

* Additional charges apply

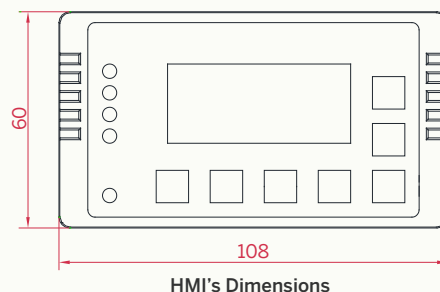
- For the DI/DO "Option A", the Dry Contact DI can be used with the PMC-KI module to convert 110V/220V excitation voltage to Dry Contact Output

Standard of Compliance

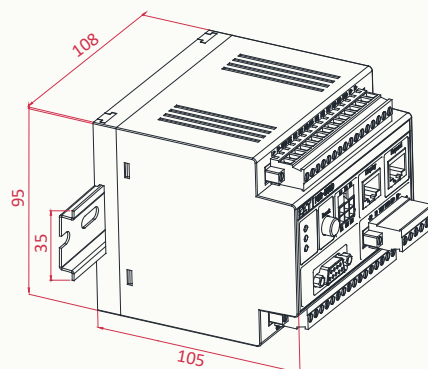
Safety Requirements	
CE LVD 2014/35/EU	EN 61010-1: 2010 +A1: 2019 EN IEC 61010-2-030: 2021
Insulation AC Voltage: 2kV @ 1 minute Insulation Resistance: > 100MΩ Impulse Voltage: 5kV, 1.2/50us	IEC 60255-5: 2000 EN 61010-1: 2010 +A1: 2019 EN IEC 61010-2-030: 2021

Dimensions and Installation

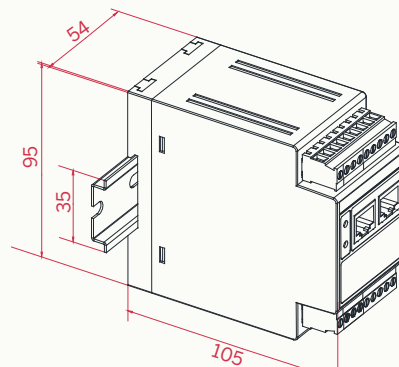
Unit: mm



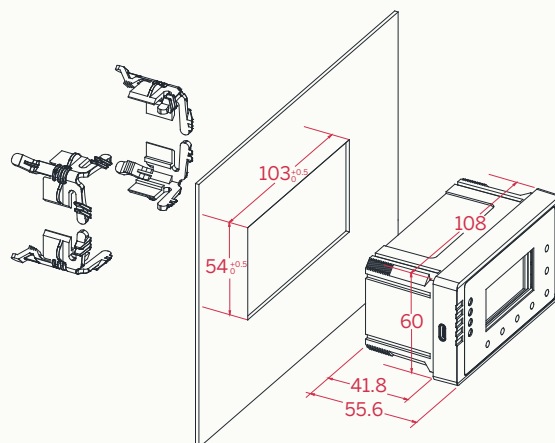
HMI's Dimensions



Main Unit's 35mm DIN-Rail Installation



Expansion Module'S Dimensions



HMI's Panel Cutout Installation

Optional Current Transducers

MTA Appearance



No.	Models	No.	Models
1	PMC-MTA-1A	6	PMC-MTA-800A-T
2	PMC-MTA-400A-T	7	PMC-MTA-300A
3	PMC-MTA-5A	8	3x1-P cable
4	PMC-MTA-25A	9	1x3-P cable
5	PMC-MTA-100A		

Motor Current Transducers (MTA)

MTA Model	Rated kW	Rated Current	Hole Ø
PMC-MTA-1A	< 0.4kW	0.2A-1A	10mm
PMC-MTA-5A	0.4-2.2kW	1A-5A	10mm
PMC-MTA-25A	2.2-12.5kW	5A-25A	20mm
PMC-MTA-100A	12.5-50kW	25A-100A	30mm
PMC-MTA-300A	50-150kW	100A-300A	30mm
PMC-MTA-400A-T	120-200kW	240A-400A	55mm
PMC-MTA-800A-T	160-400kW	320A-800A	75mm

Current Transducers Accessories

MTA Model	Application Range	Description
3-P MTA Special Cable	3-P Moulded Case MTA for PMC-550D	3-Phase MTA can be connected through this cable
1-P MTA Special Cable	1-P Moulded Case MTA for PMC-550D	3x1-Phase MTA can be connected through this cable

1. Additional charges apply for Motor Current Transducers (MTA) and Cables.
2. The Motor Power mentioned is based on a 380V system. For other voltages, please use a suitable multiplier based on the actual system voltage (e.g. for a 415V rated motor, multiply the suggested figure by 415/380=1.092).
3. The required type and quantity of MTA Connection Cables must be ordered separately.
4. The default cable length is 2m, feel free to contact CET for customized cable lengths.

MIR Appearance

No.	Models	
1	PMC-MIR-35	
2	PMC-MIR-50	
3	PMC-MIR-75	
4	PMC-MIR-120	
5	PMC-MIR-265*103	

Motor Residual Current Transducer (MIR)-For Cable

MIR Model	Rated kW (380V system)	Rated Current	Hole Ø
PMC-MIR-35	0.55-7.5kW	0-63A	35mm
PMC-MIR-50	7.5-22kW	63-125A	50mm
PMC-MIR-75	22-150kW	125-250A	75mm
PMC-MIR-120	>150kW	250-1000A	120mm

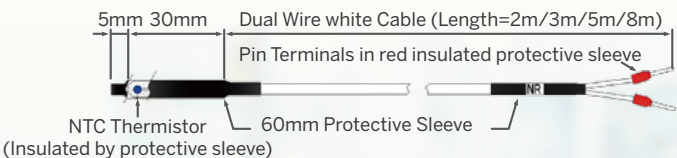
Motor Residual Current Transducer (MIR)-For Busbar

MIR Model	Inner Dimension	External Dimension
PMC-MIR-265*103	265(W)×103(H)mm	307(W)×211(H)×60(D)mm

1. Additional charges apply for Motor Residual Current Transducers (MIR) and Cables.
2. Connection cables are included with the MIR.
3. The standard cable length for both "Cable" and "Busbar" type MIR is 4m. Please contact CET.
4. The Specified Motor Power is based on a 380V system. For other voltage systems, please use a suitable multiplier based on the actual system voltage (e.g. for a 415V rated motor, multiply the suggested figure by 415/380=1.092).

Negative Temperature Coefficient (NTC) Thermistor

Product Code	Cable Length	B Value
NTC-1041	2m	10000



Note: we also offer insulated NTC Thermistor with a choice of 3m, 5m or 8m cable.





Our Services

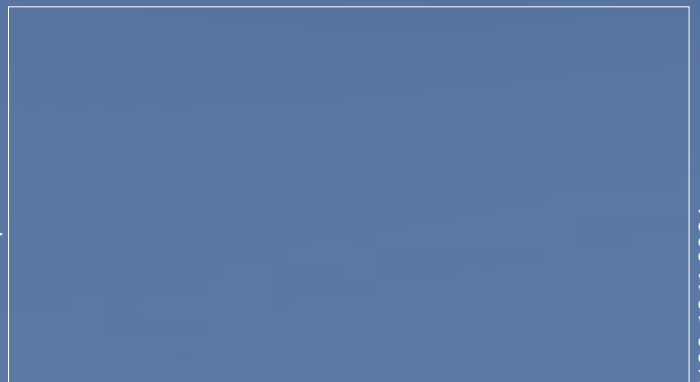
CET has a team of dedicated and proficient Engineering Services personnel who are ready to provide expert assistance for your system deployment needs. We are committed in helping our customers create a more secure and reliable, energy conserving and environmentally friendly electrical power system. Our team of experts is prepared to provide customized solutions for your different application needs with timely and efficient services. Please do not hesitate to contact our sales office or your local representative for more information.

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Website: www.cet-global.com

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Your Local Representative



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