Energy Monitoring Panel

PANEL_EM100A

FOR INSTALLERS

INSTALLATION MANUAL
Version 1.01

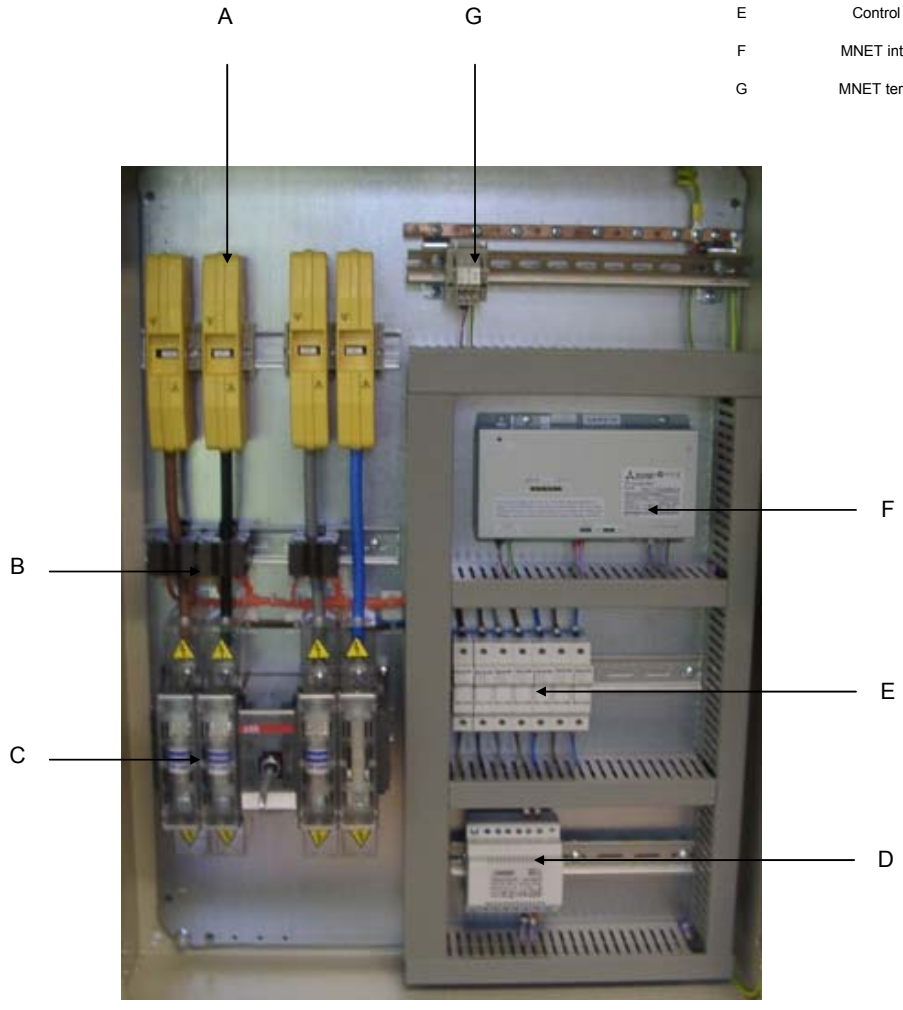
For safe and correct use, please read this installation manual thoroughly before installing the PANEL_EM100A.

MITSUBISHI ELECTRIC

1

[Fig. 1]

A	380 ~ 415v 3 Phase power supply terminal
B	Current transformers
C	100A fuse door interlocked isolator
D	24VDC power supply
E	Control fuse
F	MNET interface
G	MNET terminals



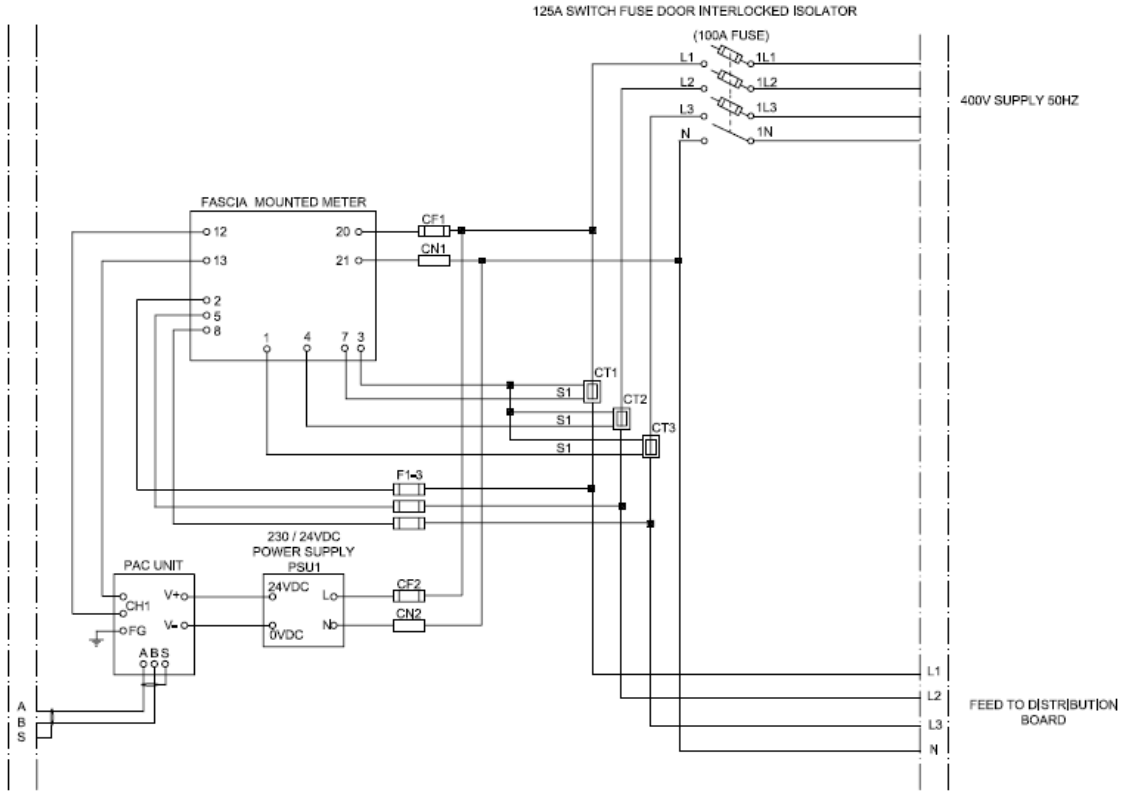
2

[Fig. 2]

A	Fascia mounted energy meter
B	Door interlocked Isolator
C	Door lock

3

[Fig. 3]


125A SWITCH FUSE DOOR INTERLOCKED ISOLATOR
(100A FUSE)
L1
1L1
L2
1L2
L3
1L3
N
1N
400V SUPPLY 50HZ
FASCIA MOUNTED METER
12
13
2
5
8
20
21
1
4
7
3
CF1
CN1
CT1
CT2
CT3
S1
S1
S1
F1-3
230 / 24VDC
POWER SUPPLY
PSU1
PAC UNIT
CH1
FG
V+
V-
24VDC
0VDC
Lo
No
CF2
CN2
A B S
A
B
S
L1
L2
L3
N
FEED TO DISTRIBUTION
BOARD

Contents

1. Safety precautions

- **Before installing the unit, make sure you read all the "Safety precautions"**
- **The "Safety precautions" provide very important points regarding safety. Make sure you follow them**

Symbols used in the text

⚠ Warning:
Describes precautions that should be observed to prevent danger of injury or death to the user.

⚠ Caution:
Describes precautions that should be observed to prevent damage to the unit.

⚠ Warning:
Carefully read the labels affixed to the main unit

⚠ Warning:

- **Ask the dealer or an authorised technician to install the unit**
  - Improper installation by the user may result in water leakage, electric shock, or fire
- **Use the specified cables for wiring. Make the connections securely so that any outside forces acting on the cables are not applied to the terminals**
  - Inadequate connection and fastening may generate heat and cause a fire
- **Never repair the unit. If the controller must be repaired, consult the dealer**
  - If the unit is repaired improperly, electric shock, or fire may result
- **When handling this product, always wear protective equipment. EG: Gloves, full arm protection and safety glasses**
  - Improper handling may result in injury
- **Have all electric work done by a licensed electrician according to "Electric Facility Engineering Standard", "Interior Wire Regulations" and the instructions given in this manual and always use a special circuit**
  - If the power source capacity is inadequate or electric work is performed improperly, electric shock and fire may result
- **Keep the electric parts away from any water - washing water etc…**
  - Contact may result in electric shock, fire or smoke
- **Do not reconstruct or change the settings of the protection devices**
  - If the protection device is shorted or operated forcibly, or parts other than those specified by Mitsubishi Electric are used, fire or explosion may result
- **To dispose of this product, consult your dealer**

⚠ Caution:

- **Ground the unit**
  - Do not connect the ground wire to gas or water pipes, lightning rods, or telephone ground lines. Improper grounding may result in electric shock
- **Install the power cable so that tension is not applied to the cable**
  - Tension may cause the cable to break and generate heat which may, in turn, cause fire
- **Install a leak circuit breaker, as required**
  - If a leak circuit breaker is not installed, electric shock may result
- **Use power line cables of sufficient current carrying capacity and rating**
  - Cables that are too small may leak, generate heat, and cause a fire
- **Use only a circuit breaker and fuse of the specified capacity**
  - A fuse or circuit breaker of a larger capacity or a steel or copper wire may result in a general unit failure or fire
- **Be careful that the installation base is not damaged**
  - If the damage is left uncorrected, the unit may fall and cause personal injury or property damage
- **Be very careful regarding product transportation**
  - Two people should be used to carry products of 20kg or more
  - Some products use PP bands for packaging. Do not use any PP bands for a means of transportation
- **Safely dispose of the packing materials**
  - Packing materials, such as nails and other metal or wooden parts, may cause stabs or other injuries
  - Tear apart and throw away plastic packaging bags so that children will not play with them - If children play with a plastic bag which has not been torn apart, they face the risk of suffocation

2. Overview

The energy monitoring panel is used to monitor the energy consumption of a device. Typically this panel will be used to monitor the energy consumption of an Air Conditioning outdoor unit.

The panel will be fed with a 380 ~ 415V 3 phase power supply.

The maximum running current should not exceed 100A.

The outdoor unit power supply will be connected to a distribution board. This distribution board will then be connected to the energy monitoring panel.

The energy monitoring panel is supplied with a MNET interface to allow direct connection to the City Multi Air Conditioning network system.

The cumulative energy consumption of the device, for instance the outdoor units can be read directly from the facia mounted energy meter or / and the G50 WebPages.

For in depth energy monitoring of the Air Conditioning (apportion across the indoor / outdoor units), the TG2000 software package in conjunction with a G50 and the dedicated PIN code (G50-EC-Full) must be used.

One G50 controller can monitor up to 5 energy monitoring panels.

Figure 1 shows the inside of the panel.

Figure 2 shows the front panel.

Figure 3 shows the wiring diagram of the panel.

3. Panel size and weight

The panel details are:

- Height 800mm
- Width 600mm
- Depth 210mm
- Weight 34Kg

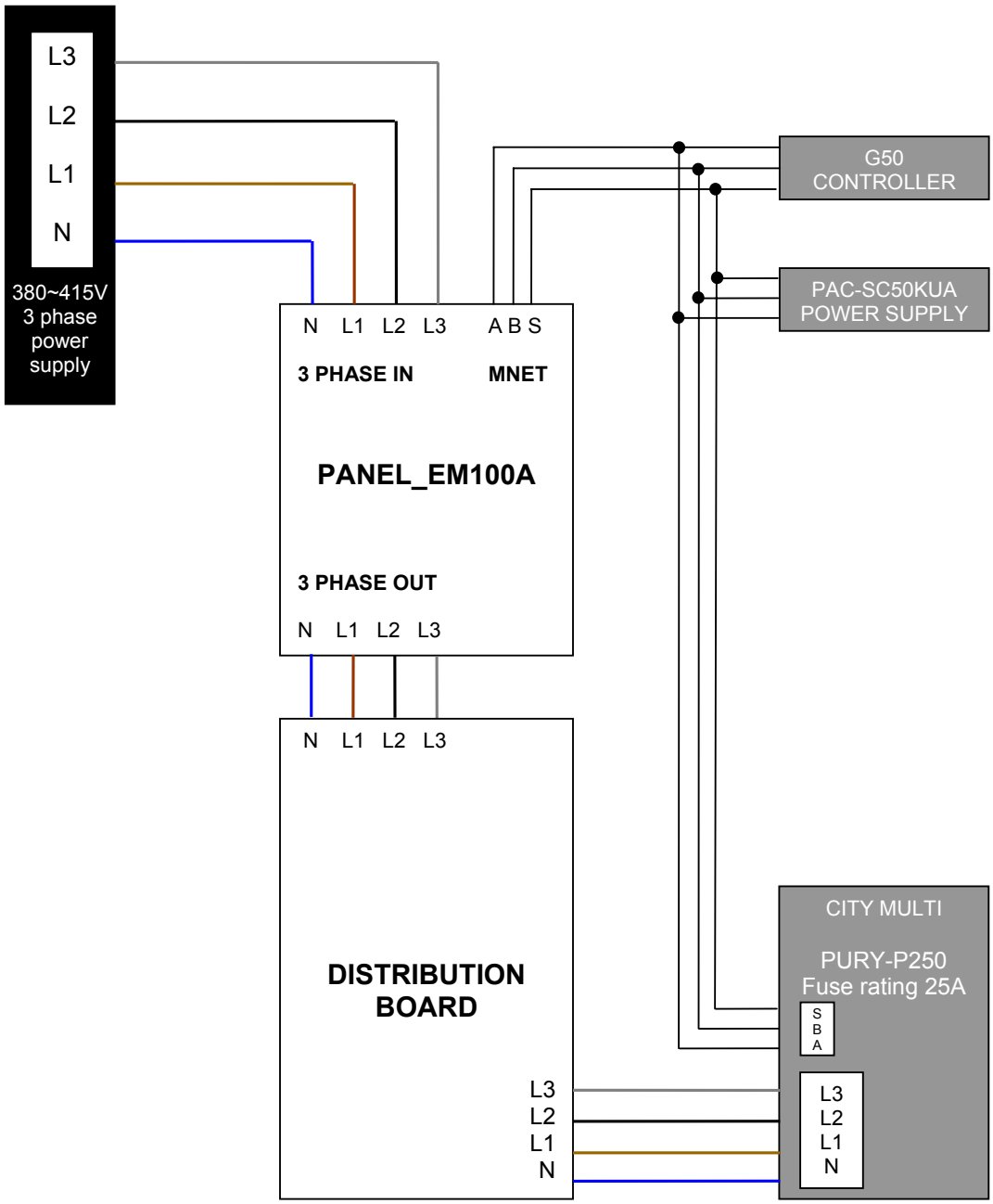
4. Selecting an installation site

- Avoid locations in direct sunlight
- Avoid locations exposed to steam or oil vapour
- Avoid locations where combustible gas may leak, settle or be generated
- Avoid installation near machines emitting high-frequency waves
- Avoid places where acidic solutions are frequently handled
- Avoid places where sulphur-based or other sprays are frequently used
- Avoid areas of high humidity (when cooling operation is required)
- Install inside the building

5. Installation

5.1. System diagram example 1

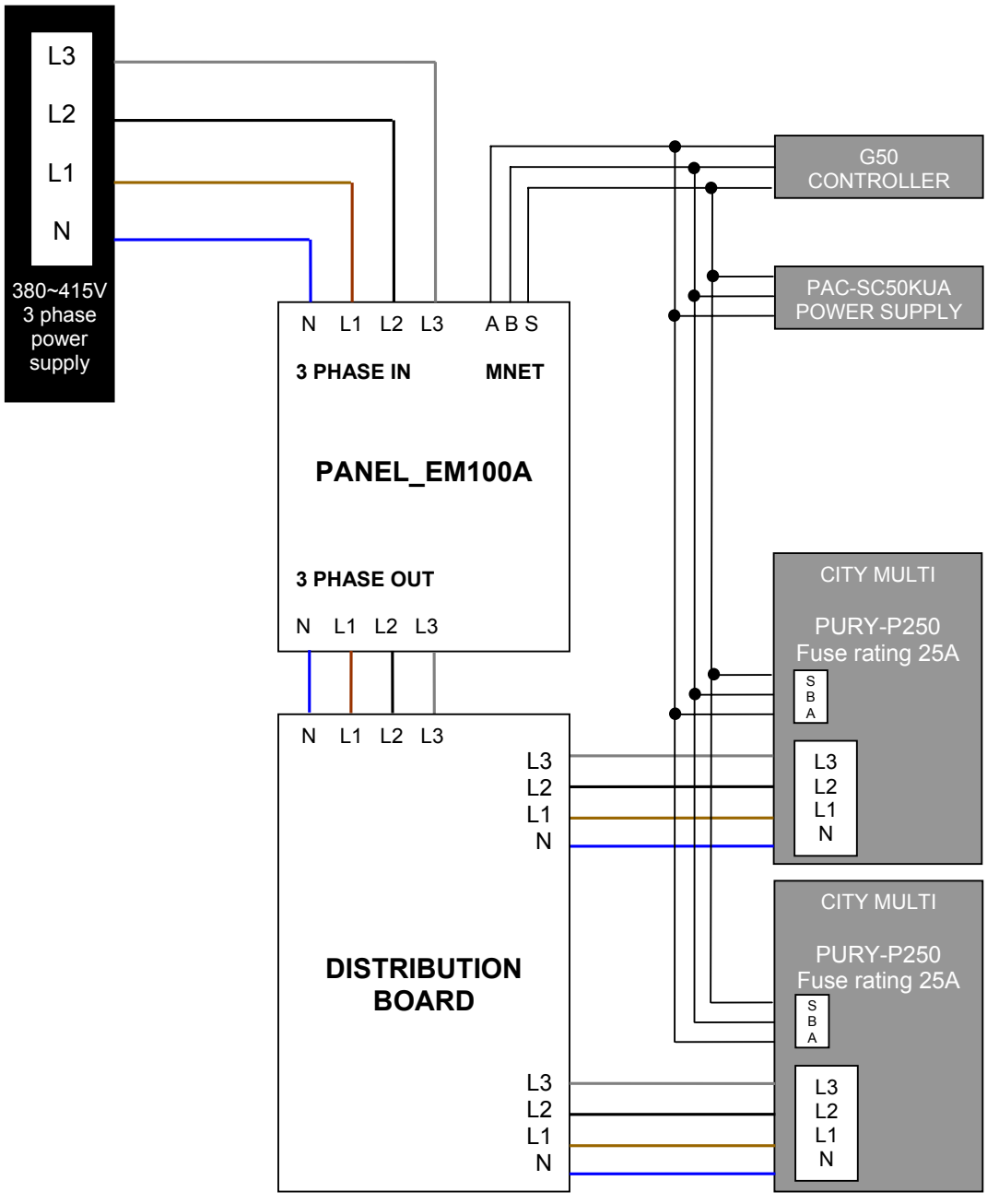
Typically one outdoor unit will be connected to one energy monitoring panel. A distribution board is required between the energy monitoring panel and the outdoor unit.



Note 1: G50 and PAC-SC50KUA power supply not shown on this diagram
Note 2: Distribution board not supplied by Mitsubishi Electric

5.2. System diagram example 2

The energy monitoring panel can monitor up to 100A which means that more than one outdoor unit can be connected to the panel as long as the fuse rating is not over 100A. For instance two PURY-P250**** may be connected (fuse rating of 25A x 2 = 50A) or even four (fuse rating of 25A x 4 = 100A). A distribution board is required between the energy monitoring panel and the outdoor units.



Note 1: G50 and PAC-SC50KUA power supply not shown on this diagram
Note 2: Distribution board not supplied by Mitsubishi Electric

6. Electrical wiring

6.1. Precautions on electrical wiring

⚠ **Warning:**
Electrical work should be done by qualified electrical engineers / electrician in accordance with "Engineering Standards for Electrical Installation" and supplied installation manuals. Dedicated circuits should also be used. If the power circuit lacks capacity or has an installation failure, it may cause a risk of electric shock or fire.

- Be sure to take power from the special branch circuit
- Be sure to install an earth leakage breaker to the power
- Install the unit to prevent any of the control circuit cables (MNET transmission cables) coming into direct contact with the power cable outside the unit
- Ensure that there is no slack on all wire connections
- Never connect the power cable to leads for the transmission cables. This will damage the transmission cable
- Select control cables from the conditions given in “Type of control cables” section

6.2. Types of control cables

Wiring transmission cables

- Cable diameter: More than 1.25 mm^2 screened cable

6.3. Connecting wiring

6.3.1. Power supply wiring

Power supply cords of appliances shall not be lighter than design 245 IEC 57 or 227 IEC 57.

⚠ **Caution:**
Do not use anything other than the correct capacity breaker and fuse. Using fuse, wire or copper wire with too large capacity may cause a risk of malfunction or fire.

6.3.2. Connecting MNET

Connect the panel MNET terminal to the outdoor unit TB5 or to the G50 controller ABS (Non-polarized 2-wire).

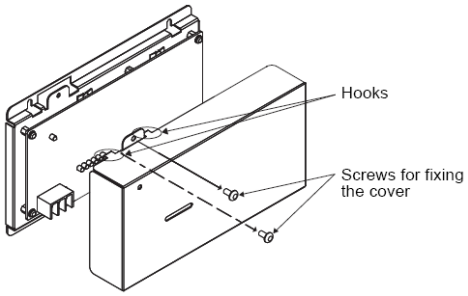
The "S" on the panel MNET terminal is a shielding wire connection. For specifications about the connecting cables, refer to the outdoor unit installation manual.

7. MNET interface setup

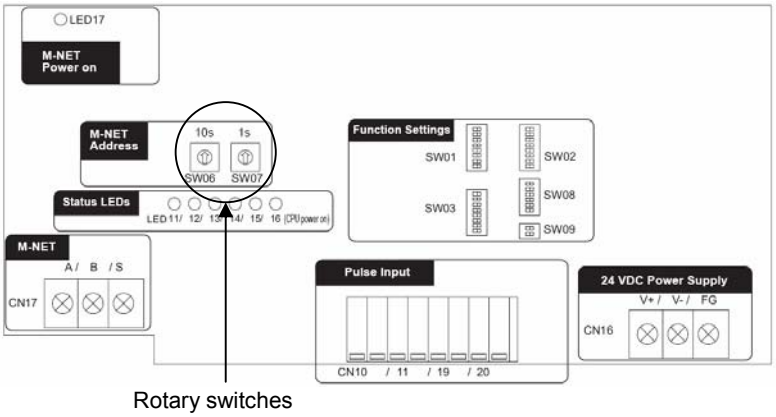
One G50 controller can monitor up to 5 energy monitoring panels.

The energy monitoring panel needs to be set with a MNET address. The panel MNET address can be set using the rotary switches on the MNET interface (PAC-YG60MCA).

The cover needs to be removed to access the rotary switches.



There are two types of rotary switch setting available: setting addresses 1 to 9 and over 10.



How to set the MNET addresses:

Example:

- to set the MNET address to “40”, SW06 needs to be set to “4” and SW07 needs to be set to “0”
- to set the MNET address to “12”, SW06 needs to be set to “1” and SW07 needs to be set to “2”

The rotary switches are all set to "0" when shipped from the factory.

The determination of energy monitoring panel MNET address varies with the system at site. Set them referring to technical data.

8. Recommendations

The energy monitoring panel will display the energy consumption on the front mounted energy meter. Energy consumption can also be reported back to the software package TG2000 in conjunction with a G50 and the dedicated PIN code (G50-EC-Full).

TG2000 needs to be set-up for Energy Monitoring.

It is recommended that the TG2000 software package is set and checked by a Mitsubishi Electric commissioning engineer.

The energy monitoring panel must be connected to the MNET City Multi Air Conditioning network system. The panel can be connected to the:

- MNET terminal on the PAC-SC50KUA power supply (TB2 terminal - A B S)
- MNET terminal on the G50 centralised controller (MNET terminal A B S)
- MNET terminal on the outdoor unit ("Centralised controller" TB7 terminal – M1 M2 S)
- MNET terminal on any CITY MULTI indoor unit (TB5 terminal – M1 M2 S)

However, it is recommended to connect the energy monitoring panel to the G50 centralised controller.

The energy monitoring panel has been set and tested prior to go to site.

It is strongly recommended not to change the CT rating, the pulse rating and/or the scale rating of the energy meter.

9. Applicable Air Conditioning models

Below is a list of Air Conditioning models that can be connected to this panel:

- Full City Multi VRF product range
- Mr Slim product range
- M Series **Inverter** product range

Please note that:

- **City Multi, Mr Slim and M series outdoor units cannot be connected to the same panel. One panel must be used for City Multi product, one must be used for Mr Slim products and one must be used for M Series Inverter products**
- Several Mr Slim outdoor units can be connected to the same panel (up to 100A fuse rating)
- Several M Series outdoor units can be connected to the same panel (up to 100A fuse rating)
- Mr Slim P series outdoor unit requires a PAC-SF80MA interface (one per outdoor unit)
- Indoor unit connected to a MUZ / MXZ / SUZ series outdoor unit requires a MAC-399IF interface (one per indoor unit)
- Heat pump boiler system can be connected to the panel
- Mixed Mode system can be connected to the panel

10. Energy charge restrictions

The air conditioning cost calculation method used by this unit is the Mitsubishi proprietary general electric power apportioning method (including counts by meter for gas, electricity, etc.).

For this reason, it may not be usable for all instances of trade or verification (by quantity), due to varying laws in different countries, as well as other possible circumstances.

Please check the relevant laws and regulations of the country where the unit will be used, and use the unit in ways that will not violate them. Mitsubishi Electric will not be held responsible for any damages suffered.

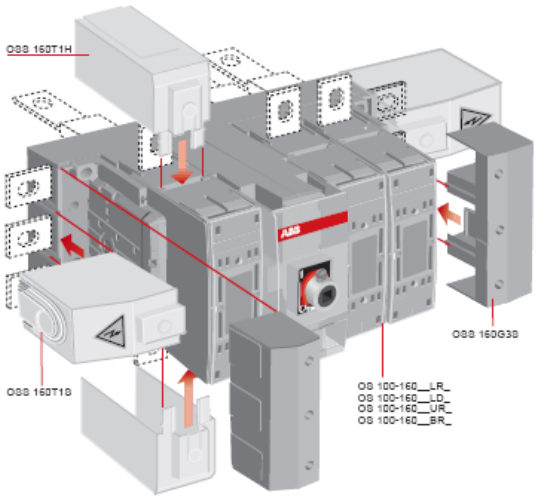
Air conditioning costs incurred in connection with the use of the unit are subsumed within the fees charged to tenants by building owners. We recommend that owners and tenants execute a separate contract, or come to a similar agreement, to the effect that air conditioning costs (which are not charged based on electrical metering) will be collected in the form of usage fees, to be pro-rated in accordance with the manner in which the air conditioners are used (including emergency support for breakdowns).

1. Watt-hour meters will not be used to measure all air conditioner electrical supply points
2. The unit cannot be used for applications demanding calculation methods that would involve installing watt-hour meters on all air conditioners
3. The system estimates pro rata electrical use by air conditioners, and thus, cannot be used for proof of transactions
4. Air conditioning usage fees may vary according to operating load on air conditioners, even though the running time may be the same
5. When connecting one or more units to a watt-hour meter, differences may result from the division of the total electrical use thus measured. Calculations are made by dividing equally, with more than one air conditioner being treated as a single unit for these purposes
6. The air conditioners are being supplied with electricity even when they are not running, and thus, usage fees will be charged even if the air conditioners are not in use
7. If computers, G-50As or PI controller break down, assistance will be provided primarily through past pro rata average rates
8. Readings of watt-hour and gas meters are taken in pulses, with performance and precision dependent on the meters themselves

11. Additional information

11.1. ABB 125A fuse door interlocked isolator

11.1.1. Overview

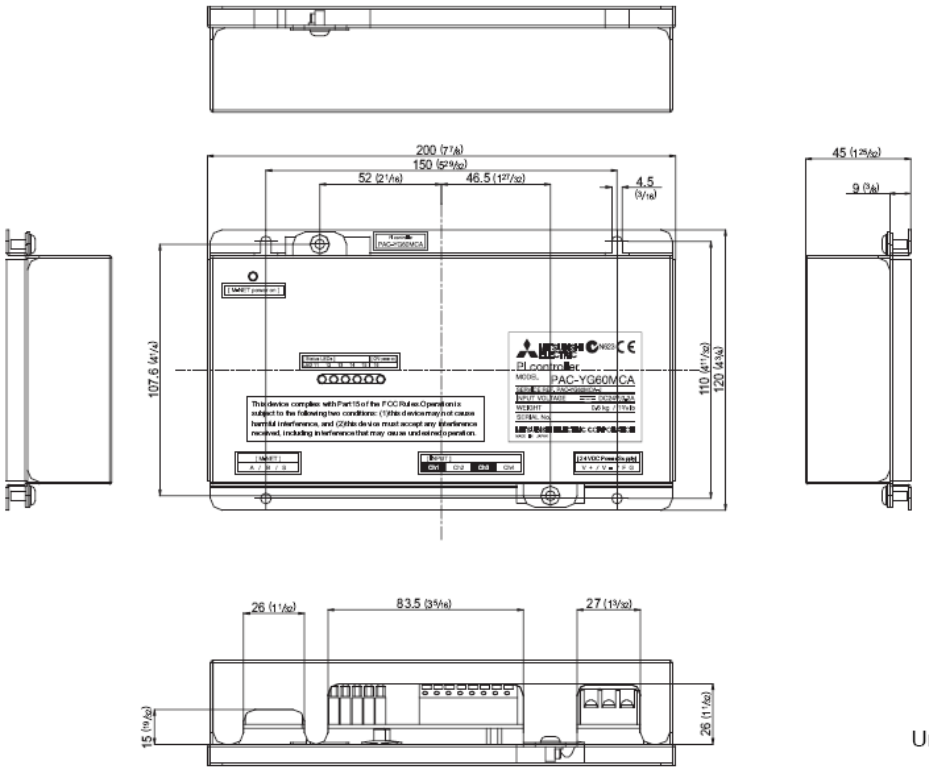


11.1.2. Switch fuse type

Switch fuse type		OS Mini					OS 30…63					OS 100…160		
Current ratings		20A	25A	30A	32A	35A	30A	32A	50A	60A	63A	100A	125A	160A
Front operated, 3 and 4- pole														
Mechanism between the poles														
Mechanism at the end of the switch														
Side operated, 3 and 4- pole														
Fuse types:														
Fuse standards DIN 43620, IEC 269-2-1SEC I														
DIN 000, 00														
DIN Neozed (available year 2000)														
Fuse standards BS 88-2, -6, IEC 269-2-1SEC II, -IV														
BS A1														
BS F1														
BS A2														
BS A3														
BS A4														
Fuse standards NFC 63210, NFC 63211, IEC 269-2-1SEC III														
NFC, 10x38														
NFC, 14x51														
NFC, 22x58														
Fuse standards UL 198C, IEC 269-2-1SEC V														
UL, J														
UL, CC														
Fuse standards CSA C22.2 No 106, IEC 269-2-1SEC II (Dim.)														
CSA, C														
Technical data														
Rated operational current, AC-23A														
Up to 500 V	A	20	25	30	32	35	30	32	50	60	63	100	125	160
690V	A	20	25	30	32	35	30	32	50	60*	63*	100*	125*	160*
* AC-23B														
Rated operational power, AC-23														
230 V	kW	5.5	6		8	8		9	15		18.5	30	37	45
400 V	kW	10	11		14	14		15	25		30	45	60	80
415 V	kW	10	12		15	15		15	25		30	55	60	90
500 V	kW	12	14		18	18		22	33		37	60	80	110
690 V	kW	15	22		25	25		30	45		60	90	110	132
Weight, 3-pole	kg	0.7	0.7	0.7	0.7	0.7	1.3	1.3	1.3	1.3	1.3	1.5	1.5	1.5

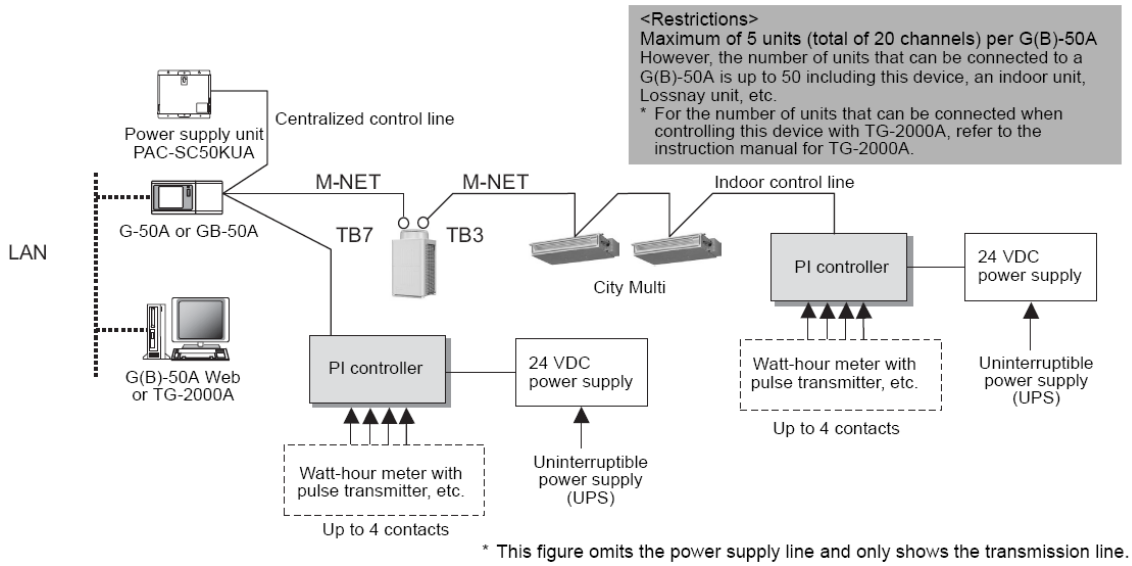
11.2. Mitsubishi Electric MNET interface

11.2.1. Overview



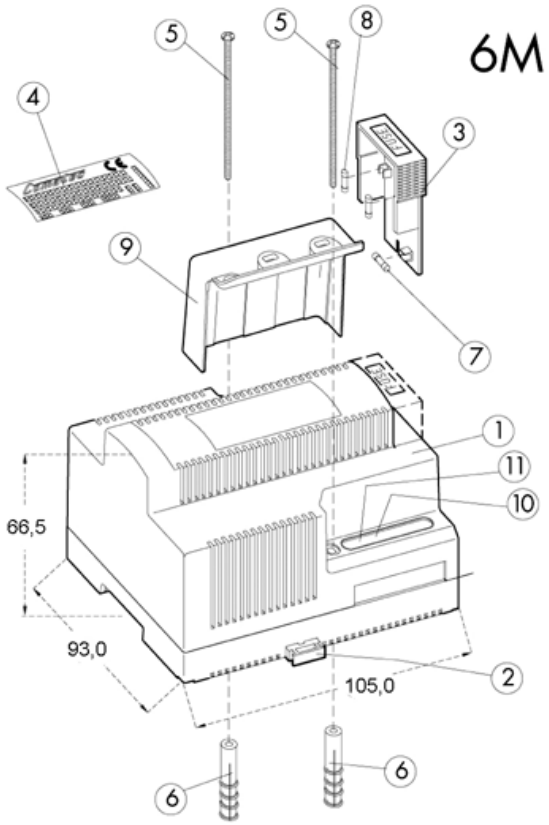
Unit: mm (in)

11.2.2. Wiring diagram



11.3. Comatec 24VDC power supply

11.3.1. Overview



1 Case 6M (TE)

2 Clamping spring

3 Fuse mounting

4 Label

5 screw for wall fixing

6 Dowel

7 Fuse

8 Spare fuse

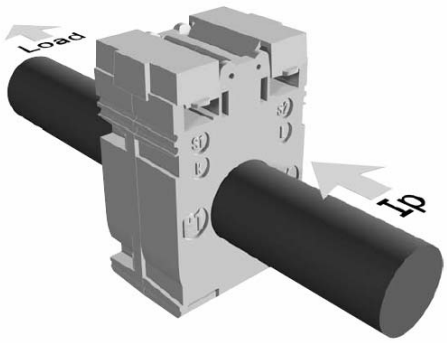
9 Clamp cover

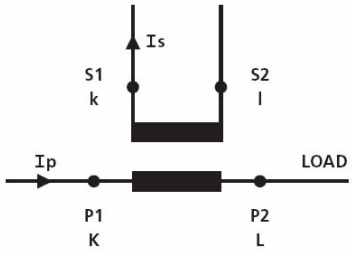
11.3.2. Technical information

Safety standard	EN61558
EMC standard	EN55022/B
Input voltage	230Vac +/- 10%
Frequency	48 - 63 Hz
Output voltage	24 VDC
Output voltage precision	+/- 6%
No-load voltage	33.57VDC
Ripple	2.53V
Output current	1.0A
Nominal power	24W
Efficiency	70%
Overload protection	FUSE
Short circuit protection	FUSE
Temperature range	20°C to + 40°C
Relative humidity	90% max
Switching frequency	50Hz
PRI/SEC dielectric strength	3,750V / 1min
MTBF (MIL HDBK217)	180'000h
Weight	0.95Kg

11.4. IME TABB50C300 current clamps

11.4.1. Overview





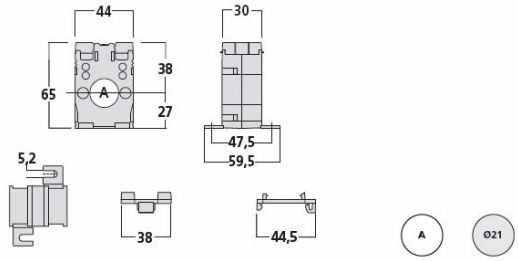
Current Transformers

- Reference Standards EN60044-1, BS3938, BS7626
- Standard secondary currents 5A or 1A
- Frequency 47÷63Hz
- Insulation reference voltage 0,72kV
  test voltage 3kV for 1' to 50Hz
- Insulation class B (CEI EN 60044-1)
- Rated continuous thermal current according to CEI EN 60044-1
- Rated short-time thermal current (Ith):
  models passing bar limited to the bar size
  models with wound primary 60In (TAQ2 and TAQ6 30In)
- Rated dynamic current (Idyn) 2,5 Ith
- Safety factor (f.s.) ≤5 for class 0,5-1-3
  (for models TAU8-9-10-11 f.s. ≤10)
- Working time with secondary winding open 1 min. (CEI 38-1, IEC 185)
- Connectors marking:
  primary P1 - P2 (K - L)
  secondary s1 - s2 (k - l)
- Terminal protection degree:
  series TAI - TRA IP20
  series TAS - TAU - TAQ - BSA - BTA IP00
  (IP20 with sealable terminal cover)
- Self-extinguishing polycarbonate housing, VO classification according to UL-94 (except for models BTA1-2-3 metallic housing, TRA11 - TRA15 thermoplastic material and partially filled with resin)
- Tropicalized execution/standard marine use
  (except for models TAQ - BSA - BTA)

Esecution on request ☎

- Frequency up to 400Hz
- Insulation reference voltage 1,2kV
  test voltage 6kV for 1' to 50Hz
  (except for model TAU - TRA - TAS170)
- Double ratio obtained on the secondary
  (except for models TAIBB - TAI200 - TAI210 - TAI230 - TAI233 - TAI300 - TAQ2 - TAQ6)
  s1 - s2 = lower ratio
  s1 - s3 = higher ratio

11.4.2. Primary current



Fixing for 35mm Din rail (EN 50022)

Bar 16 x 12,5

TAIBB	Burden VA			Secondary 5A			Secondary 1A			UTF Certification
Primary current	cl.0,5	cl.1	cl.3	Ordering code	Stock		Ordering code	Stock		
40A			1	TABB50B400	•		TABB10B400	•		
50A		1,3	1,5	TABB50B500	•		TABB10B500	•		
60A		1,3	2	TABB50B600	•		TABB10B600	•		
70A		1,5	2,5	TABB50B700	•		TABB10B700			
75A		1,5	2,5	TABB50B750	•		TABB10B750	•		
80A		1,5	2,5	TABB50B800	•		TABB10B800	•		
100A	2	2,5	3,5	TABB50C100	•		TABB10C100	•		
120A	2,5	3,5	4	TABB50C120	•		TABB10C120			
125A	2,5	3,5	4	TABB50C125	•		TABB10C125			
150A	3	4	5	TABB50C150	•		TABB10C150	•		•
160A	3	4	5	TABB50C160	•		TABB10C160			•
200A	4	5,5	6	TABB50C200	•		TABB10C200			•
250A	5	6	7	TABB50C250	•					•
300A	6	7,5	8	TABB50C300	•					•
accessory	sealable terminal cover						ATACOP12	•		

11.5. IME Nemo 72-L facia mounted energy meter

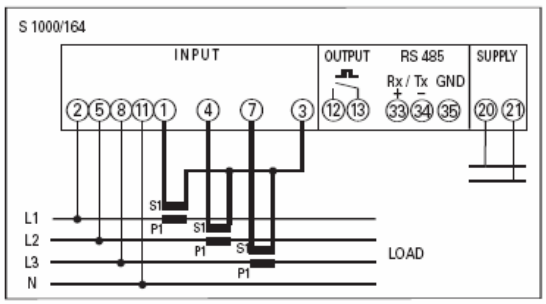
11.5.1. Overview

11.5.2. Display options

Twelve display options are available with the Nemo 72-L energy meter.

Page 1	Phase voltage and active energy
Page 2	Phase current and reactive energy
Page 3	Linked voltage and active energy
Page 4	Phase active power and active energy
Page 5	Phase reactive power and reactive energy
Page 6	Active, reactive, apparent three-phase power and active energy
Page 7	Neutral current, frequency, three-phase power factor and reactive energy
Page 8	Working hours and minutes and active energy
Page 9	Power demand and max demand and reactive energy
Page 10	Phase current demand and active energy
Page 11	Phase current max demand and reactive energy
Page 12	Total harmonic distortion for each current

11.5.3. Wiring diagram



Linea trifase 4 fili • Three-phase network 4-wire

This product is designed and intended for use in the residential, commercial and light-industrial environment.

The product at hand is based on the following EU regulations:

• Low Voltage Directive 73/23/EEC

• Electromagnetic Compatibility Directive 89/336/EEC

Please be sure to put the contact address/telephone number on this manual before handing it to the customer.

MITSUBISHI ELECTRIC UK

MITSUBISHI ELECTRIC UK, TRAVELLERS LANE, HATFIELD HERTFORDAHIRE, AL10 8XB