MITSUBISHI ELECTRIC

Changes for the Better

Programmable Controllers
MELSEC-Q Series
Insulation Monitoring Module

Continuously Monitoring of Insulation by PLC

- Production Equipment Preventive Maintenance Support -

MELSEC Q Series

QE82LG

Insulation Monitoring Module

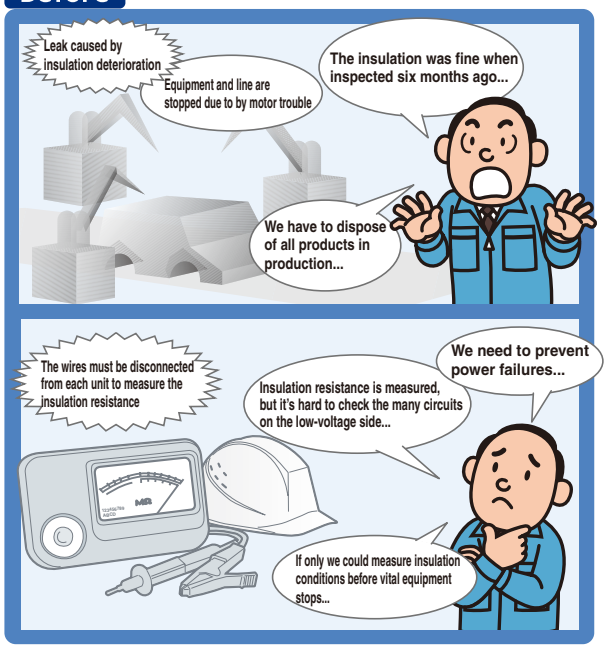
e&ecoFactory

Improving productivity and reducing cost by visualizing energy information

for a greener tomorrow eco Changes

Insulation monitoring by PLC. Insulation deterioration in equipment can be detected without omission.

Before



After

Insulation deterioration is constantly monitored for each unit/load

Insulation Monitoring Module
QE82LG

- Prevention of sudden failure of machines and lines
- Reduction of downtime caused by insulation deterioration
- Cost reduced by ending defective product disposal due to sudden line stoppage
- Reduction of maintenance hours for periodic inspections
- Detection of insulation deterioration (earth leakage) at early stage

Features of MELSEC-Q Series Insulation Monitoring Module

Feature 1 Early Detection of Insulation Deterioration in Production Equipment

- Since this module is connected directly to the PLC in the control panel, leakage current from points close to loads can be measured easily without the need for additional installation space.
- The module can detect troubles caused by earth leakage (ground fault) and monitor the insulation of motor loads in the production equipment. It does not overlook ongoing insulation deterioration.
- Upper-limit monitoring values for alarms can be set in two stages. Insulation deterioration/condition is detected at each stage, enabling countermeasures before equipment stoppage/malfunction.

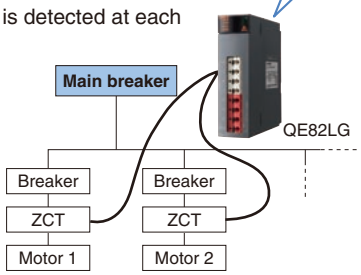
Conventional insulation monitoring equipment

System where leakage occurs can be identified, but it's not possible to detect insulation deterioration in equipment.

Insulation Monitoring Unit

Insulation monitoring pinpoints the problematic equipment, making it possible to recognize deteriorated insulation location early on!

One module can measure the insulation resistance on two circuits



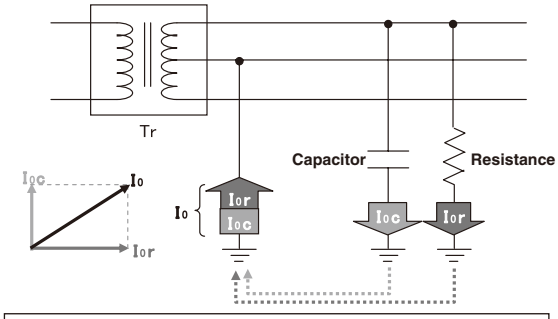
Feature 2 Constant Monitoring for Insulation Deterioration of Equipment Using Ior Method

- The module can measure resistive-component leakage current (Ior). Even on circuits which cannot be monitored for insulation using the conventional Io method, such as inverter circuits on which capacitor component leakage current (Ioc) is large, the module removes the Ioc component and can correctly monitor the leakage current caused by insulation deterioration.
- The module constantly measures the resistive-component leakage current (Ior) even while equipment is running. It detects any sign of insulation deterioration without power interruption.

The Ior method stated in the "Standard Specifications for Public Works Construction (Electric Equipment Work)" edited by the Ministry of Land, Infrastructure, Transport and Tourism is used.

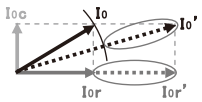
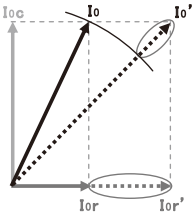
Since leakage current (Io) is affected by the Ioc of the whole equipment, the Ior measurement is effective for insulation deterioration diagnosis

■Method of leakage current measurement (Io and Ior measurements)



Ior : Leakage current caused by insulation deterioration (leakage current from resistive component)
Ioc : Leakage current flowing even in good insulation condition (leakage current from electrostatic capacity)
Io : Leakage current obtained by synthesizing Ior and Ioc (vector synthesis)

- The Ioc fluctuates on equipment with long wiring distance or inverter devices and filters.

When Ioc is low	When Ioc is high
Amount of change = due to insulation deterioration	
	
Amount of change in Io ≒ Amount of change in Ior	Amount of change in Io < Amount of change in Ior

Advantages of Introducing the Insulation Monitoring Module

■Conventional systems

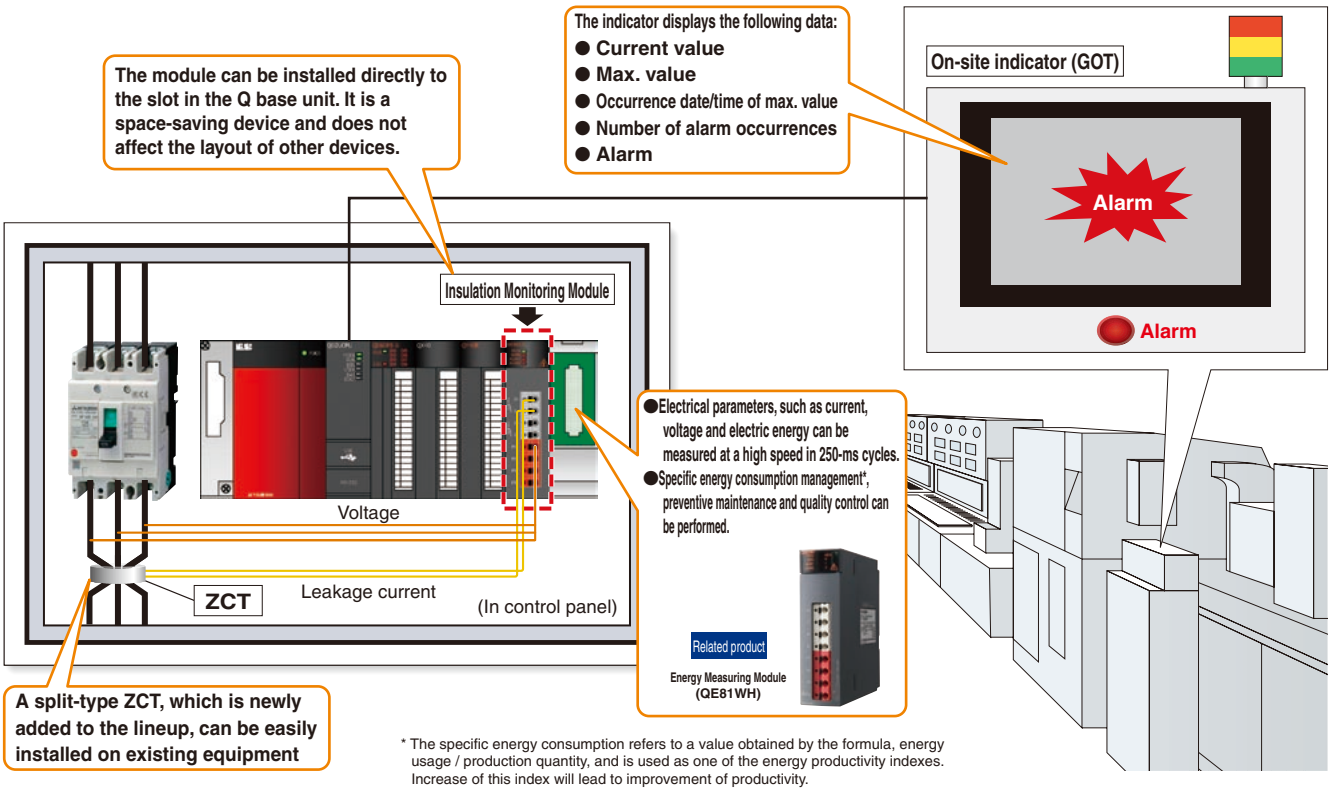
- Measurement of insulation resistance with wiring disconnected during inspection
- Power must be suspended to set the equipment in the non-voltage state
- When leakage current is detected, power supply stops suddenly
- Insulation deterioration cannot be detected easily due to the Ioc component

■Insulation Monitoring Module

Constant monitoring of leakage current during operation

- Reduction of labor for insulation resistance test
- No need to suspend power supply to equipment
- Early detection of insulation deterioration signs
- Improvement of availability and reduction of product loss through measures taken before sudden stop

System Configuration Example



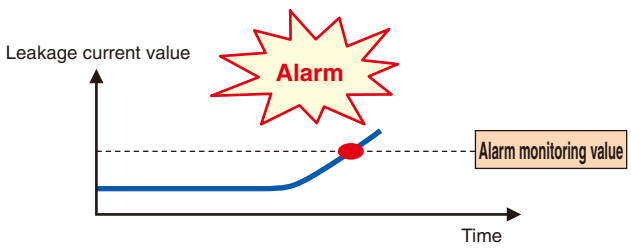
* The specific energy consumption refers to a value obtained by the formula, energy usage / production quantity, and is used as one of the energy productivity indexes. Increase of this index will lead to improvement of productivity.

Insulation Monitoring Module Solution Example

From Corrective to Preventive Maintenance as a Result of Insulation Monitoring

Constant measurement of leakage current (Io or Ior) can prevent sudden trouble and reduce production loss due to equipment stoppage.

Example: Increase in leakage current is detected based on the preset alarm monitoring value, so maintenance of deteriorated insulation is performed.



Monitoring of upper limit alarm (leakage current) (Monitoring of equipment trouble)

↓ Alarm

Equipment maintenance and repair

↓

Reduction of production loss due to equipment stoppage

Applicable Systems

(1) Number of modules which can be installed on applicable units

(a) When installing on a CPU unit

Applicable CPU units						Installable quantity
CPU type	CPU model name					
Basic model QCPU	Q00JCPU					16
	Q00CPU	Q01CPU				24
High-performance model QCPU	Q02CPU	Q02HCPU	Q06HCPU	Q12HCPU	Q25HCPU	64
Process CPU	Q02PHCPU	Q06PHCPU	Q12PHCPU	Q25PHCPU		64
Redundant CPU	Q12PRHCPU	Q25PRHCPU				53
Universal model QCPU	Q00UJCPU					16
	Q00UCPU	Q01UCPU				24
	Q02UCPU					36
	Q03UDCPU Q20UDHCPU Q10UDEHCPU	Q04UDHCPU Q26UDHCPU Q13UDEHCPU	Q06UDHCPU Q03UDECPU Q20UDEHCPU	Q10UDHCPU Q04UDEHCPU Q26UDEHCPU	Q13UDHCPU Q06UDEHCPU	64

(b) When installing on a MELSECNET/H remote I/O station

Applicable network units	Installable quantity*1
QJ72LP25-25 QJ72LP25G QJ72BR15	64

*1: Limited within the number of I/O points on the network units.

(2) Applicable base units

QE82LG can be installed in any I/O slot (*2) of the basic base unit or an extension base unit.

*2: In the case of a redundant CPU, the module can be installed only on an extension base unit. It cannot be installed on the basic base unit. The number of installed modules is limited within the number of I/O points on the CPU unit.

(3) Application to multi-CPU systems

QE82LG is applicable to multi-CPU systems. When using QE82LG on a multi-CPU system, first please refer to the "QCPU User's Manual (Multi-CPU System)."

(4) Applicable software packages

The software packages compatible with QE82LG are shown below.

Product name	Model name	Remarks
GX Developer	SWnD5C-GPPW	MELSEC PLC programming software. The "n" in the model name is 4 or higher.
GX Works2	SWnDNC-GXW2	iQ Platform compatible PLC engineering software. The "n" in the model name is 1 or higher.

General Specifications & Measurement Items

(1) General specifications

Item			Specification
Phase wire system			Single-phase 2-wire, single-phase 3-wire and 3-phase 3-wire systems common use
Instrument rating	Voltage circuit *1 *2	Single-phase 2-wire	110VAC and 220VAC common use
		3-phase 3-wire	
		Single-phase 3-wire	110VAC (between wires 1-2, between wires 2-3), 220VAC (between wires 1-3)
	Leakage current circuit		AC1A (ZCT is used. The current is the primary current of ZCT.)
	Frequency		50-60Hz (automatic frequency selection)
Main unit tolerances (excluding ZCT)			Leakage current ±2.5% (10% to 100% of rating) Resistive-component leakage current ±2.5mA (≤10% of rating) (The resistive-component leakage current does not include electrostatic capacity.)
Number of measurement circuits			2 circuits*3
Data refresh period			Leakage current : 2 sec or less Resistive-component leakage current : 10 sec or less
Response time			Leakage current : 4 sec or less Resistive-component leakage current : 30 sec or less
Power outage compensation			Backup to nonvolatile memory (Saved items: Setting values, max. value and its occurrence date/time, alarm occurrence times)
Number of occupied I/O points			16 points (I/O assignment: intelligent 16 points)

(2) Measurement items

Measurement items	
	Details
Leakage current ($I_{\Delta n}$)	Current value
	Max. value
	Occurrence date/time of max. value
	Number of first stage alarm occurrences
	Number of second stage alarm occurrences
Resistive-component leakage current ($I_{\Delta r}$)	Current value
	Max. value
	Occurrence date/time of max. value
	Number of first stage alarm occurrences
	Number of second stage alarm occurrences

*1: The module can be connected directly to 110V and 220V. To connect to 440V, an external voltage transformer (VT) is necessary. Leakage current ($I_{\Delta n}$, $I_{\Delta r}$) cannot be measured without voltage input.

*2: $I_{\Delta r}$ can be measured on a single-phase 3-wire or 3-phase 3-wire delta circuit. On special grounded circuits, such as 3-phase 3-wire star circuits, high-resistance grounded circuits and capacitor grounded circuits, only $I_{\Delta n}$ can be measured.

*3: Leakage current ($I_{\Delta n}$ and $I_{\Delta r}$) of CH1 and CH2 can be measured only on circuits when the voltage input was on the same system.

(3) Specifications for Zero-phase Current Transformer (ZCT)

■Split-type Zero-phase Current Transformer

Item	Specification				
Model name	CZ-22S	CZ-30S	CZ-55S	CZ-77S	CZ-112S
Hole diameter [mm]	22	30	55	77	112
Allowable current	See the following table "Penetrable max. wire size and allowable current of ZCT"				
Mass [kg]	0.5	0.6	1.8	2.8	6.0
Rated short-time current	50kA (peak value is 100kA)				

■Through-type Zero-phase Current Transformer

Item	Specification					
Model name	ZT15B	ZT30B	ZT40B	ZT60B	ZT80B	ZT100B
Hole diameter [mm]	15	30	40	60	80	100
Allowable current	See the following table "Penetrable max. wire size and allowable current of ZCT"					
Mass [kg]	0.2	0.4	0.6	2.0	2.6	3.3
Rated short-time current	50kA (peak value is 100kA)					

■Zero-phase Current Transformer with primary conductor

Item	Specification		
Model name	ZTA600A	ZTA1200A	ZTA2000A
Allowable current [A]	600	1200	2000
Mass [kg]	6.5	11	27
Number of poles	3		
Rated voltage	AC600V		
Rated short-time current	100kA (peak value)		

■Penetrable max. wire size and allowable current of ZCT

Wiring method			Penetrable max. wire size (mm²) (allowable current (A))										
			Split-type					Through-type					
Phase wire system	No. of wires	Wire type	CZ-22S	CZ-30S	CZ-55S	CZ-77S	CZ-112S	ZT15B	ZT30B	ZT40B	ZT60B	ZT80B	ZT100B
Single-phase 2-wire	2	600-V vinyl wire (IV wire)	22 (115)	60 (217)	250 (556)	500 (842)	–	14 (88)	60 (217)	150 (395)	325 (650)	600 (992)	800 (1185)
		600-V cross-linked polyethylene insulated wire with single core (CV wire)	22 (130)	38 (190)	200 (545)	500 (920)	1000 (1465)	2 (33)	38 (190)	60 (260)	250 (655)	400 (870)	600 (1140)
Single-phase 3-wire	3	600-V vinyl wire (IV wire)	22 (115)	38 (162)	200 (496)	500 (842)	–	8 (61)	38 (162)	100 (298)	250 (556)	500 (842)	725 (1095)
3-phase 3-wire		600-V cross-linked polyethylene insulated wire with single core (CV wire)	14 (100)	22 (135)	150 (455)	325 (760)	800 (1285)	2 (33)	22 (135)	60 (260)	200 (560)	325 (760)	600 (1140)

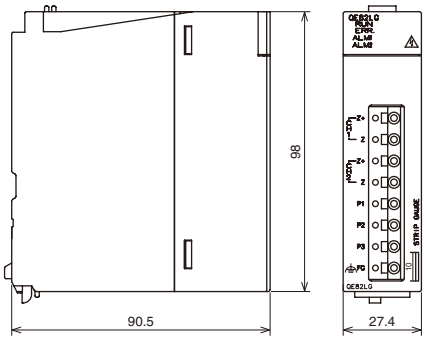
Remarks (1) Note that the wire thickness may vary slightly depending on the manufacturer. (2) The IV wire applies to cases where insulators are used. (3) The CV wire applies to cases of installation in a covered conduit in air. (Cables of 600mm² or more have various structures. The values are shown for reference.)

Outline Dimension Drawings

Item name	Model name	Outline dimension dwg.
MELSEC-Q Series Insulation Monitoring Module	QE82LG	①
Split-type Zero-phase Current Transformer	CZ-22S	②
	CZ-30S	
	CZ-55S	
	CZ-77S	
	CZ-112S	
Through-type Zero-phase Current Transformer	ZT15B	③
	ZT30B	
	ZT40B	
	ZT60B	④
	ZT80B	
	ZT100B	
Zero-phase Current Transformer with primary conductor	ZTA600A	⑤
	ZTA1200A	⑥
	ZTA2000A	⑦

Unit : mm

①QE82LG

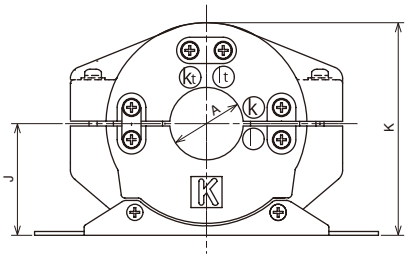


Unit : mm

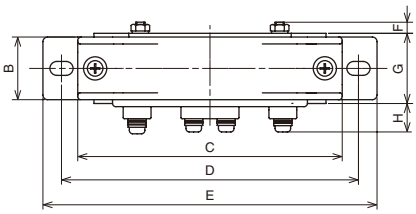
②CZ-22S/30S/55S/77S/112S

■Dimensions of Split-type Zero-phase Current Transformer

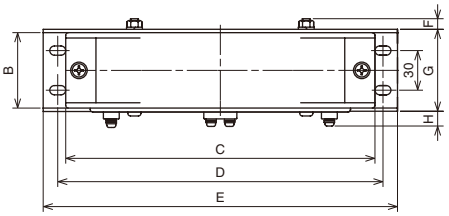
	CZ-22S	CZ-30S	CZ-55S	CZ-77S	CZ-112S
A	22	30	55	77	112
B	27	27	32	41	57
C	100	114	148	198	234
D	112	130	160	210	246
E	128	144	177	232	268
F	5	5	7	10	8
G	30	30	36	45	62
H	12	12	12	12	12
J	41	47	66	90	109
K	77	89	124	171	207



(CZ-22S/30S/55S/77S)

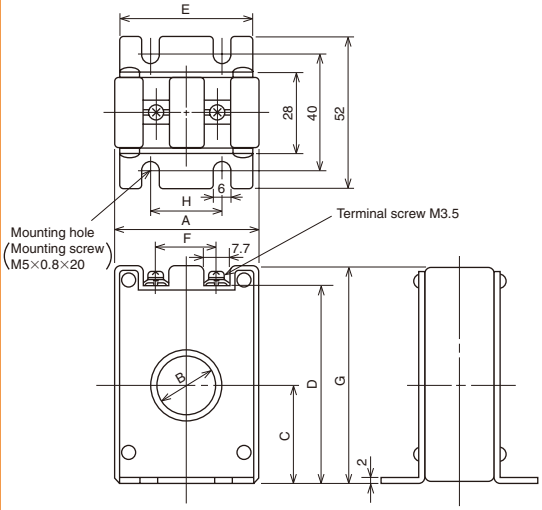


(CZ-112S)



Unit : mm

③ZT15B/30B/40B



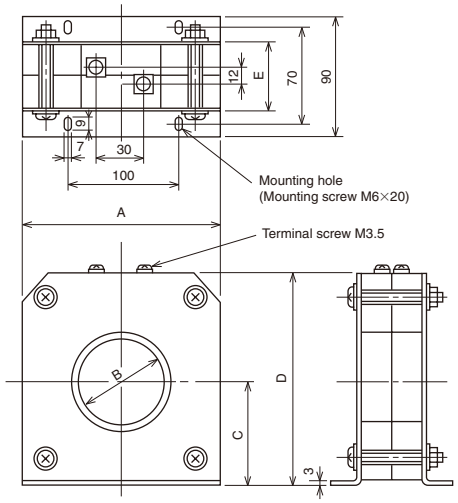
■Dimensions of ZT15B, 30B and 40B

	ZT15B	ZT30B	ZT40B
A	48	68	85
B	15	30	40
C	29	37	43
D	62	82	92
E	46	66	81
F	15	30	40
G	70	90	100
H	25	50	50

■Dimensions of ZT60B, 80B and 100B

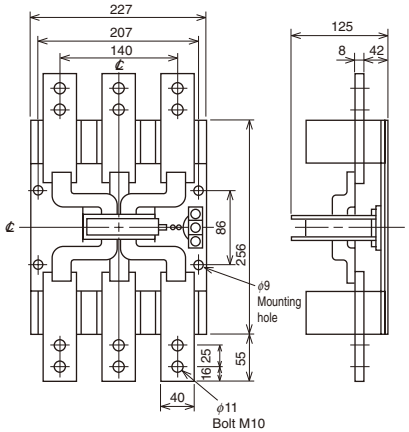
	ZT60B	ZT80B	ZT100B
A	140	160	185
B	60	80	100
C	73	82	93
D	150	169	190
E	46	48	50

④ZT60B/80B/100B

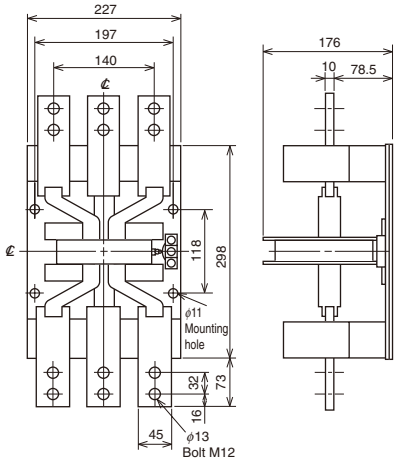


Unit : mm

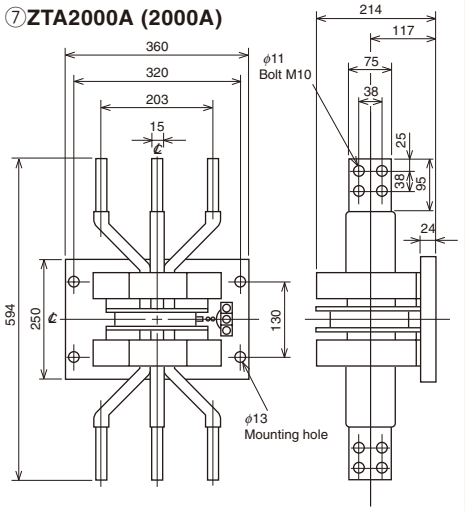
⑤ZTA600A (600A)



⑥ZTA1200A (1200A)

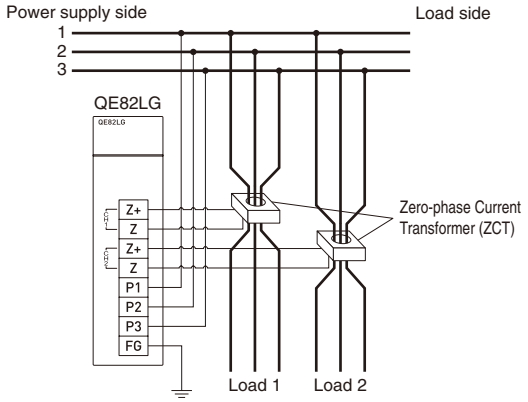


⑦ZTA2000A (2000A)

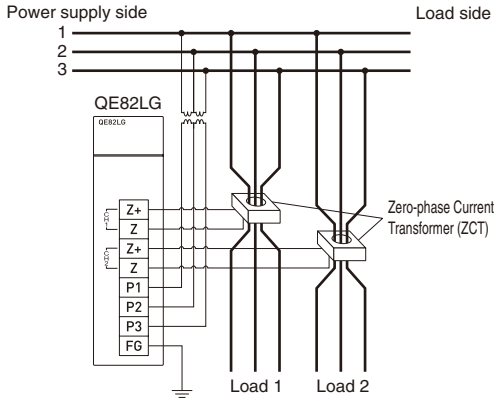


Connection Diagrams

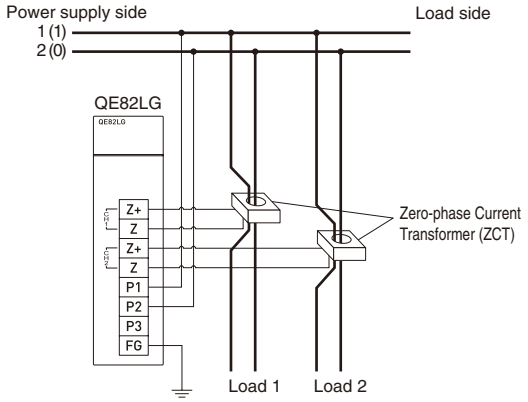
For 3-phase 3-wire type



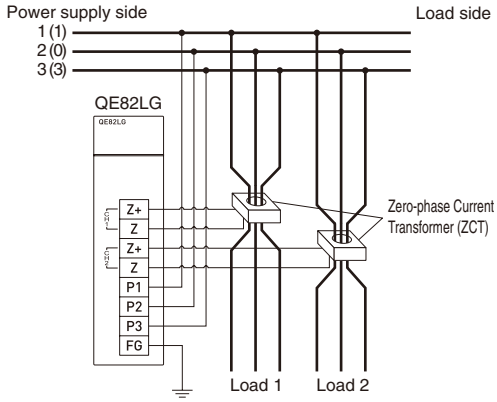
For 3-phase 3-wire type (with voltage transformer)



For single-phase 2-wire type



For single-phase 3-wire type

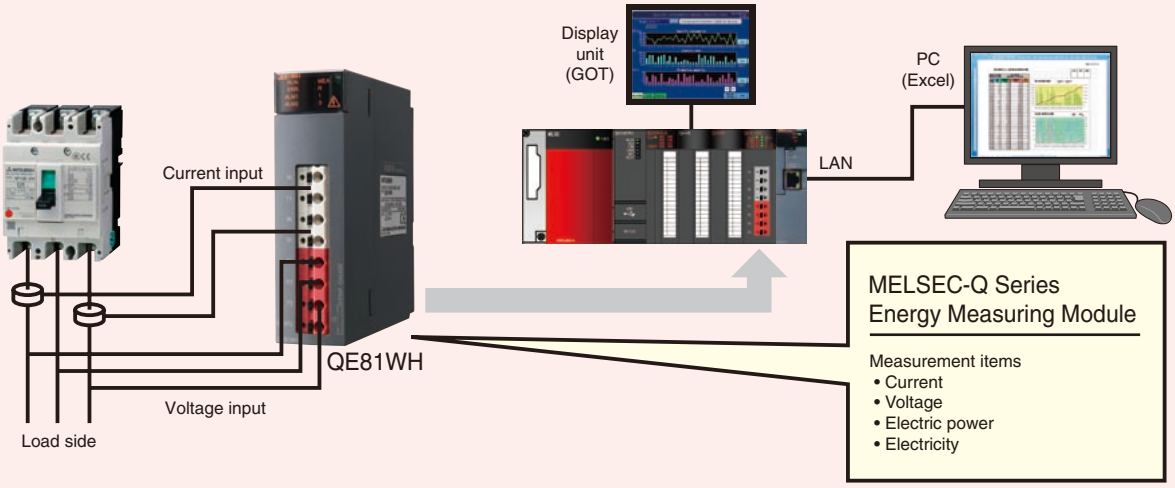


* Cables between QE82LG and Zero-phase Current Transformer (ZCT) are to be prepared by the customer. * In all cases, make sure to connect FG to ground.

Related Models

Industry's First*! PLC-slot-mounted-type Energy Measuring Module

*As of September 2010



Features

- By mounting the Energy Measuring Module onto the open slot of the base unit, a measuring instrument can be added without changing the layout in the control panel.
- The communication unit eliminates the need for communication cables and creation of a communications program, lowering costs by reducing wire volume and engineering workload.
- Allows for easy specific energy consumption management by matching the "production information" of the CPU unit with the "energy information" of the energy measuring module.
  Since measured data is automatically collected in a buffer memory at 250ms, detailed specific energy consumption management is also available.
- Allows for easy graphic display of specific energy consumption with a graphic operation terminal (GOT) installed on the control panel at the manufacturing site.
  Combination with the "high-speed data logger module (QD81DL96)" allows specific energy consumption analysis to be performed easily using personal computer.

MEMO

Mitsubishi Electric Programmable Controllers Insulation Monitoring Module

Precautions Before Use

This catalogue explains the special features of the MELSEC Q Series programmable controllers. It does not contain other information regarding restrictions, usage or unit combinations. Please be certain to read the relevant product user's manual before using any system or machine. Mitsubishi Electric Corporation shall not be liable, to the customer or equipment user, for:

1) Any damege found not to be attributable to a Mitsubishi Electric product.
2) The loss of opportunity or profits for the customer or user caused by any fault in a Mitsubishi Electric product.
3) Damege, secondary damege or accident compensation resulting from special factors regardless of whether or not such factors could be predicted by Mitsubishi Electric.
4) Damege to products of other companies and/or guarantees relating to other services.

⚠ For Safe Use

- To ensure the proper use of products presened in this catalogue, please be certain to read the relevant user's manual before use.
- The products presented in this catalogue are manufactured as general-purpose parts for use in general industries. They are NOT designed or manufactured for use with devices or systems that are utilized under conditions that are life-threatening.
- Please consult with a Mitsubishi Electric representative when considering the application of products presented in this catalogue with machinery or systems designed for specialized use such as nuclear power, electrical power, aerospace/outer space, medical, or passenger transportation vehicles.
- The products have been manufactured under strict quality control. However, when installing the products where major accidents or losses could occur if the products fail, install appropriate backup or fail-safe functions in the system.

Country/Region	Sales office	Tel/Fax
USA	Mitsubishi Electric Automation Inc. 500 Corporate Woods Parkway Vernon Hills, IL 60061, USA	Tel : +1-847-478-2100 Fax : +1-847-478-0327
Brazil	MELCO-TEC Rep. Com.e Assessoria Tecnica Ltda. Av Paulista, 1439-Cj. 72 Cerqueira Cesar CEP 01311-200, Sao Paulo, SP, CEP:01311-200, Brazil	Tel : +55-11-3146-2200 Fax : +55-11-3146-2217
Germany	Mitsubishi Electric Europe B.V. German Branch Gothaer Strasse 8 D-40880 Ratingen, Germany	Tel : +49-2102-486-0 Fax : +49-2102-486-1120
UK	Mitsubishi Electric Europe B.V. UK Branch Travellers Lane, Hatfield, Hertfordshire AL10 8XB, UK	Tel : +44-1707-276100 Fax : +44-1707-278992
Italy	Mitsubishi Electric Europe B.V. Italy Branch Viale Colleoni 7-20041 Agrate Brianza (Milano), Italy	Tel : +39-039-60531 Fax : +39-039-6053312
Spain	Mitsubishi Electric Europe B.V. Spanish Branch Carretera de Rubi 76-80 E-08190 Sant Cugat del Valles (Barcelona), Spain	Tel : +34-93-565-3131 Fax : +34-93-589-1579
France	Mitsubishi Electric Europe B.V. French Branch 25, Boulevard des Bouvets, F-92741 Nanterre Cedex, France	Tel : +33-1-5568-5568 Fax : +33-1-5568-5757
Czech Republic	Mitsubishi Electric Europe B.V. Czech Branch Avenir Business Park, Radlická 714/113a CZ-158 00 Praha 5	Tel : +420-251-551-470 Fax : +420-251-551-471
Poland	Mitsubishi Electric Europe B.V. Polish Branch ul. Krakowska 50 32-083 Balice, Poland	Tel : +48-12-630-47-00 Fax : +48-12-630-47-01
Russia	Mitsubishi Electric Europe B.V. Moscow Office 52/3, Kosmodamianskaya nab., 115054, Moscow, Russia	Tel : +7-812-633-3497 Fax : +7-812-633-3499
South Africa	Circuit Breaker Industries Ltd. Private Bag 2016, ZA-1600 Isando, South Africa	Tel : +27-11-928-2000 Fax : +27-11-392-2354
China	Mitsubishi Electric Automation (China) Ltd. 17/F ChuangXing Financial Center, No. 288 West Nanjing Road, Shanghai 200003 China	Tel : +86-21-2322-3030 Fax : +86-21-2322-3000
Taiwan	Setsuyo Enterprise Co., Ltd. 6F., No.105 Wu-Kung 3rd.Rd, Wu-Ku Hsiang, Taipei Hsine 248, Taiwan	Tel : +886-2-2299-2499 Fax : +886-2-2299-2509
Korea	Mitsubishi Electric Automation Korea Co., Ltd. 1480-6, Gayang-dong, Gangseo-ku Seoul 157-200, Korea	Tel : +82-2-3660-9552 Fax : +82-2-3664-8372
Singapore	Mitsubishi Electric Asia Pte, Ltd. 307 Alexandra Road #05-01/02, Mitsubishi Electric Building Singapore 159943	Tel : +65-6470-2480 Fax : +65-6476-7439
Thailand	Mitsubishi Electric Automation (Thailand) Co., Ltd. Bang-Chan Industrial Estate No.111 Soi Serithai 54, T.Kannayao, A.Kannayao, Bangkok 10230 Thailand	Tel : +66-2-517-1326 Fax : +66-2-517-1328
Indonesia	P.T. Autoteknindo Sumber Makmur Muara Karang Selatan Block A/Utara No.1 Kav. No.11 Kawasan Industri/Pergudangan Jakarta-Utara 14440, P.O Box 5045 Jakarta 11050, Indonesia	Tel : +62-21-663-0833 Fax : +62-21-663-0832
India	Messung Systems Pvt., Ltd. Electronic Sadan NO:III Unit No15, M.I.D.C Bhosari, Pune-411026, India	Tel : +91-20-2712-3130 Fax : +91-20-2712-8108
Australia	Mitsubishi Electric Australia Pty. Ltd. 348 Victoria Road, Rydalmere, N.S.W. 2116, Australia	Tel : +61-2-9684-7777 Fax : +61-2-9684-7245

eco Changes **for a greener tomorrow**

Eco Changes is the Mitsubishi Electric Group's environmental statement, and expresses the Group's stance on environmental management. Through a wide range of businesses, we are helping contribute to the realization of a sustainable society.

MITSUBISHI ELECTRIC CORPORATION
HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN

Y-0709 1101 (MDOC)

New publication effective Jan. 2011.
Specifications are subject to change without notice.