

Motion Controller Q series for the iQ Platform
with Built-in Safety Signal Monitor Function

MODEL
Q173DCPU-S1/Q172DCPU-S1 Safety Signal Module Q173DSXY

March 2011

New Product Release

SV1103-2E

A simple solution for monitoring safety signals

Mutual safety signal monitoring between the PLC and the motion CPUs

The motion controller with built-in safety signal monitor function along with a safety signal module will consistently check for errors and perform a forced OFF if an error is detected.



Addressing urgent issues of factory automation safety.

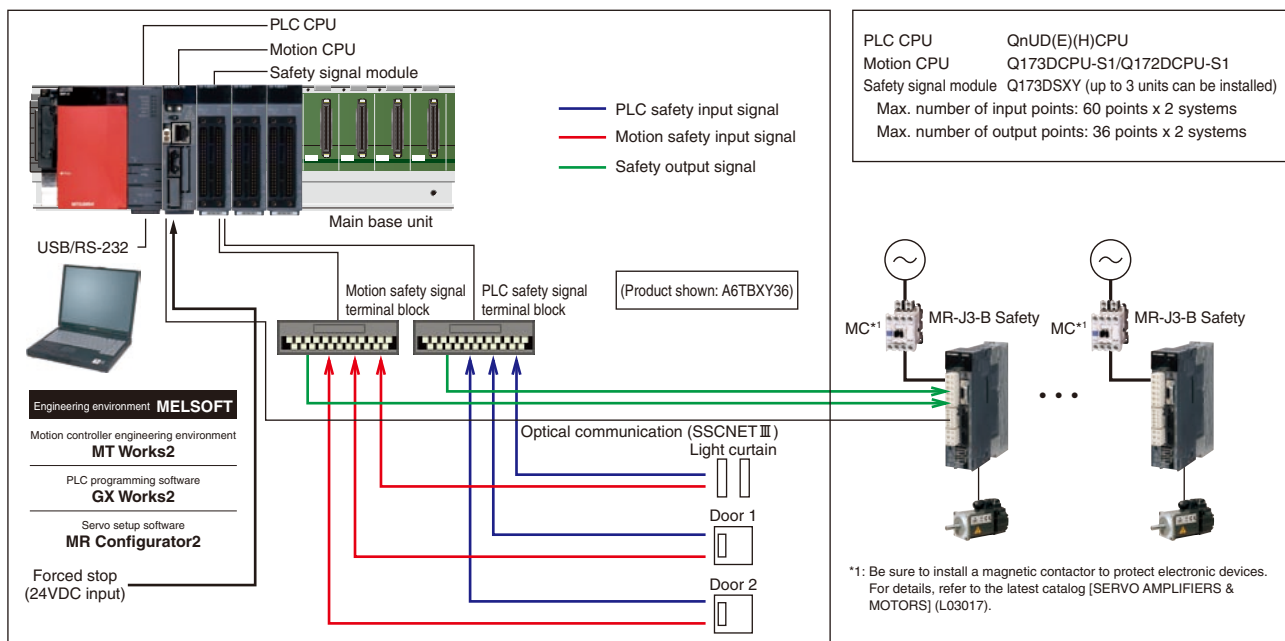
- Certified under the "EN ISO 13849-1: 2008 Category 3 PLd" European safety standard.
- 'Safety signal monitor function' allowing the PLC and motion CPUs to mutually monitor each other's status.
- "Dual safety circuit" enables safety signal consistency checks for 2 systems, PLC and motion controller.
- Safety function integrated MR-J3-B Safety series servo amplifiers are available. Support of the STO (Safe Torque Off) function ensures an even higher level of safety

Motion control with a built-in safety signal monitor function...Simplifies the safety system building process.

- Certified under the "EN ISO 13849-1: 2008 Category 3 PLD" European safety standard.
- Features a built-in "safety signal monitor function" that allows the PLC CPU and motion CPU to mutually monitor each other's safety signal status.
- Supports the STO (Safe Torque Off) function of drive safety compatible MR-J3-B Safety servo amplifiers, enabling an even higher level of system safety.

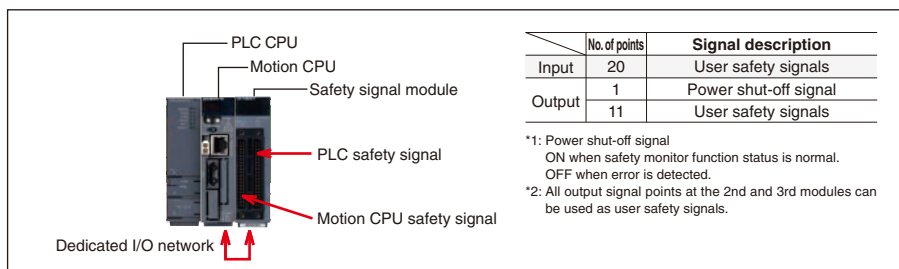


System Configuration



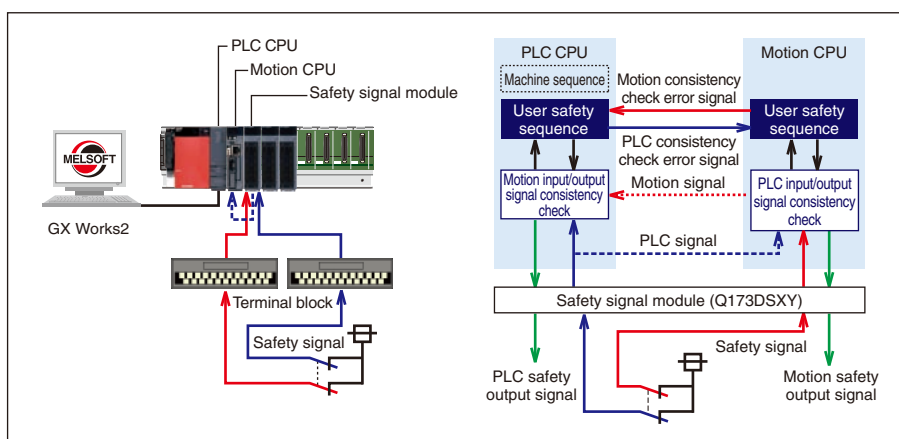
■ Safety signal module (Q173DSXY)

20 input points and 12 output points are connected in 2 systems. Up to 3 safety signal modules can be installed.



■ Safety input/output signal consistency check (Dual safety circuit)

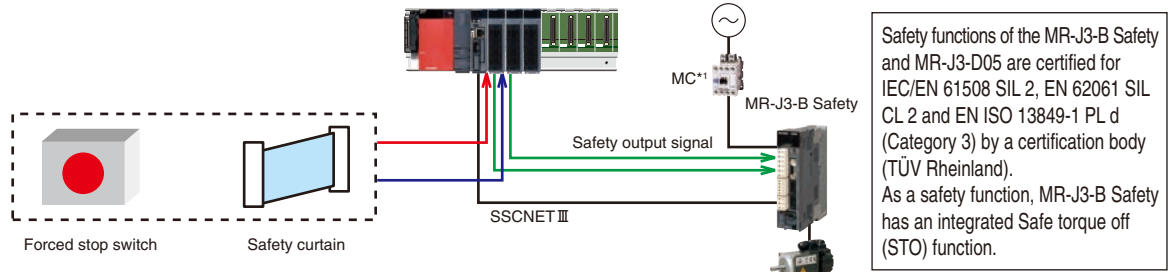
Checks to verify the consistency of input/output safety signals for the 2 systems, PLC and motion CPU. The user safety sequence is executed by the 2 CPUs, PLC and motion CPU. Drive power is shut off if an error is detected during the safety signal consistency check.



Motion controller with built-in safety signal monitor function examples

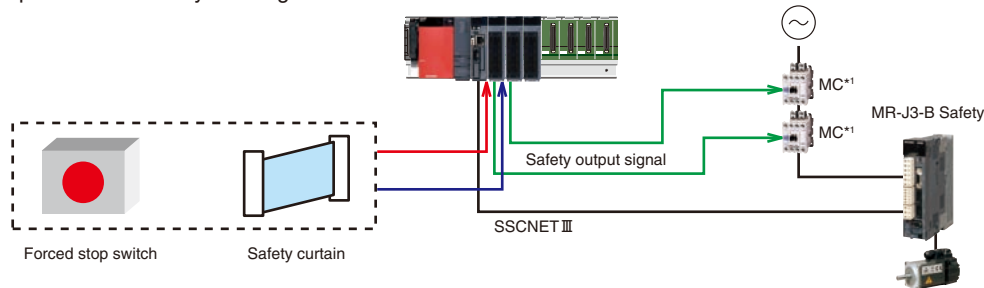
■ Example when using MR-J3-B Safety Amplifiers

The control logic for the safety input and safety output signals is specified by the user's safety sequence program. When using the drive safety compatible servo amplifier, STO can be achieved without the use of multiple magnetic contactors. In addition, using the timer in the user's safety sequence program achieves SS1 (Safe STOP 1).



■ Example when using the MR-J3-B Amplifiers

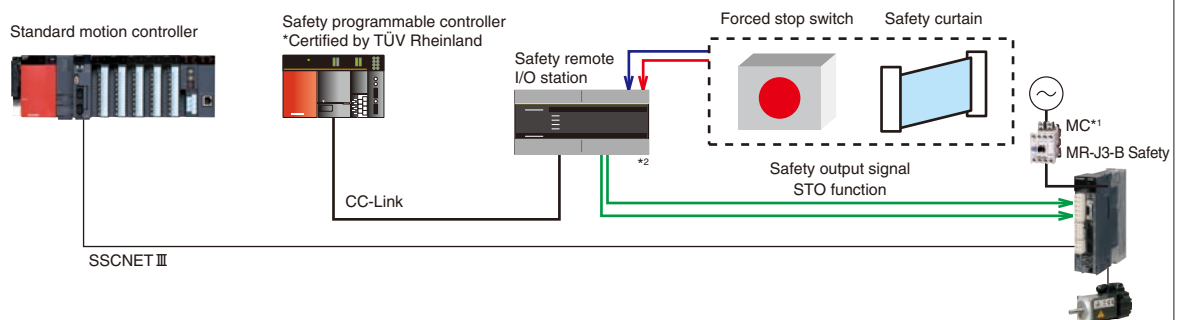
A safety signal consistency check is performed by using the safety signal module (Q173DSXY), if an error is detected, the servo amplifier power is shut off by the magnetic contactors.



Standard motion controller examples

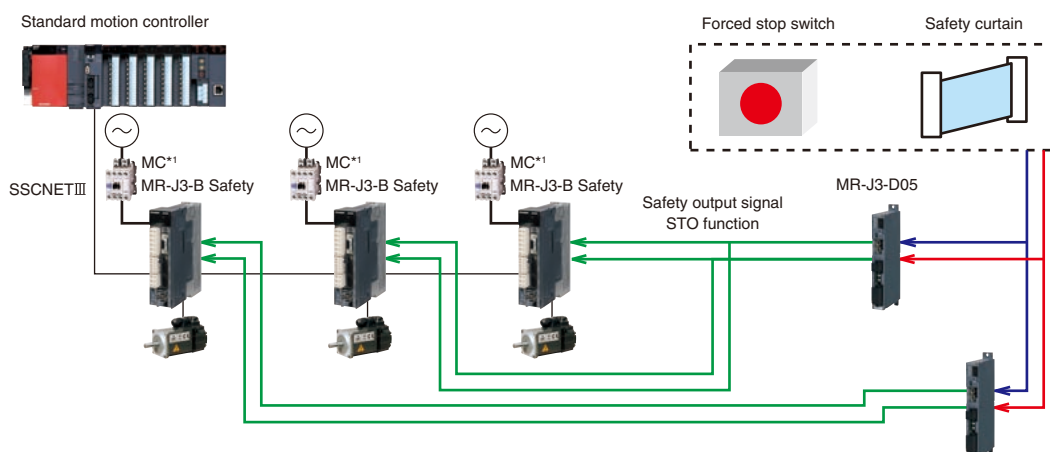
■ Example when using MR-J3-B Safety Amplifiers

A separate Safety programmable controller is required in order to perform safety control.



■ Example when using MR-J3-B Safety Amplifiers and MR-J3-D05 module

The number of MR-J3-D05 modules must be the same as the number of axes where safety control is required.



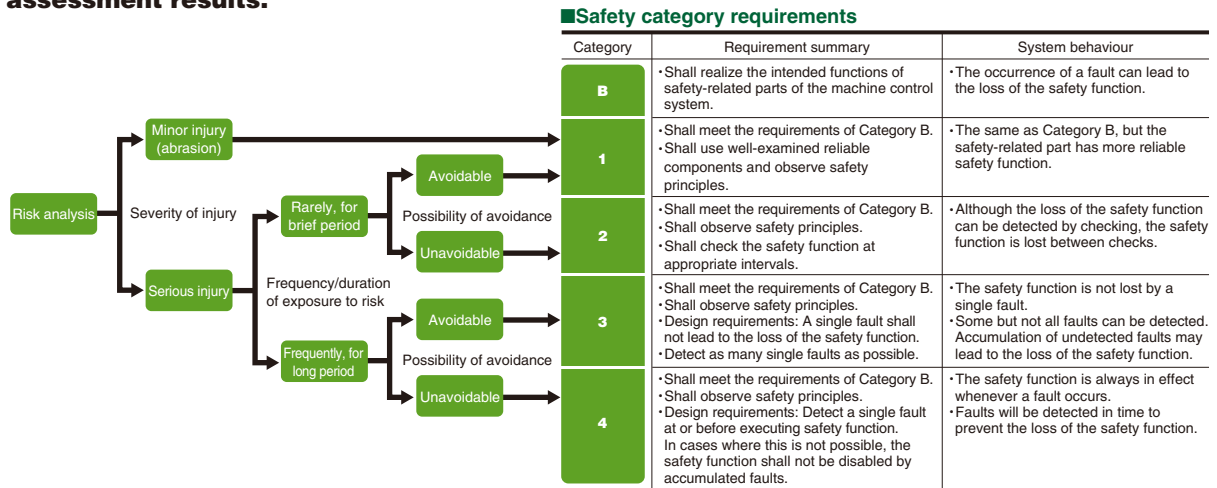
*1: Be sure to install magnetic contactors to protect electronic devices. For details, refer to the latest servo amplifier and motor catalog.
*2: An input dark test function (pulse check).



Safety Category

ISO13849-1 Safety categories

"Safety categories" are indicators used to determine specific safety measures based on risk assessment results.

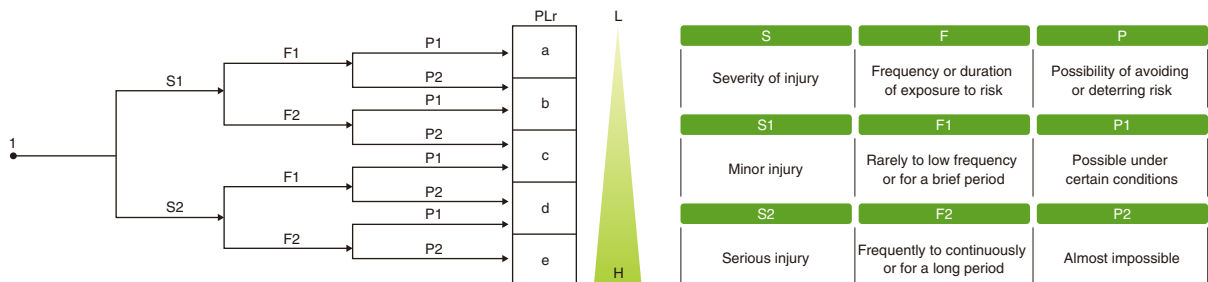


ISO13849-1:2006 Performance level

Performance levels for safety-related parts of control systems have been revised in ISO13849-1:2006. Based on the original safety categories, frequency of a dangerous failure occurrence (the safety function does not work when needed), rate of a failure detection by diagnostics, etc. were added to evaluate comprehensively. The evaluation result is classified into five levels from "a" to "e" by the performance level (PL).

● Like the safety categories, the risk is evaluated from a perspective of "S: Severity of injury," "F: Frequency or duration of exposure to risk," and "P: Possibility of avoidance."

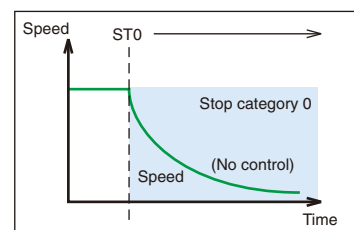
■ Risk graph in ISO13849-1:2006 and PLr for safety function



IEC 61800-5-2 Safety Standard

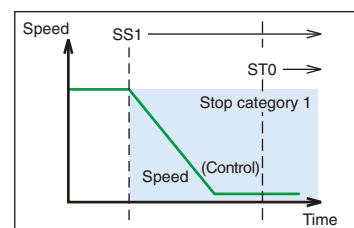
(1) Safe Torque Off (STO) function

Electronically shuts off the motor's drive energy (secondary-side output shut-off) at the drive unit in accordance with signal inputs from an external device.



(2) Safe STOP 1 (SS1) function

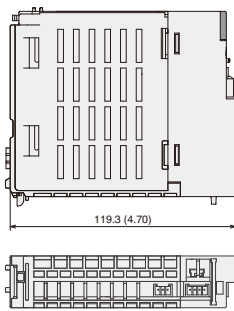
Following a controlled STOP, this function executes an STO (Safe Torque OFF) after a specified time period elapses.



Item	Specification	
Input signals	Number of input points	32 points x 2 systems (32 PLC CPU control points + 32 motion CPU control points; 20 safety input points x 2 systems; 12 feedback input points for outputs x 2 systems)
	Input isolation method	Photocoupler
	Rated input voltage	24VDC (+10 / -10%), minus common type
	Rated input current	Approx. 4mA
	Input resistance	Approx. 8.2Ω
	Input ON voltage / ON current	20VDC or more/3mA or more
	Input OFF voltage / OFF current	5VDC or less/1.7mA or less
	Input response time	PLC CPU control I/O: 10ms (digital filter's default value) Motion CPU control I/O: 15ms (CR filter)
	Input common format	32 points/common (separate commons for the PLC CPU control I/O and the motion CPU control I/O)
	Input operation indicator LED	32 points (indication for PLC CPU control portion)
Output signals	Number of output points	12 points x 2 systems (12 PLC CPU control points + 12 motion CPU control points)
	Output isolation format	Photocoupler
	Rated output voltage	24VDC (+20 / -15%), source type
	Max. load current	(0.1A x 8 points, 0.2A x 4 points) x 2 systems, common current: each connector 1.6A or less
	Max. inrush current	0.7A 10ms or less (1.4A 10ms or less for 0.2A output pin)
	Response time	1ms or less
Output common format	12 points/common (separate commons for the PLC CPU control I/O and the motion CPU control I/O)	
Output operation indicator LED	Shared with inputs	
Number of I/O occupying points	32 points	
Communication between PLC CPUs	Parallel bus communication (via main base unit)	
Communication between motion CPUs	Serial communication (RS-485), H500 cable used	
Terminal block converter module	① FA-LTB40P (Mitsubishi Electric Engineering brand) ② A6TBXY36	
Connection cable	① FA-CBL□□FMV-M (provided with FA-LTB40P as a set) ② AC50TB (provided with A6TBXY36 as a set)	
Number of installed modules	Up to 3 modules (max. number of input points: 60 points x 2 systems; max. number of output points: 36 points x 2 systems)	
5V current consumption	200mA (TYP. all points ON)	

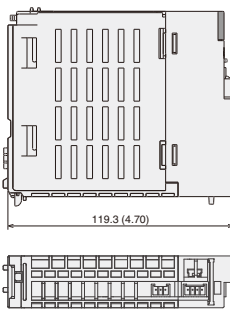
Exterior Dimensions

Q173DCPU-S1



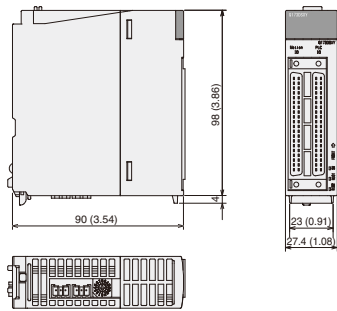
[Unit: mm (inch)]

Q172DCPU-S1



[Unit: mm (inch)]

Q173DSXY



[Unit: mm (inch)]

Software List

■ Operating system software

Application	Model name		Applicable version
	Q173DCPU (-S1)	Q172DCPU (-S1)	
Conveyor assembly use SV13*1	SW8DNC-SV13QB	SW8DNC-SV13QD	Ver. 00N or later
Automatic machinery use SV22*1	SW8DNC-SV22QA	SW8DNC-SV22QC	Ver. 00N or later

*1: The operating system software is the same as that for the Q173DCPU / Q172DCPU.

■ Engineering environment

Application	Model name	Applicable version
MT Works2	SW1DNC-MTW2-E	Ver. 1.02C or later
MR Configurator2*1	SW1DNC-MRC2-E	Ver. 1.00A or later

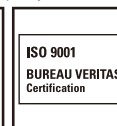
*1: If you would like to use MR-configurator2 on a personal computer equipped with GX Works2 and MT Works2, please contact your nearest Mitsubishi sales representative.

Equipment

Application	Model name	Remarks	Standards
Motion CPU module*1	Q173DCPU-S1	Up to 32 axes control, Attachments [battery holder unit and battery (Q6BAT)]	CE,UL
	Q172DCPU-S1	Up to 8 axes control, Attachments [battery holder unit and battery (Q6BAT)]	CE,UL
Safety signal module	Q173DSXY	Attachment [RIO cable (Q173DSXYCBL01M)]	CE,UL
RIO cable	Q173DSXYCBL01M	Q17□DCPU-S1⇔Q173DSXY	0.1m -
	Q173DSXYCBL05M	Q173DSXY⇔Q173DSXY	0.5m -

*1: Be sure to use the cable for forced stop input (sold separately). The forced stop cannot be released without using it.

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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
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
China	Mitsubishi Electric Automaiton (China) Ltd. 17/F Chong Hing Finance 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 Bulding 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
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

MITSUBISHI ELECTRIC CORPORATION

HEAD OFFICE: TOKYO BUILDING, 2-7-3, MARUNOUCHI, CHIYODA-KU, TOKYO 100-8310, JAPAN
NAGOYA WORKS: 1-14, YADA-MINAMI 5, HIGASHI-KU, NAGOYA, JAPAN