MITSUBISHI

WS0-CPU000200/WS0-CPU130202

Safety Controller CPU Module User's Manual (Hardware)

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MODEL	WS-CPU-U-HW
MODEL CODE	13J200
IB(NA)-0800443-B(1002)MEE	

Precautions regarding warranty and specifications

MELSEC-WS series products are jointly developed and manufactured by Mitsubishi and SICK AG, Industrial Safety Systems, in Germany. Note that there are some precautions regarding warranty and specifications of MELSEC-WS series products.

<Warranty>

- The gratis warranty term of the product shall be for one (1) year after the date of delivery or for eighteen (18) months after manufacturing, whichever is less.
- The onerous repair term after discontinuation of production shall be for four (4) years.
- Mitsubishi shall mainly replace the product that needs a repair.
- It may take some time to respond to the problem or repair the product depending on the condition and timing.

<Specifications>

- General specifications of the products differ.

	MELSEC-WS	MELSEC-Q, MELSEC-QS
Operating ambient temperature	-25 to 55°C*1	0 to 55°C
Operating ambient humidity	10 to 95%RH	5 to 95%RH
Storage ambient temperature	-25 to 70°C	-25 to 75°C
Storage ambient humidity	10 to 95%RH	5 to 95%RH

*1: When the WS0-GCC100202 is included in the system, operating ambient temperature will be 0 to 55°C.

- EMC standards that are applicable to the products differ.

	MELSEC-WS	MELSEC-Q, MELSEC-QS
EMC standards	EN61000-6-2, EN55011	EN61131-2

1 About this document

This document is the original mounting instructions.

1.1 Documentations for the MELSEC-WS system

These manuals describe the mounting of the CPU module of a MELSEC-WS safety control system.

Mounting of the MELSEC-WS Ethernet Interface module WS0-GETH, extension modules WS0-XTIO and WS0-XTDI and the relay output modules WS0-4RO is described in separate manuals.

The installation, configuration and commissioning of the MELSEC-WS safety control system are described in the "Safety Controller User's Manual" and "Safety Controller Setting and Monitoring Tool Operating Manual".

Title	Number
Safety Controller User's Manual	WS-CPU-U-E (13JZ32)
Safety Controller Ethernet Interface User's Manual	WS-ET-U-E (13JZ33)
Safety Controller CC-Link Interface User's Manual	WS-CC-U-E (13JZ45)
Safety Controller Setting and Monitoring Tool Operating Manual	SW1DNNWS0ADR-B-O-E (13JU67)

In addition mounting protective devices also requires specific technical skills which are not detailed in this documentation.

1.2 Function of this document

These manuals instruct *the technical staff of the machine manufacturer* and/or *of the machine operator* on the safe operating of the CPU module of the MELSEC-WS modular safety control system.

These manuals do *not* provide manuals for operating the machine in which the safety control system is, or will be, integrated. Information of this kind will be found in the operating manuals for the machine.

2 On safety

This chapter deals with your own safety and the safety of the equipment operators.

- Please read this chapter carefully before beginning with the mounting work.

2.1 Safety persons

The MELSEC-WS modular safety control system may only be mounted by safety persons.

Safety persons are defined as persons who …

- have undergone the appropriate technical training **and**
- who have been instructed by the responsible machine operator in the operation of the machine and the current valid safety guidelines **and**
- have access to the operating manuals of the MELSEC-WS and have read and familiarised themselves with them **and**
- have access to the operating manuals for the protective devices (e.g. light curtain) connected to the safety control system and have read and familiarised themselves with them.

2.2 Applications of the device

The MELSEC-WS modular safety control system is a configurable control system for safety applications. It can be used

- in accordance with EN 61508 to SIL 3
- in accordance with EN 62061 to SIL CL 3
- in accordance with EN ISO 13849-1:2006 up to Performance Level e
- in accordance with EN 954-1 up to Category 4

The degree of safety actually attained depends on the external circuit, the redisation of the wiring, the parameter configuration, the choice of the pick-ups and their location at the machine. Opto-electronic and tactile safety sensors (e.g. light curtains, laser scanners, safety switches, sensors, emergency-stop buttons) are connected to the modular safety control system and are linked logically. The corresponding actuators of the machines or systems can be switched off safely via the switching outputs of the safety control system.

2.3 Correct use

The MELSEC-WS modular safety control system may only be used within specific operating limits (voltage, temperature, etc., refer to the technical data and to the section "Application areas of the device"). It may only be used by specialist personnel and only at the machine at which it was mounted and initially commissioned by specialist personnel in accordance with the "Safety Controller User's Manual" and "Safety Controller Setting and Monitoring Tool Operating Manual".
Mitsubishi Electric Co. accepts no claims for liability if the equipment is used in any other way or if modifications are made to the device, even in the context of mounting and installation.

For UL/CSA applications:

- Use 60°C / 75°C conductors.
- The terminal tightening torque must be 5-7 lbs in.
- To be used in a Pollution Degree 2 environment only.
- Memory plug and CPU module shall be supplied by an isolating power source protected by an UL248 fuse, rating 42.4VDC which is the maximum voltage requirements of UL508.
- The safety functions are not evaluated by UL. The approval is accomplished according to UL508, general use applications.

2.4 General protective notes and protective measures

ATTENTION **Observe the protective notes and measures!**
Please observe the following items in order to ensure proper use of the MELSEC-WS safety control system.

- When mounting, installing and using the MELSEC-WS safety control system, observe the standards and directives applicable in your country.
- The national rules and regulations apply to the installation, use and periodic technical inspection of the MELSEC-WS safety control system, in particular:
  - Machinery Directive 2006/42/EC
  - EMC Directive 2004/108/EC
  - Provision and Use of Work Equipment Directive 89/655/EC
  - Low-Voltage Directive 2006/95/EC
  - Work safety regulations/safety rules.
- Manufacturers and owners of the machine on which a MELSEC-WS safety control system is used are responsible for obtaining and observing all applicable safety regulations and rules.
- It is imperative that the notices, in particular the test notices of the manuals be observed.
- The tests must be carried out by specialised personnel or specially qualified and authorised personnel and must be recorded and documented to ensure that the tests can be reconstructed and retraced at any time by third parties.
- The external voltage supply of the device must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204. Suitable PELV- and SELV-compatible power supply units.
- The system may not start up normally if power is restored immediately after power supply was shut down (within five seconds). Wait for five seconds or longer before restoring power.
- The modules of the MELSEC-WS system conform to Class A, Group 1, in accordance with EN 55011. Group 1 encompasses all the ISM devices in which intentionally generated and used conductor-bound RF energy that is required for the inner function of the device itself occurs.

ATTENTION **The MELSEC-WS system fulfils the requirements of Class A (industrial applications) in accordance with the "Interference emission" basic specifications!**
The MELSEC-WS system is therefore only suitable for use in an industrial environment and not for private use.

2.5 Disposal

Disposal of unusable or irreparable devices should always occur in accordance with the applicable country-specific waste-disposal regulations (e.g. European Waste Code 16 02 14).

3 Conditions of use for the product

(1) Although MELCO has obtained the certification for Product's compliance to the international safety standards IEC61508, EN954-1/ISO13849-1 from TUV Rheinland, this fact does not guarantee that Product will be free from any malfunction or failure. The user of this Product shall comply with any and all applicable safety standard, regulation or law and take appropriate safety measures for the system in which the Product is installed or used and shall take the second or third safety measures other than the Product. MELCO is not liable for damages that could have been prevented by compliance with any applicable safety standard, regulation or law.

(2) MELCO prohibits the use of Products with or in any application involving, and MELCO shall not be liable for a default, a liability for defect warranty, a quality assurance, negligence or other tort and a product liability in these applications.
1) power plants,
2) trains, railway systems, airplanes, airline operations, other transportation systems,
3) hospitals, medical care, dialysis and life support facilities or equipment,
4) amusement equipments,
5) incineration and fuel devices,
6) handling of nuclear or hazardous materials or chemicals,
7) mining and drilling,
8) and other applications where the level of risk to human life, health or property are elevated.

4 Product description

4.1 CPU modules WS0-CPU0 and WS0-CPU1

The CPU modules WS0-CPU0 or WS0-CPU1 are the central process unit of the entire system in which all the signals are monitored and processed logically in accordance with the configuration stored in the memory plug. The outputs of the system are switched as a result of the processing, whereby the FLEX BUS+ backplane bus serves as the data interface.

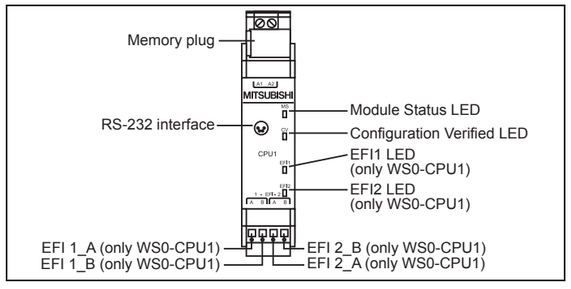
The memory plug has to be ordered separately, refer to the "Safety Controller User's Manual".

The CPU modules further more have an RS-232 interface with the following functions:

- Downloading the configuration from the memory plug and from the connected EFI-compatible devices to the MELSEC-WS Setting and monitor tool
- Transferring the configuration from the MELSEC-WS Setting and monitor tool to the memory plug and the connected EFI-compatible devices
- Online monitoring of the MELSEC-WS system

The WS0-CPU1 CPU module additionally has 2 EFI interfaces. If intelligent SICK sensor equipment is connected, a functional extension at the sensors is then possible by simple means.

4.2 Display elements



4.2.1 Displays of the MS LED (module status)

MS LED	Meaning
Off	Supply voltage lies outside range
Flashes red/green (1 Hz)	A self test is carried out and the system is initialised
Flashes green (1 Hz)	System is ready for operation
Lights up green	Application is being carried out
Flashes red (1 Hz)	Correctable error either in the CPU module or one of the extension modules
Flashes red (2 Hz)	Module has caused internal system error
Lights up red	Critical error in the system

4.2.2 Displays of the CV LED (configuration status)

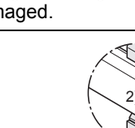
CV LED	Meaning
Off	Configuration required
Flashes yellow (2 Hz)	Storing of configuration data in the memory plug. Supply voltage may not be interrupted until the storage process has been completed
Flashes yellow (1 Hz)	Valid but unverified configuration
Lights up yellow	Valid and verified configuration

4.2.3 Displays of the EFI LEDs (only WS0-CPU1)

EFI LED (EFI1 or EFI2)	Status	Meaning
Off	OK	–
Red (1 Hz)	Error	Integration check failed
Red	Error	Waiting for integration of EFI devices after power up

4.3 Terminal assignment

4.3.1 Pin assignment of RS232 interface

Plug/socket	Pin	Assignment
	1	Reserved
	2	RXD
	3	GND
	4	TXD

4.3.2 Terminal assignment of memory plug WS0-MPL0

Terminal	Assignment
A1	24 VDC
A2	0 VDC

5 Mounting/Dismantling

ATTENTION

The MELSEC-WS system is only suitable for mounting in a control cabinet with at least IP 54 degree of protection.
While supply voltage is applied, modules must not be plugged to nor be removed from the MELSEC-WS system.
To ensure full electromagnetic compatibility (EMC), the DIN mounting rail must be connected to functional earth (FE).

5.1 Mounting the modules

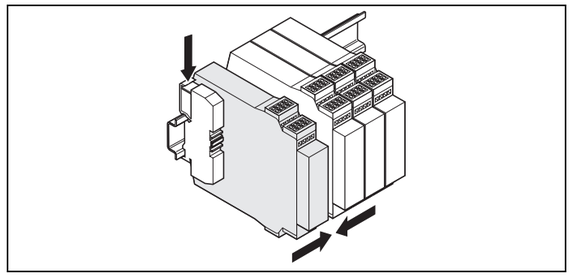
- In a MELSEC-WS system the CPU module WS0-CPU0 or WS0-CPU1 is positioned at the extreme left, the two optional gateways follow directly. Only then do the expansion modules follow. The relays modules WS0-4RO have to be mounted at the extreme right.
- The modules are located in a 22.5-mm wide modular system for 35 mm DIN rails to EN 60715.
- The connection between the modules is effected by means of the plug connection integrated in the housing.
- Mount the modules in accordance with EN 50274
- Ensure that suitable ESD protective measures are also taken during mounting. Otherwise the FLEXBUS+ bus may be damaged.

⇒ Make sure that the voltage supply of the MELSEC-WS system is switched off.

⇒ Hang the device onto the DIN rail (1).

⇒ Ensure that the earthing spring contact (2) contacts the DIN rail such that it can electrically conduct.

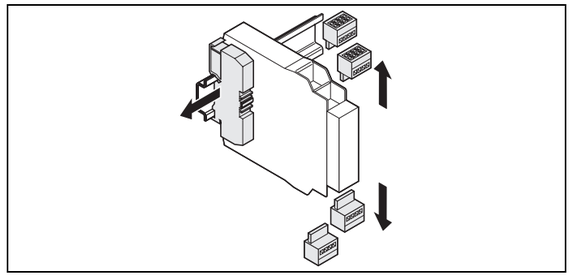
⇒ Latch the module onto the DIN rail by pressing it lightly in the direction of the arrow (3).



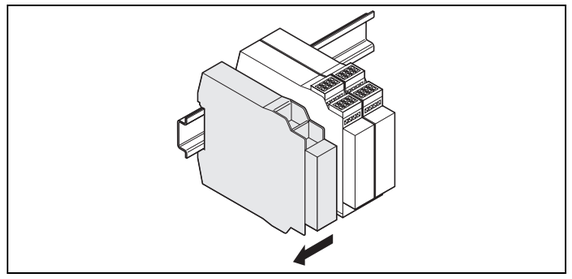
⇒ If there are several modules, slide the modules together individually in the direction of the arrow until the side plug connection latches in.

⇒ Install the end clips on the right and left.

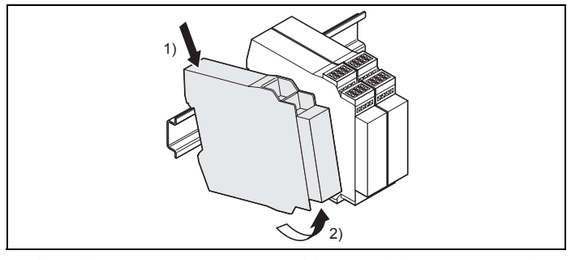
5.2 Steps for dismantling the modules



⇒ Remove the removable terminals with wiring and the end clips.



⇒ If there are several modules, slide the modules away from each other individually in the direction of the arrow until the side plug connection is separated.



⇒ Press the module downwards at the rear (1) and remove it from the DIN rail in the direction of the arrow while keeping it pressed down (2).

6 Electrical installation

ATTENTION

De-energize the entire system!
The system could start up unexpectedly while you are connecting the devices.

- The MELSEC-WS safety control system fulfils the EMC requirements in accordance with the basic specification EN 61000-6-2:2005 for industrial use.
- The control cabinet or assembly casing of the MELSEC-WS safety control system must comply at least with enclosure rating IP 54.
- Mounting in accordance with EN 50274
- Electrical installation in accordance with EN 60204-1
- To ensure full electromagnetic compatibility (EMC), the DIN rail has to be connected to functional earthing (FE).
- You must connect all the modules of the MELSEC-WS safety control system, the connected protective devices as well as the voltage supply/ies with the same 0V(GND).
- The voltage supply of the device must be capable of buffering brief mains voltage failures of 20 ms as specified in EN 60204-1.
- The voltage supply has to fulfil the regulations for extra-low voltages with safe separation (SELV, PELV) in accordance with EN 60664 and DIN 50178 (equipment of electrical power installation with electronic devices).
- The cables (for example of a connected reset button) must be laid in separate sheathing lines.
- All connected pick-ups and downstream controllers as well as wiring and installation have to fulfil the required safety characteristics.
- In order to protect the safety outputs and to increase the service life, the external loads have to be equipped with, for example, varistors or RC elements. Take into account that the response times may increase, depending on the type of protective circuiting.
- The safety outputs and the monitoring of the motor contactors (EDM) have to be wired inside the control cabinet.
- If modules are replaced, ensure that the memory plug is plugged into the suitable CPU module, e.g. through wiring or marking.
- For further information that is to be taken into consideration when the MELSEC-WS safety control system is used refer to the "Safety Controller User's Manual" and "Safety Controller Setting and Monitoring Tool Operating Manual".

7 Technical data

	WS0-CPU0	WS0-CPU1
Category	Category 4 (EN/ISO 13849-1) Category 4 (EN 954-1)	
Safety Integrity Level	SIL3 (IEC 61508), SILCL3 (EN 62061)	
Performance Level	PL e (EN/ISO 13849-1)	
PFHd	1.07E-09 1/h	1.69E-09 1/h
Ambient temperature in operation	–25 °C ... +55 °C	
Storage temperature	–25 °C ... +70 °C	
Humidity	10% to 95%, non-condensing	
Climatic conditions	EN 61131-2 (55 °C, 95% rel. humidity) No corrosive gases	
Rigidity	Tested in accordance with EN 61131-2	
Degree of protection to EN/IEC 60529	Terminals: IP20 Housing: IP40	
Electromagnetic compatibility	EN 61000-6-2, EN 55011 (Class A)	
Protection class	III	

	WS0-CPU0	WS0-CPU1
Cross-circuit of connecting wires	Single-core or finely stranded: 1 x 0.14 ... 2.5 mm² or 2 x 0.14 ... 0.75 mm² Finely stranded with wire end ferrules to DIN 46228: 1 x 0.25 ... 2.5 mm² or 2 x 0.25 ... 0.5 mm²	
EFI connection method	–	Two-tier tension-spring terminals
Dimensions (WxHxD)	22.5 x 96.5 x 120.8 mm	22.5 x 101.7 x 120.8mm
Weight	100 g	110 g

Power supply unit (A1, A2)

	WS0-CPU0	WS0-CPU1
Supply voltage	24 VDC (16.8 ... 30 VDC)	
Type of supply voltage	PELV or SELV The current of the power supply unit that supplies the CPU module has to be limited to a maximum of 4 A – either by the power supply unit itself or by a fuse	
Power consumption	Max. 2.5 W	
Switch-on time	Max. 18 s	
Short-circuit protection	4 A gG (with tripping characteristic B or C)	
Number of EFI interfaces	0	2
Data interface	Backplane bus (FLEXBUS+)	
Configuration interface	RS-232	

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