Mitsubishi FX-Series

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5.3 Mitsubishi FX

5.3.1 General Information

The operating terminals allow for a simple connection to every Mitsubishi PLC of the FX series thus making the operating terminals the perfect man-machine-interface for your Mitsubishi PLC.

The operating terminal is connected to the **programming unit interface** of the PLC. An additional communications module is not necessary. The data communication on the interface is handled by the Mitsubishi FX protocol.

The software components of the system are fully adapted to the parameters and marginal conditions of the interface.

This offers the user the following advantages:

- Random write and read access to any data within the PLC. Data of existing PLC programs can be displayed and modified directly in the operating terminal. It is not necessary to adapt the PLC program to the operating terminal in any respect since it is not required that communications data be stored in a specified address area or data type area.
- The operating terminal automatically polls the freely definable data areas for cyclic data.
- No configuration is required in the PLC.
- The protocol is handled entirely by the operating system of the PLC. A PLC program in the PLC is not required for the handling of the communication.
- The protocol provides error control. Transmission errors are detected and, if possible, eliminated by repeating the transmission. A noise-immune interface hardware in accordance with the RS485 interface standard permits the application even in a harsh industrial environment.
- The parameters of the interface SER1 are assigned in the programming software in a protocol specific manner and are stored in the application description. Modifying of the parameters is possible in the setup mask or in each other I/O-mask of the terminal at any time.
- The programming system provides a maximum of support to the operator in programming the operating terminal. The definitions (abbreviations) used here are identical with the definitions used within the PLC program (e.g. M3 corresponds to flag 3).

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5.3.2 Technical Description

The interfacing of the operating terminal to the Mitsubishi-FX Series- PLCs is effected by means of the FX protocol.

The FX protocol allows random read and write access to all PLC (programmable logic controller) data. Any byte-structured data types can also be accessed in bit-mode. The size of the address area depends on the respective PLC.

5.3.3 Protocol parameters Mitsubishi FX

The parameters of the interface SER1 are set to the following values:

Baud rate:	300, 600, 1200, 2400, 4800, **9600**, 19200, 38400, 375000, 500000 Baud
Parity:	none, **even**, odd
Data length:	5, 6, **7**, 8 bits
Stopbits:	**1**, 1.5, 2
Handshake:	**No Handshake**, Hardware, Software

The default values are printed in **bold**.

5.3.3.1 Parameter Maximum Waiting Time for Response

This timer indicates the length of time that the operating terminal (master) will wait for the response from the PLC (slave).
Permitted values are in the range of 0 ms to 65535 ms.
The default value is 5000 ms.

5.3.3.2 Parameter Delay Until Connection Setup

Specifies the period of time that the terminal allows to elapse after an unsuccessful attempt to establish the communication and before making another attempt.
Permitted values are in the range of 0 ms to 65535 ms.
The default value is 10000 ms.

5.3.4 Data Types

Reference Type	Reference	Access
Step Flag Operand (Status)	S	Bit / Byte Mode
Inputs	X	Bit / Byte Mode
Outputs	Y	Bit / Byte Mode
Flags	M	Bit / Byte Mode
Timer Flags	T	Bit / Byte Mode
Time Values	T	Word Mode
Count Flags	C	Bit / Byte Mode
Count Values	C	Word / Double Word Mode
Flag (Also Special Register)	M	Bit / Byte Mode
Data Register (Also Special Data Register)	D	Word / Double Word Mode

Table 5.3-1: Data types

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5.3.5 Additional Functions

In addition to the random write and read access to PLC variables, a memory area comprising 11 or 12 bytes is specified in the application description as cyclic data area. The location of this memory area is specified in the mask definition and must be located on a byte boundary.

Only marginal conditions regarding this memory area:
– the PLC must be able to access in bit-mode
– the memory area must be contiguous.

Byte-structured Memory Mapping

The start address must be located on a physical byte boundary.

The following start addresses are possible in accordance with (8 * n) n = 0, 1, 2 : M0, M8, M16.

Example: Cyclic Data on M0

MSB	Description	LSB
M7	Write Coordination Byte	M0
M15	Message Channel Low Byte	M8
M23	Message Channel High Byte	M16
M31	LED 1 to 4	M24
M39	LED 5 to 8	M32
M47	LED 9 to 12	M40
M55	LED 13 to 16	M48
M63	LED 17 to 20	M56
M71	LED 21 to 24	M64
M79	LED 25 to 28	M72
M87	LED 29 to 32	M80

Table 5.3-2: Byte-structured poll area

Word-structured Memory Mapping

Example: Cyclic data on D1

Register	High Byte	Low Byte
D1	Write Coordination Byte	Reserved
D2	Message Channel High Byte	Message Channel Low Byte
D3	LED 1 to 4	LED 5 to 8
D4	LED 9 to 12	LED 13 to 16
D5	LED 17 to 20	LED 21 to 24
D6	LED 25 to 28	LED 29 to 32

Table 5.3-3: Word-structured poll area

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5.3.6 Physical Interfacing

Pin	Designation	Function
1	Shield	Shielding
2	T(A)	Transmit Data, Channel A
3	R(A)	Receive Data, Channel A
4	RTS(A)	Request To Send, Channel A
5	CTS(A)	Clear To Send, Channel A
6	nc	not connected
7	nc	not connected
8	SG	Signal Ground
9	T(B)	Transmit Data, Channel B
10	R(B)	Receive Data, Channel B
11	RTS(B)	Request To Send, Channel B
12	CTS(B)	Clear To Send, Channel B
13	nc	not connected
14	nc	not connected
15	nc	not connected

Table 5.3-4: Pin assignment of the interface X2 RS485

Pin	Designation	Function
8	T(A)	Transmit Data, Channel A
9	T(B)	Transmit Data, Channel B
11	SGND	Signal Ground
22	R(A)	Receive Data, Channel A
23	R(B)	Receive Data, Channel B

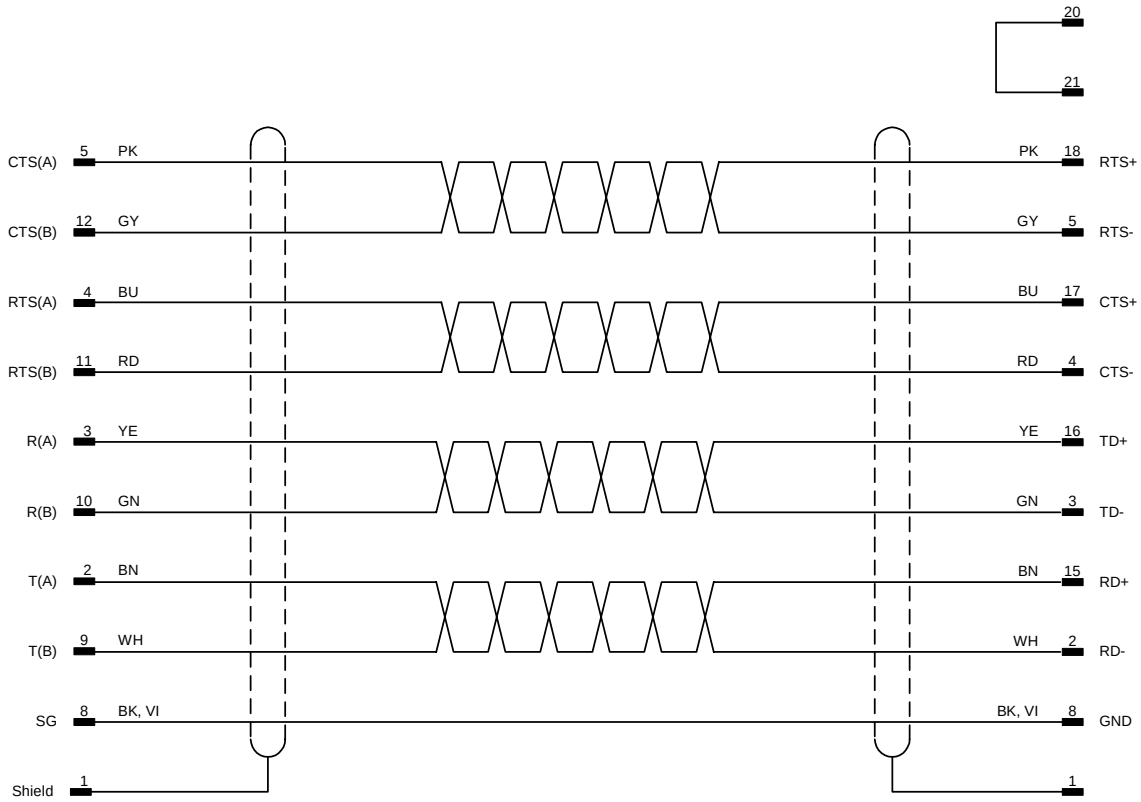
Table 5.3-5: Pin assignment of the universal interface SER1 RS485

5.3.6.1 Connecting Cable RS485 - Mitsubishi FX

The following wiring diagram does not apply to terminals with universal interface.

TesiMod
Operating Terminal

Mitsubishi
FX Series



D-Subminiature
Male Connector
15-pin

D-Subminiature
Male Connector
25-pin

Pin 1 is connected to the shield / metallic enclosure.
Each end of the shield is connected to the metallic enclosure.

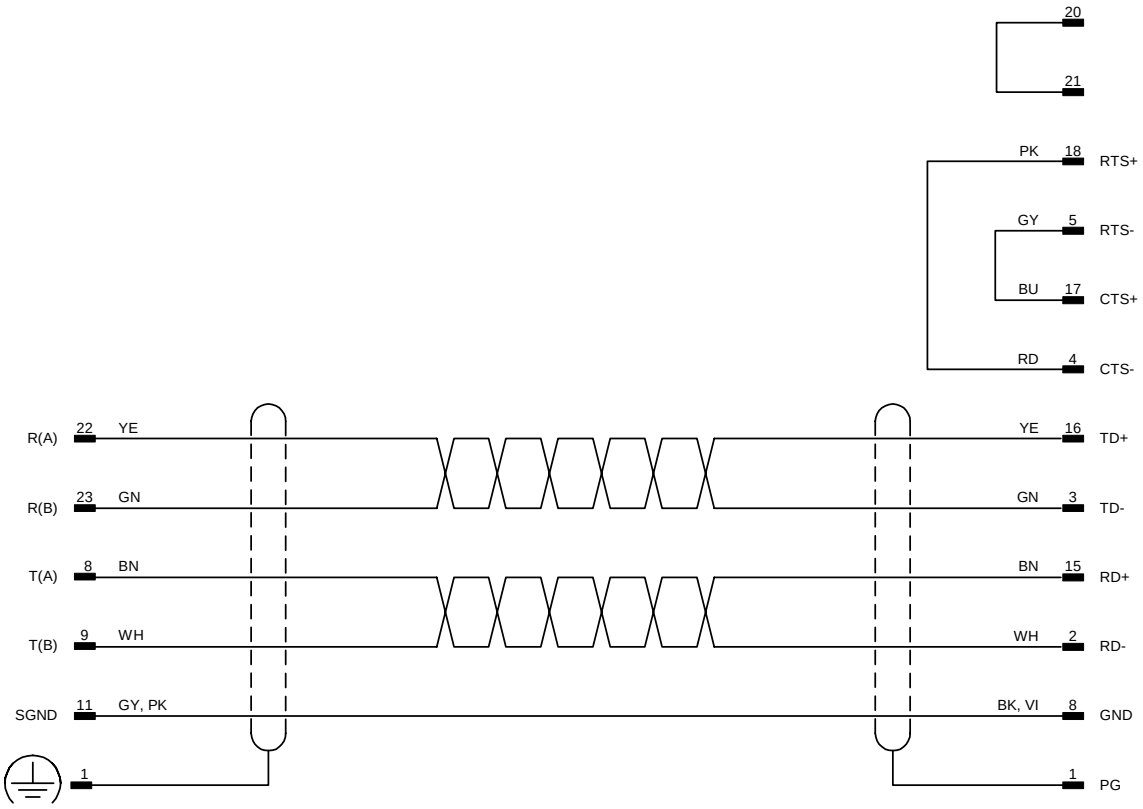
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5.3.6.2 Connecting Cable Universal Interface SER1 RS485 - Mitsubishi FX

The following wiring diagram applies to terminals with universal interface only.

TesiMod
Operating Terminal

GE Fanuc
Series 90



D-Subminiature
Male Connector
25-pin

D-Subminiature
Male Connector
25-pin

Pin 1 is connected to the shield / metallic enclosure.

5.3.7 Error Messages

Code	1	E_SLAVE_NOT_READY	Slave not ready or incorrect CPU-ID
	2	E_PROTOKOL	Sequence of the packets
	3	E_FRAME	Character frame error
	4	E_TIMEOUT	Timeout error
	5	E_CRC_BCC	CRC error
	6	E_PARITY	Parity error
	7	E_SEND_ABORT	Abort send process
	8	E_REC_ABORT	Abort receive process
	9	E_BUF_SIZE	Insufficient cyclic buffer
	10	E_NO_DEFINE	No cyclic data defined
	12	E_DEFINE	Cyclic data already defined
	15	E_NO_PROTOCOL	Selected protocol is not supported
	16	E_OVERRUN	Receive buffer overrun
	17	E_NAK	NAK from the PLC
	40	E_SYS_ADDRESS	Undefined system variable

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