

4.8 Expansion Module MAC00-FS1/FS4



4.8.1 High speed serial RS485 module MAC00-FS1 and FS4 Introduction

The MAC00-FS1 and FS4 are used for high speed RS485 communication typically in multi axis systems. They are capable of running at Baud-rates up to 460kbit. All the registers of the MAC motor can be read and written.

The modules includes a few inputs and outputs, 2 of which can be defined as end-limit inputs. These can be read from the RS485 interface.

The MAC motor is controlled by writing to the internal registers in the motor.

The expansion modules MAC00-FS1 and FS4 can be mounted on the standard MAC motors MAC50, MAC95, MAC140, MAC141, MAC400-800.

Both modules offer the same functions but with the following hardware differences:

Type	Protection class	Connectors		
		I/O.	Power supply	RS232/485
MAC00-FS1	IP42	DSUB 15 pole	3 pole Phoenix	DSUB 9 pole
MAC00-FS4	IP67/IP65*	M12 connector 8pin male and female	M12 connector 5pin male	M12 connector 5pin female

Note*: IP65 on MAC400-800

Both modules are delivered without any cables as standard.

Optional the MAC00-FS4 module can be delivered with cables in 5 or 20m length.

The pages in the first part of this section concern the common features of both modules. Please consult the last pages in this section to see specific information about each module such as example connection diagrams.

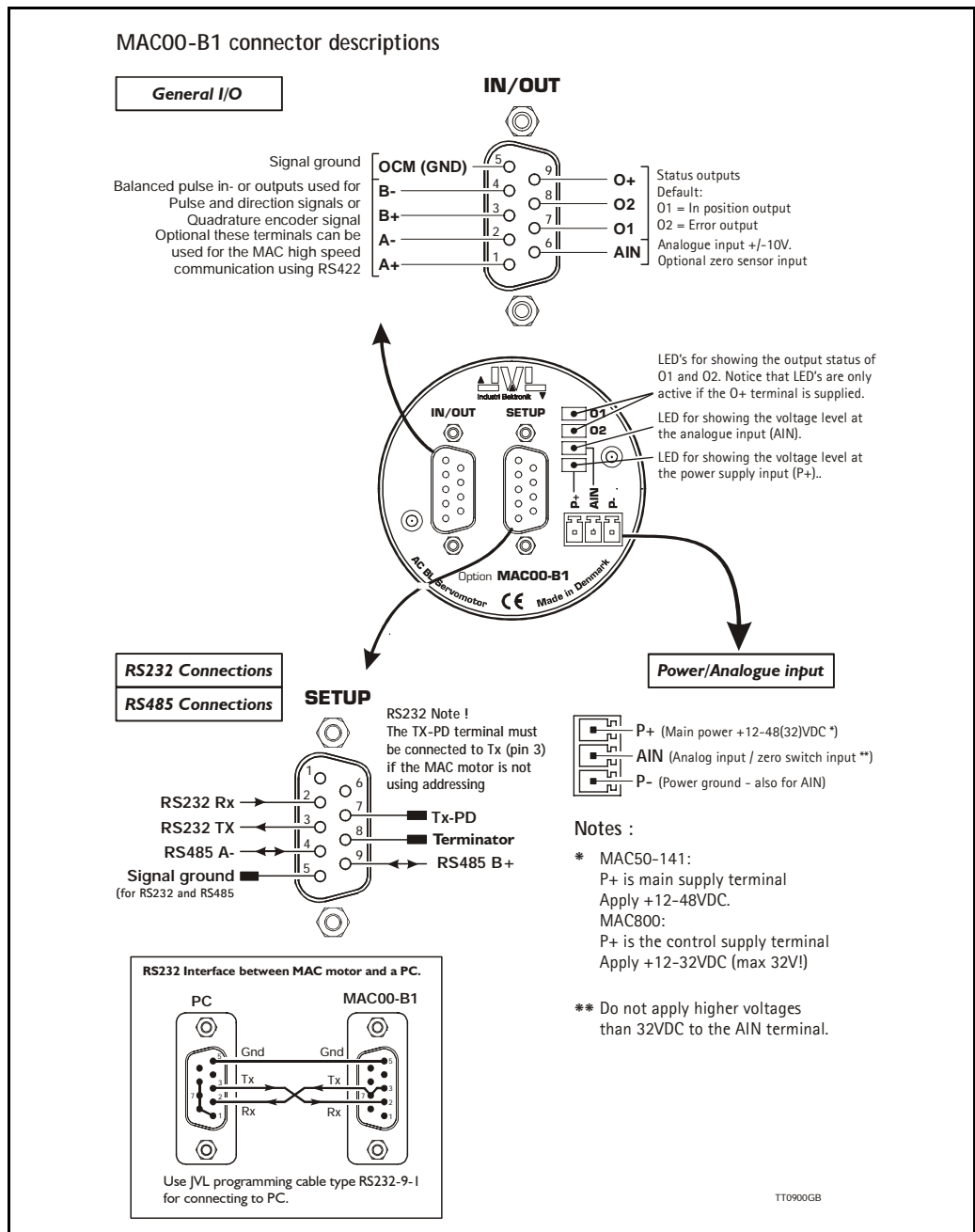
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4.8.2 General description MAC00-FS1

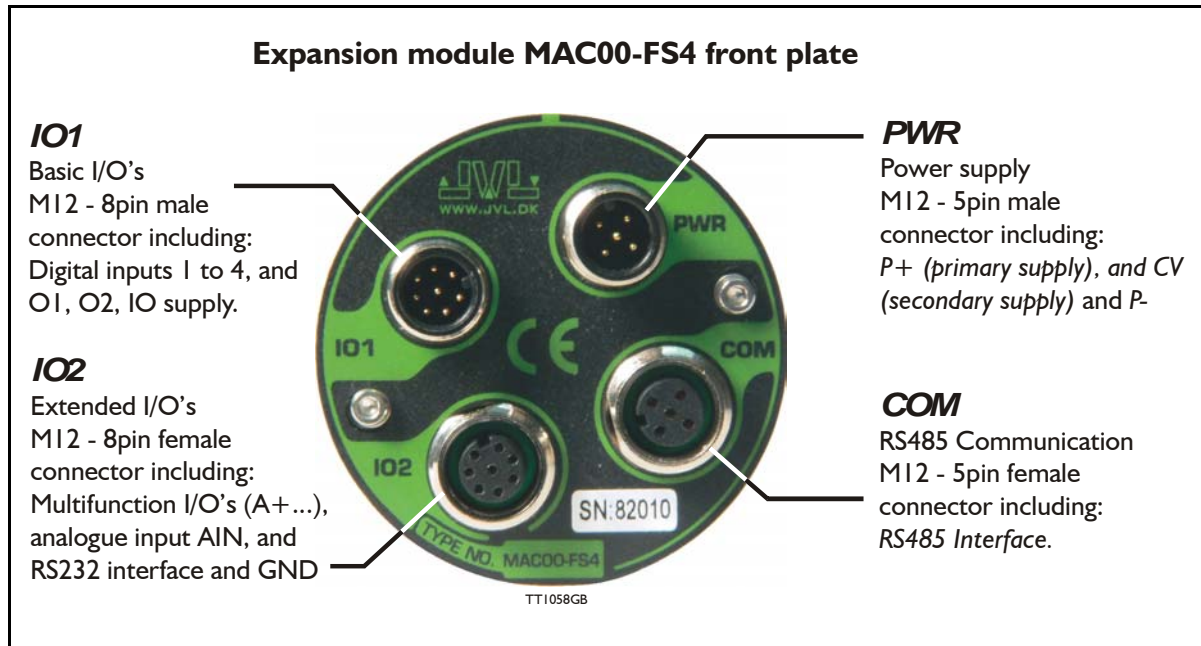
The MAC00-FS1 expansion module is an industrial interface that mates with the standard MAC motor and offers a number of feature enhancements, including:

- Standard 9-pin D-SUB connectors for additional reliability.
- Addition of a Zero switch input for locating a mechanical zero point of the actuator when used in position-related modes.
- Pluggable screw terminal connector for power supply and Zero switch.
- LEDs to indicate: O1 and O2 output status, Zero switch (analogue input) status. Input power status.
- Full RS232 and RS485 protocol support for use with standard 9-pin DSUB.
- Sourcing (PNP) outputs for status signals O1 and O2 instead of sinking (NPN).

The following illustration shows all the connectors on the MAC00-FS1 module.



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4.8.3 Expansion MAC00-FS4 hardware description

The MAC00-FS4 offers a IP67 on MAC050-141 protection and M12 connectors which makes it ideal for automation applications where no additional protection is desired. The M12 connectors offers a solid mechanical protection and are easy to operate.

The connector layout:

“PWR” - Power input. M12 - 5pin male connector				
Signal name	Description	Pin no.	JVL Cable W11000-M12F5T05N	Isolation group
P+	Main supply +12-48VDC. Connect with pin 2 *	1	Brown	1
P+	Main supply +12-48VDC. Connect with pin 1 *	2	White	1
P-	Main supply ground. Connect with pin 5 *	3	Blue	1
CV	Control voltage +12-48VDC.	4	Black	1
P-	Main supply ground. Connect with pin 3 *	5	Grey	1
* Note: P+ and P- is each available at 2 terminals. Make sure that both terminals are connected in order to split the supply current in 2 terminals and thereby avoid an overload of the connector.				
“COM” - Interface RS485. M12 - 5pin female connector				
Signal name	Description	Pin no.	JVL Cable W11000M12 M5T05N	Isolation group
-	Leave open	1	Brown	1
-	Leave open	2	White	1
RS485 A-	RS485 interface positive terminal. Leave open if unused	3	Blue	2
RS485 B+	RS485 interface negative terminal. Leave open if unused	4	Black	2
GND	Interface ground	5	Grey	2

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"IO1" - Basic I/O's. M12 - 8pin male connector.				
Signal name	Description	Pin no.	JVL Cable WI1000-M12 F8T05N	Isolation group
IN1	Digital input 1	1	White	3
IN2	Digital input 2	2	Brown	3
IN3	Digital input 3	3	Green	3
IN4	Digital input 4	4	Yellow	3
O1	Digital output 1 - PNP output Output current maximum 25mA	5	Grey	3
O2	Digital output 2 - PNP output Output current maximum 25mA	6	Pink	3
O+	Output supply +5-32VDC. Used for O1-4. Not used/necessary for using IN1-8	7	Blue	3
IO-	I/O ground. Used for IN1-8 and O1-4.	8	Red	3
"IO2" - Extended I/O's. M12 - 8pin female connector.				
Signal name	Description	Pin no.	JVL Cable WI1000-M12 M8T05N	Isolation group
AIN1	Analogue input +/-10V. Directly connected to basic motor	1	White	1
Tx	RS232 interface - transmit output	2	Brown	1
Rx	RS232 interface - receive input	3	Green	1
GND	RS232 Ground - also used with analogue input	4	Yellow	1
A+	Multifunction I/O terminal A+. Maximum 5V !	5	Grey	1
A-	Multifunction I/O terminal A-. Maximum 5V !	6	Pink	1
B+	Multifunction I/O terminal B+. Maximum 5V !	7	Blue	1
B-	Multifunction I/O terminal B-. Maximum 5V !	8	Red	1
Cable Screen				
Some standard cables with M12 connector offers a screen around the cable. This screen is at some cables fitted to the outer metal at the M12 connector. When fitted to the MAC00-FS4 modul this means that the screen will get in contact with the complete motor housing and thereby also the power ground (main ground).				
Isolation groups				
The MAC00-FS4 offers optically isolation at the digital inputs and outputs (IN1-4 and O1-2). In the table is shown a number for each pin. This number refers to which isolation group the terminal is connected to. Isolation group 1 means that the terminals refers to the main ground (P-, GND and the motor housing). Isolation group 2 means that the terminals refer only to the RS485 interface. Isolation group 3 means that the terminals refer to the I/O ground (IO-).				

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MAC00-FS4 Dip switch settings

Dip 1-6 - I/O setup

Makes it possible to share I/O signals in the same cable

Function:

- 1: Connect **CV** to **O+**
- 2: Connect **P-** to **IO-**
- 3: Connect **IN3** to **AIN**
- 4: Connect **IN4** to **AIN**
- 5: Connect **O1** to **AIN**
- 6: Connect **O2** to **AIN**

To activate the mentioned connection please set the actual switch to position "ON"

SW1B default settings =

- 1, 2 and 4 set in position "ON"
- 3, 5 and 6 set in position "OFF"

Mini dip-switch

OFF ← ON

SW1B

Rear side of the MAC00-FS4 expansion module

Mini dip-switch

OFF ← ON

SW2

Dip 1-2 - Line termination

Both set to ON = Term. enabled

Both set to OFF = Term. disabled

SW2 default settings =

Both switches in position "OFF"

Dip 1-10 - For Future use

SW1A default settings =

all set in position "ON"

Mini dip-switch

OFF ← ON

SW1A

Dip switch location on the MAC00-FS4 Expansion module

M12 external connectors

Basic MAC motor housing

Internal circuit boards

Dip Switches placed on the rear side of the module

Module seen from rear side

SW1B
I/O setup

SW1A
For Future use







SW2
Line termination

TTI017GB

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4.8.4 Cables for the MAC00-FS4

Following cables equipped with M12 connector can be supplied from JVL.

MAC00-FS4 Connectors				Description	JVL Order no.	Picture
"IO1" 8pin Male	"IO2" 8pin Female	"COM" 5pin Female	"PWR" 5pin Male			
	X			RS232 Interface cable. Connects directly from MAC00-R4 to PC Length: 5m (197 inch)	RS232-M12-1-5-5	
			X	Cable (Ø5.5mm) with M12 female 5-pin connector loose wire ends 0.35mm ² (22AWG) and foil screen. Length: 5m (197 inch)	WI1000-M12F5T05N	
			X	Same as above but 20m (787 inch)	WI1000-M12F5T20N	
		(X) Note1		Cable with M12 male 5-pin connector loose wire ends 0.35mm ² (22AWG) and screen. Length: 5m (197 inch)	WI1000-M12M5T05N	
		(X) Note1		Same as above but 20m (787 inch)	WI1000-M12M5T20N	
X				Cable with M12 female 8-pin connector loose wire ends 0.22mm ² (24AWG) and screen. Length: 5m (197 inch)	WI1000-M12F8T05N	
X				Same as above but 20m (787 inch)	WI1000-M12F8T20N	
	X			Cable with M12 male 8-pin connector loose wire ends 0.22mm ² (24AWG) and screen. Length: 5m (197 inch)	WI1000-M12M8T05N	
	X			Same as above but 20m (787 inch)	WI1000-M12M8T20N	
Protection caps. Optional if connector(s) needs to be protected from dust / liquids.						
	X	X		IP67 protection cap for M12 female connector.	WI1000-M12FCAP1	
X			X	IP67 protection cap for M12 male connector.	WI1000-M12MCAP1	

Note 1: The illustrated cable is not twisted pair and is not recommended for noisy environment. We recommend to use a shielded twisted pair cable for noisy applications. Also it is recommended to use a metal type connector where the screen can be terminated to obtain optimal screening effect.

Important: Please notice that the cables are a standard type. It is not recommended to be used in cable chains or where the cable repeatable are being bended. If this is required use a special robot cable (2D or 3D cable). See also *Accessories*, page 378 where additional M12 connectors are shown.