Profibus expansion modules for MAC motors. MAC00-FP2 and MAC00-FP4

This expansion module for the JVL integrated servo motors is a Profibus DP slave module with baudrate up to 12Mbit. All registers of the MACmotor can be read and written. Isolated IO are available for high speed start/stop, end limit and Zero search function. Address can be set up via software or with DIP switch. The module has M12 connector for use in harsh environment and BUS IN and BUS OUT for easy implementation of bus systems GSD file and and program example for Siemens S7 are available for download.

All the registers1 of the MAC motor can be read and written.
The modules include 6 inputs, 2 of which are end-limit inputs. These can be read from the Profibus-DP. The end-limit inputs can automatically halt the motor. The other inputs can be used to activate different movements.
The MAC motor is controlled by writing to the input data (9 bytes).
The expansion modules MAC00-FP2 and FP4 can be mounted on standard MAC motors MAC50, MAC95, MAC140, MAC141, MAC400 and MAC800.
Both modules offer the same functions but with the hardware differences shown in table.

- Control and setup through 12Mbit/s Profibus-DP
- Logic I/O's for High speed start/stop
- In position indication
- Home switch
- Protection IP67

- RS232/RS485 interface
- M12 connector or cable glands
- MAC00-FP4-05 solution with 5m power and I/O cable and 2pcs. Profibus connectors

Type	Protection Class	Connectors		
		I/O and interface	Power supply	Bus interface
MAC00-FP2	IP67/IP65*	Cable glands (Mini crimp connectors internally)	Cable glands (Screw terminals internally)	Cable glands x2 (Screw terminals internally)
MAC00-FP4	IP67/IP65*	M12	M12	M12 B-coded x2

Note*: IP65 with MAC400 and MAC800

PROFIBUS

The PROFIBUS DP (PROcess FIeld BUS for Decentralized Peripherals) has been around since 1989, and is a widely used fieldbus; an estimated almost 30 million Profibus devices are in operation worldwide, many of them controlled from Siemens PLCs.

The bus is a high-speed serial bus using RS-485 electrical characteristics A Profibus cable uses a single twisted pair of wires plus a digital ground and shield daisy-chained to connect one master controller PLC to up to 125 slave devices, like drives and sensors. Depending on the selected speed, the cable length can be from 100 to 1200 meters at speeds from 12 megabits down to 10 kilobits/second.

The most common PROFIBUS variant, PROFIBUS DP V0, uses a completely cyclical scheme to transmit data between the master and the slaves on the bus. Cycle times can go down to approximately 1 ms.

PROFIBUS DP V0 is optimized for cyclic data transfers, and probably the fastest fieldbus, relative to its bit rate, to keep large numbers of discrete values like digital and analogue inputs and outputs updated. Also its operation fits well with the traditional operation of PLCs that first read all inputs in the system, then performs the needed processing and at the end updates all the outputs.
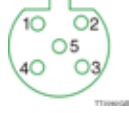
For other applications, the cyclical scheme may be less optimal, especially where critical process data with high priority must be delivered with the shortest delay possible. For such systems, the PROFIBUS V1 and V2, that support acyclic communications, have been designed, but these are less widely used than V0.

The capabilities of a PROFIBUS slave device is presented to the PROFIBUS master device through a GSD text file, that informs of the data format, I/Os

and other functions the slave device offers. During start up of a system, the slave devices are configured by the master based on this GSD file, and the system is then put into data exchange mode for operartion.

PROFIBUS was defined in 1991/1993 in DIN 19245, was then included in EN 50170 in 1996 and, since 1999, established in IEC 61158/IEC 61784. The organization behind the technology is currently the PROFIBUS – PROFINET International organisation, (PI) at http://www.profibus.com.

Motor Connector Description

|		Connector	1	2	3	4	5	6	7	8
BUS1 (Bus in)	Profibus	M12 Male 5pin	–	A–	DGND	B+	SHIELD			
	Cable Color code		–	green		red	shield			
BUS2 (Bus out)	Profibus	M12 Female 5pin	–	A–	DGND	B+	SHIELD			
	Cable Color code			green		red	shield			
PWR (Power supply)	Profibus	M12 Male 5 pin	P+ (12-48VDC)	P+ (12-48VDC)	P- (GND)	CV control voltage	P- (GND)			
	Cable Color code		Brown	White	Blue	Black	Grey			
I/O	Profibus	M12 Female 8 pin	IOC. PL or O1	Tx (RS232)	Rx (RS232)	GND (RS232)	IOA AIN or O2	IOB IN1 or O1	IO-	IOD NL or O+
	Cable Color code		White	Brown	Green	Yellow	Grey	Pink		Red
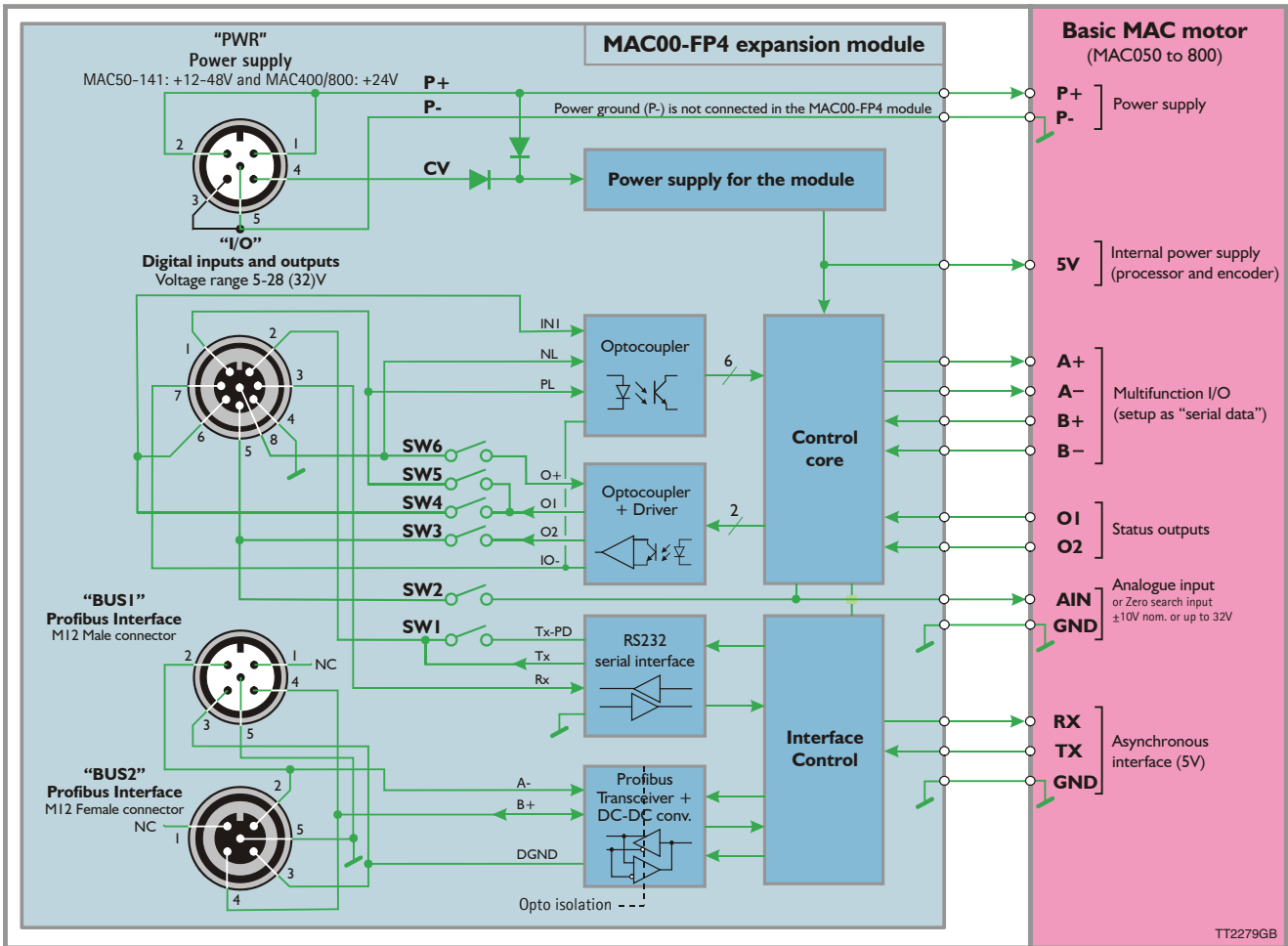
Block diagram of MAC00–FP4 with MAC motor

Easy start with sample code for Siemens S7 PLC

At no additional cost the GSD files and program example for the most common profibus PLC S7 from Siemens can be downloaded from www.jvl.dk. Function blocks are fully documented so they can be readily adapted for use with other PLC types.
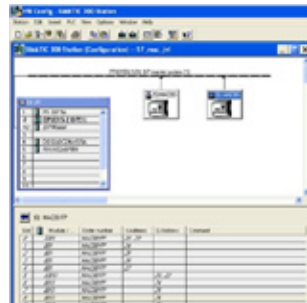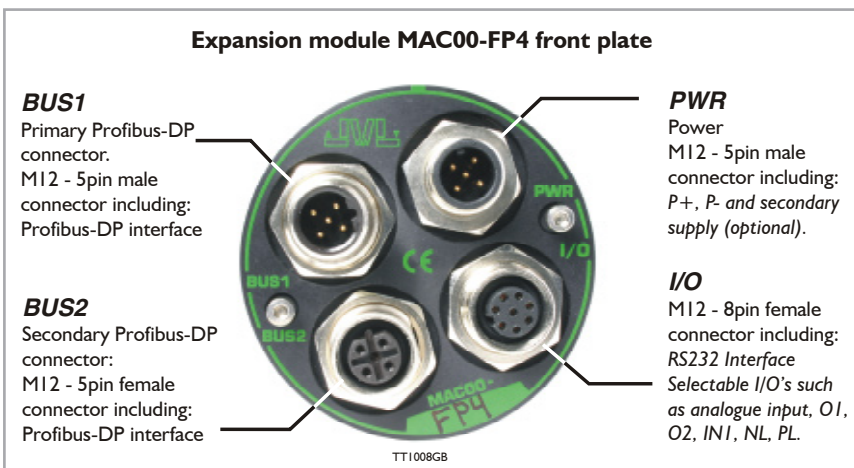

Easy installation with M12 con–nector

JVL MACmotor expansion board MAC00-FP4 uses a standard M12 connector with 5 and 8 pin. To ease installation there is one connector for BUS In and one for BUS Out.

I/O possibilities

The expansion board is equipped with 6 inputs and 2 outputs, all galvanically isolated. Because of the limited number of pins in the M12 connector only some of the I/O´s are available in the connector. With an internal dipswitch it is possible to select between O1, O2, AIN, INI, NL, PL, IO- and IO+ on 4 of the pins.
Contact JVL if other configurations are required. For OEM use, a solution with cable glands (MAC00-FP2) or customer specified connector with all I/O´s supported can be delivered.

Expansion module MAC00-FP4 front plate

BUS1
Primary Profibus-DP connector.
M12 - 5pin male connector including:
Profibus-DP interface

BUS2
Secondary Profibus-DP connector:
M12 - 5pin female connector including:
Profibus-DP interface

PWR
Power
M12 - 5pin male connector including:
P+, P- and secondary supply (optional).

I/O
M12 - 8pin female connector including:
*RS232 Interface Selectable I/O's such as analogue input, O1, O2, IN1, NL, PL.*

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Cables and accessories

Cable and accessory	Description M12 IP67 (Standard cable with shield)	Connector	Type code	Picture
A	RS232 programming cable	I/O	RS232-M12-1-5-8	
B	Power cable	PWR	WI1000-M12F5VxxN	
C	IO cable	I/O	WI1000-M12F8VxxN	
D	BUS1 cable.	BUS1	WI1006-M12F5SxxR	
E	BUS2 cable.	BUS2	WI1006-M12M5SxxR	
F	Protection cap for M12 male	BUS1	WI1000-M12MCAP1	
G	Protection cap for M12 female	BUS2 or I/O	WI1000-M12FCAP1	
H	Connector 5 pin female straight solder terminals	PWR	WI1008-M12F5SSC	
I	Connector 5 pin female straight solder terminals	BUS1	WI1028-M12M5SSC	

xx indicates cable length 05 or 20 meters (flying leads)
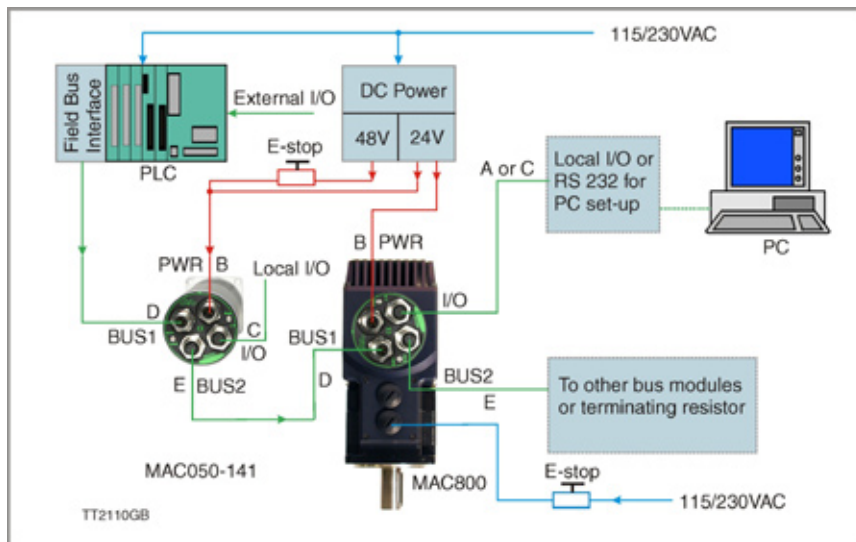
Two MAC motors in a network

Technical specifications

Absolute maximum rating

Description	Min	Typ	Max	Absolute Max	Unit
CV Current@ 24VDC*		250	400		mA
Voltage O+	10		30	32	VDC
Voltage P+	12		48	50	VDC
Control Voltage CV	12		48	50	VDC
Input IN1–4, NL,PL	4,5		28	32	VDC
Input Impedance		5.6			kOhms
Input current @24V		4.3			mA
Analoque input **	–10		10	32	VDC
Output O1, O2	0		30	32	VDC
Output current O1,O2			25		mA

* Only expansion module. Remember to add the current for the basic motor
** Resolution 11bit+sign for MAC800 and 9bit+sign for MAC050-MAC141

Profibus Features

Protocol type	PROFIBUS DP V0
Minimum speed	9600 bits/second
Maximum speed	12 megabits/second
Speed selection	Automatic
Data format	Proprietary (not PRO-FIdrive compatible)
Output data length	9 bytes
Input data length	8 bytes
Device address selection	DIP switches or software
Number of digital inputs	6 (galvanically isolated)
Number of digital outputs	2 (galvanically isolated)

Protection

The Module is supplied with M12 connectors (IP67) with watertight connection for use in industrial environments. Modules with other types of connector can be developed to suit customer requirements.