Controllers FEC, Standard

- **Sturdy control rack requiring a minimum of space**

- **Analogue inputs/outputs and Ethernet optional**

- **Quick installation using the SAC sensor/actuator connector system**

- **User-oriented software – programming the way you think or according to standard**

The installation-saving controller

The FEC Standard is not just a new mini controller. It shows that there is still room for innovation in mini controllers at the start of the new millennium.

With its robust extruded aluminium housing, it demonstrates that compact design and toughness can go hand in hand.

Its connector system is accessible from the front, ensuring no wastage of space within control cabinets. And the sensor/actuator connector system SAC, making its world premiere in this product, very largely replaces terminal strips in the I/O area.

This means that control cabinets with FEC Standard have a decisive advantage: Up to 50% less space required, and up to 40% less time. Thanks to the integration of a high-speed counter into every CPU, this mini controller is well able to carry out counting and simple positioning operations. Additionally, the optional analogue inputs/outputs turn a smart mini controller into a smart process controller.

The two serial interfaces in every CPU make the FEC Standard into a talented communicator which allows programming via one interface and operation and monitoring via the other, at the same time. The leading concept in communication today is Ethernet, the "network of networks". This can of course be integrated into FEC Standard as an option. After all, smart automation technology demands smart network technology.

With Ethernet and a web server, the FEC Standard paves the way for the visualisation technology of tomorrow: Controller surfing.

3.Controllers FEC, Standard

Key features

Hardware

The FEC Standard has a clip for a top-hat rail and corner holes for bolt-mounting using a mounting plate. All connections are accessible from the front; there is no need for additional space for connections from above or below.

Power supply

The FEC Standard is powered exclusively via 24 V DC as per modern control cabinet technology.
24 V DC (+25%/-15%) power supply for the controller itself,
24 V DC (+/−25%) power supply for the input signals, positive switching,
24 V DC output signals 400 mA, proof against short-circuits and low-resistance loads.
The analogue inputs/outputs are 0(4) ... 20 mA I/Os, 12 bit resolution.

Serial interfaces

Every FEC Standard is equipped with two serial interfaces – COM and EXT. These are universal TTL interfaces with a maximum data transmission rate of 115 kbits/s. Depending on requirements, the interfaces can be used as RS232c (SM14 or SM15) or RS485 (SM35) interfaces. Adapters should be ordered separately. The COM interface is generally used together with the SM14 for programming, while the EXT interface can be used for an MMI device, a modem or other devices with a serial interface.

Ethernet interface

The FEC Standard versions with an Ethernet interface incorporate an Ethernet 10BaseT interface with an RJ45 connection and a data transmission rate of 10 Mbits/s. A combined "Link/Active" LED indicates the connection status. The FEC Standard supports data communication and programming/troubleshooting via the Ethernet interface.
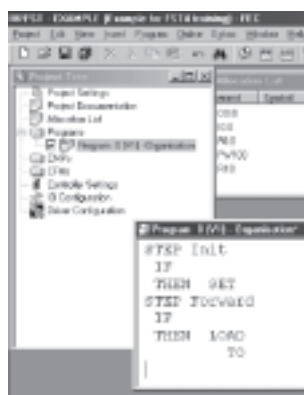
Programming

The FEC Standard is programmed using FST.
FST is a unique programming language rich in tradition and very easy to use, allowing "programming the way you think":
IF ... THEN ... ELSE
FST also supports STEP operation for sequence programming. FST can be used for programming via Ethernet; a web server is also available.
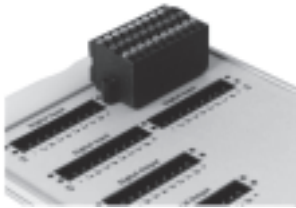
The sensor/actuator connector

Together with the FEC Standard, we are introducing an innovative new installation concept, the sensor/actuator connector SAC. This connector combines three functions in a very compact design:

- Connection of inputs, outputs and power supply
- Status signal by means of an LED
- Replaces terminal strip for sensors and actuators

The three-wire version of the connector has internally connected straps for 0 V and 24 V DC. This allows any sensor (up to 3 wires) or actuator (up to the maximum permissible output current) to be fed directly to the connector. There is no need for a terminal strip for sensors and actuators. This allows space savings in control cabinets of up to 50%.

The SAC uses a tension-spring contact system. This means no need for screw connections. Solid wires can simply be pushed into the connector, while in the case of finely-stranded wire, all that is necessary is to open the contact by pressing on the relevant pin and then introduce the wire. Cable end sleeves can be used if desired but are not essential. The tension-spring system and the fact that no terminal strip between the controller and sensors/actuator is required means that a time saving of up to 40% can be achieved during installation.

The pin assignment for the I/O panel is simple and is always the same:

Pin	
Pin 1	+24 V DC
Pin 2	Bit 0
Pin 3	Bit 1
Pin 4	Bit 2
Pin 5	Bit 3
Pin 6	Bit 4
Pin 7	Bit 5
Pin 8	Bit 6
Pin 9	Bit 7
Pin 10	0 V

The power supply for the LEDs is taken from the signal pins in the connector. This means that the entire input assignment can be checked without a controller.
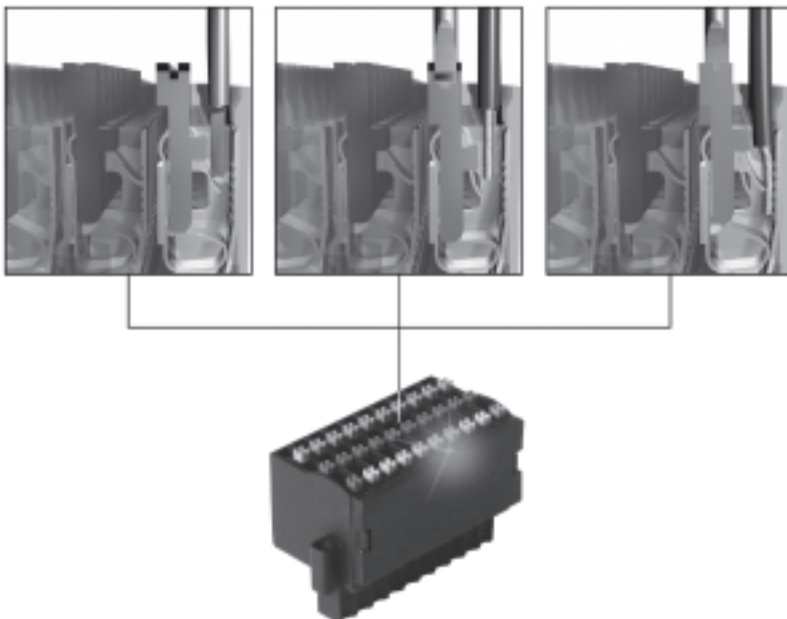
Controllers FEC, Standard

Key features

Programming with FST

Programming the way you think

How do we describe a machine?
"When a workpiece reaches here, this cylinder should advance."
How does the software interpret this?

Or does your machine work through a sequence step by step?
"First, this cylinder must advance and stop the workpiece, and then the workpiece must be clamped, and then finally..."

Programming just couldn't be easier.

How, for example, can we sub-divide a task?

Program 0:	Organisation
Program 1:	Set-up program
Program 2:	Automation program
Program 3:	Fault monitoring
Program 4:	Manual operation
.	
.	
.	
Program 63:	Troubleshooting program

How does one controller communicate with another?
Every controller with Ethernet can send and receive data from every other controller within a network – no matter whether this data relates to inputs, outputs, flags or registers.

Central programming of distributed controllers
Every controller within a network can be programmed from any desired network interface.

A controller on the World Wide Web
FST incorporates a web server – the Internet and the world of automation meet.

Electronic control systems
Front End Controllers

7.1
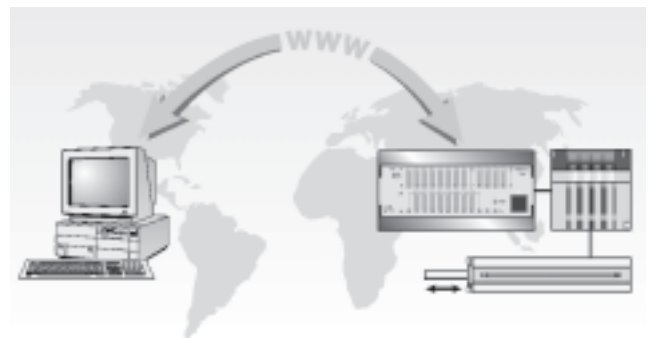
The FEC Standard


```
┌─────────────────────────┐
│       FEC Standard       │
│        Aluminium         │
│     Extruded housing     │
│ Can be mounted on top-hat rail │
│    2 serial interfaces   │
└─────────────────────────┘

        ┌─────────────────────────┐
        │          FC4…           │
        │    16 digital inputs    │
        │    8 digital outputs    │
        │    4 slots (96.3 mm)    │
        └─────────────────────────┘
                      ┌─────────────────┐
                      │      FC400       │
                      └─────────────────┘
                      ┌─────────────────┐
                      │      FC440       │
                      │     Ethernet     │
                      │     10BaseT      │
                      └─────────────────┘

        ┌─────────────────────────┐
        │          FC6…           │
        │    32 digital inputs    │
        │    16 digital outputs   │
        │    6 slots (138.9 mm)   │
        └─────────────────────────┘
                      ┌─────────────────┐
                      │      FC600       │
                      └─────────────────┘
                      ┌─────────────────┐
                      │      FC640       │
                      │     Ethernet     │
                      │     10BaseT      │
                      └─────────────────┘
        ┌─────────────────────────┐
        │          FC660          │
        │    3 analogue inputs    │
        │    1 analogue output    │
        └─────────────────────────┘
                      ┌─────────────────┐
                      │      FC660       │
                      │     Ethernet     │
                      │     10BaseT      │
                      └─────────────────┘
```

The principle of the FEC Standard
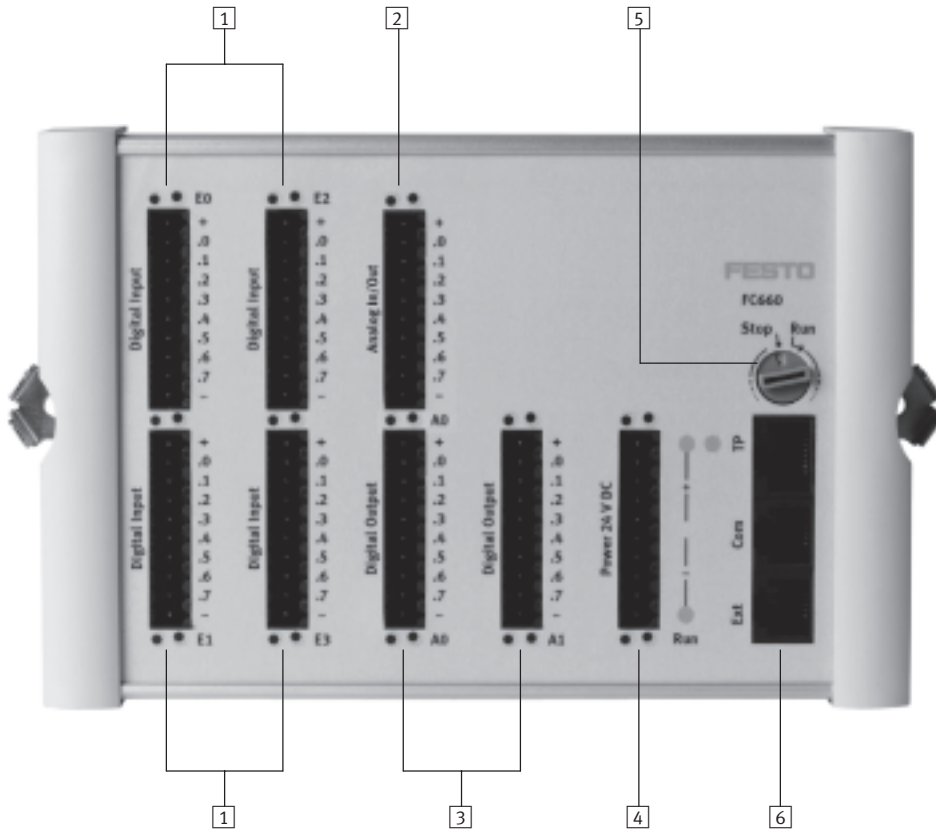
1	In each case 16 digital inputs, 24 V DC, positive-switching	3	In each case 8 digital outputs
2	Optionally: 3 analogue inputs/ 1 analogue output	4	Power supply
		5	Rotary RUN/STOP switch
		6	2 serial interfaces, option of Ethernet

8.Controllers FEC, Standard

Technical data

General technical data					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Max. operating temperature	0 ... 55 °C				
Max. transport and storage temperature	−25 ... +70 °C				
Rel. humidity	0 ... 95% (non condensing)				
Operating voltage	24 V DC +25%/−15%				
Power consumption	<5 W				
Degree of protection	IP20				
Degree of protection	Degree of protection III. Power pack in accordance with IEC 742/EN60742/VDE0551/PELV with at least 4 kV insulation resistance or switched-mode power supplies with safety isolation as defined by EN 60950/VDE 0805 are required				
Certification	C-Tick				
I/O connection	Tension spring connector				
EMC	EN 61000-6-4				

Digital inputs					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	16		32		
Number of above usable as high-speed inputs (max. 2 kHz)	2 Minimum pulse length for TRUE: 250 µs, Minimum pause length for FALSE: 250 µs				
Input voltage/current	24 V DC, typical 5 mA				
Nominal value for TRUE	15 V DC min.				
Nominal value for FALSE	5 V DC max.				
Input signal delay	Typical 5 ms				
Electrical isolation	Yes, via optocoupler				
Permissible length of connecting cable	Max. 30 m				
Status display via LED	Optional, in connector				

Analogue inputs					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	0	0	0	0	3
Signal range	0(4) ... 20 mA				
Resolution	12 bit, ±3 LSB				
Conversion time	10 ms				
Permissible length of connecting cable	Max. 30 m				

Digital outputs					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	8		16		
Contacts	Transistor				
Current/voltage	24 V DC, max. 400 mA				
Short circuit proof	Yes				
Proof against low-resistance loads	Yes, up to 5 W				
Overload-proof	Yes				
Electrical isolation	Yes, via optocoupler				
Switching speed	Max. 1 kHz				
Electrical isolation in groups	Yes, in each case 1 byte				
Maximum group current	3.2 A				
Switching cycles	Unlimited				
Status display via LED	Optional, in connector				

Analogue outputs					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	0	0	0	0	1
Signal range	0(4) ... 20 mA				
Resolution	12 bit				
Conversion time	10 ms				
Max. load resistance	700 Ω				

Rotary switch					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	1				
Positions	16				
STOP/RUN	0 = Stop				
	1 ... F = RUN				

Serial interface					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	2				
Connection	RJ12 plug socket				
Features	Serial, asynchronous, TTL level, no electrical isolation				
Use as RS232c	PS1-SM14 or PS1-SM15 required				
Terminal assignment SM14/15	Transmit, receive, RTS, CTS				
Use as RS485	PS1-SM35 required				
Use as programming interface	9600 bits/s, 8/N/1				
Use as universal interface: COM	300 ... 9600 bits/s, 7N1, 7E1, 7O1, 8N1, 8E1, 8O1				
Use as universal interface: EXT	300 ... 115,000 bits/s, 7N1, 7E1, 7O1, 8N1, 8E1, 8O1				

SAC connector					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number of connectors required	4	4	7	7	8
Insulating material	PBT, colour black				
Temperature range	PS1-SAC10/SAC30: −20 ... +100 °C				
	PS1-SAC11/SAC31: −20 ... +75 °C				
Flammability class	V-0				
Grid dimension	3.5 mm				
Connector system	Spring connection				
Insulation-stripping length	9 ... 10 mm				
Clamping range	0.05 ... 1.5 mm^2				
Single-conductor H05(07)V-U	0.20 ... 1.5 mm^2				
Multi-stranded without cable end sleeves	0.5 ... 1.5 mm^2				
Multi-stranded with cable end sleeves in accordance with DIN 46 228/1	0.5 ... 1.5 mm^2				
Multi-stranded hot-dip galvanized	0.05 ... 0.2 mm^2				
Current rating for strap contacts	16 A				
Current rating for individual contacts	2 A (max. 6 A per contact, please note the admissible loads for distributor board and supply contacts)				

Ethernet					
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC640	FEC-FC660
Number	0	1	0	1	1
Bus interface	IEEE802.3 (10BaseT)				
Data transmission speed	10 Mbits/s				
Connector	RJ45				
Supported protocols	TCP/IP, EasyIP, http				
OPC server	upon request				
DDE server	Yes, for EasyIP				

Controllers
Elektronic controllers

4.1

Programming	
	FST
Programming languages	Version 4.02: statement list
	(with version 3.2: statement list and ladder diagram in German and English)
Working language	German and English
Number of programs and tasks per project	64 (0 … 63)
Permissible input addresses	0 … 255
	addressable as bits or words
Permissible output addresses	0 … 255
	addressable as bits or words
Number of flags	10,000 (0 … 9999),
	addressable as bits or words
Number of timers and counters	256 (0 … 255) in each case, with 1 status bit, 1 setpoint and 1 actual value
Number of registers (words)	0 … 255
	addressable as words
Programming interface	RS232 or Ethernet
Number of different operations	> 28
Subroutine	Up to 200 different subroutines per project
C/C++	Yes, for modules and drivers
File handling	Yes
RS232c	Yes
ABG	Yes
FED	Yes
Web server	Yes (FST from version 4)
Remanence	Flag words 0 … 255
	Register 0 … 126
	Timer and counter preselects and counter words 0 … 127
	Password
Performance	1.6 ms/1k instructions approx.

Dimensions

Direct mounting or mounting on top-hat-rail in accordance with DIN EN 50 022 using integrated clip
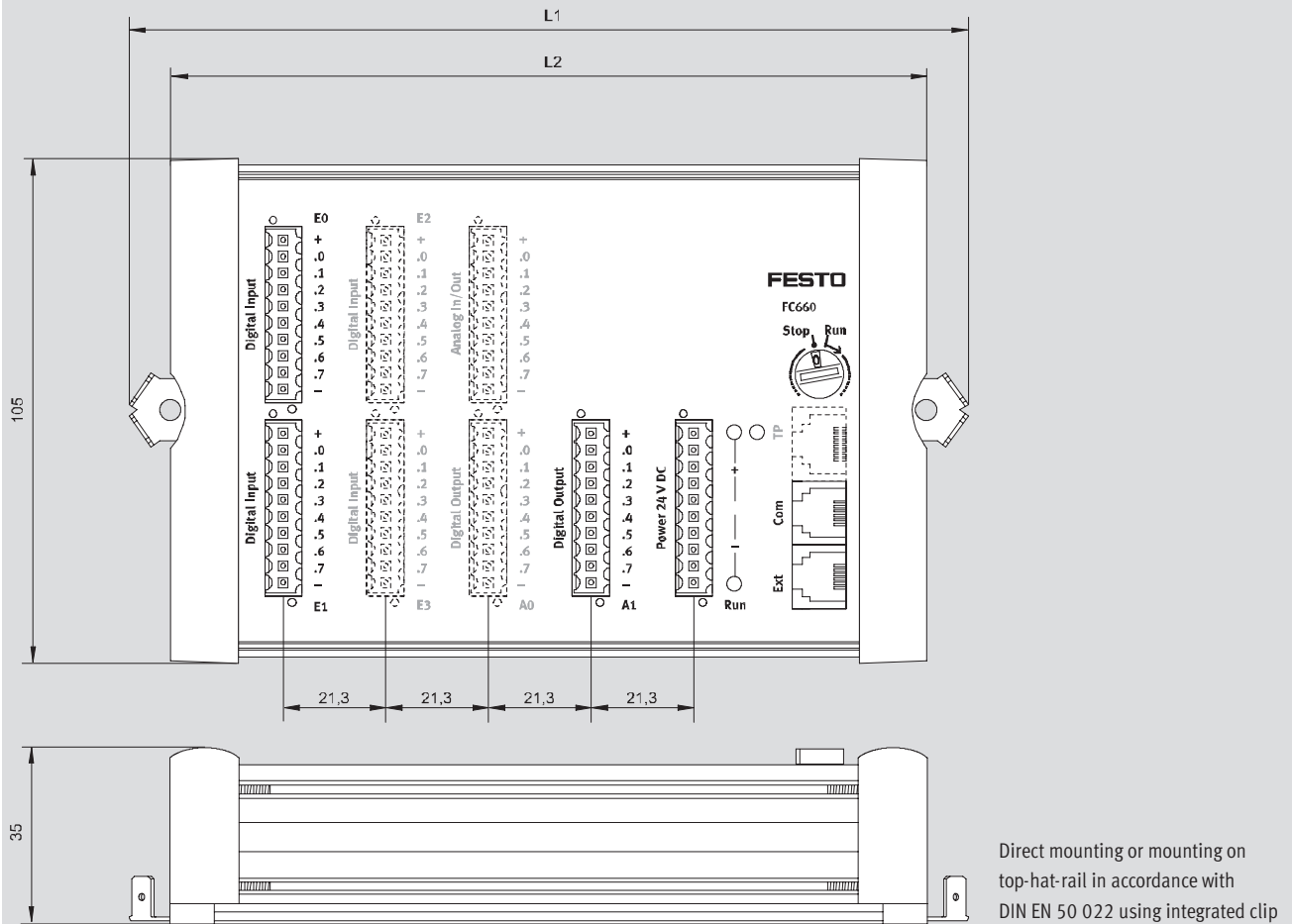
Type	L1	L2
FEC-FC4...	132.1	114.2
FEC-FC6...	174.7	156.8

Ordering data – The FEC Standard with FST programming

Designation	Features	Part No.	Type
IPC controller	16 I/8 O	**183 862**	**FEC-FC400-FST**
	16 I/8 O, Ethernet	**185 205**	**FEC-FC440-FST**
	32 I/16 O	**191 449**	**FEC-FC600-FST**
	32 I/16 O, Ethernet	**191 450**	**FEC-FC640-FST**
	32 I/16 O, 3/1 analogue I/Os, Ethernet	**197 157**	**FEC-FC660-FST**

Ordering data – Connectors for the FEC Standard

Designation	Features	Part No.	Type
Plug	1-row, no LED, tension-spring system	**197 159**	**PS1-SAC10-10POL**
Plug	1-row, with LED, tension-spring system	**197 160**	**PS1-SAC11-10POL+LED**
Plug	3-row, no LED, tension-spring system	**197 161**	**PS1-SAC30-30POL**
Plug	3-row, with LED, tension-spring system	**197 162**	**PS1-SAC31-30POL+LED**

- ▯ -   Note

Connectors must be ordered separately.

Ordering data – Cables for the FEC Standard

Designation	Features	Part No.	Type
Programming cable	RS232 adapter for programming from PC, complete with neutral modem cable	**188 935**	**PS1-SM14-RS232**
Converter	RS232 adapter for connection of any desired devices with a serial interface, with top-hat-rail clip, no neutral modem or RS232 cable	**192 681**	**PS1-SM15-RS232**
Converter	RS485 adapter, with top-hat-rail clip	**193 390**	**PS1-SM35-RS485**
Cable	Neutral modem cable	**160 786**	**PS1-ZK11-NULLMODEM-1,5M**
Earthing set	Earthing set for earthing of cable screening via the H-rail	**526 683**	**FEC-ZE30**

- ▯ -   Note

For programming from a PC via RS232, a PS1-SM14 must be ordered separately. For programming via Ethernet, the necessary drivers must first be loaded via RS232 (PS1-SM14).

Ordering data – Display and operating units

Designation	Features	Part No.	Type
Operator unit	Display and operating unit, LCD with 4 lines, 20 characters each, illuminated background, 4 function keys, real-time clock and expansion interface, e.g. Ethernet	**533 531**	**FED-50**
Operator unit	Display and operating unit, LCD with 4 lines, 20 characters each, illuminated background, 12 function keys, numeric keypad, real-time clock and expansion interface, e.g. Ethernet	**533 532**	**FED-90**
Fieldbus interface	Ethernet interface module for FED	**533 533**	**FEDZ-IET**
Programming cable	Programming cable for FED	**533 534**	**FEDZ-PC**
Cable	Connecting cable FEC (RJ12, COM and EXT) to FED	**189 432**	**FEC-KBG6**

Ordering data – Software and manuals for the FEC Standard

Designation	Features	Part No.	Type
Programming software	FST software version 4.X on CD, manuals on CD	**191 440**	**PS1-FST2-CD-WIN**
	FST software version 4.1 on CD with manual DIN A5 in German	**537 927**	**P.SW-FST4-CD-DE**
	FST software version 4.1 on CD with manual DIN A5 in English	**537 928**	**P.SW-FST4-CD-EN**
Manual	System manual FEC Standard, German	**525 368**	**P.BE-FEC-S-SYS-DE**
	System manual FEC Standard, English	**525 369**	**P.BE-FEC-S-SYS-EN**

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