■ **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**

Controllers FEC, Standard

Key features

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.

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 either FST or MULTIPROG. FST is a unique programming language which is 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.
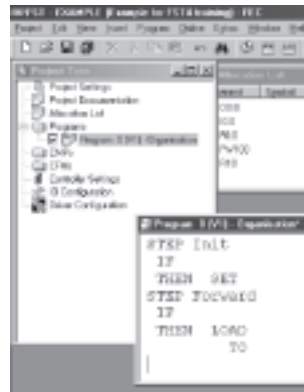
MULTIPROG is a programming system in accordance with IEC 6 1131-3 for all 5 standard programming languages. MWT facilitates standardised programming with its integrated facilities for operations, modules and variables management. MWT provides ideal support for the programming of complete networks within a project.

Electronic control systems
Front End Controllers

7.1

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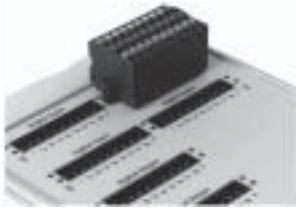
The three-wire version of the connector has internally connected straps for 0 V and 24 V DC. This allows any sensor (up to 3 wires) or actuator (up to the maximum permissible output current) to be fed directly to the connector. There is no need for a terminal strip for sensors and actuators. This allows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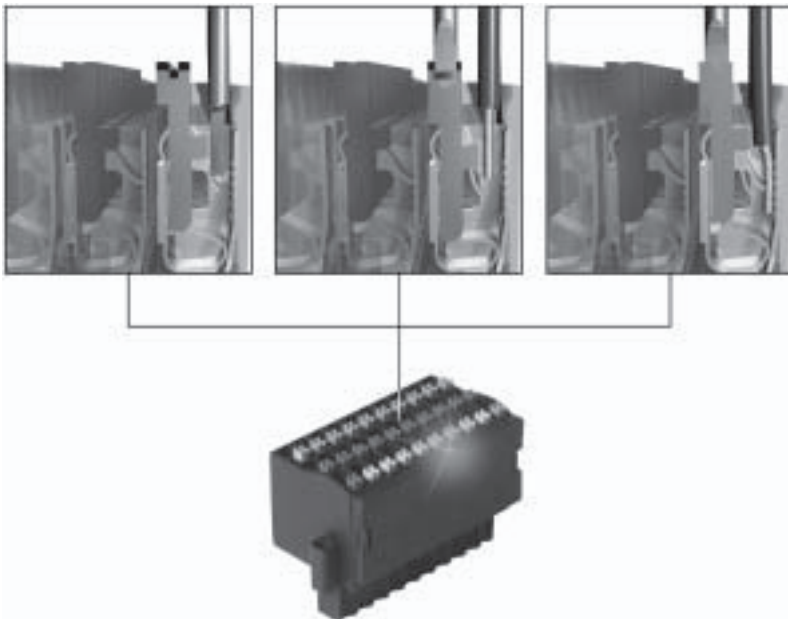
Programming with FST

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?

```
IF              I0.6
THEN    SET     O0.6
```

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…"

```
STEP Aplus
  IF              I0.0
  THEN    SET     O0.0

STEP Close
  IF              I0.2
  THEN    RESET   O0.2
          SET     O0.3
STEP More
```

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.

Programming with MWT

Programming based on the international standard

DIN IEC 6 1131-3 is the international standard for PLC programming. MULTIPROG supports all the 5 programming languages defined by this standard:
- Text-based languages: statement list and structured text
- The graphical languages: ladder diagram and function block diagram
- The language for organisation: sequential function chart

MWT makes everything easy
MULTIPROG offers assistance and dialogues to ensure that programming in accordance with IEC 6 1131-3 is easy even with mini controllers. Ready-made templates support direct access to controller equipment.

Network
With MWT, you can link up any desired number of controllers. This allows all the controllers in a network to be dealt with as a single project. Similarly, it means that programs and modules can be written just once and used in a large number of stations –

software re-usability is a central feature of IEC 6 1131-3.

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

MULTIPROG MWT
MWT is based on MULTIPROG from KW-Software. For more information about our software partner KW-Software
→ www.kw-software.com

PLCopen
No. C15/C16
IL/ST
01.04.97
BASE LEVEL

The FEC Standard


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

```
┌─────────────────────────┐
│        FC4XX            │
│   16 digital inputs     │
│   8 digital outputs     │
│   4 slots (96.3 mm)     │
└─────────────────────────┘
```

```
┌──────────────┐
│    FC400     │
└──────────────┘
```

```
┌──────────────┐
│    FC440     │
│   Ethernet   │
│   10BaseT    │
└──────────────┘
```

```
┌─────────────────────────┐
│        FC6XX            │
│   32 digital inputs     │
│   16 digital outputs    │
│   6 slots (138.9 mm)    │
└─────────────────────────┘
```

```
┌──────────────┐
│    FC600     │
└──────────────┘
```

```
┌──────────────┐
│    FC640     │
│   Ethernet   │
│   10BaseT    │
└──────────────┘
```

```
┌─────────────────────────┐
│       FC620/660         │
│   3 analogue inputs     │
│   1 analogue output     │
└─────────────────────────┘
```

```
┌──────────────┐
│    FC620     │
└──────────────┘
```

```
┌──────────────┐
│    FC660     │
│   Ethernet   │
│   10BaseT    │
└──────────────┘
```

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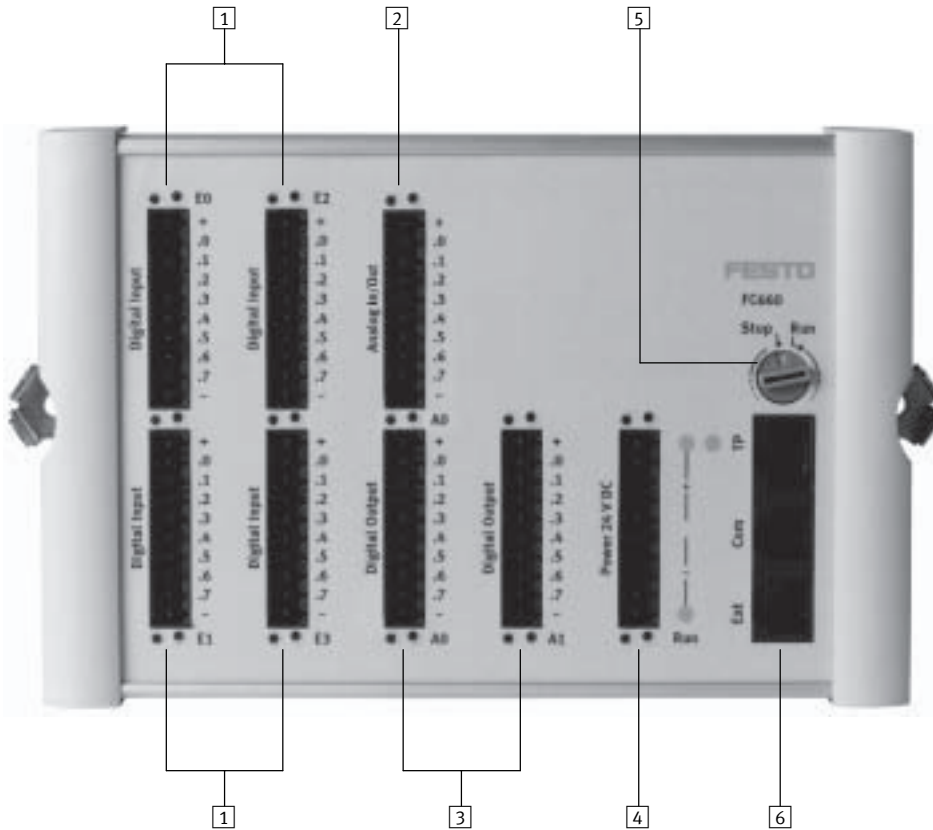
☐	In each case 16 digital inputs, 24 V DC, positive-switching	☐	In each case 8 digital outputs	☐	Rotary RUN/STOP switch
☐	Optionally: 3 analogue inputs/ 1 analogue output	☐	Power supply	☐	2 serial interfaces, option of Ethernet

Controllers FEC, Standard

Technical data

General						
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC620	FEC-FC640	FEC-FC660
Max. operating temperature	0 ... 55 ºC					
Max. transport and storage temperature	−25 ... +70 ºC					
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.					
I/O connection	Tension spring connector					
EMC	EN 61000-6-2, EN 50081-2					

Digital inputs						
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC620	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-FC620	FEC-FC640	FEC-FC660
Number	0	0	0	3	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-FC620	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-FC620	FEC-FC640	FEC-FC660
Number	0	0	0	1	0	1
Signal range	0(4) ... 20 mA					
Resolution	12 bit					
Conversion time	10 ms					
Max. load resistance	700 Ω					

Controllers FEC, Standard

Technical data

Rotary switch						
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC620	FEC-FC640	FEC-FC660
Number	1					
Positions	16					
STOP/RUN	0 = Stop					
	1 ... F = RUN					

Serial interface						
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC620	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-FC620	FEC-FC640	FEC-FC660
Number of connectors required	4	4	7	8	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)					

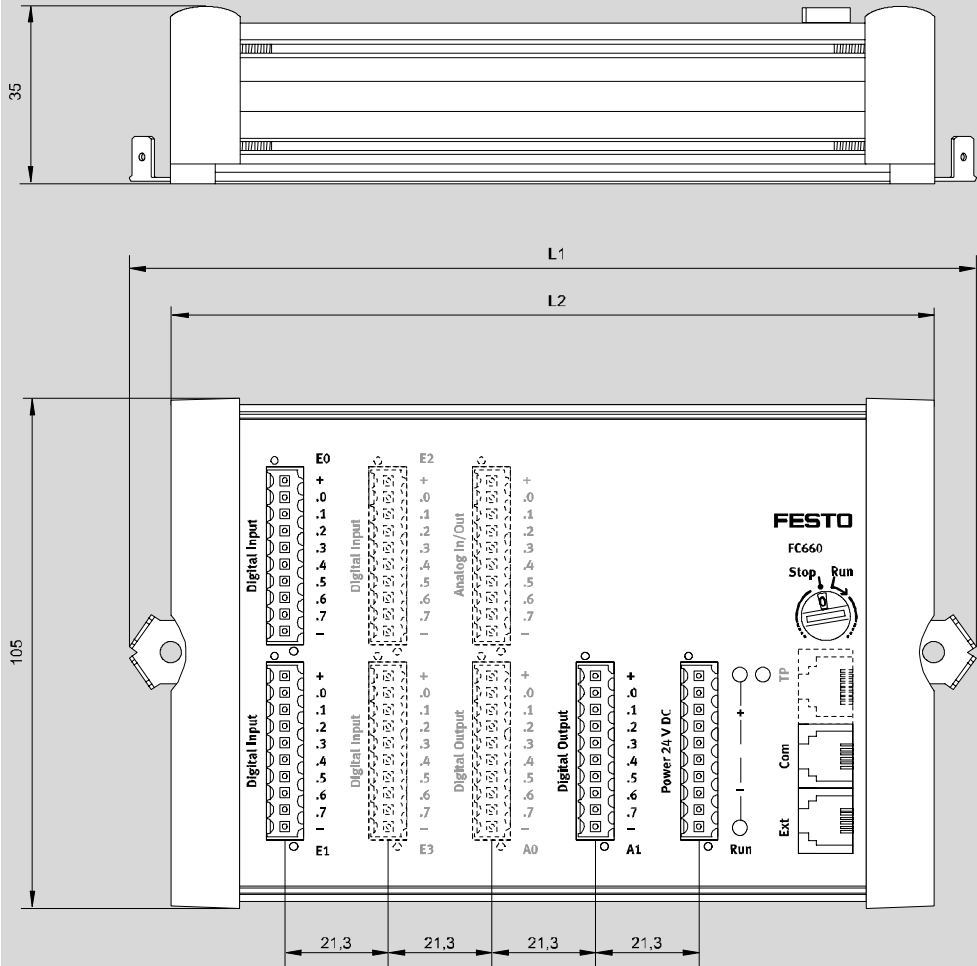| Ethernet						
	FEC-FC400	FEC-FC440	FEC-FC600	FEC-FC620	FEC-FC640	FEC-FC660
Number	0	1	0	0	1	1
Bus interface	IEEE802.3 (10BaseT)					
Data transmission speed	10 Mbits/s					
Connector	RJ45					
Supported protocols	TCP/IP, EasyIP, http (FST only)					
OPC server	upon request					
DDE server	Yes, for EasyIP					

Programming		
	FST	MWT
Programming languages	Version 4.02: statement list (with version 3.2: statement list and ladder diagram in German and English)	Statement list, structured text, ladder diagram, function block diagram and sequential function chart
Working language	German and English	German, English, French
Number of programs and tasks per project	64 (0 ... 63)	Unlimited number of programs (limited only by memory size), max. 15 tasks
Permissible input addresses	0 ... 255 addressable as bits or words	Permanently defined for FEC Standard
Permissible output addresses	0 ... 255 addressable as bits or words	Permanently defined for FEC Standard
Number of flags	10,000 (0 ... 9999), addressable as bits or words	32,000 bytes, addressable as bits or bytes or words
Number of timers and counters	256 (0 ... 255) in each case, with 1 status bit, 1 setpoint and 1 actual value	Unlimited (limited only by memory size)
Number of registers (words)	0 ... 255 addressable as words	0
Programming interface	RS232 or Ethernet	
Number of different operations	> 28	> 50
Subroutine	Up to 200 different subroutines per project	Unlimited (limited only by memory size)
C/C++	Yes, for modules and drivers	Yes
File handling	Yes	No
RS232c	Yes	Yes
ABG	Yes	Partial
FED	Yes	Partial
Web server	Yes (FST from version 4)	No
Remanence	Flag words 0 ... 255 Register 0 ... 126 Timer and counter preselects and counter words 0 ... 127 Password	2 kB
Performance	1.6 ms/1k instructions approx.	Smallest task pulse: 4.3 ms

Controllers FEC, Standard

Technical data

E0
+
.0
.1
.2
.3
.4
.5
.6
.7
–

E2
+
.0
.1
.2
.3
.4
.5
.6
.7
–

+
.0
.1
.2
.3
.4
.5
.6
.7
–

Digital Input

Digital Input

Analog In/Out

Digital Input

Digital Input

Digital Output

Digital Output

Power 24 V DC

FESTO

FC660

Stop Run

TP

Com

Ext

Run

E1

E3

A0

A1

21,3   21,3   21,3   21,3

L1

L2

35

105

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

Type	Part No.	Designation	Features
FEC-FC400-FST	183 862	IPC controller	16 I/8 O
FEC-FC440-FST	185 205		16 I/8 O, Ethernet
FEC-FC600-FST	191 449		32 I/16 O
FEC-FC620-FST	197 154		32 I/16 O, 3/1 analogue I/Os
FEC-FC640-FST	191 450		32 I/16 O, Ethernet
FEC-FC660-FST	197 157		32 I/16 O, 3/1 analogue I/Os, Ethernet

Ordering data – The FEC Standard with MWT programming

Type	Part No.	Designation	Features
FEC-FC400-MWT	185 200	IPC controller	16 I/8 O
FEC-FC440-MWT	185 206		16 I/8 O, Ethernet
FEC-FC600-MWT	197 153		32 I/16 O
FEC-FC620-MWT	197 155		32 I/16 O, 3/1 analogue I/Os
FEC-FC640-MWT	197 156		32 I/16 O, Ethernet
FEC-FC660-MWT	197 158		32 I/16 O, 3/1 analogue I/Os, Ethernet

Ordering data – Connectors for the FEC Standard

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

- ▤ - Note   Connectors must be ordered separately.

Ordering data – Cables for the FEC Standard

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

- ▤ - 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).

Controllers FEC, Standard

Technical data

Ordering data – Display and operating units

Type	Part No.	Designation	Features
FED-50	533 531	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
FED-90	533 532	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
FEDZ-IET	533 533	Fieldbus interface	Ethernet interface module for FED
FEDZ-PC	533 534	Programming cable	Programming cable for FED
FEC-KBG6	189 432	Cable	Connecting cable FEC (RJ12, COM and EXT) to FED

Ordering data – Software and manuals for the FEC Standard

Type	Part No.	Designation	Features
PS1-FST2-CD-WIN	191 440	Programming software	FST software version 4.X on CD, manuals on CD
FEC-CD-MWT	189 530		MWT software version 2.01 on CD, manuals on CD
FST 4.1 DE	537 927		FST software version 4.1 on CD with manual DIN A5 in German
FST 4.1 EN	537 928		FST software version 4.1 on CD with manual DIN A5 in English
P.BE-FEC-S-SYS-DE	525 368	Manual	System manual FEC Standard, German
P.BE-FEC-S-SYS-EN	525 369		System manual FEC Standard, English

Electronic control systems
Front End Controllers

7.1