

## SIMATIC FM 458-1 DP

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# SIMATIC FM 458-1 DP

## Basic Module

### FM 458-1 DP Basic Module

#### Overview



- Basic module for handling computing, open-loop control and closed-loop control tasks
- PROFIBUS DP interface for linking of distributed I/O and drive engineering
- Modular configuration with expansion modules for I/O and communication
- Max. ambient temperature 40 °C

#### Application

The FM 458-1 DP basic module handles complete closed-loop control and computing tasks. Very short sampling times down to 100  $\mu$ s even enable the handling of dynamic control tasks.

- Normalization not required
- Practically unlimited value range
- Very high resolution

The shortest sampling times from 100  $\mu$ s also allow dynamic closed-loop control tasks to be mastered. These include, for example, cross-cutter applications, hydraulic press control systems.

#### Design

- 64-bit RISC processor for the highest computational performance
- 8 fast digital inputs for signal level or edge-controlled call of up to 8 interrupt tasks (interrupts)
- PROFIBUS DP interface to couple distributed I/O (peripherals) and drive technology
- Battery-buffered SRAM with 256 Kbytes to save up to 1000 process quantities or recorded trace data in a non-volatile fashion

- A fan is required at ambient temperatures above 40 °C.

#### Expansion modules

Expansion modules are available for the FM 458-1 DP basic module for fast signal transmission.

#### EXM 438-1: I/O expansion

- Analog and digital inputs/outputs
- Incremental and absolute encoder connections

#### EXM 448: communication expansion

- PROFIBUS DP (master or slave), not equidistant or capable of internode communication; must be configured using COM PROFIBUS
- One slot for MASTERDRIVES option modules, e.g., for the
  - SIMOLINK module SLB (this is already integrated for the EXM 448-1)
  - high-resolution multi-turn encoder module SBM2
  - PROFIBUS DP slave module CBP2

The EXM 448 communication expansion is available unchanged for compatibility reasons and is configured using COM PROFIBUS.

#### EXM 448-2: communication expansion

- Communication through up to 2 SIMOLINK interfaces
- Scan-time synchronous coupling of several FM 458-1 DP

The expansion modules can only be used with the FM 458-1 DP, where max. two of these expansion modules can be combined.

Any number of these "FM 458-1 DP combinations" can be used in a SIMATIC S7-400 station taking into consideration the power consumptions.



Basic module FM 458-1 DP with expansion modules EXM 438-1 and EXM 448 (from the left)

#### Function

##### Communication

Data exchange with the assigned SIMATIC CPU (according to configuration in HW Config) is implemented via the backplane bus which has been designed for fast data exchange.

Startup and servicing using the online functions of STEP 7/CFC is carried out via the so-called C-bus on the S7-400 station.

It is then possible to start and diagnose the FM 458-1 DP e.g., via the central MPI connection of the SIMATIC CPU.

Communication with partners outside the S7-400 is preferably via the PROFIBUS DP interface present on the FM 458-1 DP basic module. This PROFIBUS DP interface offers the following properties:

- **Equidistance:**  
The PROFIBUS DP cycle is always the same length. This PROFIBUS DP cycle can be used as the start event for one of the eight interrupts. This permits synchronization of the user program with the PROFIBUS DP cycle.
- **Internode communication:**  
The configured slaves can exchange data "directly" with one another without configuration in the FM 458-1 DP.
- **Routing capability:**  
The slaves connected to this PROFIBUS DP interface can be parameterized and diagnosed by means of the integrated C-bus function via any other interfaces on the S7-400 system (e.g., the MPI interface integrated on the SIMATIC CPU) providing this is supported by the slaves, e.g., with MASTER-DRIVES or DC-MASTER.
- **Configuration using HW Config:**  
The configuration software is already integrated in STEP 7 (not an additional tool).
- **Isochrone mode**  
The CPU, IO equipment and the user program run synchronously on the PROFIBUS cycle.

### Accessories

- SB10, SB61, SU12 interface modules with SC64 cable (for digital inputs)
- Micro memory Cards (Program memory modules, required for operation)

## Configuring

### Configuring with CFC instead of programming

Configuring of the FM 458-1 DP is carried out using the well-known STEP 7 and CFC (Continuous Function Chart), optionally with SFC:

- The CFC test mode permits fast and graphically-supported startup and signal tracing during operation by means of:
  - Viewing and modification of values
  - Creation, modification and deletion of links between function blocks
  - Insertion or deletion of function blocks
- The application block generator D7-FB-Gen lets you create individual function blocks. These can also be integrated into the CFC.

*For further details about D7-SYS, see page 7/4.*

## Technical specifications

FM 458-1 DP basic module	
Voltage/current supply (rated values)	+5 V: 2.3 A
Backup battery (of SIMATIC power supply)	3.4 V: 10 µA
<b>PROFIBUS DP interface (connector X3)</b>	Equidistant with linking to alarm tasks Internode communication capability Configuration with HW Config
<b>Digital inputs (connector X2)</b>	
Quantity	8 inputs, with interrupt capability
Galvanic isolation	No, only through optional interface module
Input voltage	
Rated value	24 V DC
• For "0" signal	-1 to +6 V or open-circuited input
• For "1" signal	+13 to +33 V
Input current	
• for "0" signal	0 mA
• For "1" signal, typ.	3 mA at 24 V
Delay time	20 µs
Real-time clock, resolution	0.1 ms
Space requirements/width	1 SIMATIC slot
Weight, approx.	0.8 kg

# SIMATIC FM 458-1 DP

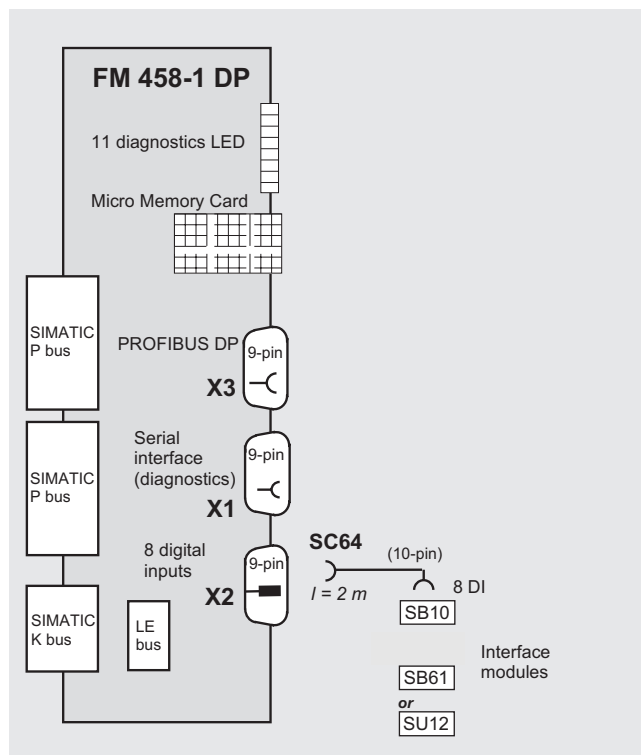
## Basic Module

### FM 458-1 DP Basic Module

#### Selection and ordering data

	Order No.
<b>FM 458-1 DP application module</b>	<b>6DD1 607-0AA1</b>
Basic module for handling computing, open-loop control and closed-loop control tasks with PROFIBUS DP interface	
<b>Micro memory card</b>	
for FM 458-1 DP basic module	
• 2 MB	<b>6ES7 953-8LL11-0AA0</b>
• 4 MB	<b>6ES7 953-8LM11-0AA0</b>
<b>FM 458-1 DP user guide</b>	<b>6DD1 904-0AE1</b>
German/English	
<b>SB10 interface module</b>	<b>6DD1 681-0AE2</b>
to connect 8 digital inputs/outputs, 24 V DC, to FM 458-1 DP	
<b>SB61 interface module</b>	<b>6DD1 681-0EB3</b>
to connect 8 digital inputs/outputs, 24/48 V DC, to FM 458-1 DP	
<b>SU12 interface module</b>	<b>6DD1 681-0AJ1</b>
to connect 10 signals to an FM 458-1 DP	
<b>SC64 interface cable</b>	<b>6DD1 684-0GE0</b>
to connect an FM 458-1 to the serial interface of a PG/PC	
<b>RS 485 bus connector with 90° outgoing feeder cable</b>	
Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7 972-0BA12-0XA0</b>
• With PG interface	<b>6ES7 972-0BB12-0XA0</b>
<b>RS 485 bus connector with slanting outgoing feeder cable</b>	
Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7 972-0BA41-0XA0</b>
• With PG interface	<b>6ES7 972-0BB41-0XA0</b>
<b>RS 485 bus connector with 90° outgoing feeder cable for FastConnect system</b>	
Max. transmission rate 12 Mbit/s	
• Without PG interface	<b>6ES7 972-0BA50-0XA0</b>
• With PG interface	<b>6ES7 972-0BB50-0XA0</b>
<b>PROFIBUS FastConnect bus cable</b>	
Standard type with special design for quick assembly, 2-core, shielded, meter goods; max. consignment 1000 m, minimum order 20 m	<b>6XV1 830-0EH10</b>
Preferred lengths:	
• 20 m	<b>6XV1 830-0EN20</b>
• 50 m	<b>6XV1 830-0EN50</b>
• 100 m	<b>6XV1 830-0ET10</b>

#### Connection diagram



### Overview



- Optional plug-in expansion module for the FM 458-1 DP basic module
- For input and output of time-critical signals
- With digital and analog inputs/outputs
- Incremental and absolute value encoders can be connected
- 4 high-resolution analog outputs
- Max. ambient temperature 40 °C

### Benefits

The optional EXM 438-1 input/output expansion module permits direct exchange of signals between the FM 458-1 DP basic module and the installation.

The EXM 438-1 is able to record and convert the signals so rapidly that an up-to-date value is available for the FM 458-1 DP in every cycle (from 100 µs).

### Design

- 5 analog inputs
- 4 analog outputs 12 bit
- 4 analog outputs 16 bit
- 16 digital inputs
- 8 digital outputs
- 8 incremental encoders, with synchronization capability
- 4 absolute encoders

A fan is required at ambient temperatures above 40 °C.

### Accessories

- SU13 interface module with SC63 cable for all signals without signal conversion
- SB10, SB71, SU12 interface modules with SC62 cable for digital outputs
- SB61, SU12 interface modules with SC62 cable for digital inputs

### Function

The EXM 438-1 is directly connected to the FM 458-1 DP basic module via the internal bus. This permits the FM 458-1 DP to access the I/O extremely rapidly. Only the power supply, but not the data transfer, is obtained from the backplane bus.

Access to the I/O of the EXM 438-1 is accomplished with configured function blocks.

### Technical specifications

<b>EXM 438-1</b>	
<b>Supply voltage</b>	
Rated value	
• DC 5 V	Yes
• DC 24 V	Yes; must be externally connected
<b>Current drain</b>	
• Current drain, typ.	1.5 A
<b>Digital inputs</b>	
• Quantity	16
Input voltage	
• Rated voltage, DC	24 V
• For a 0 signal	-1 to +6 V or open-circuit input
• For a 1 signal	+13 to +33 V
Input current	
• For a 0 signal, max. (permissible idle current)	0 mA
• For a 1 signal, typ.	3 mA
Input delay (for rated input voltage)	
• for standard inputs - from 0 to 1, max.	200 µs
<b>Digital outputs</b>	
• Quantity	8
• Short-circuit protection	Yes; electronic/thermal
• Short-circuit protection, response threshold, typ.	250 mA
• Limiting of inductive switch-off voltages	Supply voltage + 1 V
Output voltage	
• Rated voltage (DC)	24 V; permissible range (including ripple): +20 to +30 V; briefly +35 V, max. 0.5 s
• for a 0 signal (DC), max.	3 V
• for a 1 signal (DC), max.	Supply voltage- 2.5 V
Output current	
• for a 0 signal, residual current, max.	20 µA
• for a 1 signal, rated value	50 mA
• for a 1 signal, permissible range for 0 up to 40 °C, min.	100 mA
• Total load	80 % at 50 °C all outputs 50 mA
Output delay time for an ohmic load	
• "0" up to "1", max.	15 µs

# SIMATIC FM 458-1 DP Expansion Modules

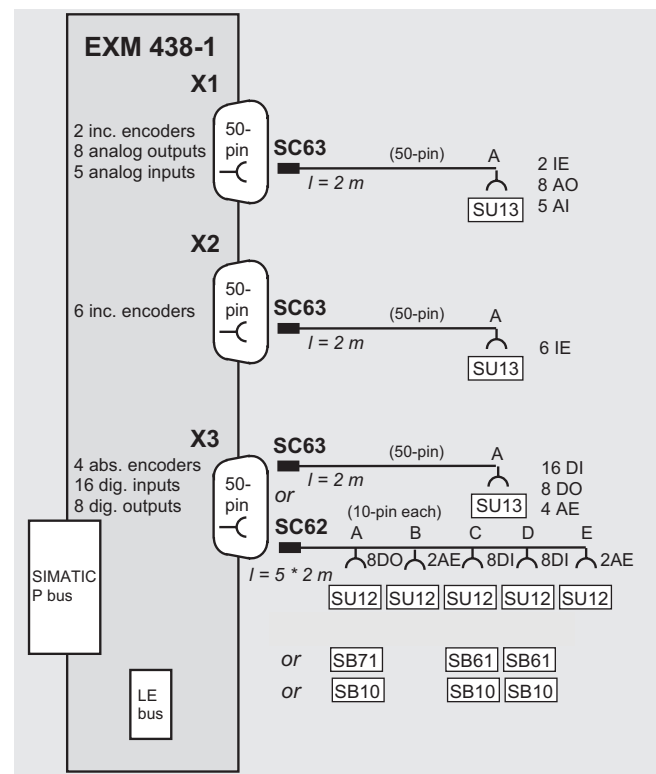
## EXM 438-1 Input/Output Expansion

<b>Analog inputs</b>	
• Quantity	5; differential inputs
Input voltage range	
• -10 V to +10 V	Yes; -10 V ± 4 LSB to +10 V ± 4 LSB (1 LSB = 4.88 mV)
• Input resistance (-10 V to +10 V)	470 kΩ
<b>Analog outputs</b>	
• Quantity	8; 4 outputs 16 bit, 4 outputs 12 bit
• Voltage output, Short-circuit protection	Yes; with respect to ground
• Current output, Short-circuit protection, max	27 mA; 16 bit: 27 mA; 12 bit: 100 mA
Output voltage range	
• -10 to +10 V	Yes
<b>Analog output values</b>	
Integration and conversion time, resolution per channel	
• with boost range (bit, incl. sign), max.	16 bit; 4 AO: 16 bit, 4 AO: 12 bit, 5 AE: 12 bit
• Conversion time (per channel)	2 μs; 4 AO (16 bit): 2 μs; 4 AO (12 bit): 4 μs; 5 AE: 45 μs
<b>Encoders</b>	
• Number of encoders, max.	12; 8 incremental encoders (can be synchronized), 4 absolute value encoders
Connectable encoders	
• incremental encoder (symmetric)	Yes
• incremental encoder (asymmetric)	Yes
• Absolute value encoder (SSI)	Yes; Single- or multiturn encoder with SSI (synchronous serial) or EnDat interface
Absolute value encoder (SSI)	
• Signal voltage	5 V according to RS 422
• Data formats	Dual-, gray-, gray-excess code
• Data transfer rate, max.	2 MHz; 100 kHz to 2 MHz (this is dependent on the cable length)
<b>Errors, accuracies</b>	
• Linearity error (with respect to output range)	(± 1 LSB)
<b>Isolation</b>	
Analog outputs	
• Isolation analog outputs	No
Analog inputs	
• Isolation analog inputs	No
Digital outputs	
• Isolation digital outputs	No
Digital inputs	
• Isolation digital inputs	No
<b>Dimensions and Weight</b>	
Weight, approx.	1 kg
Space requirement	1 slot

### Selection and ordering data

	Order No.
<b>EXM 438-1 input/output expansion</b>	<b>6DD1 607-0CA1</b>
for direct exchange of digital and analog signals between FM 458-1 DP and the plant	
<b>FM 458-1 DP user guide</b>	<b>6DD1 904-0AE1</b>
German/English	
<b>SB10 interface module</b>	<b>6DD1 681-0AE2</b>
to connect 8 digital inputs/outputs, 24 V DC, to FM 458-1 DP	
<b>SB61 interface module</b>	<b>6DD1 681-0EB3</b>
to connect 8 digital inputs/outputs, 24/48 V DC, to FM 458-1 DP	
<b>SB71 interface module</b>	<b>6DD1 681-0DH1</b>
to connect 8 digital outputs with transistors, 24/48 V DC	
<b>SU12 interface module</b>	<b>6DD1 681-0AJ1</b>
to connect 10 signals to an FM 458-1 DP	
<b>SU13 interface module</b>	<b>6DD1 681-0GK0</b>
to connect 50 signals to an FM 458-1 DP	
<b>SC62 interface cable</b>	<b>6DD1 684-0GC0</b>
to connect up to 5 interface modules SBxx and/or SU12, 2 m long	
<b>SC63 interface cable</b>	<b>6DD1 684-0GD0</b>
to connect an SU13 interface module, 2 m long	

### Connection diagram



### Overview



- Optional plug-in expansion module for the FM 458-1 DP basic module
- For fast communication via PROFIBUS DP or SIMOLINK
- EXM 448: with vacant slot for a MASTERDRIVES option module
- EXM 448-1: with installed MASTERDRIVES option module SLB for configuration of a SIMOLINK fiber-optic connection
- Max. ambient temperature 40 °C

### Application

The optional EXM 448/EXM 448-1 communication expansion permits fast communication between the FM 458-1 DP basic module and drives, ET 200 stations or other components.

### Design

#### EXM 448

- PROFIBUS DP interface (master or/and slave), not equidistant and not slave-to-slave communications-capable, to be configured with COM PROFIBUS
- Vacant slot for a MASTERDRIVES option module, e.g., for:
  - SLB for configuration of a SIMOLINK fiber-optic connection for very fast, synchronized connection of drives (MASTERDRIVES); operation as SIMOLINK master, dispatcher or slave (transceiver).
  - SBM2 for connection of a high-resolution multiturn encoder (sin/cos encoder)
  - CBP2 for PROFIBUS DP slave or USS
- A fan is required at ambient temperatures above 40 °C.

#### EXM 448-1:

- PROFIBUS DP interface (master or/and slave), not equidistant and not slave-to-slave communications-capable, to be configured with COM PROFIBUS
- Fitted MASTERDRIVES option module SLB in order to set up a SIMOLINK fiber-optic connection for very fast, synchronized connection of drives (MASTERDRIVES); operation as SIMOLINK master, dispatcher or slave (transceiver). See System and Communication Manual, Chapter 17, SIMOLINK Drive Interfacing.
- A fan is required at ambient temperatures above 40 °C.

### Function

#### Mode of operation

The EXM 448/EXM 448-1 is directly connected to the FM 458-1 DP basic module via the internal bus. Only the power supply, but not the data transfer, is obtained from the backplane bus. Access to the EXM 448/EXM 448-1 is accomplished with configured function blocks.

#### Configuration

##### DP master programming with COM PROFIBUS

If an EXM 448 or an EXM 448-1 is to be used as a PROFIBUS DP master, the associated bus parameters must be calculated using the COM PROFIBUS PC program and transferred to the EXM 448/EXM 448-1.

When used as a DP slave, no parameterization is required with COM PROFIBUS.

The bus parameters can be transferred to the EXM 448/EXM 448-1 expansion module via the following interfaces:

- Directly with a PROFIBUS cable for a PROFIBUS DP connection, e.g., using the CP 5511 (PCMCIA).
- Using the "SS52load" program via the RS 232 interface of the EXM 448/EXM 448-1; "SS52load" is included in COM PROFIBUS V3.1 or later.

### Technical specifications

EXM 448, EXM 448-1 communications expansion module	6DD1 607-0EA0	6DD1 607-0EA1
<b>Power supply voltage</b>		
Rated voltage	DC 5 V	DC 5 V
Current drain, typ.	0.6 A	0.8 A
<b>Dimensions and Weight</b>		
Weight, approx.	0.8 kg	0.9 kg
Space requirement	1 slot	1 slot

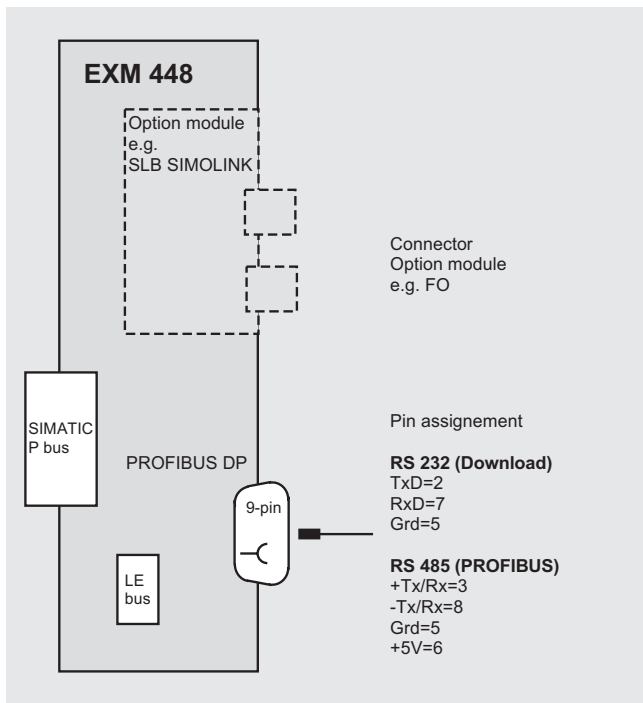
# SIMATIC FM 458-1 DP Expansion Modules

## EXM 448, EXM 448-1 Universal Communication Expansion

### Selection and ordering data

	Order No.
<b>EXM 448 universal communications expansion module</b> for fast communication, e.g. with drives; with vacant slot for MASTERDRIVES option module	<b>6DD1 607-0EA0</b>
<b>EXM 448-1 universal communications expansion module</b> for fast communication, e.g. with drives; with MASTERDRIVES option module SLB for designing a SIMOLINK fiber-optic connection	<b>6DD1 607-0EA1</b>
<b>COM PROFIBUS V5.1 parameter assignment software</b> for parameterization of PROFIBUS networks for Windows 95/98/NT/2000/Me on CD-ROM, in 5 languages, incl. documentation	<b>6ES5 895-6SE03</b>
<b>FM 458-1 DP user guide</b> German/English	<b>6DD1 904-0AE1</b>

### Connection diagram





# SIMATIC FM 458-1 DP Expansion Modules

## EXM 448-2 Universal Communication Expansion

### Overview



- Optional plug-in expansion module for the FM 458-1 DP basic module
- For fast communication over up to 2 SIMOLINK interfaces
- For coupling several FM 458-1 DP application modules in synchronism with the sampling time

### Application

The optional communications expansion EXM 448-2 supports high-speed communication of the FM 458-1 DP-basic module with drives on the basis of the SIMOLINK protocol.

### Design

- 2 SIMOLINK interfaces (master and/or slave) for connecting drive units (MASTERDRIVES) quickly and synchronized; operation as SIMOLINK master, dispatcher or slave (transceiver).
- Vacant slot for a MASTERDRIVES option module, e.g., for:
  - SBM2 for connection of a high-resolution multitrans encoder (sin/cos encoder)
  - CBP2 for PROFIBUS DP slave

### Function

#### Mode of operation

##### Coupling to FM 458-1 DP

The EXM 448-2 is directly connected to the FM 458-1 DP basic module via the internal bus. Only the power supply, but not the data transfer, is obtained from the backplane bus. Access to the I/O is by means of configured function blocks..

#### Configuration

##### Configuring with CFC instead of programming

Configuring of the FM 458-1 DP is carried out using the well-known STEP 7 and CFC (Continuous Function Chart) software tools which are also used for programming the SIMATIC S7-400.

CFC is an object-oriented and intuitively applied Windows program which is simple to learn. The D7-SYS add-on software package expands the CFC by the function blocks and the optimized operating system. Data is exchanged with the connected drives using the SIMOLINK function blocks contained in D7-SYS.

For further details about D7-SYS, see page 7/4.

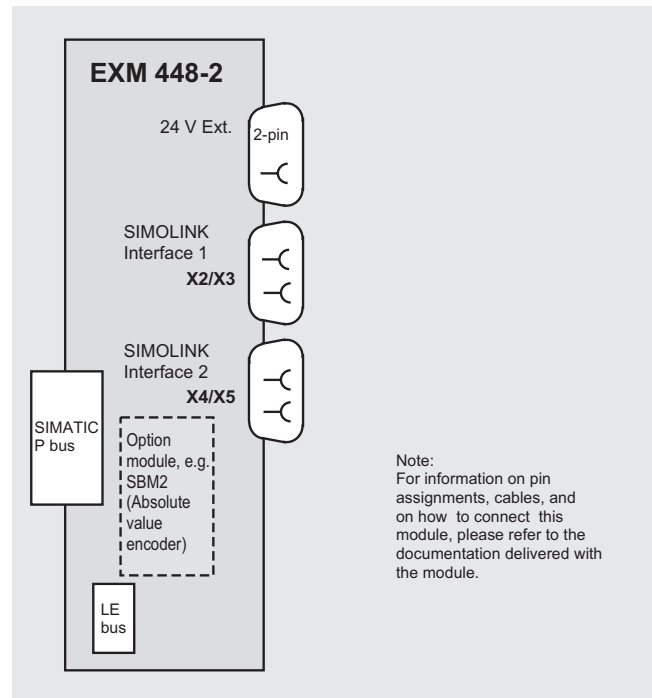
### Technical specifications

<b>EXM 448-2 universal communications expansion module</b>	<b>6DD1 607-0EA2</b>
Power supply voltage	
• Rated voltage	DC 5 V
• Current, typ.	0.6 A
Weight, approx.	0.9 kg
Space requirement	1 slot

### Selection and ordering data

	Order No.
<b>EXM 448-2 universal communications expansion module</b>	<b>6DD1 607-0EA2</b>
For fast communication with drives; for constructing two SIMOLINK fiber-optic connections	
Can be delivered as of November 2004	
<b>FM 458-1 DP User guide</b>	<b>6DD1 904-0AE1</b>
German/English	

### Connection diagram



# SIMATIC FM 458-1 DP

## Expansion Modules



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