2.1.8 Technical data

Order No.

Application module FM 458-1 DP	6DD1607-0AA1 / 6DD1607-0AA2

Program memory

Usable MMC-Cards: 2, 4 or 8 MB

Serial service interface (X1)

RS232 interface (V.24)	
• Service protocol	• DUST1
• Data transfer rate	• 19.2 kbaud

Binary inputs (X2)

Number	8
Electrical isolation	No (only via optional IF modules)
Input voltage	
• permissible range	• -1 V to +33 V
• nominal voltage	• 24 V
• for a 0 signal	• -1 V to +6 V or open-circuit inputs
• for a 1 signal	• +13.5 V to +33 V
Input current	
• for a 0 signal, typical	• 0 mA
• for a 1 signal, typical	• 3 mA
Delay time per channel, max.	100 µs

PROFIBUS DP interface (X3)

Data transfer rate	max. 12 Mbaud

Voltage, currents

Nominal voltages at 25° C	Typical current drain (typical = 2/3 max.)
+5 V	2.2 A / 1.5 A
Battery +3.4V	15 µA

Power loss

Power loss, typical	11 W / 7.5 W

ambient temperature

ambient temperature	max. 40° C
	max. 50° C only in stand alone mode with the interface modules SU12. SB10 and SB61 with the cable SC64

Dimensions

Assignment, slots	1
Dimensions W x H x D [mm]	260 x 197 x 20.32
Weight	1.0 kg

2.2 I/O expansion module EXM 438-1

Designation	Order No.
I/O expansion module EXM 438-1	6DD1607-0CA1

2.2.1 Application and design

Application

The EXM 438-1 expansion module provides additional binary and analog I/O as well as incremental- and absolute value encoders. Fast data transfer with the FM 458 application module is realized via the internal LE bus. The power supply is obtained via the P bus of SIMATIC S7-400. It is not possible to directly transfer process data via the P bus.

To connect the 24V DC power supply of the binary inputs and outputs, terminals 9 and 10 on the SU13 interface module must be used:

- Terminal 9: 24V
- Terminal 10: M

These terminals have been designed so that the polarity cannot be interchanged.

Design

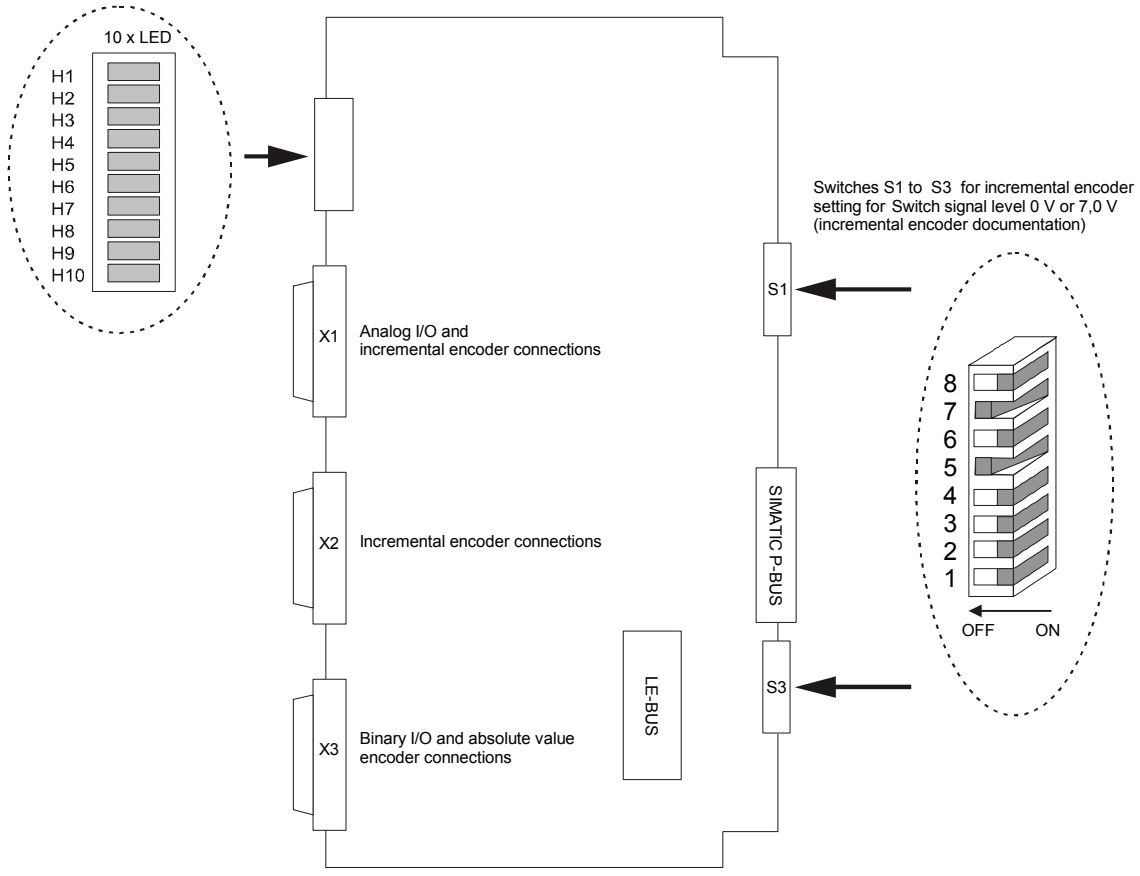

Fig. 2-4 Mechanical design of the I/O EXM 438-1 expansion module

2.2.2 Performance features

- 8 incremental encoders:
- 4 absolute value encoders (SSI or EnDat)
- 5 analog inputs
- 4 analog outputs 12 Bit (analog outputs 5 - 8)
- 4 analog outputs 16 Bit (analog outputs 1 - 4)
- 16 binary inputs, 24 V
- 8 binary outputs, 24 V
- Fanless operation up to 40° C air intake temperature (ambient temperature) possible.
- 8 LEDs which the user can configure as required

  LED displays H1 to H8, when required, can be controlled using function block BIQ8 (binary output).
  LEDs H9 and H10 have no function.

- LE bus

  The LE bus ensures fast data transfer between the FM 458 application module and its expansion modules.

- P bus

  The peripheral bus (P bus) is the parallel SIMATIC backplane bus, which only provides the power supply for the EXM 438-1.

Load Current Power Supply

The DC load current power supply must meet the following requirements:

Only a safe, isolated extra-low voltage of DC ≤ 60 VDC may be used as the load current supply. Isolation may be implemented according to the requirements of the following, amongst other publications:
VDE 0100-410 / HD 384-4-41 S2 / IEC 60364-4-41
(as a functional extra-low voltage with isolation) or
VDE 0805 / EN 60950 / IEC 60950
(as a safely extra-low voltage SELV) or VDE 0106 Part 101.

NOTE

Ground-free operation is not possible when using the EXM 438-1.

EXM 438-1 is an “open type” and therefore only can be installed in closed switch cabinets or switch rooms.

2.2.3 Supplementary components

Interface modules

All of the I/O signal cables are not directly connected to the module, but via interface modules. The interface modules are used as mechanical connecting elements (screw terminals) as well as to electrically adapt the plant/system signals and convert them (optional).

Components	Designation	Order No.
Interface module, electrical 1:1 connection	SU12	6DD1681-0AJ1
Interface module, electrical 1:1 connection	SU13	6DD1681-0GK0
Interface module, electrical 1:1 connection	SB10	6DD1681-0AE2
Interface module with electrical isolation and signal conversion	SB61	6DD1681-0EB3
Interface module with electrical isolation and signal conversion	SB71	6DD1681-0DH1
power supply connector for interface module SB10, SB61, SB71	SM11	6DD1680-0BB0

Table 2-7 Interface modules for the I/O expansion module EXM 438-1

NOTE

The operation of the EXM438-1 is only allowed with these interface modules.

The interface modules are “open type” and therefore only can be installed in closed switch cabinets or switch rooms.

For further informations about the interface modules see documentation “SIMADYN D Hardware”

Cables

The module is connected to the interface modules via the appropriate plug-in cables. Plug-in cable SC62 has five cable ends which can be connected to the appropriate number of suitable interface modules.

Components	Designation	Order No.
Connecting cable, 50-pin/5*10-pin	SC62	6DD1684-0GC0
Connecting cable, 50-pin/50-pin	SC63	6DD1684-0GD0

Table 2-8 Cables for the input/output expansion module EXM 438-1

2.2.4 Connection possibilities

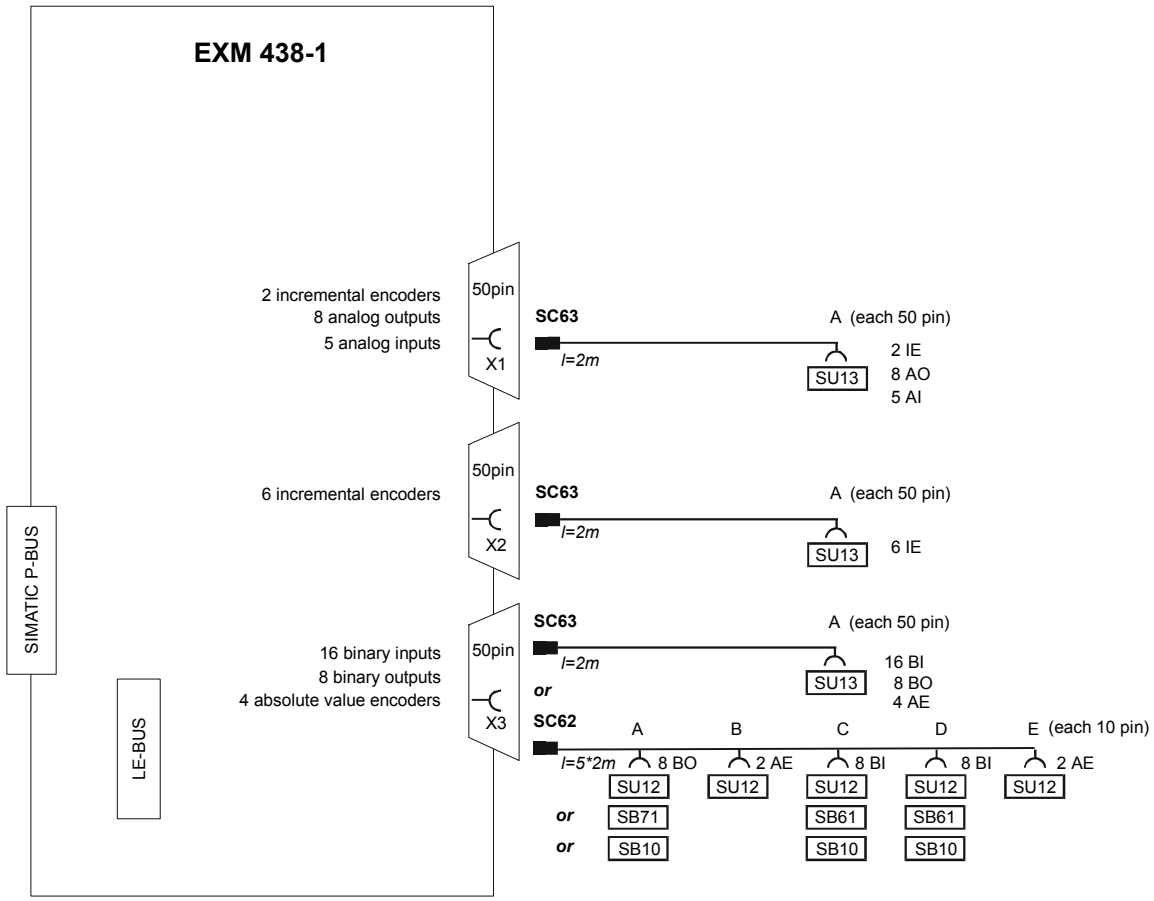

Fig. 2-5 Connection possibilities of the input/output expansion module EXM 438-1

LE-bus connection An additional expansion module (EXM 438-1 or EXM 448/EXM 448-2) can be inserted at this 5 x 24 pin socket connector.

P-bus connection The 5 x 17 pin socket connector is used to connect to the SIMATIC S7 backplane (only power supply).

2.2.8 Technical data

Order No.

/O expansion module EXM 438-1	6DD 1607 0CA1

Analog outputs

Number	4 (Output 5 – 8)
Electrical isolation	No
Output voltage range	- 10 V to + 10 V
Output current	± 10 mA
Resolution	12 bit
Conversion time per channel, typ.	4 µs
Accuracy • Integral linearity error, max. • Gain error, max. • Offset error, max.	 • ± 1 LSB • ± 0.3 % • ± 24 mV
Slew rate	approx. 3.5 V/µs
Voltage output • Short-circuit protection • Short-circuit current	 • Yes (with respect to ground) • approx. 100 mA

Number	4 (Output 1 – 4)
Electrical isolation	No
Output voltage range	- 10 V to + 10 V
Output current	± 10 mA
Resolution	16 bit
Conversion time per channel, typ.	2 µs
Accuracy • Integral linearity error, max. • Gain error, max. • Offset error, max.	 • ± 1 LSB • ± 0.1 % • ± 1 mV
Slew rate	approx. 0.7 V/µs
Voltage output • Short-circuit protection • Short-circuit current	 • Yes (with respect to ground) • approx. 27 mA for a channel

Analog inputs

Number	5
Version	Differential inputs
Electrical isolation	No
Input voltage range	- 10 V to + 10 V
Resolution	12 bit
Conversion time per channel, max	approx.10 µs – 100ksps sampling rate
Accuracy	
• Integral linearity error, max.	• ± 1/2 LSB
• Gain error, max.	• ± 0.3 %
• Offset error, max.	• ± 10 LSB
Input resistance	20 kΩ
Input filter	34 kHz
Incorrect polarity protection	No

Binary outputs

Number	8
Electrical isolation	No
External power supply	
• Nominal voltage	• 24 V
• Permissible range	• 20 V to 30 V
• Briefly	• 35 V (for max. 0.5 sec.)
• Max. current drain, without load	• 20 mA
Output voltage range	
• For a 0 signal, max.	• 3 V
• For a 1 signal, min.	• ext. power supply voltage, – 2.5 V
Output current	
• For a 0 signal, min.	• -20 µA
For a 1 signal	
• Nominal value	• 30 mA
• Brief, permissible range, max.	• 100 mA
Delay time	100 µs
Switching frequency of the outputs for ohmic load, max.	6 kHz
Short-circuit protection with respect to	
• Ground	• Yes
• External power supply	• No
Short-circuit current, max.	250 mA
Total currents of the outputs	8 x 30 mA
Limiting inductive switch-off voltages	ext. power supply voltage +1 V

Binary inputs

Number	16
Electrical isolation	No
Input voltage • Permissible range • Nominal voltage • For a 0 signal • For a 1 signal	 • -1 V to +33 V • 24 V • -1 V to + 6 V • +13.5 V to +33 V
Input current • For a 0 signal, typ. • For a 1 signal, typ.	 • 0 mA • 3 mA
Delay time per channel, max	100 µs

Absolute value encoders

Number	4
Version	Differential inputs, RS485 signal level
Types which can be connected	
Protocols	SSI, EnDat
Data formats	Gray, binary
Data direction • Uni-directional • Bi-directional	 • SSI : uni-directional • EnDat : bi-directional
Data bits	SSI: 25 + parity EnDat: variable
Pulse frequency, max.	2 MHz
Electrical isolation	No
Input voltage	RS485 signal level

Power supply voltage for the encoders

Output voltage, typ.	13.5 V
Output current, max.	150 mA (short-circuit proof, short-current, approx. 250 mA)

Incremental encoders

The encoder types, corresponding to the technical data can be freely connected to the incremental encoder inputs.

Number	8	
Version	Differential inputs, either 15V or 5V encoder signals can be selected	Differential inputs, either 15V or 5V encoder signals can be selected
Track signals	Tracks A, B displaced through 90° and with zero pulse	Forwards, reverse track
Phase difference of the track signals, min.	200 ns	200 ns
Pulse frequency, max.	1 MHz	2.5 MHz
Noise pulse suppression	Can be configured	Can be configured
Electrical isolation	No	No
Input voltage 15 V encoder: • Permissible range • For a 0 signal • For a 1 signal 5 V encoder • Permissible range • For a 0 signal • For a 1 signal	 • -30 V to +30 V • -30 V to +4 V • +8V to +30 V • -7 V to + 7 V • -7 V to -0.7 V • +1.5 V to +7 V	 • -30 V to +30 V • -30 V to +4 V • +8V to +30 V • -7 V to + 7 V • -7 V to -0.7 V • +1.5 V to +7 V
Input current • 15 V encoder (typ., abs.) • 5 V encoder (typ., abs.)	 • 5 mA • 1.5 mA	 • 5 mA • 1.5 mA

Monitoring output (alarm reset output not available)
• Short-circuit protection with respect to
  • Ground
  • External power supply
• Short-circuit current, max.
	Not available	Not available

Monitoring inputs, Input voltage • Permissible range • Nominal voltage • 0 signal, max. • 1 signal, min.	 • -1 V to 33V • 24 V • -1 V to +6 V • +13.5 V to +33 V	
Monitoring input, Input current • 0 signal, min. • 1 signal, min.	 • 0 mA • 3 mA	

Voltage, currents

Rated voltages at 25° C	Typical current drain
+5 V	1.5 A

Power loss

Power loss, typ.	7.5 W

ambient temperature

ambient temperature	max. 40° C

Dimensions

Number of slots required in the subrack	1
Dimensions W x H x D [mm]	24 x 290 x 210
Weight, approx.	0.76 kg