SIEMENS

Data sheet

6ES7146-5FF00-0BA0



SIMATIC DP, ET 200AL, F-DI 4+F-DQ 2x24VDC/2A, 4xM12, PROFIsafe, up to PL e (ISO 13849), Up to SIL 3 (IEC 61508), Degree of protection IP67

General Information F-DI 4+F-DQ 2x24VDC/2A, 4xM12 Product type designation F-DI 4+F-DQ 2x24VDC/2A, 4xM12 HW functional status FS01 Product function V1.0.x Product function V1.0.x Product function V1.0.x Product function STEP 7 IXP ortal configurable/integrated from version Operating mode STEP 7 V17 or higher • DI Yes • DD Yes Supply voltage Rated value (DC) Permissible range, lower limit (DC) 24 V • Rated value (DC) 24 V • permissible range, upper limit (DC) 24 V • permissible range, upper limit (DC) 24 V • Rated value (DC) 24 V • permissible range, upper limit (DC) 24 V • Rated value (DC) 24 V • permissible range, upper limit (DC) 24 V <th></th> <th></th>		
HW functional status FS01 Firmware version V1.0.x Product function V10.x • I&M data Yes; I&M0 to I&M3 Engineering with STEP 7 V17 or higher • • STE 7 TIA Portal configurable/integrated from STEP 7 V17 or higher • operating mode • DI • DI Yes • DQ Yes Supply voltage Rated value (DC) Permissible range, lower limit (DC) 24 V • Rated value (DC) 24 V • permissible range, lower limit (DC) 26.8 V • Reverse polarity protection Yes; against destruction Load voltage 2L+ Externel (DC) 24.4 V • permissible range, lower limit (DC) 26.8 V V • Reverse polarity protection Yes; against destruction Load voltage 2L+ • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value 4 A; Maximum value Encoder supply Yes	General information	
Firmware version V1.0.x Product function V10.x Product function Ves; I&M0 to I&M3 Engineering with STEP 7 V17 or higher • STEP 7 TIA Portal configurable/integrated from version STEP 7 V17 or higher Operating mode • DI • D0 Yes Supply voltage 24 V Rated value (DC) 24 V power supply according to NEC Class 2 required No Load voltage 11-* • Rated value (DC) • Permissible range, lower limit (DC) 24 V • permissible range, upper limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction Load voltage 21-* • • Reverse polarity protection Yes; against destruction: outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 1L+, max. 4 A; Maximum value Encoder supply Number of outputs 2 24 V encoders supply <	Product type designation	F-DI 4+F-DQ 2x24VDC/2A, 4xM12
Product function • I&M data Engineering with • STEP 7 TIA Portal configurable/integrated from version Operating mode • DI • DQ STEP 7 TIA Portal configurable/integrated from version Operating mode • DI • DQ Supply voltage Rated value (DC) 24 V power supply according to NEC Class 2 required No Load voltage 1L* • Rated value (DC) 24 V • permissible range, lower limit (DC) 26 AV • permissible range, lower limit (DC) 28 AV • Reverse polarity protection Yes; against destruction Load voltage 2L* • Rated value (DC) 24 V • permissible range, lower limit (DC) 28 AV • permissible range, lower limit (DC) 26 AV • permissible range, upper limit (DC) 28 AV • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load	HW functional status	FS01
• I&M data Yes; I&M0 to I&M3 Engineering with • STEP 7 V17 or higher • OTF 7 TIA Portal configurable/integrated from version STEP 7 V17 or higher Operating mode • D0 • D0 Yes Supply voltage - Rated value (DC) 24 V • Power supply according to NEC Class 2 required No Load voltage 1L+ - • Rated value (DC) 24 V • permissible range, lower limit (DC) 20.4 V • permissible range, lower limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction Load voltage 2L+ - • Rated value (DC) 24 V • permissible range, lower limit (DC) 28.8 V • permissible range, upper limit (DC) 28.8 V • permissible range, upper limit (DC) 28.8 V • permissible range, upper limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current - Current consumption (rated value) 55 mA (1L+) /	Firmware version	V1.0.x
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version Version Operating mode 01 • DQ Yes Supply voltage Rated value (DC) Power supply according to NEC Class 2 required No Load voltage 1L+ • • Rated value (DC) 24 V • permissible range, upper limit (DC) 26 V • permissible range, upper limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction Lad voltage 2L+ • • Rated value (DC) 20.4 V • permissible range, lower limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply 2 Number of outputs 2 24 V encoder supply 5 per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V	Engineering with	
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Down supply according to NEC Class 2 required No Load voltage 1L+ Rated value (DC) 24 V • Rated value (DC) 20.4 V 20.4 V • permissible range, lower limit (DC) 28.8 V • • Reverse polarity protection Yes: against destruction • Load voltage 2L+ • • • • Reterse polarity protection Yes: against destruction • Load voltage 2L+ • • • • permissible range, lower limit (DC) 24.4 V • • • permissible range, lower limit (DC) 24.4 V • • • • permissible range, lower limit (DC) 28.8 V • • • • permissible range, lower limit (DC) 28.8 V • • • • • Reverse polarity protection Yes: against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct • • • • • • • • • • • • • • • • •	Supply voltage	
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 Rated value (DC) Permissible range, lower limit (DC) 20.4 V permissible range, upper limit (DC) 28.8 V Reverse polarity protection Ves; against destruction Load voltage 2L+ Rated value (DC) permissible range, lower limit (DC) 24.V permissible range, lower limit (DC) 20.4 V permissible range, lower limit (DC) 20.4 V permissible range, lower limit (DC) 20.4 V permissible range, upper limit (DC) 28.8 V Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) from load voltage 1L+ (unswitched voltage) from load voltage 1L+ (unswitched voltage) from load voltage 2L+, max. 4 A; Maximum value Encoder supply Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) Output current, max. Output current, max. A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss, typ. A7 W Address area 	power supply according to NEC Class 2 required	No
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• Reverse polarity protection Yes; against destruction Load voltage 2L+ • Rated value (DC) 24 V • Patted value (DC) 20.4 V • permissible range, lower limit (DC) 20.4 V • permissible range, upper limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply 2 Ves; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss Power loss, typ. 4.7 W Address area 4.7 W	 permissible range, lower limit (DC) 	20.4 V
Load voltage 2L+ Rated value (DC) 24 V • permissible range, lower limit (DC) 20.4 V • permissible range, upper limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply V Number of outputs 2 24 V encoder supply Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss Power loss repair 4.7 W Address area 4.7 W	 permissible range, upper limit (DC) 	28.8 V
• Rated value (DC) 24 V • permissible range, lower limit (DC) 20.4 V • permissible range, upper limit (DC) 28.8 V • Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply 2 Number of outputs 2 24 V encoder supply • Short-circuit protection • Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss, typ. Power loss, typ. 4.7 W Address area 4.7 W	 Reverse polarity protection 	Yes; against destruction
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 permissible range, upper limit (DC) Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) from load voltage 1L+ (unswitched voltage) from load voltage 2L+, max. A; Maximum value Fanceder supply Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) Output current, max. Power loss Power loss, typ. At 7 W Address area 	 Rated value (DC) 	24 V
Reverse polarity protection Yes; against destruction; outputs applied with reversed polarity for loads connected between M-switch and 2L+ will conduct Input current Current consumption (rated value) from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value from load voltage 2L+, max. A; Ves; per load voltage, electronic (response threshold 0.7 A to 1.7 A) A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss, typ. A:7 W Address area	 permissible range, lower limit (DC) 	20.4 V
Input current connected between M-switch and 2L + will conduct Input current Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply Vencoder supply Number of outputs 2 24 V encoder supply Short-circuit protection • Output current, max. Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss 4.7 W Address area 4.7 W	 permissible range, upper limit (DC) 	28.8 V
Current consumption (rated value) 55 mA (1L+) / 40 mA (2L+); without load from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply 4 A; Maximum value Number of outputs 2 24 V encoder supply 9 • Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss, typ. 4.7 W Address area 4.7 W	 Reverse polarity protection 	
from load voltage 1L+ (unswitched voltage) 4 A; Maximum value from load voltage 2L+, max. 4 A; Maximum value Encoder supply 4 A; Maximum value Number of outputs 2 24 V encoder supply 9 • Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss 4.7 W Address area 4.7 W	Input current	
from load voltage 2L+, max. 4 A; Maximum value Encoder supply Number of outputs 2 24 V encoder supply 2 • Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss 4.7 W Address area 4.7 W	Current consumption (rated value)	55 mA (1L+) / 40 mA (2L+); without load
Encoder supply 2 Number of outputs 2 24 V encoder supply • Short-circuit protection • Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss 4.7 W Address area 4.7 W	from load voltage 1L+ (unswitched voltage)	4 A; Maximum value
Number of outputs 2 24 V encoder supply • Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) • Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss 4.7 W Address area 4.7 W	from load voltage 2L+, max.	4 A; Maximum value
24 V encoder supply • Short-circuit protection • Output current, max. Power loss Power loss, typ. 4.7 W Address area	Encoder supply	
Short-circuit protection Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) Output current, max. Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A) 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss, typ. 4.7 W Address area	Number of outputs	2
Output current, max. 1 A; total current of all encoders, max. 0.5 A per load voltage; maximum of 2.0 V drop Power loss Power loss, typ. 4.7 W Address area	24 V encoder supply	
of 2.0 V drop Power loss Power loss, typ. 4.7 W Address area	 Short-circuit protection 	Yes; per load voltage, electronic (response threshold 0.7 A to 1.7 A)
Power loss, typ. 4.7 W Address area 4.7 W	Output current, max.	
Address area	Power loss	
	Power loss, typ.	4.7 W
Address space per module	Address area	
	Address space per module	

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Inputs	8 byte
Outputs	6 byte
Digital inputs	
Number of digital inputs	4
Input characteristic according to IEC 61131	Type 1
Number of simultaneously controllable inputs	1960 -
all mounting positions	
— up to 55 °C, max.	4
Input voltage	
Rated value (DC)	24 V
 for signal "0" 	-30 to +5 V
● for signal "1"	+15 to +30 V
Input current	
● for signal "1", typ.	4.85 mA
Input delay (for rated value of input voltage)	
for standard inputs	
— parameterizable	Yes
— at "0" to "1", min.	0.8 ms
— at "0" to "1", max.	12.8 ms
— at "1" to "0", min.	0.8 ms
— at "1" to "0", max.	12.8 ms
Cable length	
• unshielded, max.	30 m
Digital outputs	
Number of digital outputs	2
• in groups of	2
Short-circuit protection	Yes; per channel, electronic
Response threshold, typ.	10 A; measured at M-switch, threshold for P-switch is higher
Open-circuit detection	Yes; per channel, only detects when output is off
Overload protection	Yes
Response threshold, typ.	3.4 A; measured at P-switch
Limitation of inductive shutdown voltage to	P-switch: -26 V DC referenced to 2M, M-switch: +48 V DC referenced to 2M
Switching capacity of the outputs	Lin
• on lamp load, max.	10 W
Load resistance range	
lower limit	12 Ω
upper limit	2 kΩ
Output voltage	
● for signal "1", min.	L+ (-2.0 V), P-switch is L+ (-1.5 V), M-switch is 0.5 V
Output current	
 for signal "1" rated value 	2 A
 for signal "0" residual current, max. 	0.5 mA
Switching frequency	
 with resistive load, max. 	30 Hz
 with inductive load, max. 	0.1 Hz
• on lamp load, max.	10 Hz
Total current of the outputs	
Current per group, max.	4 A
Cable length	
 unshielded, max. 	30 m
Encoder	
Connectable encoders	
• 2-wire sensor	No
 permissible quiescent current (2-wire sensor), 	0.5 mA
max.	
Interrupts/diagnostics/status information	
Substitute values connectable	No
Alarms	
Diagnostic alarm	Yes; Parameterizable

Diagnoses	
 Monitoring the supply voltage 	Yes
Wire-break	Yes; outputs when off
Short-circuit	Yes; inputs, outputs, encoder supply
Diagnostics indication LED	
 Channel status display 	Yes; green LED
 for channel diagnostics 	Yes; red LED
 for module diagnostics 	Yes; green/red LED
 For load voltage monitoring 	Yes; green LED
Potential separation	
between the load voltages	Yes
Potential separation channels	
 between the channels, in groups of 	4 DI channels are isolated from 2 DQ channels
 between the channels and backplane bus 	Yes
 between the channels and the power supply of the electronics 	DI channels are non-isolated from supply voltage 1L+ and DQ channels are isolated from the supply voltage 1L+
Isolation	
Isolation tested with	707 V DC (type test)
Degree and class of protection	
IP degree of protection	IP65/67
Standards, approvals, certificates	
Highest safety class achievable in safety mode Performance level according to ISO 13849-1	PLd (DI single-channel), PLe (DI two-channel, DQ)
5	
Category according to ISO 13849-1	Cat. 3 (DI single-channel), Cat. 4 (DI two-channel, DQ)
• SIL acc. to IEC 61508	SIL 2 (DI single-channel), SIL 3 (DI two-channel, DQ)
Probability of failure (for service life of 20 years and repa	
— Low demand mode: PFDavg in accordance with SIL2	< 1.00E-03 DI single-channel; < 1.00E-03 DQ with dark test disabled
 Low demand mode: PFDavg in accordance with SIL3 	< 1.00E-05 DI two-channel; < 2.00E-05 DQ with dark test enabled
 High demand/continuous mode: PFH in accordance with SIL2 	< 1.00E-08 1/h DI single-channel; < 1.00E-07 1/h DQ with dark test disabled
 High demand/continuous mode: PFH in accordance with SIL3 	< 1.00E-09 1/h DI two-channel; < 1.00E-08 1/h DQ with dark test enabled
Ambient conditions	
Ambient temperature during operation	
• min.	-30 °C
• max.	55 °C
connection method / header	
Design of electrical connection for the inputs and outputs	M12, 5-pole
Design of electrical connection for supply voltage	M8, 4-pin
ET-Connection	
• ET-Connection	M8, 4-pin, shielded
Dimensions	
	45 mm
Width Height	45 mm
Height	
Depth	40 mm
Weights	
Weight, approx.	220 g
last modified:	6/8/2022 🖸