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Data sheet 6ES7146-5FF00-0BA0



SIMATIC DP, ET 200AL, F-DI 4+F-DQ 2x24 V DC/2 A, 4xM12, PROFIsafe, up to PL e (ISO 13849), up to SIL 3 (IEC 61508), degree of protection IP67, including eCoding plug-in connector

General information	
Product type designation	F-DI 4+F-DQ 2x24VDC/2A, 4xM12
Product function	
● I&M data	Yes; I&M0 to I&M3
Engineering with	
● STEP 7 TIA Portal configurable/integrated from version	STEP 7 V17 or higher
Operating mode	
● DI	Yes
● DQ	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, upper limit (DC)	28.8 V
● Reverse polarity protection	Yes; against destruction
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	
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	
Power loss, typ.	4.7 W
Address area	
Address space per module	
● Inputs	8 byte
● Outputs	6 byte
Digital inputs	

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Number of digital inputs	4
Input characteristic according to IEC 61131	Type 1
Number of simultaneously controllable inputs	
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	
● 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), max.	0.5 mA
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	

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● 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)
● 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 repair time of 100 hours)	
— 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	
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	
Width	45 mm
Height	159 mm
Depth	40 mm
Weights	
Weight, approx.	220 g

Classifications

	Version	Classification
eClass	14	27-24-26-04
eClass	12	27-24-26-04
eClass	9.1	27-24-26-04
eClass	9	27-24-26-04
eClass	8	27-24-26-04
eClass	7.1	27-24-26-04
eClass	6	27-24-26-04
ETIM	9	EC001599
ETIM	8	EC001599
ETIM	7	EC001599
IDEA	4	3566
UNSPSC	15	32-15-17-05

Approvals / Certificates

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General Product Approval					
Manufacturer Declaration	CE EG-Konf.	UKCA	Miscellaneous	UL	RCM

Functional Saftey		Industrial Communication
TÜV	Type Examination Certificate	PROFIsafe

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