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Kuhnke FIO I/O System

Product Manual: Digital I/O Modules

12/03/2024

PRECISION. SAFETY. MOTION.

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1 Preface

1.1 Legal Notice

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Document History

Modification History	
Date	**Comments / Modifications**
12.03.2024	New document structure created according to module groups

1.2 About this Manual

This technical information is primarily directed to system designers, project engineers and device developers. It does not contain any availability information. We reserve the rights for errors, omissions and modifications. Pictures are similar.

This product manual extends the system, installation and safe handling information provided by the Kuhnke FIO System Manual. This product manual only applies in conjunction with the system manual.

2 Digital I/O Modules

2.1 Generalities

The range of digital I/O modules comprises all Kuhnke FIO modules equipped with just digital inputs or digital outputs or with both digital inputs and outputs.

2.1.1 Numeric Values

As a general rule, numeric values are shown as decimals.

A prefixed 0x marks hexadecimal values (example: 0xFFFF)

A prefixed 0b marks binary values (example: 0b01010011)

Objects from the object dictionary generally show as hexadecimal value.

2.2 FIO DI16/DO16

2.2.1 Function

Digital input/output module with 16 inputs and 16 outputs (high side switching)

2.2.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts
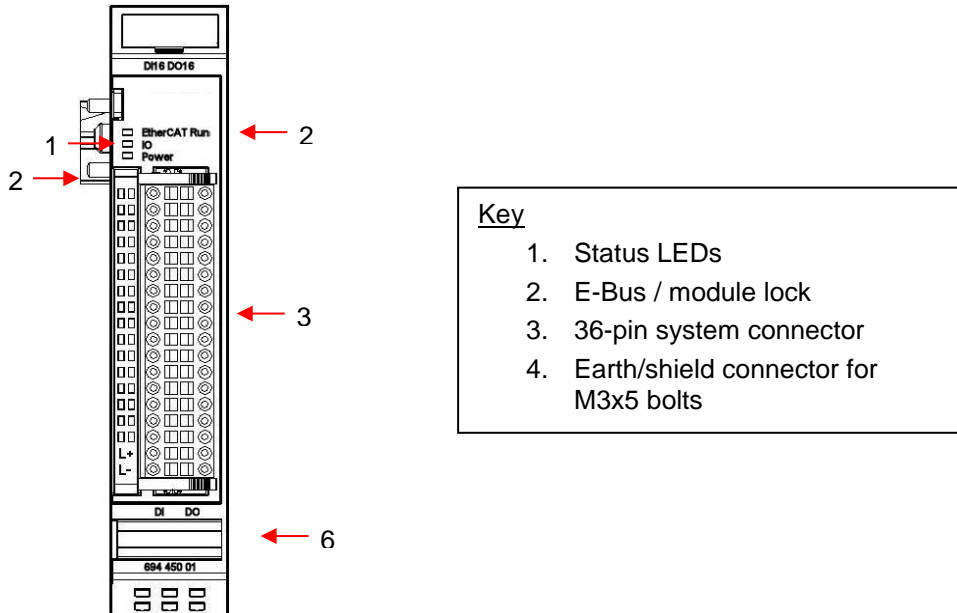
2.2.3 Connectors

I/O Power Supply (Load)

System connector pin 16:   L+   24 VDC
System connector pin 17:   L-   0 V

Digital Inputs

Left row of pins of system connector, pins 0…15

Digital Outputs

Right row of pins of system connector, pins 0…15

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector
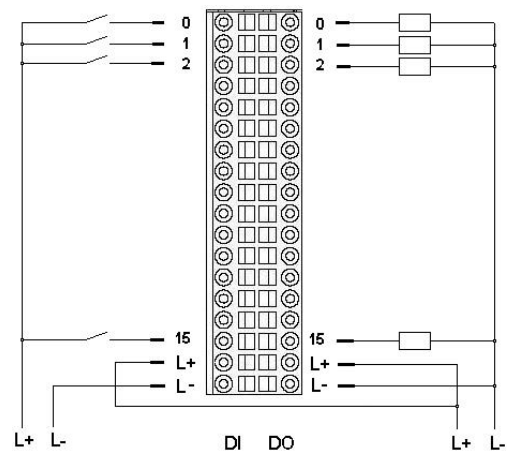
> **NOTE**
>
> *The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.*

2.2.4 Status LEDs

LED "EtherCAT Run":

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Input signal TRUE / output enabled
Off	Off	Input signal FALSE / output disabled

2.2.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput15	BOOL	Digital outputs 0 … 15
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.2.6 Technical Data

Digital inputs 16

Rising delay .... 1 ms / 5 ms (typical)

Signal level .... Off: -3V … 5V (EN 61131-3, type 1)

                                                          On: 15V … 30V

Digital outputs 16

Max. current... 0.5 A each

Max. total current .... 8 A

I/O / power connection.................................   36-pin male

EtherCAT slave controller............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 135 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation...................................... 500V E-Bus / power supply

Part no.

Kuhnke FIO DI16/DO16 5ms/0.5A 694.450.01

Kuhnke FIO DI16/DO16 1ms/0.5A. 694.450.03

Permits:...

2.3 FIO DI16/DO16 LS (LowSide)

2.3.1 Function

Digital input/output module with 16 inputs and 16 outputs (low side switching)

2.3.2 Front View

Key

1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts
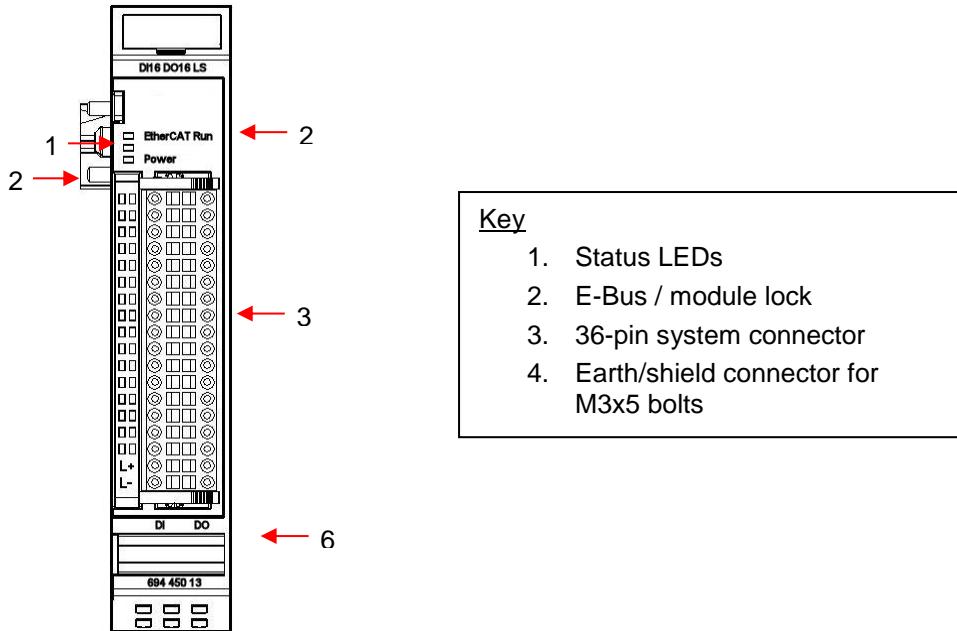
2.3.3 Connectors

I/O Power Supply (Load)

System connector pin 16:	L+	24 VDC
System connector pin 17:	L-	0 V

Digital Inputs

Left row of pins of system connector, pins 0…15

Digital Outputs

Right row of pins of system connector, pins 0…15

EtherCAT

E-Bus IN	female 10-pole connector
E-Bus Out	10-pole multi-pin connector
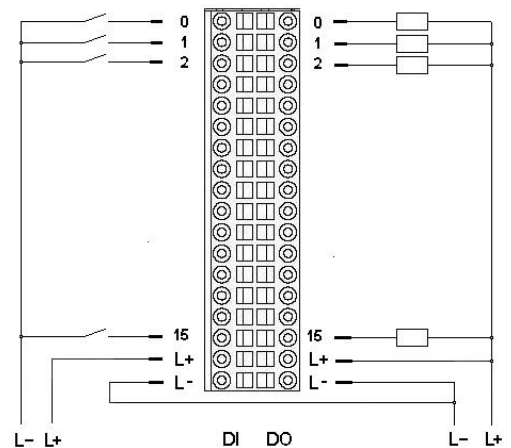
NOTE	
The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.	

2.3.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Input signal TRUE / output enabled
Off	Off	Input signal FALSE / output disabled

2.3.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput15	BOOL	Digital outputs 0 … 15
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.3.6 Technical Data

Digital inputs 16

Rising delay .... 1 ms (typical)

Logic level.. On: -3 … 5V

                                                           Off: 15V … 30V

Input current .... 2mA (typical)

Digital outputs 16

Max. current... 0.5 A each

Max. total current... 8 A

I/O / power connection................................... 36-pin male

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load... 135 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation....................................... 500V E-Bus / power supply

Part no. 694.450.13

Permits:..

2.4 FIO DI16/DO8

2.4.1 Function

Digital input/output module with 16 inputs and 8 outputs (high side switching)

2.4.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts

2.4.3 Connectors

I/O Power Supply (Load)

System connector pin 16:   L+   24 VDC
System connector pin 17:   L-   0 V

Digital Inputs

Left row of pins of system connector, pins 0…15

Digital Outputs

Right row of pins of system connector, pins 0, 2…12, 14

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector
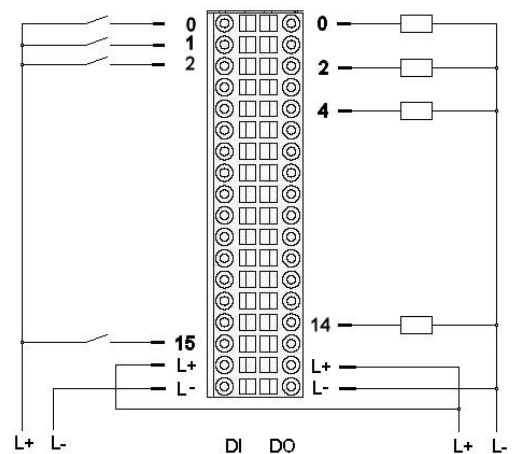
NOTE

The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.

2.4.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Input signal TRUE / output enabled
Off	Off	Input signal FALSE / output disabled

2.4.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput7	BOOL	Digital outputs 0 … 7
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.4.6 Technical Data

Digital inputs 16

Rising delay .... 1 ms (typical)

Signal level .... Off: -3V … 5V (EN 61131-3, type 1)

On: 15V … 30V

Digital outputs 8

Max. current.. 1.0 A each

Max. total current .... 8 A

I/O / power connection................................... 36-pin male

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load... 135 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation....................................... 500V E-Bus / power supply

Part no. 694.450.02
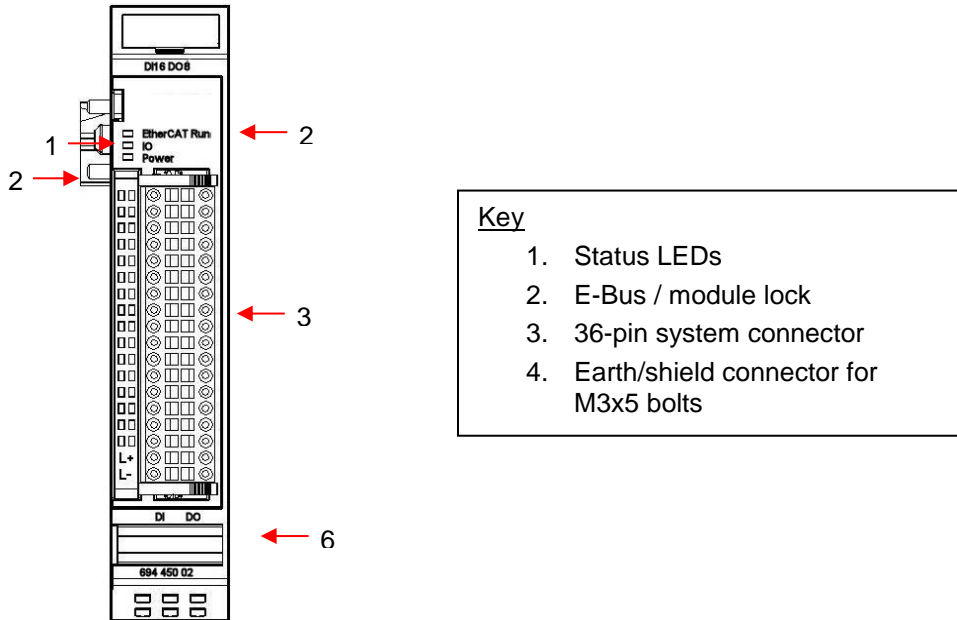
Permits:..

2.5 FIO DI8/DO8

2.5.1 Function

Digital input/output module with 8 inputs and 8 outputs (high side switching)

2.5.2 Front View

Key

1. Status LEDs
2. E-Bus / module lock
3. 18-pin system connector
4. Earth/shield connector for M3x5 bolts
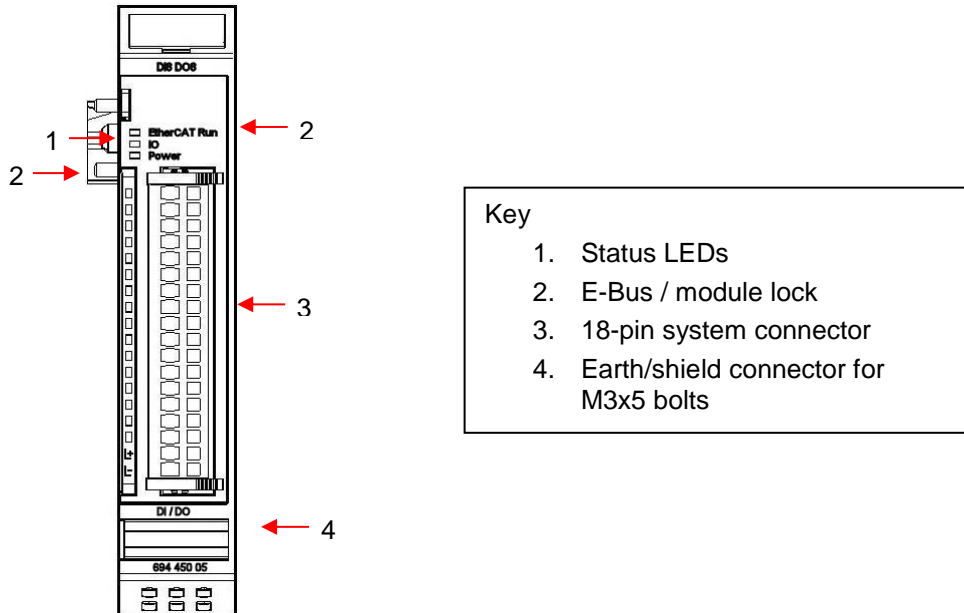
2.5.3 Connectors

I/O Power Supply (Load)

System connector pin 16:	L+	24 VDC
System connector pin 17:	L-	0 V

Digital Inputs

System connector pins 0 … 7

Digital Outputs

System connector pins 8 … 15

EtherCAT

E-Bus IN	female 10-pole connector
E-Bus Out	10-pole multi-pin connector

NOTE

The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.

2.5.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Input signal TRUE / output enabled
Off	Off	Input signal FALSE / output disabled

LED "Channel"

State	LED	Explanation
On	On	Input signal TRUE / output enabled
Off	Off	Input signal FALSE / output disabled

2.5.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput7	BOOL	Digital outputs 0 … 7
DigitalInput0 … DigitalInput7	BOOL	Digital inputs 0 … 7

2.5.6 Technical Data

Digital inputs 8

Rising delay .... 1 ms / 5 ms (typical
)

Signal level .... Off: -3V … 5V (EN 61131-3, type 1)

                                                                On: 15V … 30V

Digital outputs 8

Max. current .... 0.5 A each

Max. total current .... 8 A

I/O / power connection .... 18-pin male

EtherCAT slave controller .... ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load .... 135 mA

Power supply .... 24 VDC (-15% ... +20%)

Part no.

Kuhnke FIO DI8/DO8 5ms/0.5A 694.450.04

Kuhnke FIO DI8/DO8 1ms/0.5A 694.450.05

Permits: ....

2.6 FIO DI16

2.6.1 Function

Digital input module with 16 inputs

2.6.2 Front View

Key

1. Status LEDs
2. E-Bus / module lock
3. 18-pin system connector
4. Earth/shield connector for M3x5 bolts
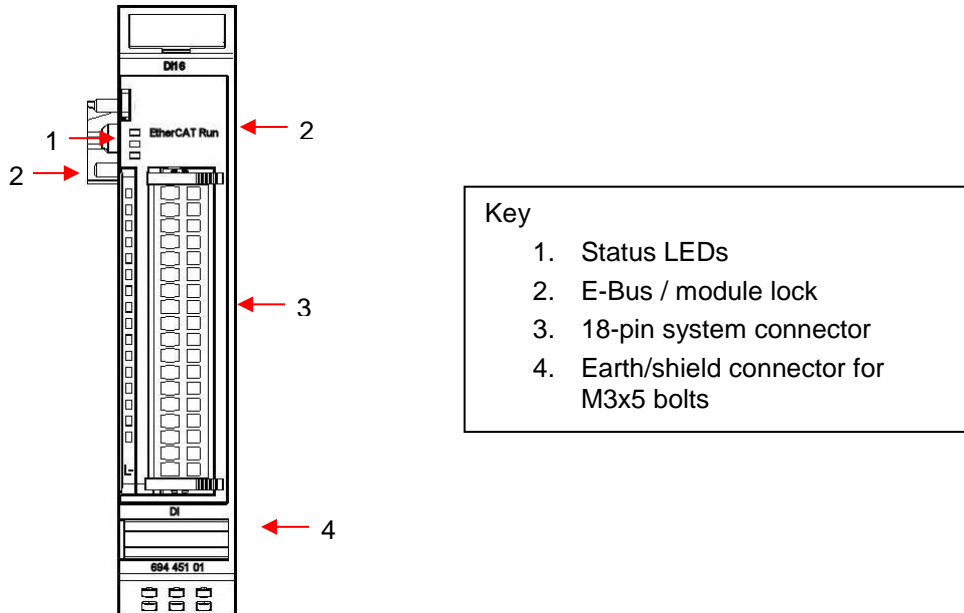
2.6.3 Connectors

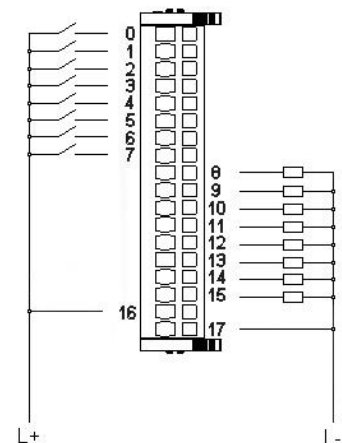### I/O Power Supply (Load)

System connector pin 17:   L-   0 V

Digital Inputs

System connector pins 0 … 15

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector
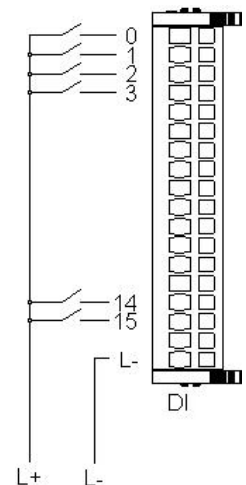
2.6.4 Status LEDs

LED "EtherCAT Run":

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

No

LED "Channel"

State	LED	Explanation
On	On	Input signal = TRUE
Off	Off	Input signal = FALSE

2.6.5 Process Data Objects

Variable	Data type	Explanation
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.6.6 Technical Data

Digital inputs 16

Rising delay .... 1 ms (typical)

Signal level .... Off: -3V … 5V (EN 61131-3, type 1)

                                                    On: 15V … 30V

I/O / power connection................................... 18-pin male

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 100 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation....................................... 500V E-Bus / power supply

Part no.

Kuhnke FIO DI16, 1ms................................. 694.451.03

Permits:..

2.7 FIO DI16 2-Wire

2.7.1 Function

Digital input module with 16 inputs and 24V supply of the 2-wire connector

2.7.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts
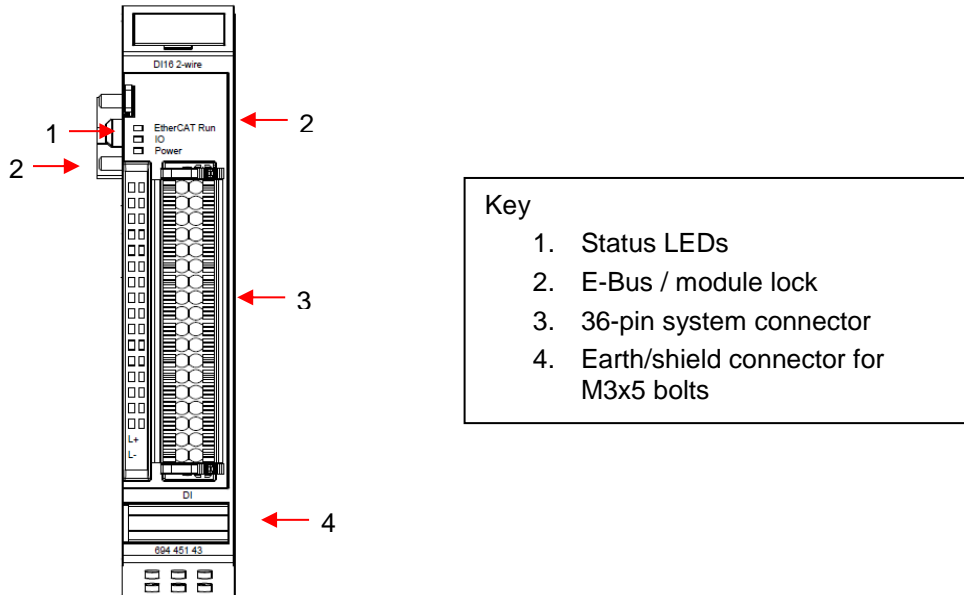
2.7.3 Connectors

I/O Power Supply (Load)

System connector pin 16:	L+	24 VDC
System connector pin 17:	L-	0 V

Digital Inputs

Left row of pins of system connector, pins 0…15

24V 2-wire Connector

Right row of pins of system connector, pins 0…15

EtherCAT

E-Bus IN	female 10-pole connector
E-Bus Out	10-pole multi-pin connector
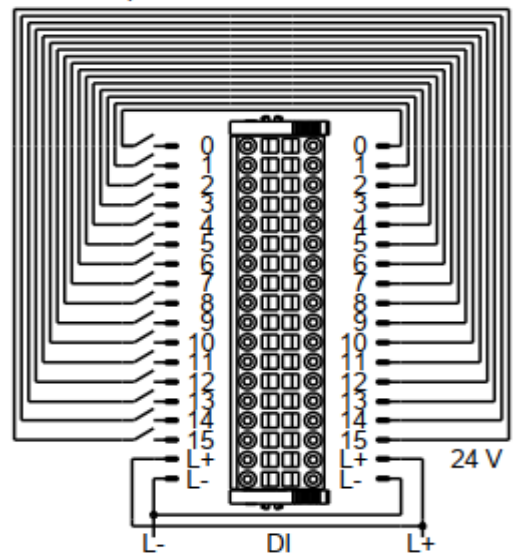
⚠️	**CAUTION**
	The 24V outputs are designed for use with the module inputs only.

ⓘ	**NOTE**
	The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.

2.7.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Input signal = TRUE
Off	Off	Input signal = FALSE

2.7.5 Process Data Objects

Variable	Data type	Explanation
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.7.6 Technical Data

Digital inputs 16   (+16 x 24VDC, max. 1A each)

Rising delay .... 1 ms   (typical)

Signal level .... Off: -3V … 5V (EN 61131-3, type 1)

On: 15V … 30V

I/O / power connection.................................... 36-pin male

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 110 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation....................................... 500V E-Bus / power supply

Part no.

Kuhnke FIO DI16, 1ms.................................. 694.451.43

Permits:...

2.8 FIO DI16 2-Wire GI

2.8.1 Function

Digital input module with 16 galvanically isolated inputs

2.8.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts
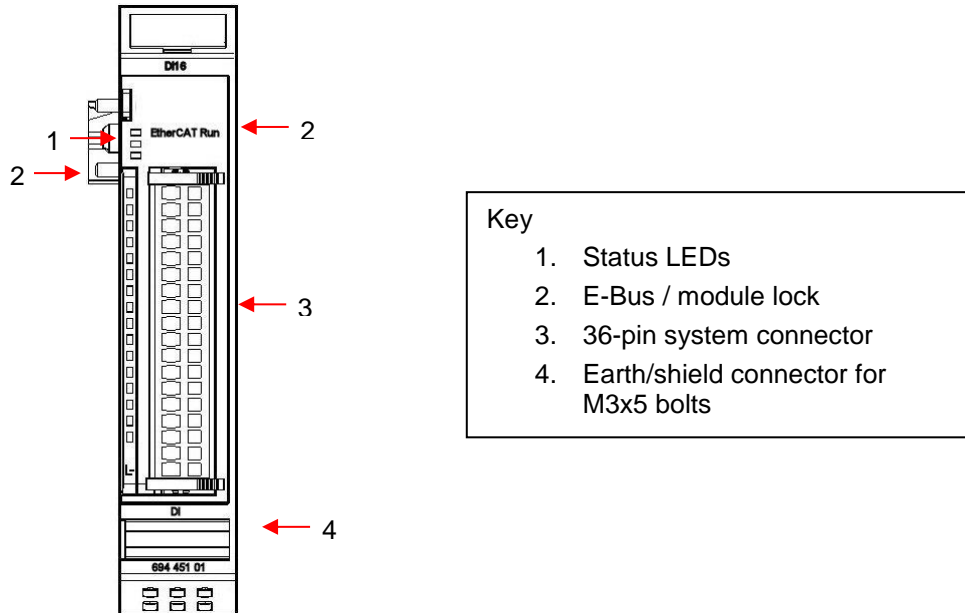
2.8.3 Connectors

I/O Power Supply (Load)

Not required

Digital Inputs (+)

Left row of pins of system connector, pins 0…15

Digital Inputs (-)

Right row of pins of system connector, pins 0…15

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector

2.8.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

No

LED "Channel"

State	LED	Explanation
On	On	Input signal = TRUE
Off	Off	Input signal = FALSE

2.8.5 Process Data Objects

Variable	Data type	Explanation
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.8.6 Technical Data

Digital inputs .... 16 (electrically insulated)

Rising delay .... 1 ms (typical)

Signal level .... Off:　　　　-3V … 5V (EN 61131-3, type 1)

　　　　　　　　　　　　　　　　　　　　　　　　On:　　　　15V … 30V

I/O / power connection.................................. male 18-pin

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 110 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation...................................... 500V E-Bus / power supply / channels from channels

Part no.

Kuhnke FIO DI16, 1ms.................................. 694.451.44

Permits:...

2.9 FIO DI32

2.9.1 Function

Digital input module with 32 inputs

2.9.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts
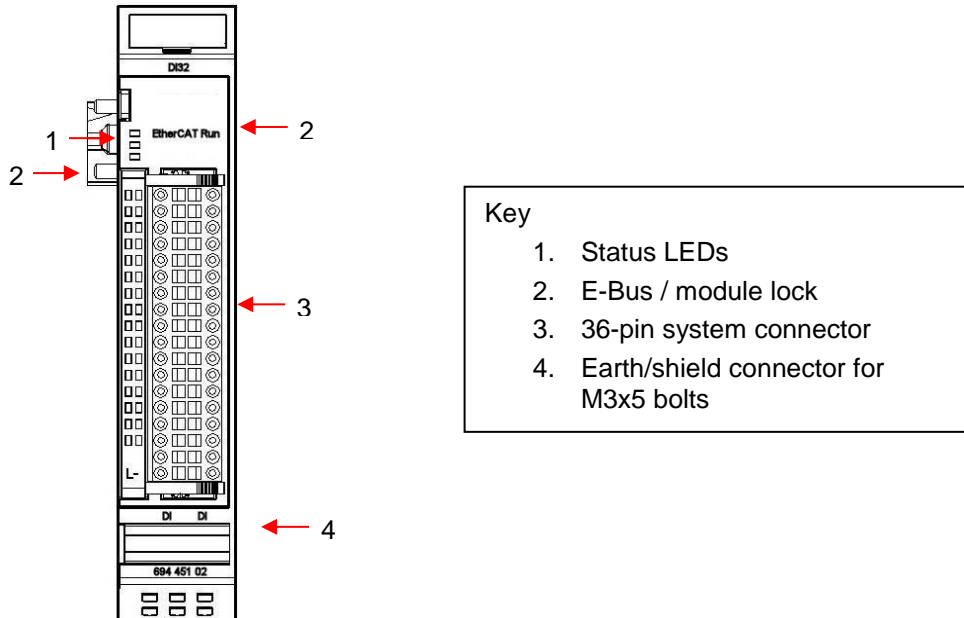
2.9.3 Connectors

I/O Power Supply (Load)

System connector pin 16:	L+	24 VDC
System connector pin 17:	L-	0 V

Digital Inputs

Left row of pins of system connector, pins 0…15
Right row of pins of system connector, pins 0…15

EtherCAT

E-Bus IN	female 10-pole connector
E-Bus Out	10-pole multi-pin connector
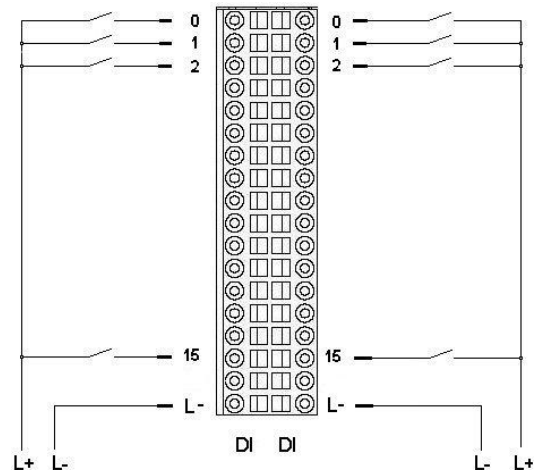
2.9.4 Status LEDs

LED "EtherCAT Run":

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

No

LED "Channel"

State	LED	Explanation
On	On	Input signal = TRUE
Off	Off	Input signal = FALSE

2.9.5 Process Data Objects

Variable	Data type	Explanation
DigitalInput0 … DigitalInput31	BOOL	Digital inputs 0 … 31

2.9.6 Technical Data

Digital inputs 32

Rising delay .... 1 ms (typical)

Signal level .... Off: -3V … 5V (EN 61131-3, type 1)

                                            On: 15V … 30V

I/O / power connection.................................. 36-pin male

EtherCAT slave controller.............................. ASIC ET1100

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 85 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation....................................... 500V E-Bus / power supply

Part no.

Kuhnke FIO DI32, 1ms.................................. 694.451.02

Permits:...

2.10 FIO DO8

2.10.1 Function

Digital output module with 8 outputs

2.10.2 Front View


```
Key
    1.  Status LEDs
    2.  E-Bus / module lock
    3.  36-pin system connector
    4.  Earth/shield connector for
        M3x5 bolts
```

2.10.3 Connectors

I/O Power Supply (Load)

System connector pin 16:   L+   24 VDC
System connector pin 17:   L-   0 V

Digital Outputs

System connector pins 0, 2, … 12, 14

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector
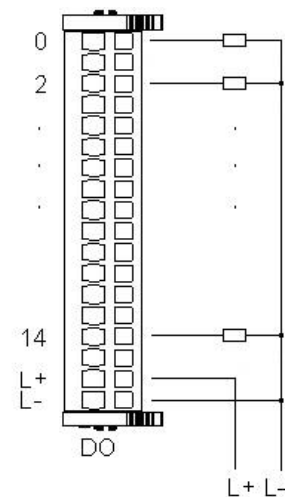
	NOTE
	The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.

2.10.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Output enabled
Off	Off	Output disabled

2.10.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput7	BOOL	Digital outputs 0 … 7

2.10.6 Technical Data

Digital outputs 8

Max. current (694.452.02) .... 1.0A per output

Max. current (694.452.06) .... 2.0A per output

Max. total current .... ∑ 10A

I/O / power connection .... male 18-pin

EtherCAT slave controller .... ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 130 mA

Power supply .... 24 VDC (-15% ... +20%)

Part no. 694.452.02

Permits:..

2.11 FIO DO16

2.11.1 Function

Digital output module with 16 outputs

2.11.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts

2.11.3 Connectors

I/O Power Supply (Load)

System connector pin 16:	L+	24 VDC
System connector pin 17:	L-	0 V

Digital Outputs

System connector pins 0 … 15

EtherCAT

E-Bus IN	female 10-pole connector
E-Bus Out	10-pole multi-pin connector

NOTE

The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.

2.11.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Output enabled
Off	Off	Output disabled

2.11.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput15	BOOL	Digital outputs 0 … 15

2.11.6 Technical Data

Digital outputs 16
Max. current.. 0.5 A each
Max. total current .... 8 A
I/O / power connection.................................. 18-pin male
EtherCAT slave controller.............................. ASIC ET1200
E-bus connector .... 10-pole system plug in side wall
E-bus load... 130 mA
Power supply .... 24 VDC (-15% ... +20%)
Electrical insulation....................................... 500V E-Bus / power supply
Part no. 694.452.01

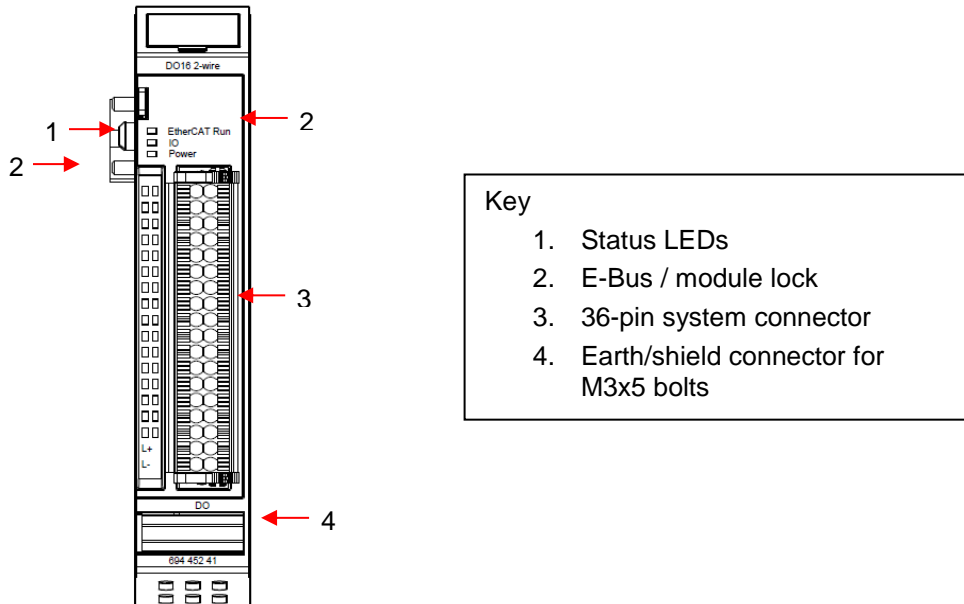Permits:...

2.12 FIO DO16 2-Wire

2.12.1 Function

Digital output module with 16 outputs and und 0V 2-wire connector

2.12.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 36-pin system connector
4. Earth/shield connector for M3x5 bolts

2.12.3 Connectors

I/O Power Supply (Load)

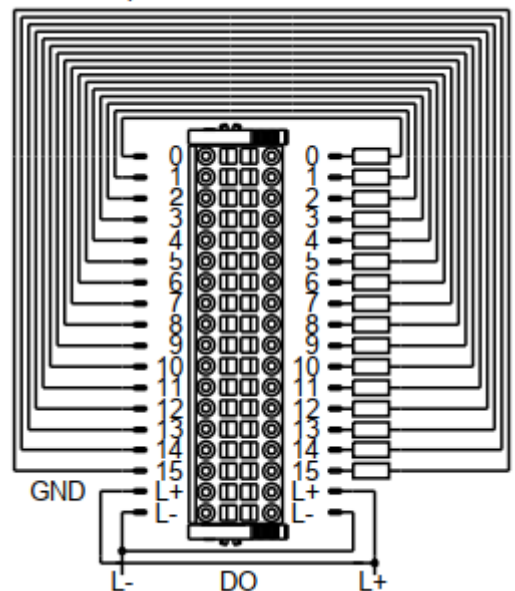| System connector pin 16:	L+	24 VDC
System connector pin 17:	L-	0 V

Digital Outputs

Right row of pins of system connector, pins 0…15

0V 2-wire Connector

Left row of pins of system connector, pins 0…15

EtherCAT

E-Bus IN	female 10-pole connector
E-Bus Out	10-pole multi-pin connector

ⓘ	**NOTE**
	The output drivers have a thermal fuse to automatically turn off any short-circuited outputs. In case the short circuit prevails, the outputs are allowed to cool down to be turned back on until the thermal fuse blows again.

2.12.4 Status LEDs

LED "EtherCAT Run":

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

State	LED	Explanation
Ok	Off	No error
SC	Red, flashing	Short-circuited digital output

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Output enabled
Off	Off	Output disabled

2.12.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput15	BOOL	Digital outputs 0 … 15
DigitalInput0 … DigitalInput15	BOOL	Digital inputs 0 … 15

2.12.6 Technical Data

Digital outputs 16   (+16 x ground)

Max. current.. 1 A each

Max. total current .... 10 A

I/O / power connection.................................... 36-pin male

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load... 100 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation.. 500V E-Bus / power supply

Part no. 694.452.41

Permits:..
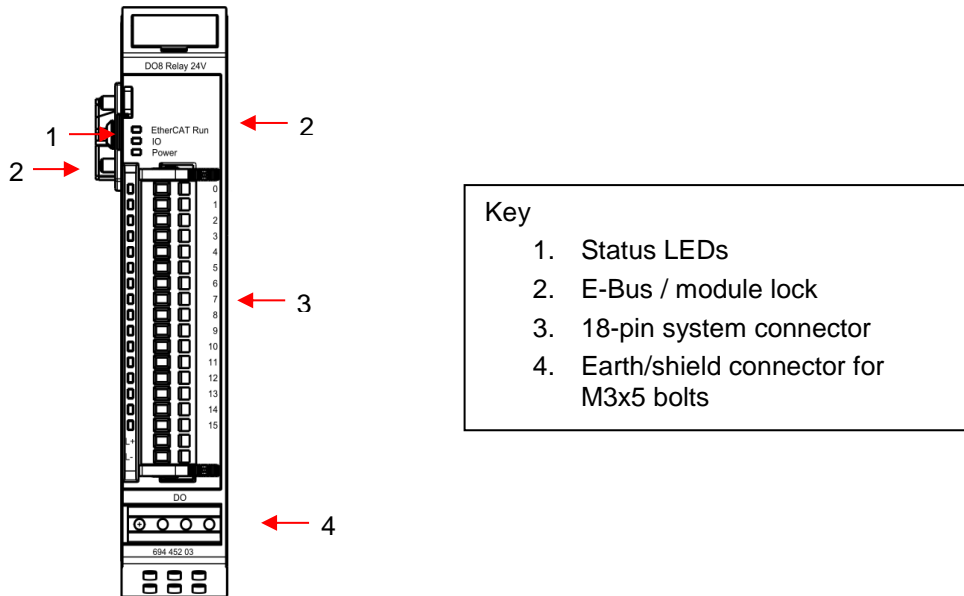
2.13 FIO DO8 NO Relay 24V (Discontinued)

2.13.1 Function

Digital output module with 8 normally open relay outputs

2.13.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 18-pin system connector
4. Earth/shield connector for M3x5 bolts

2.13.3 Connectors

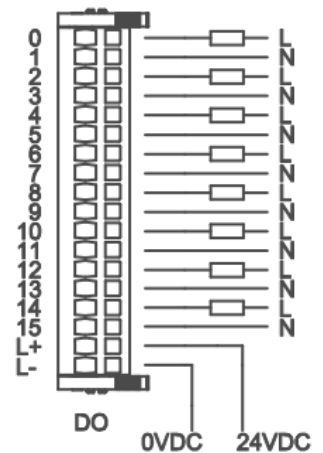### I/O Power Supply (Load)

System connector pin 16:   L+   24 VDC
System connector pin 17:   L-   0 V

Relay Contacts

System connector pins 0 … 15

A relay contact is located between 2 consecutive pins

Channel	0	1	2	3	4	5	6	7	
Pin	0	2	4	6	8	10	12	14	
	1	3	5	7	9	11	13	15	

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector

	NOTE
🛈	*Low voltage stops the relays from switching and causes energised relays to de-energise.*

	NOTE
🛈	*Operating the module near its limits (temperature/total current) will shorten the module's life. Check that the switching currents share well between the outputs, for example: avoid placing two 5A outputs immediately next to each other.*

2.13.4 Status LEDs

LED "EtherCAT Run"

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Output enabled
Off	Off	Output disabled

2.13.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput7	BOOL	Digital outputs 0 … 7

2.13.6 Technical Data

Digital outputs .... 8 normally open relays

Max. switching current (resistive) .... 5.0 A each

Max. switching current (inductive) .... 2.0 A each

Min. admissible load .... 10 mA @ 5 VDC

Min. mech. switching cycles .... 2×10^7

Min. electr. switching cycles .... 3×10^5 (2A/30 VDC)

Swiching voltage... max. 24 VDC / VAC

I/O / power connection.................................. male 18-pin

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 130 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation (module)......................... 500V E-Bus / power supply

Electrical insulation (relay)............................ 1500 VAC (<=1min) contacts / power supply

                                             750 VAC (<=1min) between contacts

Part no. 694.452.03

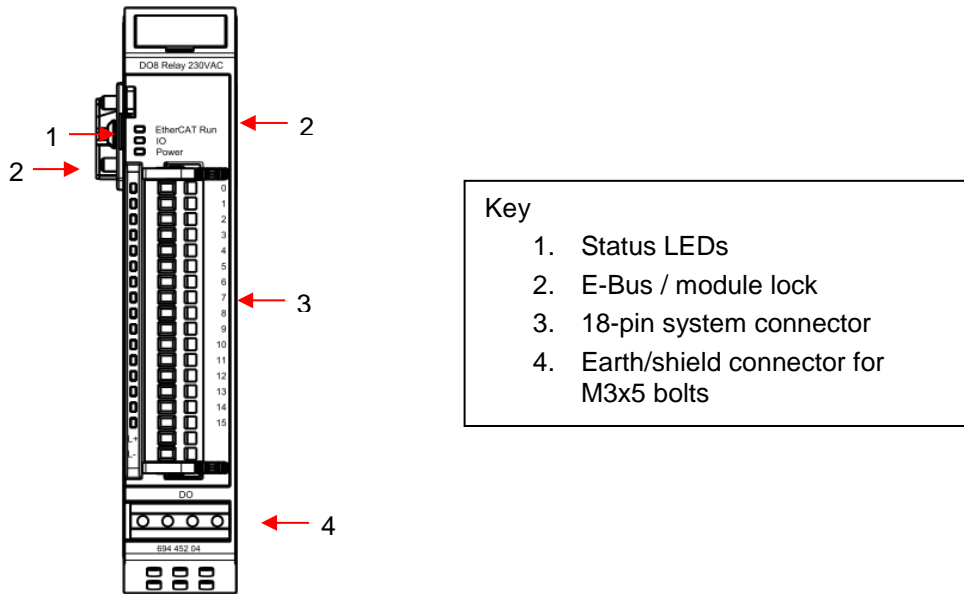Permits:...

2.14 FIO DO8 NO Relay 230VAC (Discontinued)

2.14.1 Function

Digital output module with 8 normally open relay outputs

2.14.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 18-pin system connector
4. Earth/shield connector for M3x5 bolts

2.14.3 Connectors

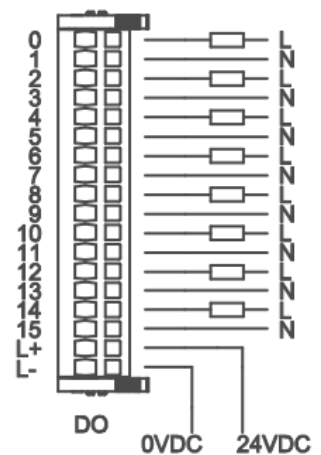### I/O Power Supply (Load)

System connector pin 16:   L+   24 VDC
System connector pin 17:   L-   0 V

Relay Contacts

System connector pins 0 … 15
A relay contact is located between 2 consecutive pins

Channel	0	1	2	3	4	5	6	7	
Pin	0	2	4	6	8	10	12	14	
	1	3	5	7	9	11	13	15	

EtherCAT

E-Bus IN   female 10-pole connector
E-Bus Out   10-pole multi-pin connector

	NOTE
(!)	*Low voltage stops the relays from switching and causes energised relays to de-energise.*

	NOTE
(!)	*Operating the module near its limits (temperature/total current) will shorten the module's life. Check that the switching currents share well between the outputs, for example: avoid placing two 5A outputs immediately next to each other.*

2.14.4 Status LEDs

LED "EtherCAT Run":

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Output enabled
Off	Off	Output disabled

2.14.5 Process Data Objects

Variable	Data type	Explanation
DigitalOutput0 … DigitalOutput7	BOOL	Digital outputs 0 … 7

2.14.6 Technical Data

Digital outputs .... 8 normally open relays

Max. switching current (resistive) .... 5.0 A each

Max. switching current (inductive) .... 2.0 A each

Min. admissible load .... 10 mA @ 5 VDC

Min. mech. switching cycles .... 2×10^7

Min. electr. switching cycles .... 3×10^5 (2A/30 VDC)

Swiching voltage... max. 24 VDC/ 230 VAC

I/O / power connection.................................. male 18-pin

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 130 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation (module)........................ 500V E-Bus / power supply

Electrical insulation (relay)............................ 1500 VAC (<=1min) contacts / power supply

750 VAC (<=1min) between contacts

Part no. 694.452.04
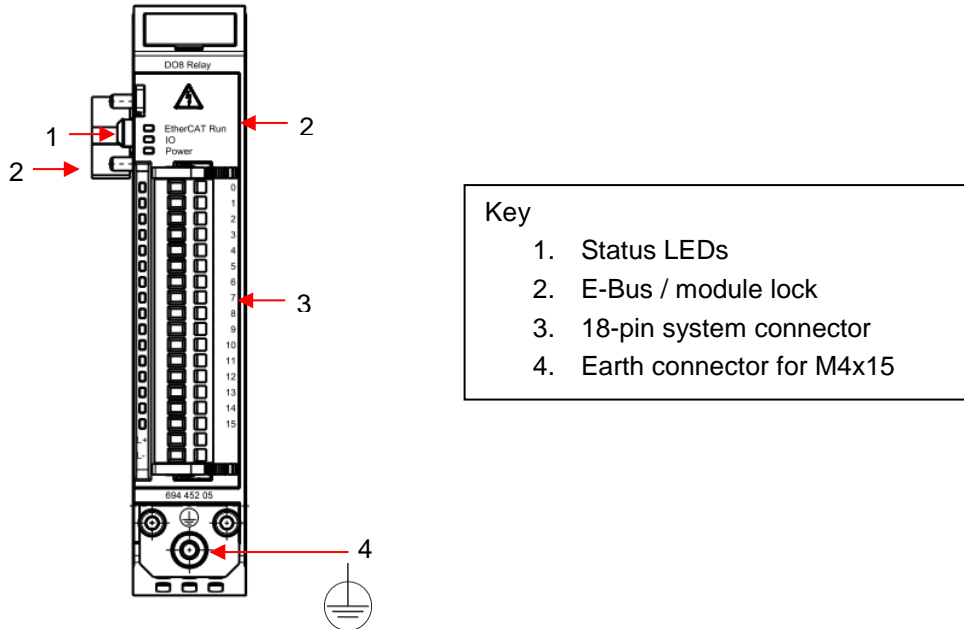
Permits:...

2.15 FIO DO8 Relais NO

2.15.1 Function

Digital output module with 8 normally open relay outputs

2.15.2 Front View

Key
1. Status LEDs
2. E-Bus / module lock
3. 18-pin system connector
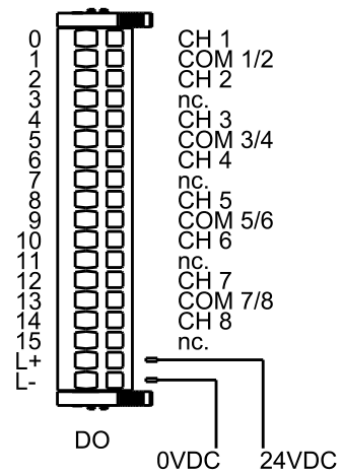4. Earth connector for M4x15

2.15.3 Connectors

I/O Power Supply (Load)

| System connector pin 16: | L+ | 24 VDC |
| System connector pin 17: | L- | 0 V |

Relaiy Contacts

System connector pins 0 … 15

2 relay contacts each have a common COM connection

Channel	1	2	3	4	5	6	7	8	
Contact Pin	0	2	4	6	8	10	12	14	
COM Pin	1		5		9		13		

EtherCAT

| E-Bus IN | female 10-pole connector |
| E-Bus Out | 10-pole multi-pin connector |

2.15.4 Danger and warning notices

Electrical connection

	WARNING
⚡	**Lethal risk of electric shock due to unearthed unit!**
	If units feature no or a badly installed PE terminal, high currents may occur on non-covered parts. Touching such parts may cause serious injury or death
	⇨ Properly connect the unit to earth.
	⇨ Connecting the PE terminal is subject to the applicable national and local regulations.

Attach a protective earth conductor to provide for protection against indirect contact in case of a fault to frame. Connection is made to the 4 mm bolt on front of the device.

- Do use a crimp terminal lug (approved pursuant to DIN 46234, for example) for a 4 mm bolt matching the cross-section of the chosen cable.

- The cross-section of the protective conductor must have the same current carrying capacity as the mains circuit

- The connection to the earthing terminal should be as short as possible.

- Connecting the PE terminal is subject to the applicable national and local regulations.

- Apply a torque of 1,2 Nm to tighten the 4 mm bolt.

- If several FIO DO8 relay modules are connected in series, a protective conductor must be connected to each individual module.

	NOTE
❗	**Installation to conform to the protective earth connection regulations of IEC 61010-1!**

	WARNING
⚠	**Cancellation of the electrical isolation**
	Connector pins 3, 7, 11 and 15 (n/c marked pins) must not be connected, as this leads to a loss of electrical isolation
	⇨ Observe the connection diagram

	WARNING
⚠	**High electrical voltages due to incorrect connection**
	Changed pin assignment FIO DO8 Relay: The module with the order number 694 452 05 is not interchangeable with the modules with the order numbers 694 452 03 and 694 452 04.
	Danger to life, risk of injury from electric shock.
	⇨ *Observe the connection diagram*

2.15.5 Status LEDs

LED "EtherCAT Run":

State	LED flash code	Explanation
Init	Off	Initialising, no data exchange
Pre-Op	Off/green, 1:1	Pre-operational, no data exchange
Safe-Op	Off/green, 5:1	Safe operation, inputs readable
Op	Green, on	Operational, unrestricted data exchange

LED "IO"

No

LED "Power"

State	LED	Explanation
On	Green	24 VDC supply to I/Os (load) ok
Off	Off	24 VDC supply not ok

LED "Channel"

State	LED	Explanation
On	On	Output enabled
Off	Off	Output disabled

2.15.6 Process Data Objects

Variable	Data type	Explanation
RelayOutput1 … RelayOutput8	BOOL	Digital relay outputs channel 1 … 8
VoltageOK	BOOL	Supply voltage is within the valid range

2.15.7 Function Notes

!	**NOTE**
	Low voltage stops the relays from switching and causes energised relays to de-energise.

!	**NOTE**
	Operating the module near its limits (temperature/total current) will shorten the module's life. Check that the switching currents share well between the outputs, for example: avoid placing two 5A outputs immediately next to each other.

2.15.8 Technical Data

Digital outputs .... 8 normally open relays

Max. switching current (resistive) .... 5.0 A each

Max. switching current (inductive) .... 2.0 A each

Min. admissible load .... 10 mA @ 5 VDC

Min. mech. switching cycles .... 2×10^7

Min. electr. switching cycles .... 3×10^5 (2A/30 VDC)

Swiching voltage... max. 24 VDC/ 230 VAC

I/O / power connection.................................. male 18-pin

EtherCAT slave controller.............................. ASIC ET1200

E-bus connector .... 10-pole system plug in side wall

E-bus load.. 130 mA

Power supply .... 24 VDC (-15% ... +20%)

Electrical insulation (module)........................ 500V E-Bus / power supply

Electrical insulation (relay)............................ 1500 VAC (<=1min) contacts / power supply

750 VAC (<=1min) between contacts

Part no. 694.452.05

Permits:...

3 Appendix

3.1 Order data

3.1.1 Modules

Kuhnke FIO DI16 / DO16 ....694 400 10 / 184111
Kuhnke FIO DI16/DO16 1ms/0.5A ....694.450.03 / 182.642
Kuhnke FIO DI16/DO16 5ms/0.5A ....694.450.01 / 182.643
Kuhnke FIO DI16/DO16 1ms/0.5A LS..694.450.13 / 182.641
Kuhnke FIO DI32 1ms...694.451.02 / 182.644
Kuhnke FIO DI16 1ms .... 694.451.03 / 182639 / 196424
Kuhnke FIO DI16 1ms 2-Wire ....694.451.43 / 196.425
Kuhnke FIO DI16 1ms 2-Wire GI ....694.451.44 / 198.500
Kuhnke FIO DI8/DO8 1ms/0.5A ....694.450.05 / 182.637
Kuhnke FIO DI8/DO8 5ms/0.5A ....694.450.04 / 182.638
Kuhnke FIO DI16/DO8 1ms/1A ....694.450.02 / 182.640
Kuhnke FIO DO8 1A..694.452.02 / 182.645
Kuhnke FIO DO8 2A..694.452.06 / 190.485
Kuhnke FIO DO16 0.5A ....694.452.01 / 182.646
Kuhnke FIO DO16 1A 2-Wire...694.452.41 / 196.429
Kuhnke FIO DO8 Relay NO 24V ....694.452.03 / 184.720
Kuhnke FIO DO8 Relay NO 230VAC..694.452.04 / 187.609
Kuhnke FIO DO8 Relay NO ....694.452.05 / 203003

3.1.2 Accessories

Kuhnke FIO Shield Terminal 2x8mm ....694 412 03 / 196445
Kuhnke FIO Shield Terminal 1x14mm ....694 412 04 /196446
Kuhnke FIO Shield Terminal 4x8mm ....694 412 05 / 196448
Kuhnke FIO Shield Terminal 2x14mm ....694 412 06 / 197524