MANUFACTURER DOCUMENT PACKAGE

Manufacturer's Manual

Reference package for procurement and maintenance review

HIMA

HIMatrix F1 DI 1601 SILworX

HIMATRIX SAFETY-RELATED REMOTE INPUT MODULE

Used with the applicable HIMatrix safety system configuration.

REFERENCE PACKAGE

OFFICIAL DOCUMENT

Selected official manufacturer pages follow this cover.

Source: HIMA HI 800 153 E F1 DI 16 01 manual

3 Product Description

The safety-related **F1 DI 16 01** remote I/O is a compact system in a metal enclosure with 16 digital inputs and 4 pulsed outputs.

The remote I/O is available in two model variants for SILworX and two model variants for ELOP II Factory. All variants are described in this manual.

The remote I/O serves to extend the I/O level of HIMax and HIMatrix controllers, and is connected to them via safe**ethernet**. The remote I/O itself is not able to run a user program.

The HIMatrix remote I/Os are not multi-master capable.

The remote I/O is suitable for mounting in Ex-zone 2, see Chapter 4.1.3.

The device has been certified by the TÜV for safety-related applications up to SIL 3 (IEC 61508, IEC 61511 and IEC 62061), Cat. 4 (EN 954-1) and PL e (EN ISO 13849-1). Further safety standards, application standards and test standards are specified in the certificate available on the HIMA website.

3.1 Safety Function

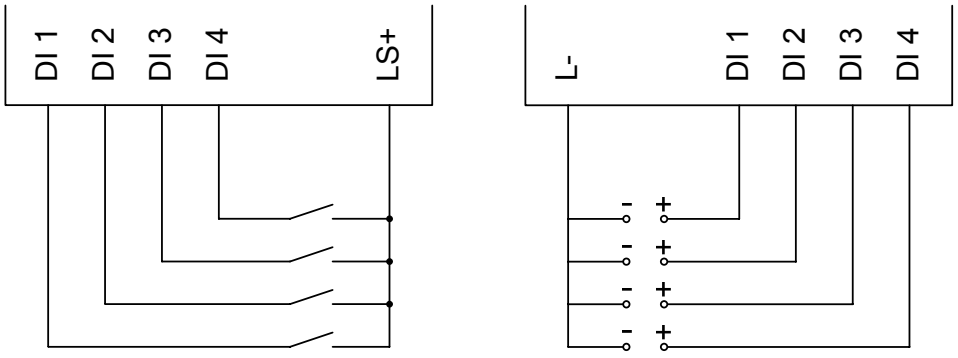
The remote I/O is equipped with safety-related inputs. The input values on the inputs are safely transmitted to the connected controller via safe**ethernet**.

3.1.1 Safety-Related Digital Inputs

The remote I/O is equipped with 16 digital inputs. The state (HIGH, LOW) of each input is signaled by an individual LED.

Mechanical contacts without own power supply or signal power source can be connected to the inputs. Potential-free mechanical contacts without own power supply are fed via an internal short-circuit-proof 24 V power source (LS+). Each 24 V power source supplies a group of 4 mechanical contacts. Figure 1 shows how the connection is performed.

With signal voltage sources, the corresponding ground must be connected to the input (L-), see Figure 1.



Connection of potential-free mechanical contacts

Connection of signal power sources

Figure 1: Connections to Safety-Related Digital Inputs

For the external wiring and the connection of sensors, apply the de-energized-to-trip principle. Thus, if a fault occurs, the input signals adopt a de-energized, safe state (low level).

An external wire is not monitored, however, an open-circuit is considered as safe low level.

For more information on how to configure line control in the user program, refer to the HIMatrix Engineering Manual HI 800 101 E.

3.2 Equipment, Scope of Delivery

The available variants and their part numbers are listed below:

Designation	Description	Part no.
F1 DI 16 01	Remote I/O with 16 digital inputs, operating temperature 0...+60 °C, for ELOP II Factory programming tool.	98 2200405
F1 DI 16 011 (-20 °C)	Remote I/O with 16 digital inputs, operating temperature -20...+60 °C, for ELOP II Factory programming tool.	98 2200456
F1 DI 16 01 SILworX	Remote I/O with 16 digital inputs, operating temperature 0...+60 °C, for SILworX programming tool.	98 2200479
F1 DI 16 011 SILworX (-20 °C)	Remote I/O with 16 digital inputs, operating temperature -20...+60 °C, for SILworX programming tool.	98 2200488

Table 4: Part Numbers

3.2.1 IP Address and System ID (SRS)

A transparent label is delivered with the device to allow one to note the IP address and the system ID (SRS for system rack slot) after a change.

IP___.___.___.___SRS____.__.__

Default value for IP address:	192.168.0.99
Default value for SRS:	60000.200.0 (SILworX)
	60000.0.0 (ELOP II Factory)

The label must not be affixed such that the air vents on the enclosure are covered.

Refer to the First Steps manual of the programming tool for more information on how to modify the IP address and the system ID.

3.4 Assembly

This chapter describes the layout and function of the remote I/Os, and their communication via safe**ethernet**.

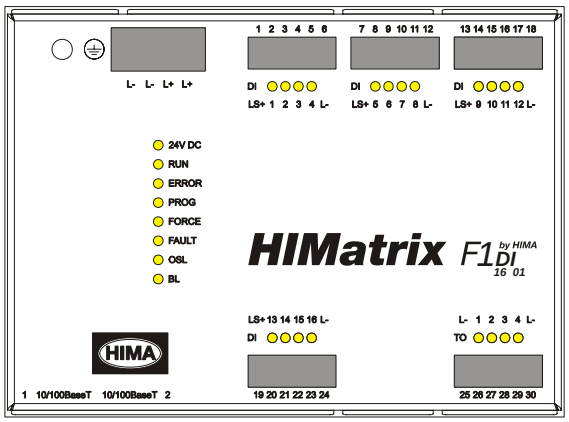
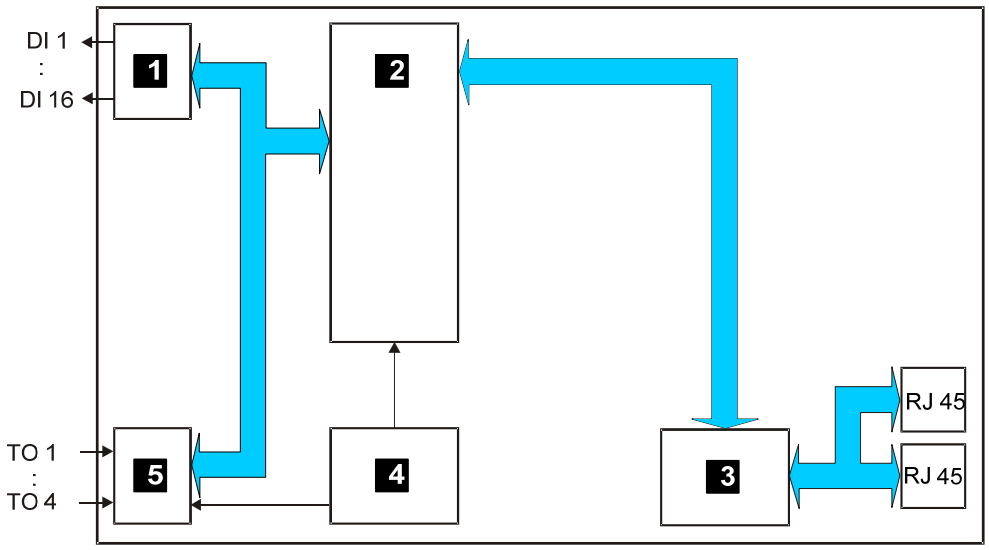


Figure 4: Front View



1 16 Digital Inputs
2 Safety-Related Processor System
3 Switch
4 Watchdog
5 4 Pulsed Outputs

Figure 5: Block Diagram

3.4.2 Communication

The remote I/O communicates with the associated controller via safe**ethernet**.

3.4.2.1 Connections for Ethernet Communication

Property	Description
Port	2 x RJ-45
Transfer standard	10/100/Base-T, half and full duplex
Auto negotiation	Yes
Auto crossover	Yes
Connection socket	RJ-45
IP address	Freely configurable[1)]
Subnet mask	Freely configurable[1)]
Supported protocols	▪ Safety-related: safe**ethernet** ▪ Non-safety-related: programming and debugging tool (PADT), SNTP
[1)] The general rules for assigning IP address and subnet masks must be adhered to.	

Table 9: Ethernet Interfaces Properties

The two RJ-45 connectors with integrated LEDs are located on the bottom left-hand side of the enclosure. For more information on the communication LEDs, refer to Chapter 3.4.1.3.

The connection parameters are read based on the MAC address (media access control address) defined during manufacturing.

The MAC address for the remote I/O is specified on a label located above the two RJ-45 connectors (1 and 2).

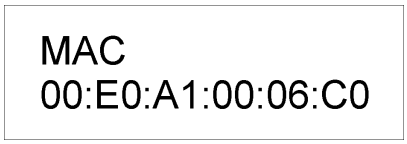


Figure 6: Sample MAC Address Label

The remote I/O is equipped with an integrated switch for safety-related Ethernet communication (safe**ethernet**). For further information on the integrated switch and safe**ethernet**, refer to Chapter *Communication* of the System Manual for Compact Systems HI 800 141 E.

3.4.2.2 Network Ports Used for Ethernet Communication

UDP ports	Usage
8000	Programming and operation with the programming tools
8001	Configuration of the remote I/O using the PES (ELOP II Factory)
8004	Configuration of the remote I/O using the PES (SILworX)
6010	safe**ethernet**
123	SNTP (time synchronization between PES and remote I/O, PES and external devices)

Table 10: Network Ports in Use

3.5 Product Data

General	
Response time	≥ 20 ms
Ethernet interfaces	2 x RJ-45, 10/100BaseT (with 100 Mbit/s) with integrated switch
Operating voltage	24 VDC, -15 %...+20 %, w_{ss} ≤ 15 %, from a power supply unit with safe insulation in accordance with IEC 61131-2.
Current input	max. 0.8 A
Fuse (external)	10 A time-lag
Operating temperature	0 °C...+60 °C
Storage temperature	-40 °C...+85 °C
Type of protection	IP20
Max. dimensions (without plug)	Width: 152 mm (with enclosure screws) Height: 114 mm (with fixing bolt) Depth: 66 mm (with earthing screw)
Weight	0.7 kg

Table 11: Product Data

Digital inputs	
Number of inputs	16 (non-galvanically isolated)
High level: voltage current input	15...30 VDC ≥ 2 mA at 15 V
Low level: voltage current input	max. 5 VDC max. 1.5 mA (1 mA at 5 V)
Switching point	typ. 7.5 V
Switching time	250 µs
Supply	4 x 19.2 V / 40 mA (at 24 V), short-circuit-proof

Table 12: Specifications for Digital Inputs

Pulsed outputs	
Number of outputs	4 (non-galvanically isolated)
Output voltage	≥ L+ minus 4 V
Output current	approx. 60 mA
Minimum load	none
Behavior with overload	4 x ≥ 19.2 V, short-circuit current 60 mA at 24 V

Table 13: Specifications for the Pulsed Outputs

3.5.1 Product Data F1 DI 16 011 (-20 °C)

The F1 16 011 (-20 °C) model variant is intended for use at the extended temperature range of -20…+60 °C. The electronic components are coated with a protective lacquer.

HIMatrix F1 DI 16 011	
Operating temperature	-20 °C...+60 °C
Weight	approx. 0.7 kg

Table 14: Product Data of F1 16 011 (-20 °C)