HIMA HIMatrix F1 DI 1601 SILworX

01 Product architecture

Product role

HIMA HIMatrix F1 DI 1601 SILworX is a safety remote I/O device with sixteen digital inputs and four pulsed outputs for monitored input circuits.

Operating context

The unit participates in a safety system through its remote input role. Certification capability does not by itself establish the integrity level of an installed function: field devices, wiring, diagnostics, host logic and response time all remain part of the validated design.

Additional engineering data

Item	Value or condition
Minimum device response time	At least 20 ms
Supply ripple	wss ≤15%
Pulsed-output voltage	At least L+ minus 4 V
Pulsed-output minimum load	None
Input channel short-circuit code	0x10
Pulse/input interruption code	0x80
Digital input module fault code	0x01

Key capabilities

Capability 1
Connects through two switched 10/100Base-T Ethernet ports.

Capability 2
Provides input line monitoring using configurable test pulses.

Capability 3
Reports input faults through channel error codes and a FAULT indicator.

Capability 4
Operates from a nominal 24 V DC supply in an IP20 housing.

System integration

The remote unit does not execute a user program. Its pulsed outputs support input-circuit testing and must not be used as safety-related actuator outputs; the controller must evaluate input values together with the relevant diagnostics.

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02 Technical data and interfaces

Principal technical data

Parameter	Value
Digital inputs	16, non-isolated
Pulsed outputs	4, non-isolated
Ethernet interfaces	2 × RJ45, 10/100Base-T, integrated switch
Supply voltage	24 V DC, −15%/+20%
Maximum current consumption	0.8 A
External fuse	10 A, slow-blow
High input level	15–30 V; at least 2 mA at 15 V
Low input level	5 V maximum; 1.5 mA maximum
Typical switching point	7.5 V
Input switching time	250 µs
Input supply groups	4 × 19.2 V / 40 mA at 24 V supply
Pulsed-output current	Approximately 60 mA at 24 V
Operating temperature	0–60 °C
Storage temperature	−40–85 °C
Protection class	IP20

How to apply these data

The input switching specification describes the electrical input circuitry. The device response begins at a longer timescale and the complete safety response also includes communication and controller processing. Assess these stages separately to avoid using the 250 µs figure as the complete shutdown time.

Technical basis

HI 800 153 E Rev. 1.01, F1 DI 16 01 manual; HIMA HIMatrix technical overview.

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03 Integration and application

Interface map

Interface	Purpose	Engineering note
DI channels	Safety-related digital input acquisition	Evaluate value and channel diagnostics together.
LS+ input supplies	Short-circuit-proof contact supply groups	Keep loads inside the group rating.
TO channels	Pulsed line-control sources	Not safety actuator outputs.
RJ45 ports	Switched Ethernet connection	Preserve the safeethernet system design.
24 V input	Device operating power	Use a safely isolated source and external protection.

Application contexts

Monitored contact circuits
Acquires safety-related contact states with a configured test-pulse arrangement.

Distributed safety inputs
Places input acquisition near field wiring while the safety logic remains in the host controller.

Line-fault diagnostics
Uses pulse evaluation and channel error codes to distinguish applicable wiring faults.

HIMatrix/HIMax expansion
Adds remote digital input capacity to an engineered safeethernet system.

Integration constraint

The 250 µs input switching time is not the complete safety-function response time. Include remote I/O processing, safeethernet communication and controller execution in the validated response-time calculation.

Commissioning record

Retain the SILworX hardware assignment, pulse-channel mapping, field-circuit diagram and completed fault-test results. Release requires the approved safety application and a validated complete response time.

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04 Engineering decisions

Diagnostic decisions

Input low without fault
Check field state and whether line monitoring is configured An open wire may resemble a normal low state.

Code 0x10
Inspect the affected channel for a short circuit Correct the field wiring before resetting the test.

Code 0x80
Inspect the pulse return path, switch state and L+ supply Resolve interruption causes before accepting the channel.

Product precautions

01
Verify the SILworX device variant before assigning the hardware configuration.

02
Isolate the supply and field circuits before changing the input wiring.

03
Use a safely isolated DC supply within the permitted voltage tolerance.

04
Keep the four pulsed outputs assigned to line control, not safety actuators.

05
Match each monitored input to its configured pulse-source channel.

06
Use channel error information together with the input value in the safety logic.

07
Validate open-circuit and cross-circuit responses with the plant in a safe state.

08
Confirm communication, diagnostics and the complete safety response before release.

Important notice

Validate the line-control wiring and assigned pulse channels in SILworX. Test the required fault responses before enabling the safety function.

Related catalogue pages

HIMA HIMatrix F3 DIO 16/8 01

HIMA F3DIO8/801

HIMA F7553

HIMA HIMatrix F1 DI 1601 SILworX

05 Questions and functional acceptance

Product-specific engineering questions

Can HIMatrix F1 DI 1601 SILworX execute a safety user program locally?
No. It is a remote I/O device; the user program runs in the connected HIMatrix or HIMax controller. The remote unit exchanges its I/O and diagnostic information through safeethernet.

How does HIMatrix F1 DI 1601 SILworX detect cross-circuits in input wiring?
Configured pulsed outputs feed the monitored input circuits. The unit evaluates the returned test pattern to detect wiring faults such as cross-circuits, open circuits and earth faults.

May the four pulsed outputs on HIMatrix F1 DI 1601 SILworX drive safety actuators?
No. These outputs are intended for input line-control functions and must not be used as safety-related outputs.

What happens to an affected input value when HIMatrix F1 DI 1601 SILworX detects an input fault?
The affected input is processed as low, and diagnostic information identifies the error. The safety application must use the relevant error codes when evaluating that input.

Which voltage levels distinguish high and low on HIMatrix F1 DI 1601 SILworX?
A high signal is 15–30 V with at least 2 mA at 15 V. A low signal is no more than 5 V and 1.5 mA; the typical switching point is 7.5 V.

Why are two Ethernet connectors fitted to HIMatrix F1 DI 1601 SILworX?
The two RJ45 connectors form an integrated 10/100Base-T switch for the remote I/O network connection. Their presence does not make the unit a multi-master remote I/O.

How are pulse sources assigned to HIMatrix F1 DI 1601 SILworX input channels?
In the SILworX DI-Channels settings, Pulse Channel selects the associated test-output source. Values 1 through 4 select the corresponding pulsed-output channel.

Does an open input wire always produce a separate fault on HIMatrix F1 DI 1601 SILworX?
An input without configured line monitoring can simply appear low when its wire opens. Use the required line-control arrangement when the application must distinguish wiring faults from normal signal states.

Functional acceptance

Test	Action	Expected result
Normal signal states	Operate each connected field signal	Correct values reach the intended host variables.
Line-control fault	Introduce an approved test fault in a safe state	The expected diagnostic and safe response occur.
Communication loss	Perform the approved network-failure test	The host executes the designed fault reaction.