



Operating instructions
IO-Link input/output module
AL2821

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1 Preliminary note

You will find instructions, technical data, approvals and further information using the QR code on the unit / packaging or at documentation.ifm.com.

1.1 Legal and copyright information

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1.2 Symbols used

- ✓ Requirement
- ▶ Instruction
- ▷ Reaction, result
- bold** Designation of keys, buttons or indications
- ↪ Cross-reference without link
- ↪ Cross-reference with link
- ! Important note
Non-compliance may result in malfunction or interference
- i Information
Supplementary note

1.3 Warnings

Warnings indicate the possibility of personal injury and damage to property. This enables safe product handling. Warnings are graded as follows:



WARNING

Warning of serious personal injury

- ▷ If the warning is not observed, fatal and serious injuries are possible.



CAUTION

Warning of minor to moderate personal injury

- ▷ If the warning is not observed, minor to moderate injuries are possible.



ATTENTION

Warning of damage to property

- ▷ If the warning is not observed, damage to property is possible.
-

2 Safety instructions

- The unit described is a subcomponent for integration into a system.
 - The system architect is responsible for the safety of the system.
 - The system architect undertakes to perform a risk assessment and to create documentation in accordance with legal and normative requirements to be provided to the operator and user of the system. This documentation must contain all necessary information and safety instructions for the operator, the user and, if applicable, for any service personnel authorised by the architect of the system.
- Read this document before setting up the product and keep it during the entire service life.
- The product must be suitable for the corresponding applications and environmental conditions without any restrictions.
- Only use the product for its intended purpose (↻ Intended use).
- If the operating instructions or the technical data are not adhered to, personal injury and/or damage to property may occur.
- The manufacturer assumes no liability or warranty for any consequences caused by tampering with the product or incorrect use by the operator.
- Installation, electrical connection, set-up, operation and maintenance of the product must be carried out by qualified personnel authorised by the machine operator.
- Protect units and cables against damage.

2.1 Cybersecurity

Installation

The device is suitable for operation in a secure environment according to IEC 62443-1-1.

The device was designed for operation behind a firewall.

- ▶ Carry out a risk assessment of the system according to IEC 62443-1-1.
- ▶ Take measures to ensure physical security.

Operation

- ▶ Observe the security functions described in the product documentation and the recommendations for their use.

Maintenance

- ▶ Regularly check whether software updates are available for the device.
- ▶ Back up system configuration and system data in accordance with your company's change management processes.

Decommissioning

- ▶ Ensure that no sensitive information can fall into unauthorised hands.
- ▶ Always reset the system settings to the factory settings before decommissioning the device.

3 Transport, handling and storage

- ▶ Store the device in its original packaging.
- ▶ When the device is to be stored again, use the original packaging.
- ▶ Otherwise, provide unused connections with either a mating connector or a protective cap and pack the device in suitable packaging.
- ▶ Observe the permissible ambient conditions for the device during storage (↻ Technical data).

4 Intended use

The device has 8 configurable ports, each of which can be used as a digital input or a digital output.

The device must not be used in the food and beverage industry (use of cleaning agents under high pressure and at high temperatures).

5 Function

5.1 IO-Link

5.1.1 General information

The unit has an IO-Link communication interface which requires an IO-Link capable module (IO-Link master).

The IO-Link interface allows direct access to the process and diagnostic data and enables setting of the parameters of the unit during operation.

You will find further information about IO-Link and all the necessary information about the required IO-Link hardware and software at:

www.io-link.ifm

5.1.2 IO Device Description (IODD)

You will find the IODDs required for configuration of the IO-Link device as well as detailed information about the process data structure, diagnostic information and parameter addresses at

documentation.ifm.com

5.1.3 IO-Link connection

The current required by the devices depends on the current load of the sensor supplies.

The IO-Link port must be connected according to the IO-Link specification.



Maximum cable length:

- ▷ With IO-Link communication: 20 m on the master side

5.1.4 Response when the IO-Link communication is interrupted

The parameter **Output state COM lost / PD invalid** (index 15000) is used to set how the outputs are to respond when the IO-Link communication is interrupted. For every output it can be defined separately if it:

- is to be switched on (HIGH)
- is to be switched off (LOW)
- or is to keep the last state

5.2 Voltage supply

5.2.1 Supply voltage US

The US supply voltage supplies the device and IO-Link with voltage (18...30 V DC).



US supplies the outputs and the sensors. Current is monitored jointly. For details, see Digital outputs ↻ 10. Switching off US also switches off the power supply for the outputs and sensors and interrupts the IO-Link communication. The device has no additional port to supply the outputs and sensors.

5.2.2 Behaviour in case of undervoltage

If the supply voltage of the outputs (US) falls below 16 V, all outputs and the IO-Link communication switch off.

5.2.3 Limit values, protection against excessive current

	AL2821
Total current (US)	50...1050 mA
Total sensor supply (pin 1)	max. 1 A

The total current is limited to 1050 mA. If the current is too high, the device switches off all outputs and sensor supplies. The Hiccup short-circuit parameter (index 15116) is set until the current returns to within the permissible range.

5.3 Inputs / outputs

The device has 8 ports (X1...X8). Each port has 2 configurable digital inputs/outputs (PIN 2 and PIN 4).



Maximum cable length:

▷ Without IO-Link communication: 30 m on each side

5.3.1 Sensor supply US

The device has 8 sensor supplies; together with the outputs, they are subject to a common current limit of 1 A. For further details, see Digital outputs → 10. The output voltage of the sensor supplies is proportional to the operating voltage (18...30 V DC).

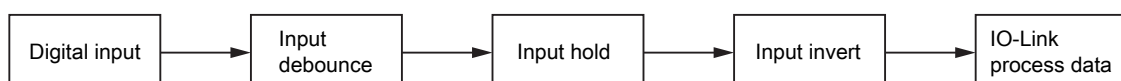
5.3.2 Digital inputs

Depending on the configuration, the device has 16 digital type 3 inputs (PNP). Connected devices must be suitable for these inputs.

5.3.3 Digital input filters

The input signals can be changed via different filters before they are passed on via IO-Link. The following filters are available and are applied to the input signal in this order:

1. Debounce
2. Hold
3. Inverting



Each of these filters can be configured separately via IO-Link. More information is available in the IODD at documentation.ifm.com.

The device detects signals of a length of min. 2 ms. Shorter signals are not detected.



Periodic signals are only detected reliably if the signal period is at least twice as long as the cycle time.

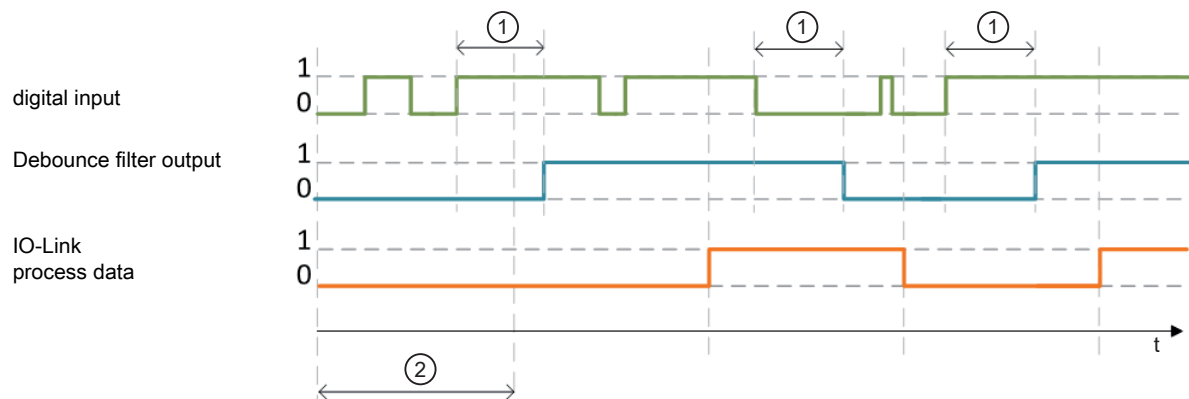


The precision of the digital input filters is ± 1 ms.

5.3.3.1 Debouncing

The input debouncing filter suppresses noise signals caused by mechanical switches, contacts or relays. The filter provides the input signals at the filter output with a delay (debounce time). All signals shorter than the set debounce time are ignored by the filter.

Time diagram debounce filter:



1: Debounce time

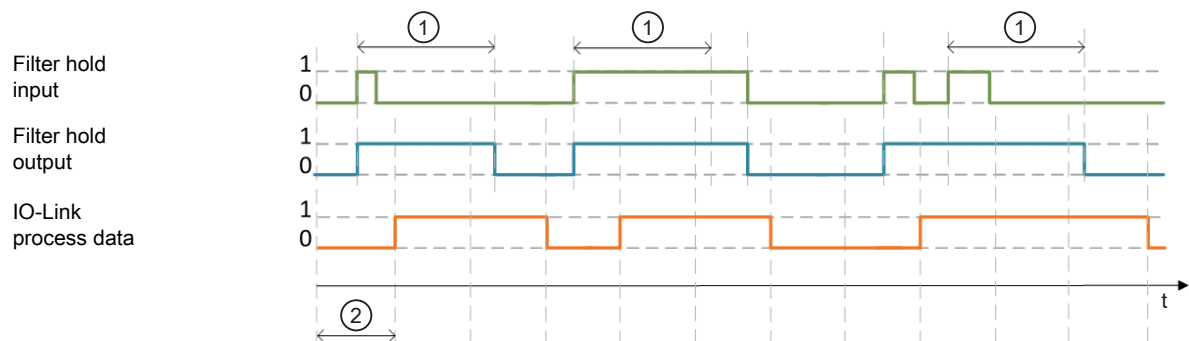
2: Cycle time

5.3.3.2 Hold

This filter stretches short input pulses. The filter is configured via the following parameters:

- Hold time: pulse duration to which short pulses are to be stretched. Pulses that are present for a longer time than the hold time are not stretched.
- Hold status: input level to be stretched (HIGH or LOW)

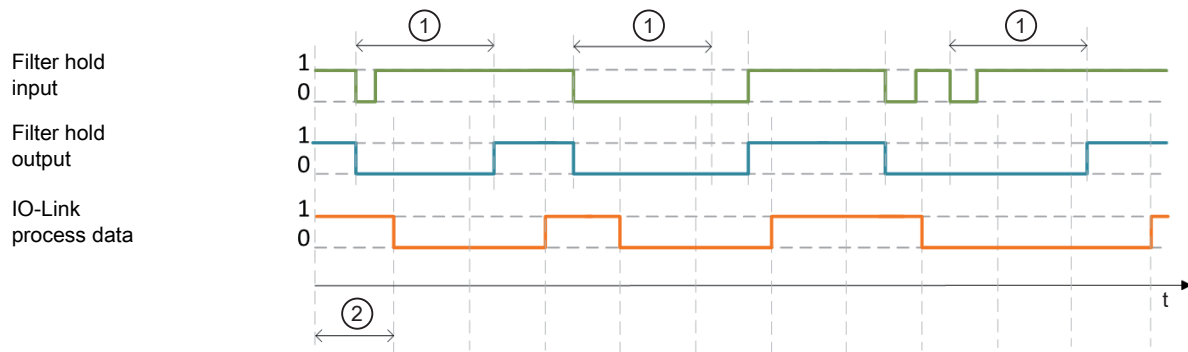
Time diagram hold filter with hold status HIGH:



1: Hold time

2: Cycle time

Time diagram for hold filter with hold status LOW:



- 1: Hold time
2: Cycle time



Input signals shorter than the cycle time are not reliably transmitted. To ensure a correct signal transmission via IO-Link the hold filter must be used.

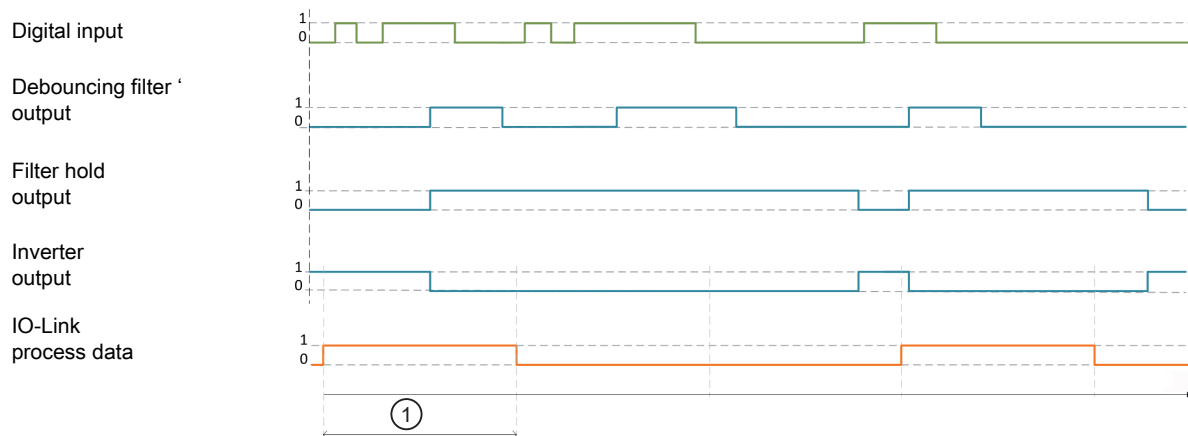
5.3.3.3 Inverting

This filter inverts incoming input signals.

5.3.3.4 Combination of different input filters

The different input filters can be combined.

In the following example all 3 filters are used:



- 1: Cycle time

5.3.4 Digital outputs

Depending on the configuration, the device has 16 digital outputs (PNP).



All outputs and sensor supplies are subject to a common current limit of 1 A. If the current is too high, the device switches off all outputs and sets the short circuit Hiccup parameter (index 15116) until the current is within the permissible range again.

6 Electrical connection



The device must be connected by a qualified electrician.

Observe the national and international regulations for the installation of electrical equipment.

Voltage supply according to SELV.

6.1 Connecting the device

► Disconnect power.

► Connect the unit as follows:

M12 plug, A-coded, IO-Link (XC1)



- 1: L+ (US)
- 2: not used
- 3: L- (US)
- 4: IO-Link

M12 socket, A-coded, ports (X1...X8)



- 1: L+ (US)
- 2: MP2
- 3: L- (US)
- 4: MP1
- 5: not used

6.1.1 Mounting the connector

The threaded connections in the device correspond to the M12 standard. To ensure compliance with the specified protection rating, only cables that comply with this standard may be used. In the case of self-assembled cables, the system manufacturer is responsible for the protection rating.

- Use connectors with gold-plated contacts.
- During installation, place the connectors vertically so that the coupling nut will not damage the thread.
- Observe the coding of the connectors during installation.

If connector in the device:

- Tighten the cable sockets according to the torque specifications indicated by the cable vendor. Maximum permissible tightening torque: 0.8 Nm

If sockets in the device:

- Tighten the cable plug using 1.0 ± 0.1 Nm.
- Cover unused connections with protective covers. Tightening torque: 0.6...0.8 Nm
- Provide all outgoing cables with suitable strain relief after a maximum of 200 mm. Observe the minimum bending radius of the cables (↪ information from the cable manufacturer).

6.2 General wiring information

- ▶ Disconnect power.
- ▶ Connect the terminals to the device.
- ▶ Wire the terminals.

The external wiring has to be carried out in a way that ensures the required separation from other circuits.



For use in USA and Canada: voltage supply according to class 2



Do not apply external voltage to the outputs.

7 Installation



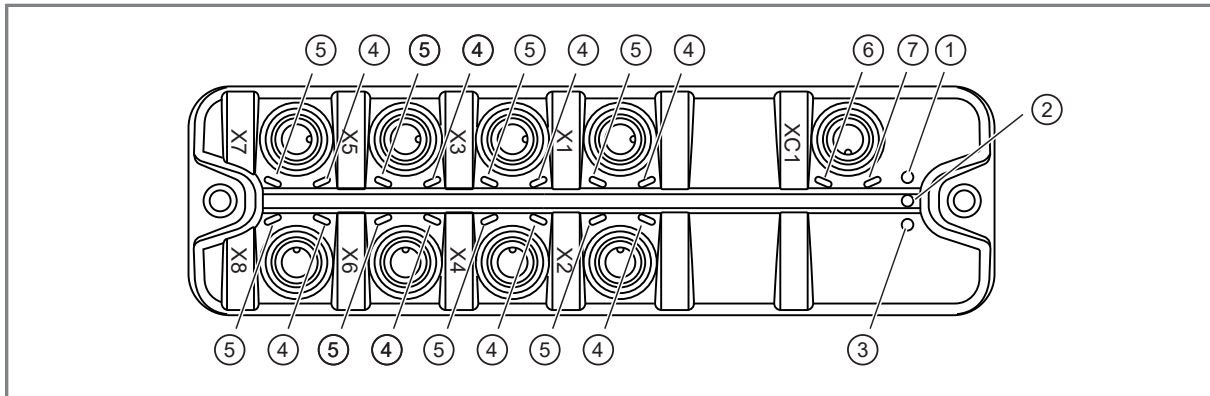
- ▶ Disconnect the power of the machine before installation.



- ▶ For installation choose a flat mounting surface.

- ▶ Fasten the module onto the mounting surface using M5 mounting screws and washers.
Tightening torque 1.8 Nm.

8 Operating and display elements



- | | | |
|----|---|-------------------------|
| 1: | LED INT | Internal error |
| 2: | LED 1 | Error |
| 3: | LED 2 | Error |
| 4: | LED MP2 | Status input/output MP2 |
| 5: | LED MP1 | Status input/output MP1 |
| 6: | LED  | IO-Link communication |
| 7: | LED US | Supply voltage |

8.1 LEDs

LED	Colour	Input/output function	Status	Designation
INT	Red		On	Internal error
			Off	No internal error Device in operating mode
1, 2	Red		On	Short circuit
			Off	No error Device in operating mode
MP1, MP2	Yellow	Digital input	On	Input signal High
			Off	Input signal Low
			Flashing	Short circuit
		Digital output	On	Output signal High
			Off	Output signal Low
			Flashing	Short circuit
	Green		On	IO-Link communication active
			Off	IO-Link communication not active
US	Green		On	Voltage supply $\geq 18\text{ V}$
			Off	Voltage supply $< 16\text{ V}$

9 Maintenance, repair and disposal

9.1 Maintenance

The unit is maintenance-free.

9.2 Cleaning the housing surface

- ▶ Disconnect the device from the voltage supply.
- ▶ Clean the device from dirt using a soft, chemically untreated and dry micro-fibre cloth.

9.3 Repair

- ▶ The device must only be repaired by the manufacturer. Observe the safety instructions (→ Safety instructions).

9.4 Disposal

- ▶ After use, dispose of the unit in an environmentally friendly way in accordance with the applicable national regulations.