



Operating instructions
IO-Link input/output module
AL5021

GB

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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 www.ifm.com.

1.1 Symbols used

- ✓ Requirement
- Instructions
- ▷ Reaction, result
- [...] Designation of keys, buttons or indications
- Cross-reference
-  Important note
Non-compliance may result in malfunction or interference.
-  Information
Supplementary note

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.
- Store the product in its original packaging.

3 Intended use

The device has 16 configurable ports, each of which can be used as a digital input or a digital output.



The device is intended for indoor use only.

- Observe the operating conditions (→ Technical data at www.ifm.com).

4 Function

4.1 IO-Link

4.1.1 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

4.1.2 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

4.1.3 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

4.2 Visual indication

The device signals

- fault-free operation (green LED US on, LED ERROR off)
- a short circuit (red LED ERROR on)
- an internal error (red LED ERROR on)

4.3 Inputs / outputs

The device has 16 ports (X1.0...X1.15). Each port has a digital input/digital output.

4.4 Voltage supply

4.4.1 Supply voltage US

The US supply voltage supplies the device and IO-Link with voltage.



US also supplies the outputs and the sensors. There is a common monitoring of the current / switching-off in case of excessive current. Switching off US also switches off the power supply for the outputs and for the sensors and interrupts the IO-Link communication. The device has no additional port to supply the outputs and sensors.

4.4.2 Behaviour in case of undervoltage

If the voltage supply of the outputs (US) falls below 16 V, all outputs switch off.

4.4.3 Limit values, protection against excessive current

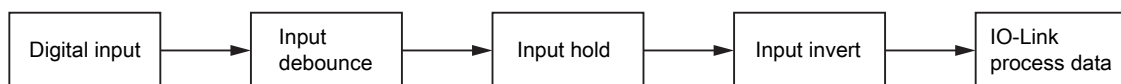
	AL5021
Total current	50...1050 mA
Power supply for sensors (pin1)	max. 1 A

The total current is limited to 1050 mA. If the current is too high, the device will switch off all outputs until the current is within the permissible range again.

4.5 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. Debouncing
2. Stretching
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.

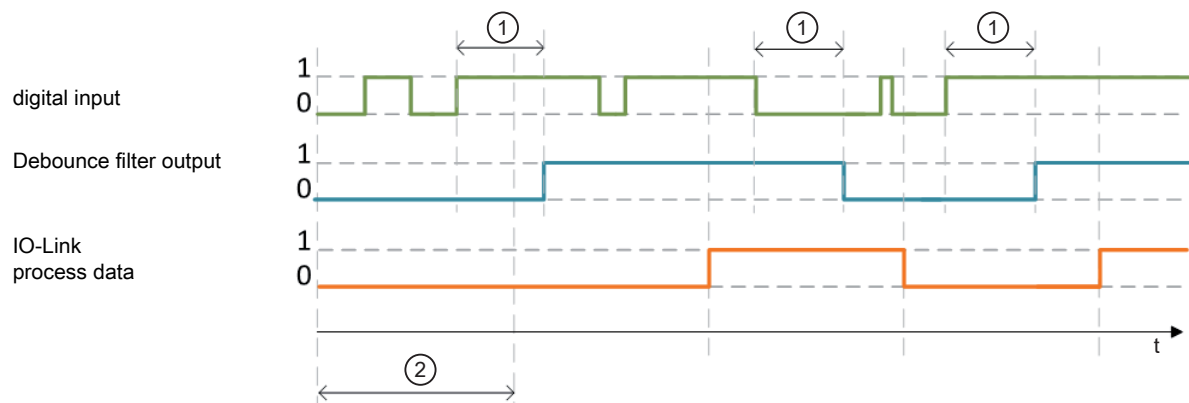


▷ Periodic signals are only detected reliably if the signal period is at least twice as long as the cycle time.

4.5.1 Debouncing

The input debouncing filter suppresses noise signals caused by mechanical switches. 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:



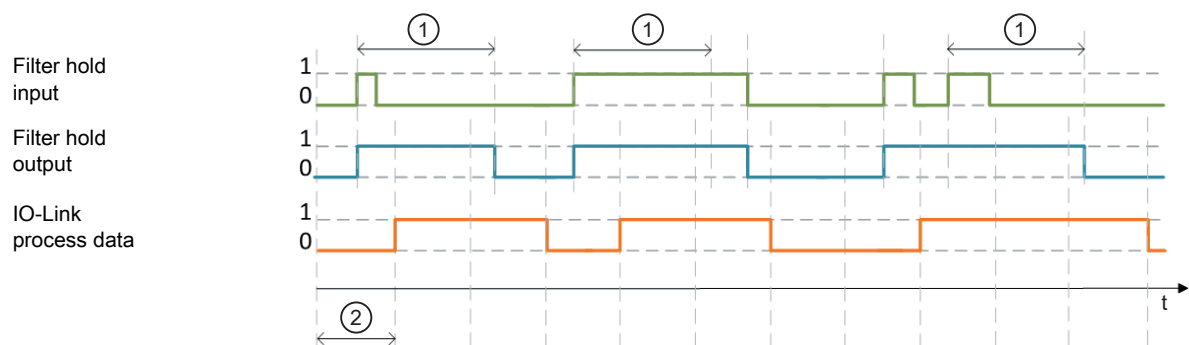
- 1: debounce time
2: cycle time

4.5.2 Stretching

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

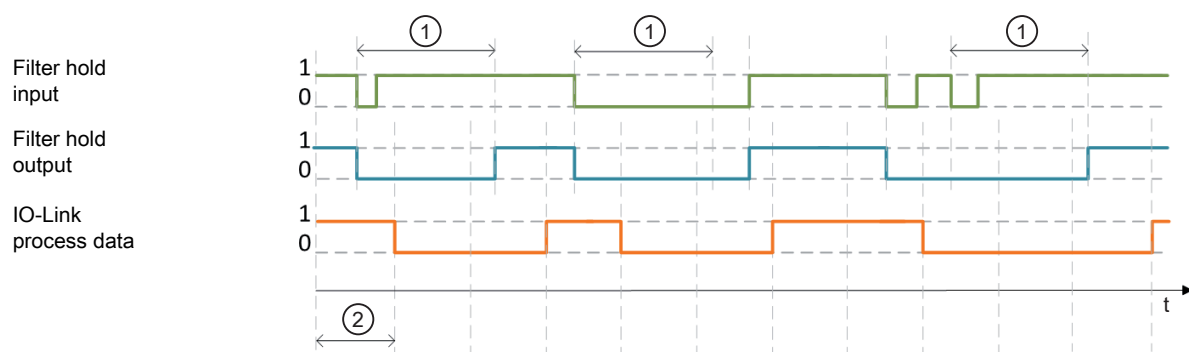
- **Hold time:** pulse duration to which short pulses are to be stretched. Pulses that are present for a longer time than the hold time are not stretched.
- **Holding status:** Input level to be prolonged (HIGH or LOW)

Time diagram filter hold with hold status HIGH:



- 1: hold time
2: cycle time

time diagram filter hold 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 filter hold must be used.

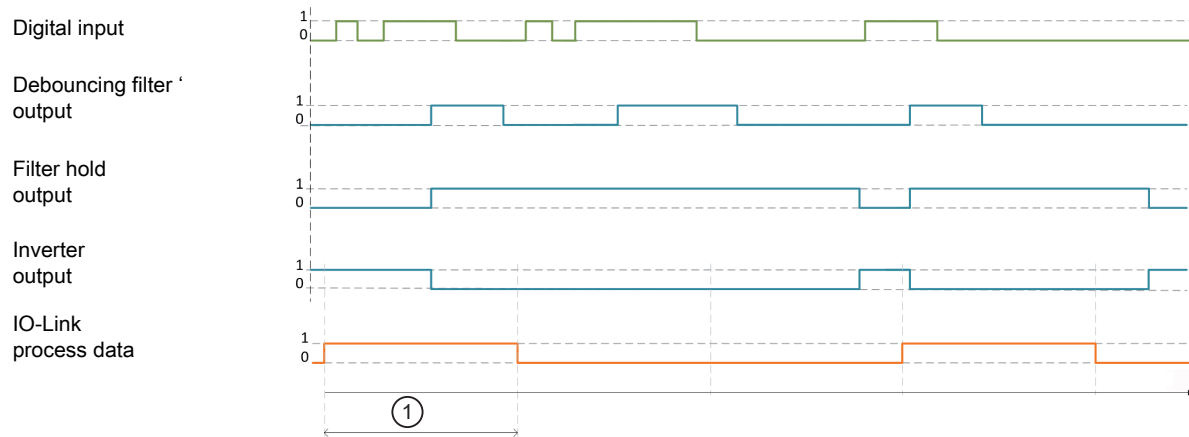
4.5.3 Inverting

This filter inverts incoming input signals.

4.5.4 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 Installation

- ! ▶ Disconnect the power of the machine before installation.
- ! ▶ For installation choose a flat mounting surface.
- ▶ Fasten the module onto the mounting surface using M4 screws and washers (tightening torque. Tightening torque 1.2 Nm.

5.1 Wiring of control panels

The device fits directly into many of the standard button housings on the market. Peripheral devices can be connected there.

For smaller push-button housings, the device is to be installed outside the housing. Due to the high IP protection, the device can also be mounted in the cable path.

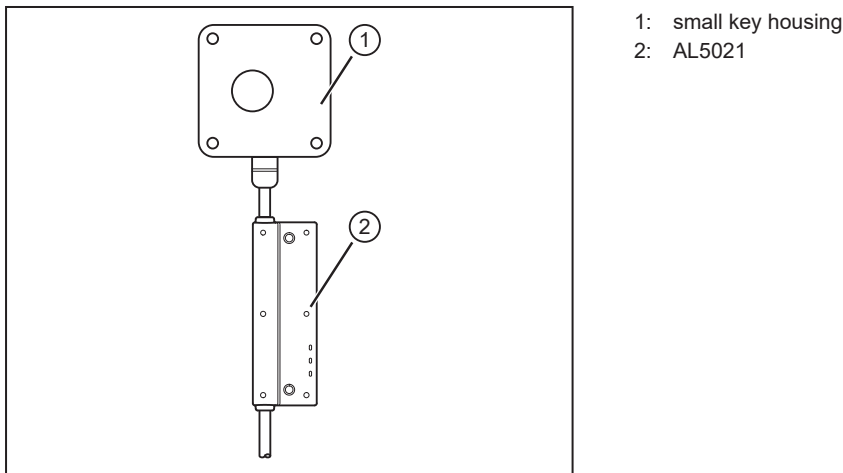


Fig. 1: Installation example

In control panels, the device can be wired open. The wiring is protected by the control panel housing.

6 Electrical connection



The unit must be connected by a qualified electrician.

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

Voltage supply according to SELV, PELV.



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

► Disconnect power.

► Connect the device.



Observe the maximum tightening torque of the connection cable.



Maximum cable length for IO-Link communication: 20 m



Do not apply external voltage to the outputs.



Maximum cable length for the inputs/outputs: 3 m



The cable for the inputs/outputs is not protected. After connection to the IO-Link master, 24 V DC are applied there.



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

6.1 IO-Link connection

The IO-Link port must be connected according to the IO-Link specification. The current required by the units depends on the current load of the sensor supplies.

6.2 Input circuit

The device has digital type 3 inputs. Connected devices must be suitable for these inputs.

6.3 Pin assignment

M12 connector - IO-Link (X1):



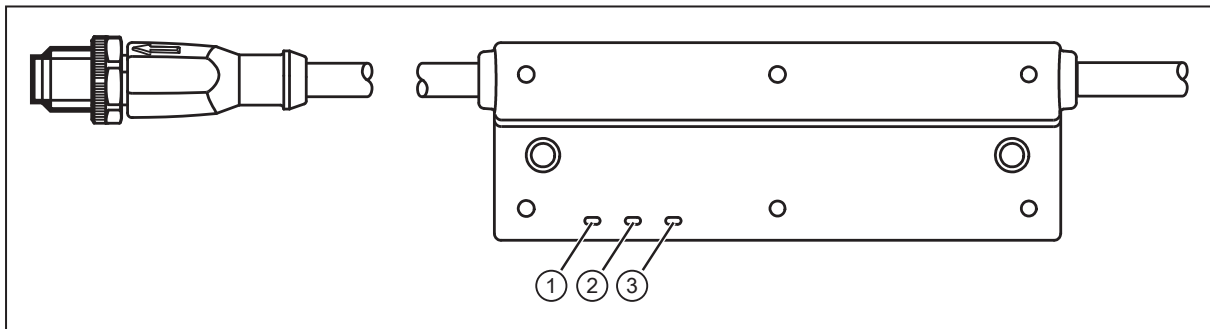
1: L+ (US)
3: L- (US)
4: IO-Link

18-pole connection cable - inputs/outputs:

Core	Colour	Designation
1	white	Input/output X1.0
2	black/white	Input/output X1.1
3	orange	input/output X1.2
4	black/red	input/output X1.3
5	yellow	input/output X1.4
6	white/violet	input/output X1.5

Core	Colour	Designation
7	green	input/output X1.6
8	black/blue	input/output X1.7
9	red	input/output X1.8
10	white/yellow	input/output X1.9
11	black	input/output X1.10
12	white/green	input/output X1.11
13	grey	input/output X1.12
14	white/blue	input/output X1.13
15	violet	Input/output X1.14
16	white/red	input/output X1.15
17	blue	L- (US)
18	brown	L+ (US)

7 Operating and display elements



- 1: LED US
 2: LED 
 3: LED ERROR

LED	Colour	Status	Designation
US	green	on	voltage supply $\geq 18\text{ V}$
		Off	voltage supply $< 16\text{ V}$
	green	on	IO-Link communication active
		Off	IO-Link communication is not active
ERROR	red	on	internal error/short circuit
		off	no error Device in operating mode

8 Maintenance, repair and disposal

The unit is maintenance-free.

- ▶ Contact ifm in case of malfunction.
- ▶ Do not open the housing as the unit does not contain any components which can be maintained by the user. The unit must only be repaired by the manufacturer.
- ▶ Clean the device using a dry cloth.
- ▶ Dispose of the unit in accordance with the national environmental regulations.