

# ECI A2

## Dual incremental encoder reader / quad counter

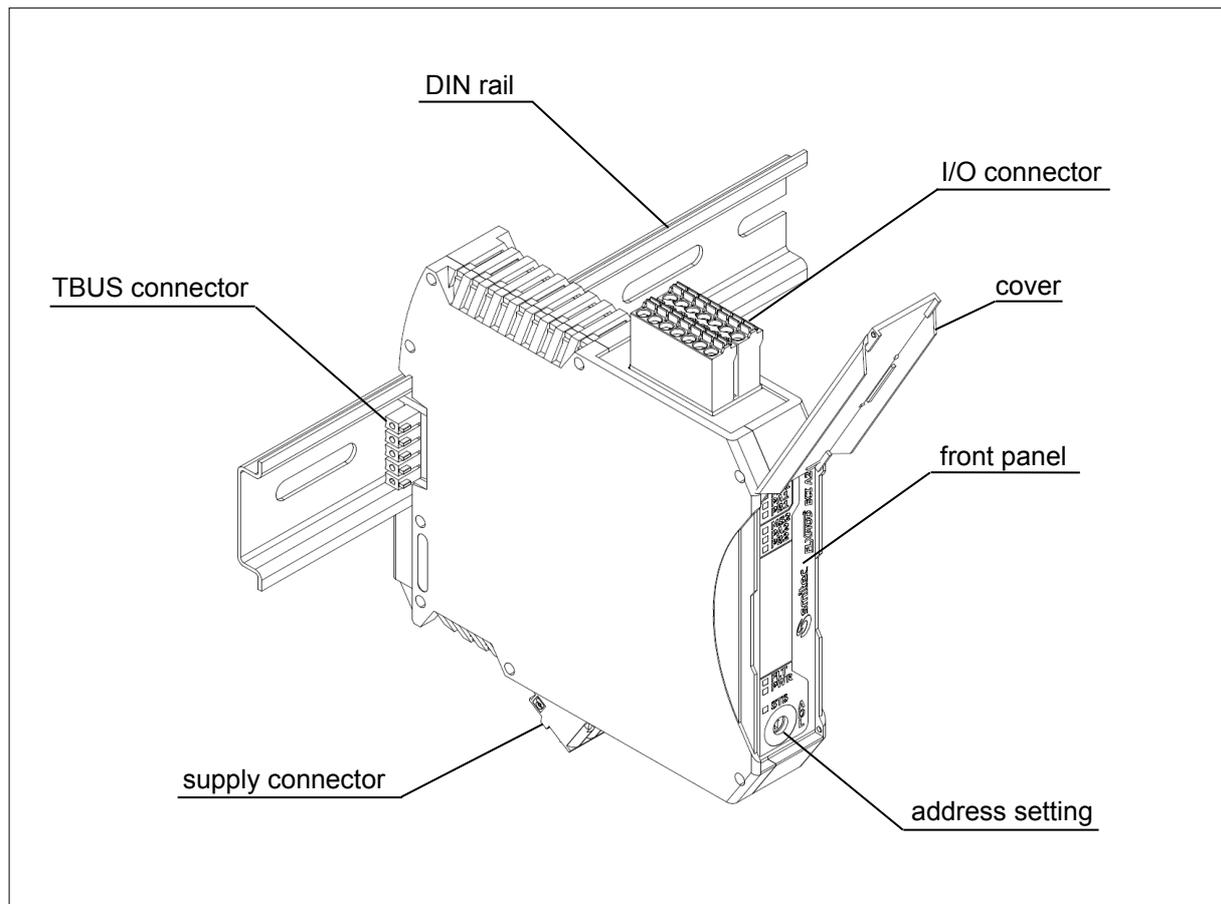
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Datasheet

### Description

Dual incremental encoder reader / quad digital counter. Main characteristics:

- Two inputs for 24V HTL incremental encoders
- Quad channel digital counter
- Type 3 digital inputs
- Status and diagnostics LEDs



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## Ordering informations

| <b>Products</b>  | <b>SMITEC part number</b> |
|--|---------------------------|
| Module for encoder acquisition, complete with accessories (power connector, inputs connector and TBUS connector) | KZ010361                  |

| <b>Accessories</b>                                   | <b>SMITEC part number</b> |
|--|---------------------------|
| Power supply connector (Phoenix Contact p/n 1910377) | KF100009                  |
| I/O connector (Phoenix Contact p/n 1738856)          | KF101049                  |
| TBUS connector (Phoenix Contact p/n 2713722)         | KF101034                  |
| Power supply fuse (Littelfuse p/n 0452 002)          | KD201035                  |

| <b>Documentation</b>                       | <b>SMITEC part number</b> |
|--|---------------------------|
| Installing instructions                    | DK400042                  |
| Datasheet for ECI A2                       | DK400129                  |
| FLXIO and FLXMOD system integration manual | DK400076                  |

## Technical data

| General data                                |   |
|---|---|
| Housing dimensions (width x height x depth) | 22.5 mm x 99.0 mm x 114.5 mm  |
| Weight                                      | 107 g (without connectors), 126 g (with connectors)                             |
| Connection method for connectors            | Spring cage terminals   |
| Conductor cross-section (power connector)   | 0.2 to 2.5 mm <sup>2</sup> (24 – 12 AWG)  |
| Conductor cross-section (inputs connector)  | 0.2 to 1.5 mm <sup>2</sup> (24 – 16 AWG)  |
| Functional earth connection                 | To the DIN rail by spring contact   |
| Mode state visual indicators                | Fault (FLT), status (STS), power (PWR), and six application dependent LED lamps |

| Environment data                                 |  |
|--|--|
| Permissible operating temperature                | +5° to +55°C                                 |
| Permissible storage and transport temperature    | -25° to +85°C                                |
| Permissible humidity                             | 10% to 95%, not condensing                   |
| Permissible air pressure (operation)             | 80 to 106 kPa (up to 2000 m above sea level) |
| Permissible air pressure (storage and transport) | 70 to 106 kPa (up to 3000 m above sea level) |
| Degree of protection (CE)                        | IP20 according to IEC 60529                  |
| Degree of protection (UL)                        | Open Type                                    |
| Overvoltage category                             | II   |
| Pollution degree                                 | 2  |
| Means of protection (UL)                         | Class III SELV power supply                  |

| Power supply                                |   |
|---|---|
| Main power supply $V_M$                     | 24 V DC ==<br>(-15% ÷ + 20% according to IEC 61131-2)   |
| Maximum allowed ripple on $V_M$             | 5% of supply voltage (according to IEC 61131-2)         |
| Current consumption from main supply        | 1.5 A max., depending on external loads absorption      |
| Supply overvoltage protection on $V_M$      | Unidirectional Zener clamp ( $V_z > 30$ V)              |
| Supply reverse polarity protection on $V_M$ | Input antiparallel diode                                |
| Supply fuse                                 | 2 A, not replaceable by the user                        |
| Local bus power supply                      | 5 V DC (from local bus)                                 |
| Power presence visual indicators            | Green LED lamp, lighted if main supply is present (PWR) |
| Power load from local bus at 5V DC          | Approx. 0,3W  |
| Power load from local bus at 24V DC         | None  |
| Total power dissipation                     | Approx. 0,3W  |

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| <b>Encoder inputs</b> |  |
|-----------------------|--|
| Number of inputs      | 2  |
| Encoder type          | Incremental quadrature encoder with single-ended 24V HTL outputs |
| Max. input frequency  | 50 kHz   |
| Counts register width | 32 bit   |

| <b>Counter inputs</b> |  |
|-----------------------|--|
| Number of inputs      | 4  |
| Inputs type           | 24V digital inputs, type 3 compatible according to IEC 61131-2 |
| Max. input frequency  | 50 kHz   |
| Counts register width | 16 bit   |

| <b>Interface</b>                |  |
|---------------------------------|--|
| Local bus                       | Proprietary FLXIO™                       |
| Module address setting          | By rotary switch on front panel          |
| Bus connections                 | By TBUS connectors on DIN rail           |
| Interface circuitry protections | ESD protections                          |
| Level of ESD protection         | ±8 kV (IEC 61000-4-2, contact discharge) |

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## Connections

The module has two connectors: a power connector and an I/O connector. They allow easy “plug and play” of the module, and also a fast replacement of a faulty unit.



**Warning:** Use a cable with cross-section suited to the current involved. A wire smaller than necessary could cause risk of fire and unwanted voltage drops.



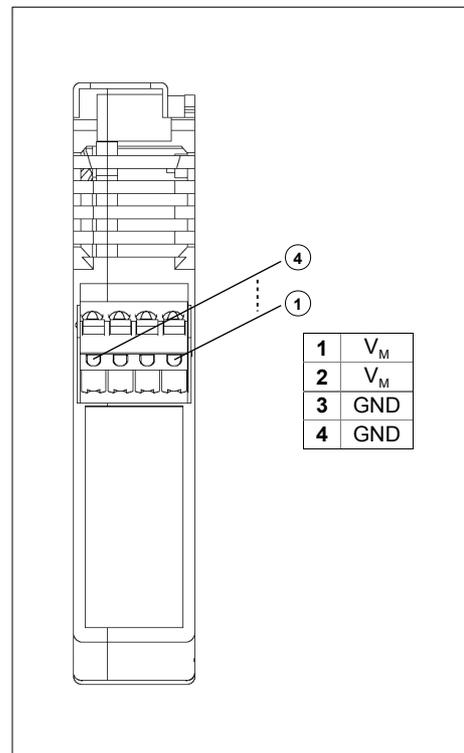
**Warning:** To ensure conformance with EMC directive 2014/30/UE, the length of the cables must not exceed 30 m!

### Power connector

The power connector is located on the bottom wall of the module. For the pinout, refer to the illustration at right.

Its function is to provide the supply for the I/O circuitry, whilst the CPU of the module is fed by the TBUS connector on the back of the unit.

Refer to the FLXIO and FLXMOD System Integration Manual for power connections topology.



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For connector ratings and the applicable wiring refer to the following table

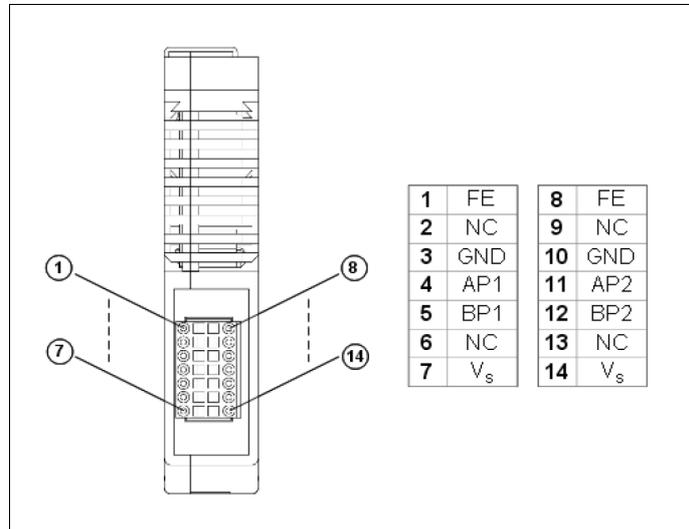
| <b>Connector type: Phoenix Contact FKC 2,5/ 4-ST (1910377)</b> |                |   |                         |
|--|----------------|---|-------------------------|
| <b>Order code: KF100009</b>                                    |                |   |                         |
| <b>Technical data</b>  |                | <b>Conductor cross section</b>  |                         |
| Nominal voltage (CE)   | 250V           | Solid (CE)  | 0,2÷2,5mm <sup>2</sup>  |
| Nominal voltage (UL)   | 300V           | Solid (UL)  | 26÷12AWG - 75°C         |
| Nominal current (CE)   | 12A            | Flexible (CE)   | 0,2÷2,5mm <sup>2</sup>  |
| Nominal current (UL)   | 10A            | Flexible (UL)   | 26÷12AWG - 75°C         |
|  |                | Flexible, with ferrule without plastic sleeve   | 0,25÷2,5mm <sup>2</sup> |
| Stripping length   | 10mm           | Flexible, with ferrule with plastic sleeve  | 0,25÷2,5mm <sup>2</sup> |
| Screwdriver to open contacts                                   | 0,6 x<br>3,5mm | 2 flexible conductors with same cross section,<br>stranded, TWIN ferrules with plastic sleeve | 0,5÷1,5mm <sup>2</sup>  |



**Warning:** Pay attention to NOT supply the module with reverse polarity. This is to not blow internal fuse and/or damage the connected devices and/or burn the module itself.

## Inputs connector

Located on the upper side of the module, this connector (see illustration below) permits the wiring of encoders or sensors.



For connector ratings and the applicable wiring refer to the following table

| <b>Connector type: Phoenix Contact FMCD 1,5/7-ST-3,5 (1738856)</b> |             |   |                          |
|--|-------------|---|--------------------------|
| <b>Order code: KF101049</b>  |             |   |                          |
| <b>Technical data</b>  |             | <b>Conductor cross section</b>                |                          |
| Nominal voltage (CE)   | 160V        | Solid (CE)                                    | 0,2÷1,5mm <sup>2</sup>   |
| Nominal voltage (UL)   | 150V        | Solid (UL)                                    | 24÷16AWG - 75°C          |
| Nominal current (CE)   | 8A          | Flexible (CE)                                 | 0,2÷1,5mm <sup>2</sup>   |
| Nominal current (UL)   | 8A          | Flexible (UL)                                 | 24÷16AWG - 75°C          |
| Stripping length   | 10mm        | Flexible, with ferrule without plastic sleeve | 0,25÷1,5mm <sup>2</sup>  |
| Screwdriver to open contacts                                       | 0,4 x 2,5mm | Flexible, with ferrule with plastic sleeve    | 0,25÷0,75mm <sup>2</sup> |

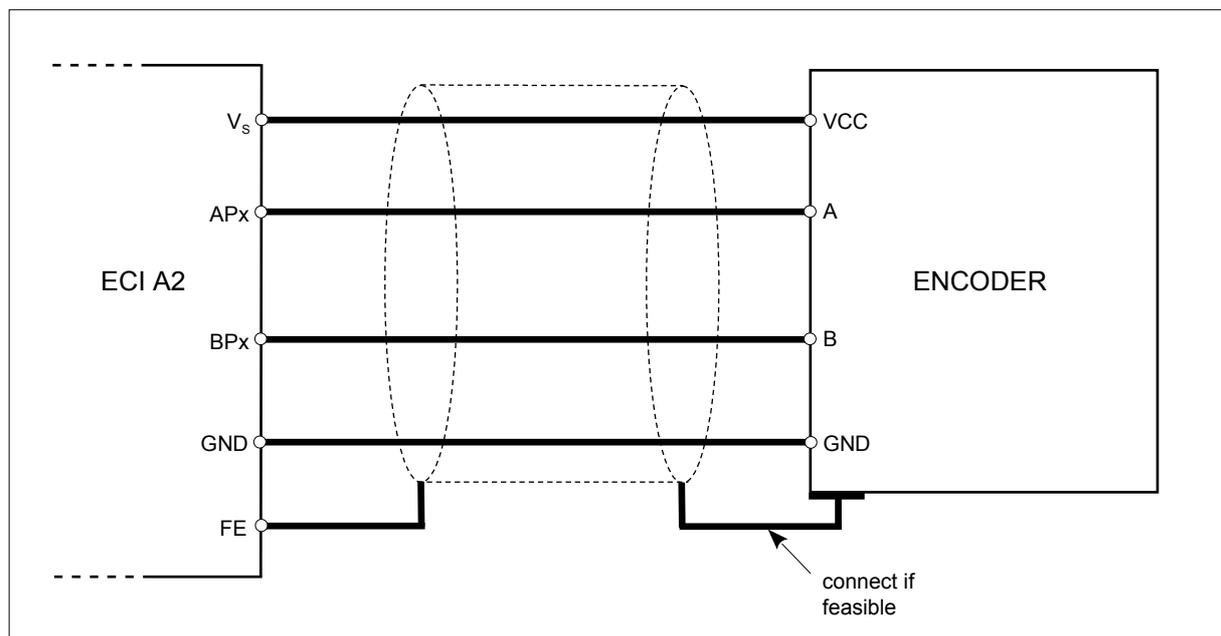
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The following paragraphs describe how to connect encoders and sensor to the module.

### Encoders

This module can read incremental encoders having 24V HTL single-ended outputs; these devices, very common in industrial environment, exhibit two digital outputs usually named A and B. When the shaft is revolving, two square waves are generated on channel A and B, with signals in quadrature.

The encoder is directly fed by the module; the recommended wiring is shown below.



Due to high levels of noise usually found in harsh industrial environments, the use of shielded cable is highly recommended; the sheath should be tied to the FE pin available on the connector. Leaving the shield unconnected greatly impairs the shielding performances of the cable, leading to a worsening of the signal to noise ratio.

When the wiring has to be realized in more than one section, check the electrical continuity of the shield and minimize the length of the unshielded wires.

If the use of shielded cable is not feasible for cost reasons, try to route the wiring far enough from noise sources, such as switching power supplies, inverters, relays, etc..

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## Counter

The module is able to act as a counter for up to four 24V digital inputs; the input stages are designed to match the specifications for type 3 inputs, as defined in IEC 61131-2; this assures compatibility with standard industrial sensors.

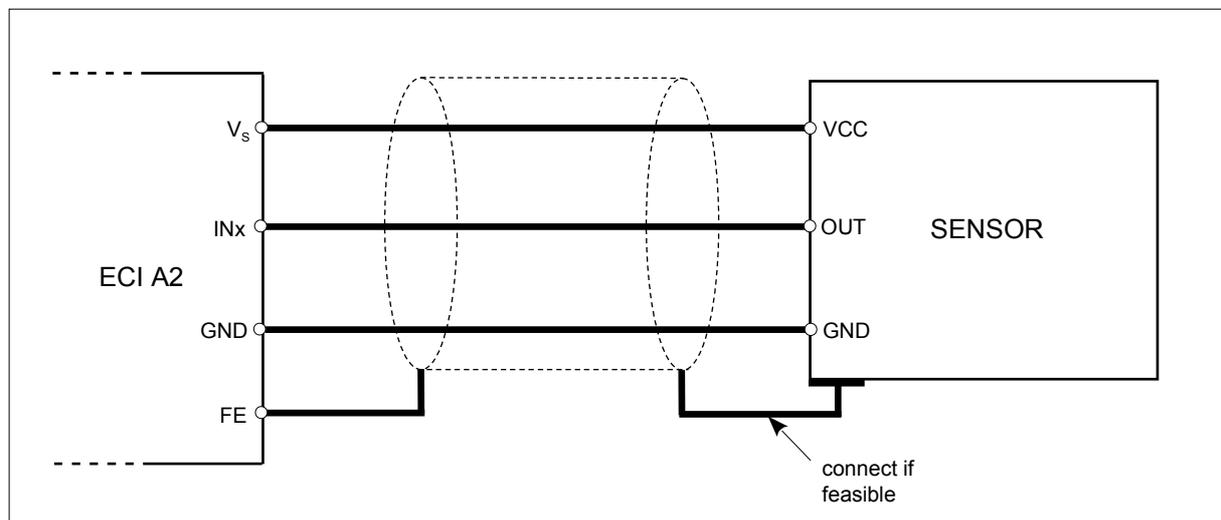
When the unit is operating as a counter, the inputs are named as follows:

| INPUT | SIGNAL NAME | PIN NUMBER |
|-------|-------------|------------|
| 1     | AP1         | 4          |
| 2     | BP1         | 5          |
| 3     | AP2         | 11         |
| 4     | BP2         | 12         |

Inputs are divided in two banks: bank 1 is formed by inputs #1 and #2, and bank 2 is formed by inputs #3 and #4; enabling a bank as a counter obviously forbids its use as an encoder reader.

The wiring should be done adopting common sense precautions as stated before (see the preceding paragraph), due to the relatively high bandwidth of the signals involved; for the same reasons, the use of shielded cable is highly recommended.

See the following illustration for an example of wiring.



## Module addressing

Before operation you must set the address of the module by the rotary switch reachable from the front panel; the operation is easily done opening the transparent plastic cover and turning the rotor with a small bladed screwdriver.

The address determination is described in the FLXIO and FLXMOD System Integration Manual.

## Diagnostic and status indicators

Each module is provided with a series of LED lamps on the front panel (see illustration); they indicate the status of the unit, the configuration of the inputs (encoder or counter) and diagnostic warnings or errors. For the sake of clarity, different lamp colours are employed.

The green power (**PWR**) LED is lighted if the 24 V supply ( $V_M$ ) is present and the internal fuse is not blown.

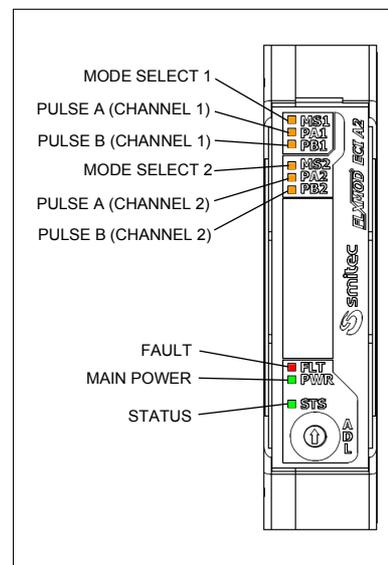
Self monitoring of supply voltage is also implemented to deliver a best self-diagnosis. The module switches in diagnostic error when  $V_M > 30Vdc$  and when  $V_M <$  of the value set up by the master module (low voltage check is disabled by default); this status is displayed by **STS** LED.

The **MS1** and **MS2** LEDs indicate that the channels #1 and #2 are set as counters (LED off) or as encoder readers (LED on). Please notice that each channel is configured separately and can work in a different manner.

In counter mode, each **Pxy** LED is lighted for a defined amount of time when a pulse is detected; the correspondence between LEDs and inputs is as follows:

| INPUT | SIGNAL NAME | LED |
|-------|-------------|-----|
| 1     | AP1         | PA1 |
| 2     | BP1         | PB1 |
| 3     | AP2         | PA2 |
| 4     | BP2         | PB2 |

In encoder mode, the **PAX** and **PBx** LEDs are lighted for a defined amount of time when a pulse is detected in forward (**PAX**) or backward (**PBx**) direction; the two lamps are never allowed to turn on simultaneously.



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The status of the unit is indicated by both status (**STS**) and fault (**FLT**) LEDs; their behaviour is described in the following logic state chart. The exact cause of a diagnostic error can be read out by master module and the application software.

