REGULATEURS EUROPA
Member of the
Heinzmann Group

Instruction Manual

ICENI/AI-01

4 Channel 4 to 20mA Input Module

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1 FOREWORD

These instructions have been compiled to assist personnel responsible for the operation and maintenance of equipment manufactured by Regulateurs Europa Ltd.

Care has been taken to ensure that the equipment has been accurately represented, but it should be appreciated that, with the continued progress of design and the diversity of application, certain items may differ in detail.

It should be noted that these instructions are issued for general information and do not constitute a specification of the equipment.

Whilst reserving the right to make any alteration in design which they may consider advisable the manufacturers absolve themselves from making any such alteration retrospective.

In addition to the information given herein, practical advice and assistance is always available from the Customer Support Department at Regulateurs Europa Ltd.

2 GENERAL USE

Before carrying out any repairs, adjustments or maintenance to any equipment supplied by Regulateurs Europa Ltd, it is essential the following safety precautions be observed.

2.1 General

The operator should take care to make themselves thoroughly familiar with the operating principles, methods of adjustment and the dismantling and assembly procedures (where applicable) concerning the equipment in use.

2.2 Product Condition

Before power-up ensure that the product is in a good condition and not damaged, paying particular attention to the ICENIbus connectors on each side of the module and the field wiring connectors at the top of the module. Ensure that any wires are fitted securely into terminals.

2.3 Signal Connection

If the module requires configuration then ensure that any critical signals are disconnected from the module until configuration of the module has been performed. This will prevent unwanted or unexpected changes in signal polarity from affecting other circuitry.

2.4 Module Damage / Repair

The Iceni modules are not repairable. Where damage is found that could compromise the operation of the module, a replacement part should be sourced from Regulateurs Europa Ltd.

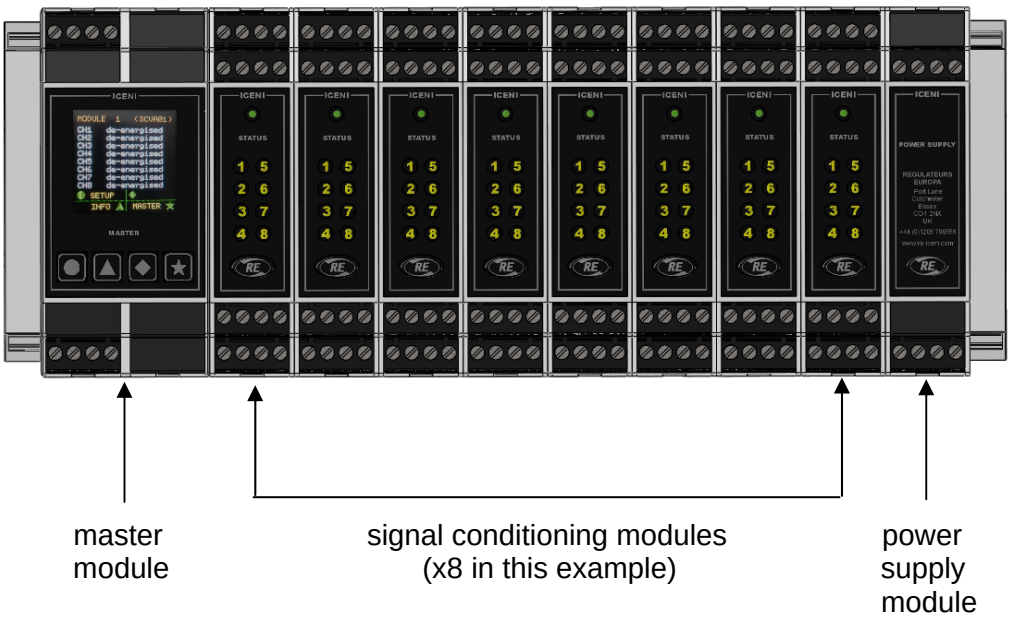
Iceni module should be disposed via an approved disposal scheme suited to electronic products and in accordance with local legislation.

3 PRODUCT OVERVIEW

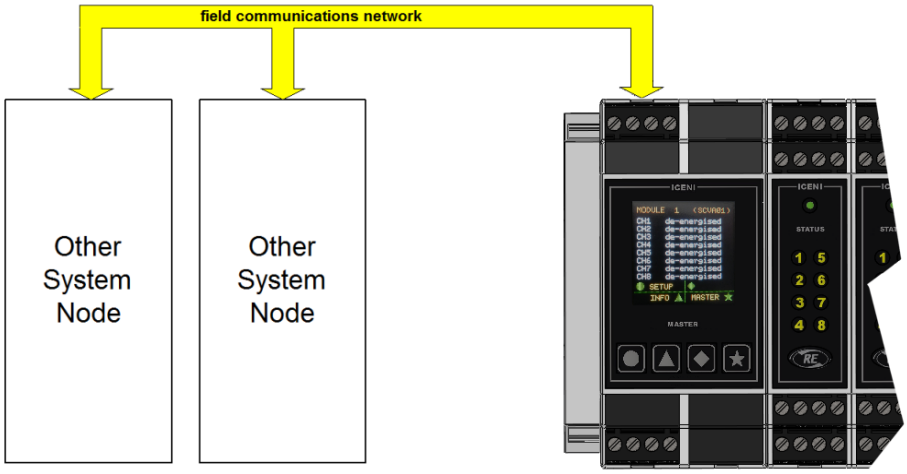
3.1 Iceni Node

An Iceni node comprises of a master module, between one and sixteen signal conditioning modules and at least one power supply module.

A typical Iceni node:

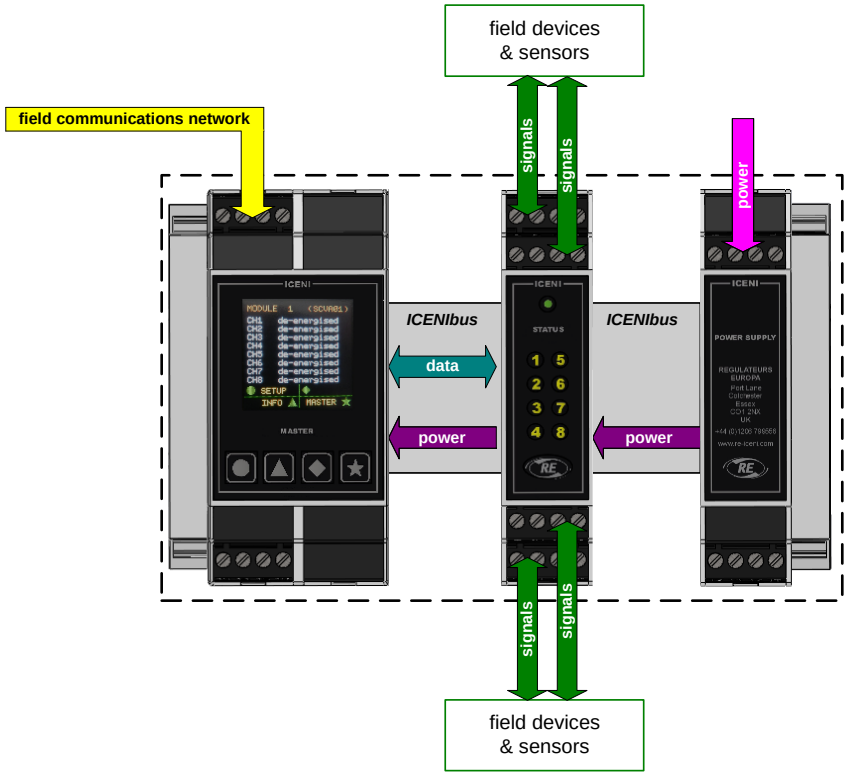


According to the mix of signal conditioning modules, the Iceni node manages the measurement and generation of electrical signals to/from sensors and field devices. Information is exchanged with other nodes in a system via a field communications network connected to the Iceni master module.

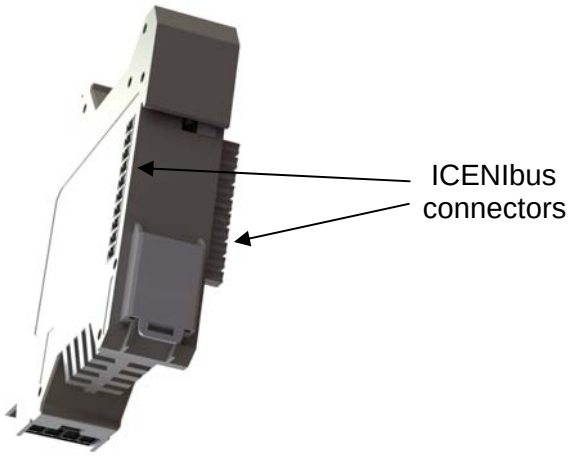


3.2 ICENIbus Interface

Iceni modules are designed to plug together to form a node. The connection system used to join one module to another is called ICENIbus and is used to transfer both data and power supply between modules.



All modules have a 10-way ICENIbus connector on both sides of the lower housing, although for end modules (master and main power supply) one side connector will be supplied fitted with a protective cover.



3.3 Field Wiring Interface

As standard, Iceni modules are supplied with screw-clamp field wiring connectors, although cage-clamp variants are available as an option.

For ICENI/AI-01 there are four connectors marked 1-4, 5-8, 9-12 and 13-16 to match the numbers marked on the Iceni housing. This arrangement identifies the connector to its location on the module.

When fitted properly, the field wiring connectors are held securely in the module housing. In order to remove a terminal, a small flat bladed screwdriver should be inserted between the top of the connector and the module housing to enable the connector to be carefully levered free. This will release the connector without damage.

4 ICENI/AI-01 KEY FEATURES

The ICENI/AI-01 module is a component of an Iceni node and provides four isolated input channels for monitoring field sensor signals (pressure, level, position, etc.)

The ICENI/AI-01 module provides the following key features:

- Four loop-powered 4-20mA device / sensor inputs each individually isolated.
- Signal fault indication via illuminated channel indicator on ICENI/AI-01 module and on master module display.
- Measured real world value (i.e. measured current) available to field communications network and master module display.
- Signal health status available to field communications network and master module display.

5 PRODUCT SPECIFICATION

5.1 Electrical Properties

5.1.1 Power Supply Input

Maximum ICENIbus consumption:	130mA

5.1.2 Signal Channels

Number of channels:	4
Input type:	current
Accuracy:	+/- 0.5% fsd
Update rate at master module (per channel):	10Hz
Internal sampling rate (per channel):	200Hz
Signal filtering:	software and hardware
Maximum voltage drop across input:	5.5V @ 20mA
Signal measurement range	
o Normal:	4 to 20mA
o Maximum:	2 to 22mA
Signal input protection:	reverse polarity current limited (to 25mA maximum)

5.1.3 Fault Status Indication

Faults sensed	
o Signal fault:	2mA < signal < 3mA 21mA < signal < 22mA
o Major signal fault:	signal < 2mA signal > 22mA

5.1.4 Signal Isolation

Signal channel to signal channel:	500V
Signal channel to external power supply:	1kV
Signal channel to other modules:	1kV

5.1.5 Field Wiring Termination

4 x 4-way free part sockets with screw terminals. (Cage-clamp option available)

Wiring cross section / strip length 0.14 to 0.5mm^2 / 7mm

5.2 Mechanical Properties

5.2.1 Temperature Range

Operating:	-20°C to +70°C (-4°F to +158°F)
Storage:	-40°C to +85°C (-40°F to +185°F)

5.2.2 Material

Enclosure:	Polyamide
Labels:	Polyester
Membrane overlay:	Polyester

5.2.3 Weight

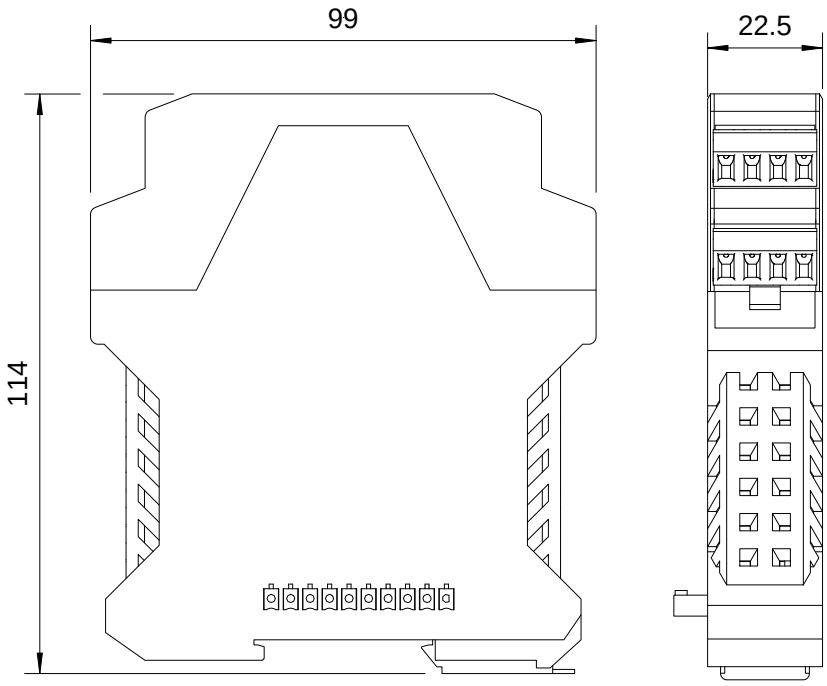
Module weight (including free part screw terminals):	130g (approx.)

5.2.4 Ingress Protection

Assembled node:	IP20

5.2.5 Dimensions

(Dimensions shown in mm)



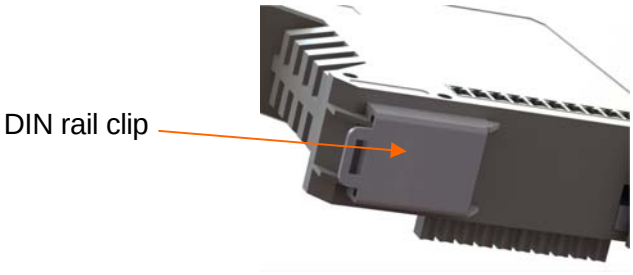
6 UNPACKING & INITIAL PREPARATION FOR USE

6.1 Unpacking

The module should be removed from the sealed bag inside the protective cardboard carton. All packaging should be disposed of in an appropriate way.

6.2 Node Assembly

The module is designed to clip and fit onto TS 35 DIN terminal rail (both standard and deep types) with other Iceni modules to form a node. A metal clip is provided on the base of each module for this purpose.



An Iceni node can be mounted in both vertical and horizontal orientations according to terminal rail layout. Assembly of the Iceni node can be achieved in one of two ways:

- The Iceni node (including the ICENI/AI-01 module) can be assembled on a bench and then fitted into place on the DIN rail with a slight tilting action. It is important that the metal DIN rail latch on the underside of each module engages properly with the rail to retain the modules in place.

- The ICENI/AI-01 module can be fitted with other modules one at a time on the DIN rail with a slight tilting action. It is important that the metal DIN rail latch on the underside of each module engages properly with the rail to retain the module in place. The modules can then be pressed together tightly to ensure that each module plugs into its neighbour to form the node.

6.3 Node Disassembly

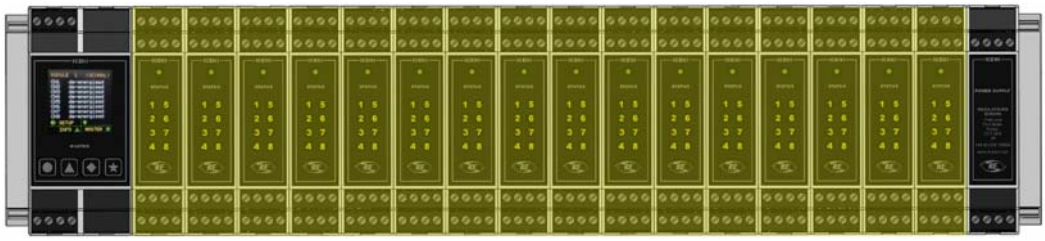
Disassembly of the Iceni node is essentially the reverse of the procedure above and can be achieved in one of two ways:

- Each module can be separated from the next on the rail. The metal DIN rail latch can then be operated with a small screwdriver and the modules removed with a tilting action, one by one.

- The metal DIN rail latches for all modules can be released in turn with a small screwdriver until the Iceni node is free to be removed with a tilting action. The modules can then be separated from each other.

6.4 Module Positioning Within a Node

The ICENI/AI-01 module/s should be fitted in any of the yellow locations shown in the diagram below according to the total number of signal conditioning modules assembled in the node.



1 16

Modules should be assembled with population starting at position 1 on the left hand side, continuing towards position 16 on the right.

7 FIELD WIRING TERMINATION

7.1 Terminal & Connector Layout

CHANNEL	TERMINAL	DESCRIPTION
1	1	I+
	2	I-
	3	-
	4	-

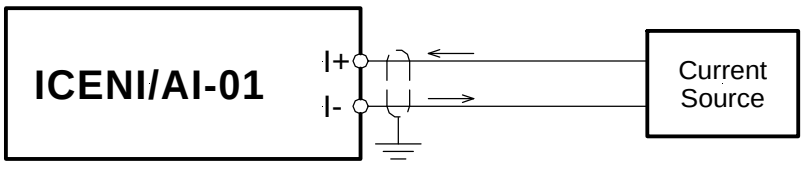
CHANNEL	TERMINAL	DESCRIPTION
2	5	I+
	6	I-
	7	-
	8	-

CHANNEL	TERMINAL	DESCRIPTION
3	9	-
	10	-
	11	I-
	12	I+

CHANNEL	TERMINAL	DESCRIPTION
4	13	-
	14	-
	15	I-
	16	I+

(- : not connected)

7.2 Wiring Schematic



7.3 Earthing / Grounding

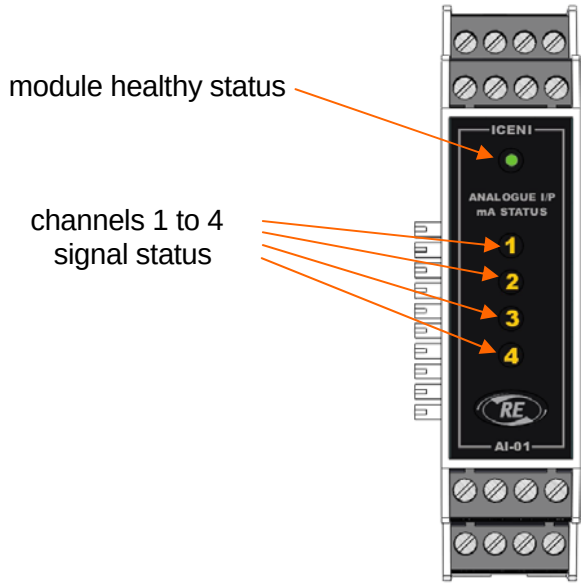
The metal terminal rail to which the Iceni node is attached should be connected to a 'clean' earth / ground point. In many applications this would be the chassis of the product.

It is recommended that screened signal cables are used, with the screen connected to a 'clean' earth / ground point at the Iceni node end only. This might be via the terminal rail, for example.

8 MODULE USER INTERFACE

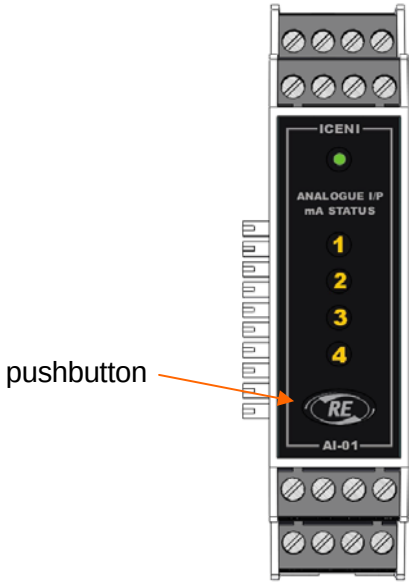
8.1 Indicators

The top face of the module presents the following status indicators:



8.2 Pushbutton

The top face of the module presents a pushbutton for access to channel information on the master module display:



9 MODULE OPERATION

9.1 Module Configuration

Following power up the ICENI/AI-01 module will wait for the master module to self-configure the Iceni node.

During the configuration process, the module healthy status indicator on the ICENI/AI-01 module will flash green.

Following a healthy node configuration, the module status indicator will light green continuously.

If the ICENI/AI-01 module loses communication with the master module, a self-reset will take place and the module will await re-configuration. During this period, the module healthy status indicator on the ICENI/AI-01 module will flash green.

9.2 Signal Configuration

As the ICENI/AI-01 module supports only one type of input signal. Therefore, no signal configuration is necessary.

However, if a user decides to initiate configuration by pressing the pushbutton on the ICENI/AI-01 module followed by selecting setup from the master display, then the master will indicate that configuration is fixed.

9.3 Signal Measurements

The current flowing through each input channel is measured by the module.

This real world measured current value (in mA) is made available to the field communications network and shown on the master module display.

Scaling on the field communications network is such that a value of 1200 represents a real world measured current of 12.00mA.

9.4 Module & Signal Failure Detection

The ICENI/AI-01 module and its input signals are monitored at regular intervals by the master module to check their health status.

The following faults are detected locally by the ICENI/AI-01 module:

Fault Type	Fault Category	Master Display	ICENI/AI-01 Channel Status LED	Field Communications Network	
				Measured Value	Status Value
signal < 3mA	minor signal fault	measured signal : *'Warning: < 3mA'*	flashing	3.00mA	1
signal >21mA	minor signal fault	measured signal : *'Warning: > 21mA'*	flashing	21.00mA	2
signal < 2mA	major signal fault	measured signal : *'Fault: < 2mA'*	off	0.00mA	3
signal >22mA	major signal fault	measured signal : *'Fault: > 22mA'*	off	22.00mA	4

The faults above are non-latching and will self-reset when the failure condition is removed.

In addition, the following faults are detected by the master module:

Fault Type	Fault Category	Master Display	Master Fault Status Output	Field Communications Network	
				Measured Value	Status Value
field communications network attempts to access data for a signal channel > 4	network configuration fault	-	-	99.99mA	7 (channel unavailable)
ICENI/AI-01 module stops responding to master module	module fault	module status shown as flashing red	de-energises	-	8 (module lost)

The faults above are non-latching and will self-reset when the failure condition is removed.

With the equipment and signals in a healthy condition then the following will be seen:

Master Display	ICENI/AI-01 Channel Status LED	Field Communications Network	
		Measured Value	Status Value
measured value	on	measured value	0 (healthy)

10 DATA COMMUNICATIONS TO MASTER MODULE

The ICENI/AI-01 module communicates its signal information to the master module via a module process image. The master module takes this image and combines it with those from other Iceni signal conditioning modules to form a process image representing the whole Iceni node. It is from this image that data will be exchanged on the field communications network.

The generic Iceni signal conditioning module process image takes the format shown in the diagram on the left below, where sixteen data slots are filled with up to eight measured or driven signal values and up to eight signal status values.

MEASURED / DRIVEN SIGNAL VALUES	CHANNEL 1 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 2 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 3 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 4 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 5 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 6 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 7 MEASURED / DRIVEN VALUE (if available)
	CHANNEL 8 MEASURED / DRIVEN VALUE (if available)
SIGNAL STATUS VALUES	CHANNEL 1 STATUS VALUE (if available)
	CHANNEL 2 STATUS VALUE (if available)
	CHANNEL 3 STATUS VALUE (if available)
	CHANNEL 4 STATUS VALUE (if available)
	CHANNEL 5 STATUS VALUE (if available)
	CHANNEL 6 STATUS VALUE (if available)
	CHANNEL 7 STATUS VALUE (if available)
	CHANNEL 8 STATUS VALUE (if available)

Generic Iceni Signal Conditioning Module Process Image

MEASURED / DRIVEN SIGNAL VALUES	CHANNEL 1 MEASURED VALUE
	CHANNEL 2 MEASURED VALUE
	CHANNEL 3 MEASURED VALUE
	CHANNEL 4 MEASURED VALUE
	CHANNEL UNAVAILABLE
	CHANNEL UNAVAILABLE
	CHANNEL UNAVAILABLE
	CHANNEL UNAVAILABLE
SIGNAL STATUS VALUES	CHANNEL 1 STATUS VALUE
	CHANNEL 2 STATUS VALUE
	CHANNEL 3 STATUS VALUE
	CHANNEL 4 STATUS VALUE
	CHANNEL UNAVAILABLE
	CHANNEL UNAVAILABLE
	CHANNEL UNAVAILABLE
	CHANNEL UNAVAILABLE

ICENI/AI-01 Module Process Image

The diagram (above right) shows the specific format of the module process image for the ICENI/AI-01 module. As only 4 signal channels are present, not all data slots are available.

11 SOFTWARE VERSION

This instruction manual is valid for the following releases of software:

K0013/001

12 CONTACT

For sales or support enquiries, the following contact details should be used. The product part number and serial number (where available) should be referenced.

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13 REVISION HISTORY

REVISION	DATE	AUTHOR	CHANGES
1	22.04.14	MMB	Original

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