

APPLICATION NOTE

COUNTIS ECi2, ECi3

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RETRIEVING A LOAD CURVE USING COMMUNICATION

This application note will give details of the procedure for retrieving a load curve for a pulsed input.

■ **Need:**

A pulsed input (input 1 in this example) will give a total value in kWh.

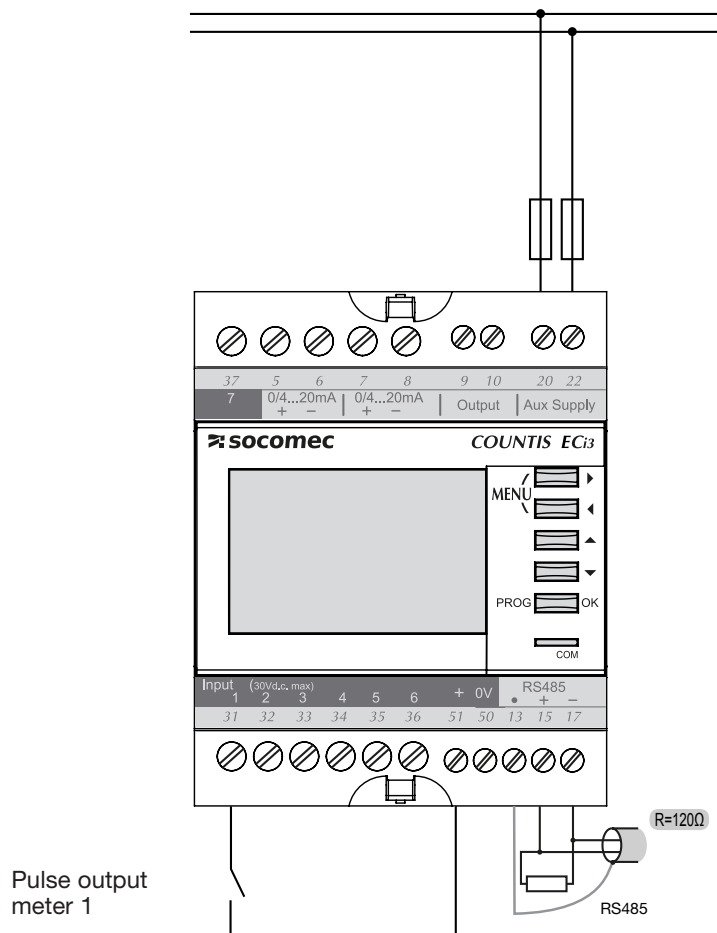
However, this value alone will not allow you to know which kWh were consumed in the "off-peak" or "peak" periods.

In order to create a pricing breakdown, the load curve allows you to know exactly when consumption took place. It is also useful to be able to confirm if the maximum subscribed power from the electricity supplier has been exceeded.

Pulse metering results, for example, from a COUNTIS E30 emitting a 100 ms pulse every 0.1 kWh.

■ **Procedure:**

-Cabling:



The load curve can only be retrieved through communication.

In this example, we are going to use a 10 minute integration period because the electricity supplier invoices energy against 10 minute average powers.

Excess power penalties are also measured over 10 minute powers.

■ Configuration:

Certain operations can be carried out in 2 ways, either by using buttons and the product screen, or by communication. In this procedure, we will detail the procedure using communication.

NB: registers are given as JBUS and not MODBUS (add 1 to obtain MODBUS registers). It is not necessary to add 40000 or 40001 to addresses.

- Configuration of retrieved pulse:

Input 1 used as pulse counter

Dec address	Hex address	Word Count	Description	Unit	Function
39685	9B05	1	Mode: 0x00: Disabled 0x01: Pulse meter 0x02: Logical input	List	3, 6, 16

Write the value "1" (01 in hexadecimal, by using the MODBUS function code 6) to allocate the input as pulse counter

- kWh pulse unit:

Dec address	Hex address	Word Count	Description	Unit	Function
39688	9B08	2	Weight	1/10 of Unit	3, 6, 16

Write the value "1" (01 in hexadecimal, by using the MODBUS function code 6) to allocate the weight 0.1

- Weight: 0.1:

Dec address	Hex address	Word Count	Description	Unit	Function
39690	9B0A	1	Unit: 9: None 0: Wh 1: Varh 2: VAh 3: m3 4: Nm3 5: J 10: kWh 11: kVarh 12: kVAh 13: km3 14: kNm3 15: kJ 20: MWh 21: MVarh 22: MVAh 23: Mm3 24: MNm3 25: MJ	/	3, 6, 16

Write the value "1" (01 in hexadecimal, by using the MODBUS function code 6) to allocate the weight 0.1

- Changing the integration period:

There are 2 levels:

1. Base integration period: this defines the recording period for load curves.
Example:
 - 17 days with base period 1 minute
 - 170 days with base period 10 minutes
2. Integration period for each input: it must be a multiple of the base integration period.
For example, if the base integration period is 10 minutes.
Configuration examples:
 - Input 1: 10 minutes => possible
 - Input 2: 20 minutes => possible
 - Input 3: 15 minutes => not possible

Number of recordings (Invariable)	24480						
Base integration period (minute) (Modifiable only using JBUS, advanced parameter, etc.)	1	1	1	1	2	2	10
Integration period for an input (minute) (Modifiable using GUI and JBUS, must be a multiple of the base integration period)	1	2	5	10	2	10	10
Equivalent recording depth (day)	17	17	17	17	34	34	170

In our example, we are going to configure the base integration period to 10 minutes and the integration time for input 1 also to 10 minutes

For protection, a password is required to be able to change the configuration:

- Using communication: write the password in a register
- Using the screen and buttons on the front of the product: enter the same password

■ Use the registers:

- Enter the code allowing configuration:

Dec address	Hex address	Word Count	Description	Unit	Function
58112	E300	1	password		3, 6, 16

Write the value "6825" (1AA9 in hexadecimal, by using the MODBUS function code 6)

- Change the base integration time:

Dec address	Hex address	Word Count	Description	Unit	Function
39869	9BBD	1	Load Curves Base Integration Time	min	3, 6, 16

Write the value "10" (0A in hexadecimal, by using the MODBUS function code 6) in the 9BBD register.

-Input 1 integration time:

Dec address	Hex address	Word Count	Description	Unit	Function
39691	9B0B	1	Integration Time	(* base) min	3, 6, 16

Write the value "1" (MODBUS function code 6) in the 9B0B register.

The unit is "(* base) min" set to 10 minutes.

NB: other parameters linked to the configuration of this pulse input (weight, synchronisation type, etc. can be configured either using MODBUS RS485 communication or by using the screen and buttons on the Countis ECi).

-Storing the configuration:

Dec address	Hex address	Word Count	Description	Unit	Function
57856	E200	1	Action: 0xA1: Product Configuration storage 0xB2: Product reset		6

Write the value "A1" (hex) in E200 register to store the configuration.

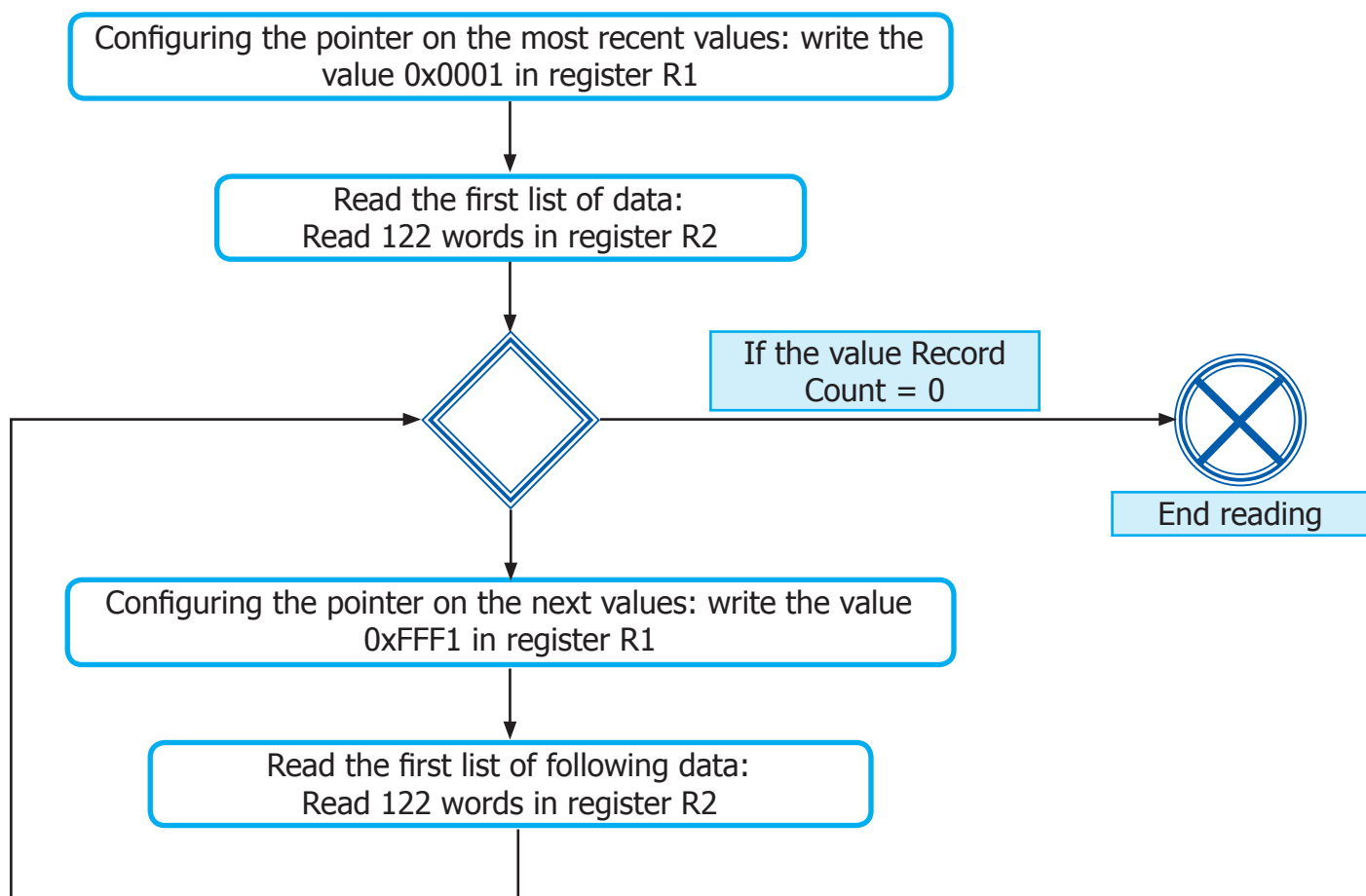
Write the value "B1" (hex) in E200 register then to restart the product.

After the input has been configured and pulses counted over time, it is possible to retrieve the load curve.

■ **Operation:**

There are not as many registers as there are points saved. The interrogation method must therefore be as follows:

Read part of the load curve in a certain register range, then update these registers with the subsequent data, go and read the subsequent data in the same register range, and so on.



The registers to be used for pulse input 1 are:

Dec address	Hex address	Word Count	Description	Unit	Function
38144	9500	1	R1 Area		6
38160	9510	122	R2 Area		3

The 122 words in areas R2 breakdown as follows:

	Dec address	Hex address	Word Count	Description	Unit	Function
Header	38160	9510	1	Record count (Maximum 29)		3
	38161	9511	1	Record size = 4 see below the data record description	Nbr of Words	3
	38162	9512	1	Integration period	second	3
	38163	9513	1	Physical Unit	Base Unit	3
	38164	9514	1	Numerator Rate		3
	38165	9515	1	Denominator Rate		3
Data Buffer	38166	9516	116	Records (x29) see below the description		3
	38282	958A	122			

Record count:

This is the number of the data packet.

If this value is 0, it means that the whole load curve has been downloaded.

Record size:

This value is always 4, means that each point of the load curve is given over 4 words.

Integration time:

The integration period specific to this input. (in seconds)

Information type:

This is the input unit. Interpretation is as follows:

0: W
1: W
2: var
3: var
4: VA
5: None
6: J
7: Pulse
8: m3
9: Nm3
20: kW
22: kVA
24: kVA
26: kJ
27: kilo-Pulse

Numerator Rate and Denominator Rate enable the weight to be allocated.

Records (X29):

In 116 words, we find $116/29 = 4$ words per point.

These 4 words are to be interpreted as follows:

Word Count	Description	Unit
2	Date	seconds since 1st Jan 2000
1	Full/incomplete period	0: full integration period 1: incomplete integration period
1	Value	Unit = Base Unit * Numerator Rate / Denominator Rate

Date:

In seconds from 1st January 2000 00h00min00s. For example, if the value is time-stamped at 1st January 2011 00h00, the value will be:

$$[11 \text{ years} \times 365 \text{ days} + 3 \text{ (leap years 2000, 2004, 2008)}] \times 24 \text{ h} \times 60 \text{ minutes} \times 60 \text{ seconds} = \mathbf{347155200}$$

Full/incomplete period:

If the Countis ECi is turned on throughout the integration of this value, the value will be 0, which would mean that this value is full.

Value:

This value is given in base unit.

To really obtain metering in base unit (info retrieved in the "information type" register) for this integration period, the following operation by be carried out between the different registers:

$$\underline{\text{Real value} = \text{Value} \times \text{Numerator} / \text{Denominator} \times \text{Type information}}$$

CENTRALISING A 0/4-20 mA OUTPUT FROM A SENSOR

This application note is going to describe the procedure for retrieving a physical measurement made by a pressure sensor having a 4-20 mA output.

It is a linear measurement from 0-5 bar to 4-20 mA.

We will use internal synchronisation to record the load curve for this analogue input with an integration period of 20 minutes.

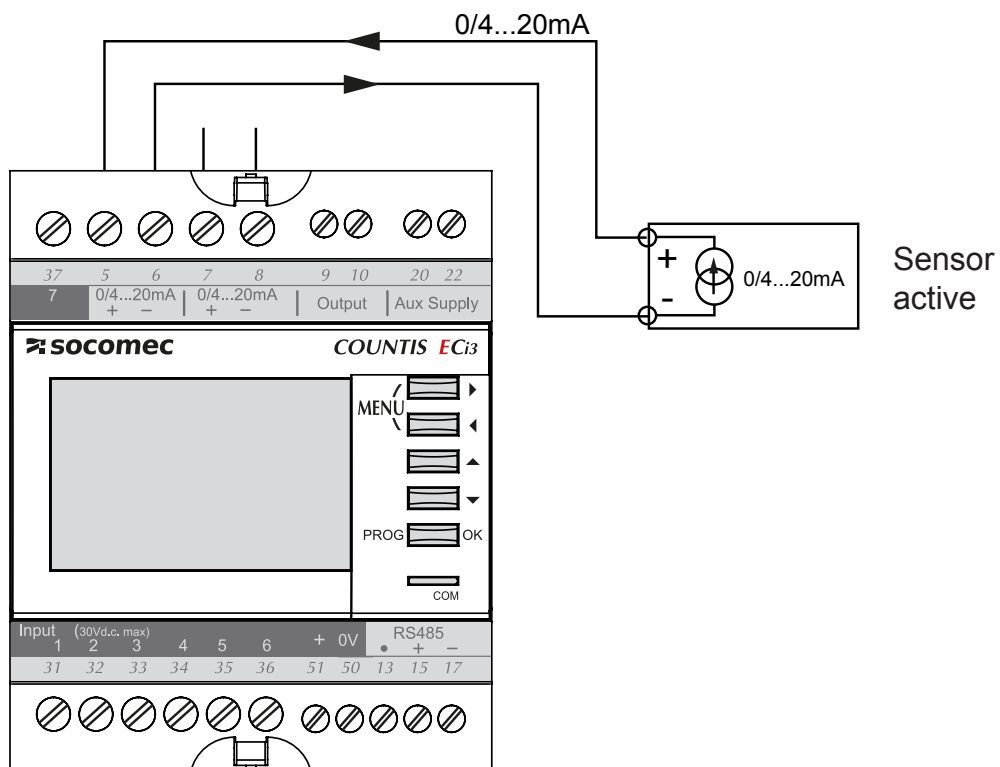
■ Need:

Retrieve the pressure value on the Countis ECI screen and on the communication network.

■ Procedure:

- Cabling:

Connect the analogue output from the pressure sensor to the analogue input on the Countis ECI.



NB: the Countis ECI analogue input is passive, the analogue output from the sensor must be active.

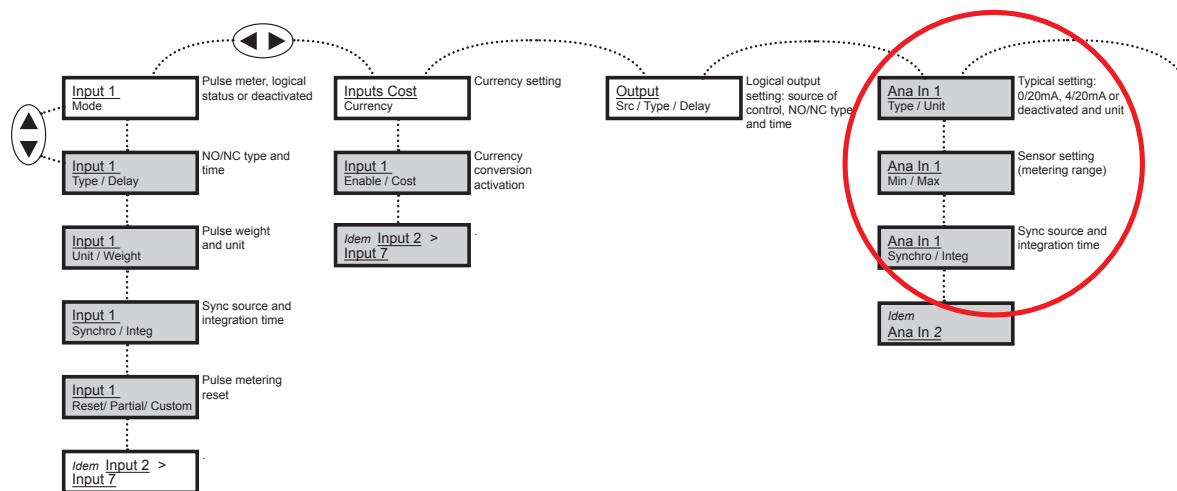
Be careful with connection direction. (inverting + and - terminal)

- Configuring the input:

Certain operations can be carried out in 2 ways, either by using buttons and the product screen, or by communication.

In this procedure, we will detail the procedure using buttons on the product.

Analogue input 1 is configured using 3 configuration screens.



- Press the PROG button for 3s
- Press the RIGHT ARROW button 3 times
- Press PROG to unlock the programming menu
(the configuration display is freely accessible, but changing it requires a password, default value 1000)
- Press the UP ARROW once to display 1000 and confirm with PROG:
the config menu now appears released
- Press PROG to select the first parameter
- Scroll through using the DOWN ARROW until 4-20 mA is displayed
- Accept using PROG
- The following menu is selected automatically, scroll using the DOWN ARROW to "mbar" (it is more useful to select mbar than bar because numbers with decimal points are not handled by Countis ECi analogue inputs)
- Accept using PROG
- The 1st configuration screen for analogue input 1 is configured, press the DOWN ARROW to display the 2nd configuration menu for analogue input 1
- The lower value (corresponding to 4 mA) is already at +0000000, which is OK (0000000 mbar).
Press PROG to select the upper value (corresponding to 20 mA).
- Press the RIGHT ARROW 4 times and the ARROW 5 times to display +0005000 (corresponding to 5,000 mbar = 5 bar gives 20 mA as sensor output)
- Accept using PROG
- Press DOWN ARROW to reach the 3rd configuration menu for analogue input 1
- Press PROG to select the synchronisation type for the load curve: the value is already set to "CLOCK",
corresponding to synchronisation with the Countis ECi internal clock.
- Accept using PROG

- The integration period is selected automatically: press the UP ARROW once to display "20 min"
- Accept using PROG
- Press the PROG button for 3 seconds to confirm the configuration and exit the configuration menu

WARNING: AFTER ONE MINUTE
NO KEY PRESS = AUTOMATICALLY EXIT MODE
CONFIGURATION IS NOT SAVED.


-Operation:

Press RIGHT ARROW twice to display the measurement retrieved from analogue input 1 (you can use the menu architecture):

2 values are available:

- The measurement allocated the unit (in mbar)
- The absolute value as % of input

For example, for a pressure of 2 bar, the displayed values are:

E. Ana 1	
Rel / Abs	
	40.0 %
	2000 mbar

HANDLING AN ALARM FOR METERING OVERRUN / EXPLAINING DIFFERENT ALARM TYPES

This application note will give details about the procedure for generating an alarm as soon as weekly metering on the input exceeds 100 kWh.

■ Need:

In the context of an energy optimisation project, the lighting systems in a workshop should not exceed 100 kWh per week if the lights are only switched on during working hours.

A meter in the COUNTIS E range meters active energy consumed by the lighting circuit.

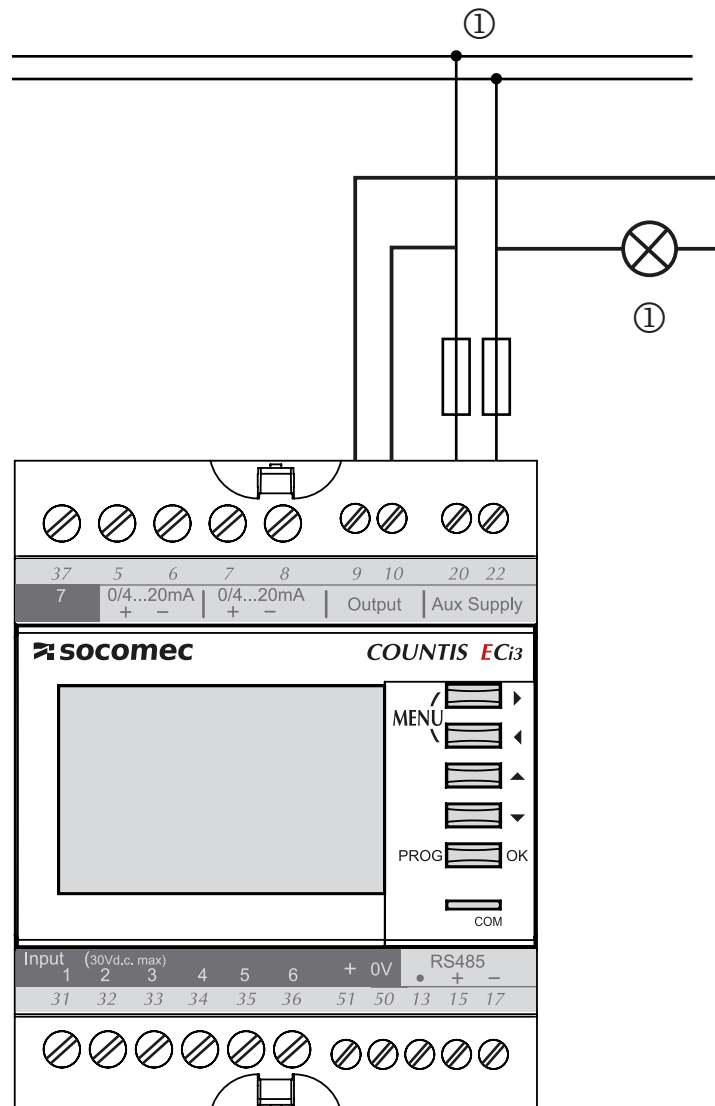
The pulse output from this meter is connected to pulse input 1 of the Countis ECi.

An alarm enables this parameter to be monitored. The alarm will be associated with an output relay to illuminate an indicator light.

■ Procedure:

-Cabling:

① Aux.: 230...240 Va.c.



- Configuration:

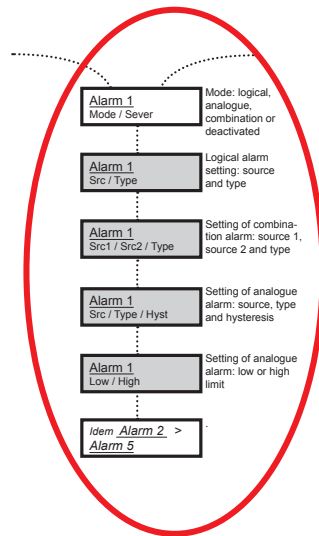
WARNING: AFTER ONE MINUTE
NO KEY PRESS = AUTOMATICALLY EXIT MODE
CONFIGURATION IS NOT SAVED.

Certain operations can be carried out in 2 ways, either by using buttons and the product screen, or by communication. In this procedure, we will detail the procedure using communication.

Different steps in configuration:

- Alarm declaration
- Assign alarm to the output relay

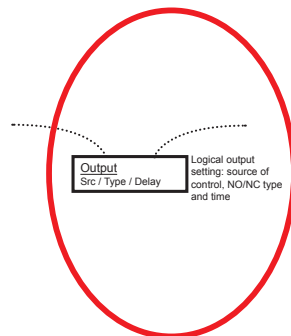
- Alarm declaration:



- Press the PROG button for 3s
- Press the RIGHT ARROW button 4 times
- Press PROG to unlock the programming menu (the configuration display is freely accessible, but changing it requires a password, default value 1000)
- Press the UP ARROW once to display 1000 and confirm with PROG: the config menu now appears released
- Press PROG to select the alarm function
- Press the DOWN ARROW 2x to select ANALOGUE
- Accept using PROG. The choice of severity is automatically selected
- Press the DOWN ARROW 2x to select ALERT (this severity is for information only, to manage different alarm levels)
- Accept using PROG
- Press the DOWN ARROW to go to the 2nd config screen for alarm 1
- Press PROG to select the parameter monitored by the alarm


- Press the DOWN ARROW several times until you reach "WEEK I.1", which is for weekly pulse metering of input 1
- Accept using PROG. The alarm type is selected automatically
- Press the DOWN ARROW 3x to reach "U LIMIT"
- Accept using PROG. Hysteresis is selected automatically
- If you don't want hysteresis, leave the value on 0 and accept using PROG
- Press the DOWN ARROW to go to the 3rd config screen for alarm 1
- Press PROG to select the lower limit.
- If you don't want an alarm for "insufficient" metering, then you can leave this value at 0 and accept using PROG. This automatically selects the upper limit.
- Press the RIGHT ARROW 5x and the UP ARROW 1x to display +0000100
- Accept using PROG. The lower limit is selected automatically

The alarm is now configured. We will assign the output relay to this alarm:



- Press the LEFT ARROW 2x to display the "OUTPUT" menu
- Accept using PROG to select the source
- Press the DOWN ARROW 1x to display ALARM 1.
The type is selected automatically
- Normally Open (NO) operation is correct
Accept using PROG, which selects the time limit automatically
- A time limit is not necessary. Leave the value at 0 and accept using PROG
- Quit the programming menu by pressing PROG for 3 seconds.

-Operation:

As soon as weekly metering on input 1 is greater than 100 kWh, a danger pictogram  will be displayed on the screen and the output relay will be closed.

■ **Appendix: different types of configurable alarms:**

There are 3 types of configurable alarms:

-Analogue alarms:

These alarms monitor measured parameters: exceeding a weekly metering value on input 1, exceeding a measurement on an analogue input, etc.

The following conditions can activate the alarm:

- "STATE" alarms / continuous alarms as long as the activation condition is fulfilled.
These alarms are only deactivated when the parameter is no longer in alarm conditions.
For example, an alarm for exceeding a daily metering value will therefore stop only when the following day begins. It is possible to associate the digital output with these alarms.
The various configurations are:
 - * U LIMIT: as soon as the parameter is above a limit
 - * L LIMIT: as soon as the parameter is below a limit
 - * U and L: as soon as the parameter is above limit U or below limit L
- "EDGE" alarms.
These alarms do not continue but are logged in the product. The alarm does not continue, even if the parameter is still in the alarm condition:
 - * UPPER: as soon as the parameter exceeds the upper limit
 - * LOWER: as soon as the parameter falls below the lower limit

It is not necessary to associate the digital output with this alarm type because the alarm does not continue.

-Combination alarm:

- These alarms are AND / OR combinations between logical variables:
 - 7 digital inputs
 - 10 alarms
- For example, you can do:
 - Alarm 1 = Input 1 OR Input 2
 - Alarm 2 = Input 3 or Alarm 1

-Logical alarm:

- The monitored parameter is a logical parameter:
 - Input 1, 2, 3, 4, 5, 6, 7
- The following conditions can activate the alarm:
 - "STATE" alarms / continuous alarms as long as the activation condition is fulfilled. These alarms are only deactivated when the parameter is no longer in alarm conditions.
For example, an alarm for exceeding a daily metering value will therefore stop only when the following day begins.
It is possible to associate the digital output with these alarms.

- The various configurations are:
 - * UPPER: as soon as the input is in the active state (depending on NO/NC configuration => input closed if configured as NO + may take account of a configured time limit)
 - * LOWER: as soon as the input is in the active state (depending on NO/NC configuration => input open if configured as NO + may take account of a configured time limit)
- "EDGE" alarms.

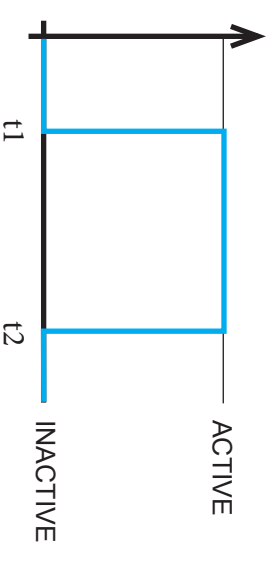
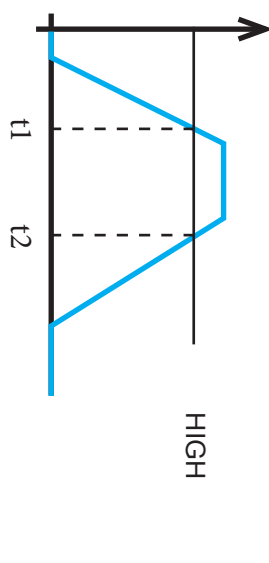
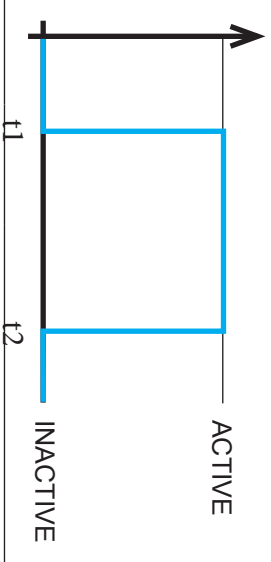
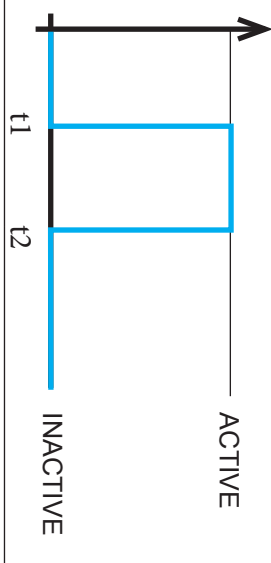
These alarms do not continue but are logged in the product.
However the alarm does not continue, even if the parameter is still in the alarm condition

 - * RISING: as soon as the alarm changes from inactive state to active state (+ may take account of a configured time limit)
 - * FALLING: as soon as the alarm changes from inactive state to active state (+ may take account of a configured time limit)
 - * FRONTS: as soon as the alarm changes state (from active to inactive, or inactive to active) + may take account of a configured time limit

It is not necessary to associate the digital output with this alarm type because the alarm does not continue.

ALARM

CONFIGURATION

LOGICAL			ANALOG		
TYPE	STATE		TYPE	STATE	
	HIGH			HIGH	
	LOW			LOW	
	EDGE	RISING FALLING		EDGE	MATCH HIGH MATCH LOW
	EDGE (RISING and FALLING)			MATCH HIGH and MATCH LOW	
EXAMPLE					
LOGICAL INPUT			ANALOG INPUT		
	t1 : the input becomes active t2 : the input becomes inactive			t1 : the input goes over the threshold t2 : the input goes under the threshold	
Alarm on logical input Type : HIGH Type : state Start date : t1.date Start time : t1.time Duration : t2-t1			Alarm on analog input Type : HIGH Type : state Start date : t1.date Start time : t1.time Duration : t2-t1		
	Alarm on logical input Type : RISING Type : edge Start date : t1.date Start time : t1.time Duration : 0			Alarm on analog input Type : MATCH HIGH Type : edge Start date : t1.date Start time : t1.time Duration : 0	

FUNCTIONS ONLY AVAILABLE USING COMMUNICATION

Certain functions are only available using communication and are not accessible using the buttons and screen of the Countis ECI.

These functions must be configured and used through the RS485 – JBUS/MODBUS communication interface.

Here is the list and registry ranges for these different functions:

FUNCTION	MODBUS REGISTRY RANGE (Hex)
Log of the last 150 alarms	F900
Use of a time signal using communication	90F0
Log of indexes	9100
17 days of load curves (1 minute values)	9500
Using non-linear analogue input	9C00
Using 10 different alarms	9D00

■ **Log of the last 150 alarms:**

It is possible to use communication to retrieve the log of the last 150 timestamped events. These events are recorded under the configured conditions using the product's buttons and screen (5 different alarms) or through communication (10 different alarms)

■ **Use of a time signal using communication:**

The time signal is used to synchronise integration times for load curves against a clock that may be:

- Internal (Countis ECI internal clock)
- External (time signal retrieved on a logical input)
- Communication (time signal retrieved using communication)

■ **Log of indexes for the 7 logical inputs used for pulse metering:**

The following logs are available:

- Daily: Last 7 days
- Weekly: Last 5 weeks
- Monthly: Last 12 months
- Annual: the last year

■ **Load curve for logical and analogue input:**

Load curves are available for logical and analogue inputs. This allows you, for example, to separate a meter total in kWh between different time periods (different pricing periods).

They record the number of pulses received per integration time over a period linked to the integration time.

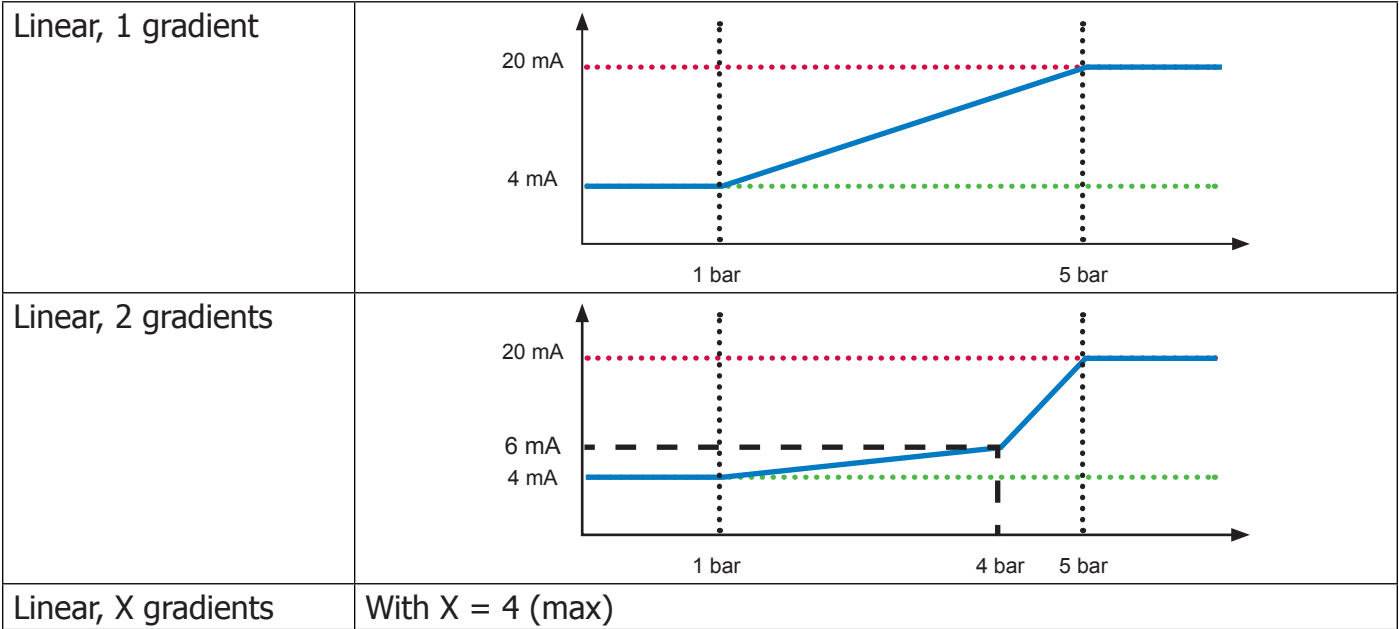
Example:

- If the integration time is 1 minute, the recording depth is 17 days.
- If the integration time is 10 minutes, the recording depth is 170 days.

See the application note for the retrieval procedure for load curves. (p.3)

■ **Using a non-linear analogue input:**

A sensor can have a analogue output that is non-linear relative to the physical measurement it makes. Using the buttons and screen on the product, it is possible to use a 1-gradient analogue input, using communication it is possible to use a 4- gradient analogue input, which enables a more accurate approximation of a non-linear output.



■ **Using 10 different alarms:**

It is possible to configure 5 alarms using the product's buttons and screen, as opposed to 10 alarms using communication (another 5).

Configuration takes account of the different alarm activation conditions.

When alarm activation conditions are fulfilled, the alarm is automatically registered and timestamped. It is also possible to link a digital electrical output to activation of an alarm.

See the application note for creating an alarm. (p.13)

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