GB Application note

GR

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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.

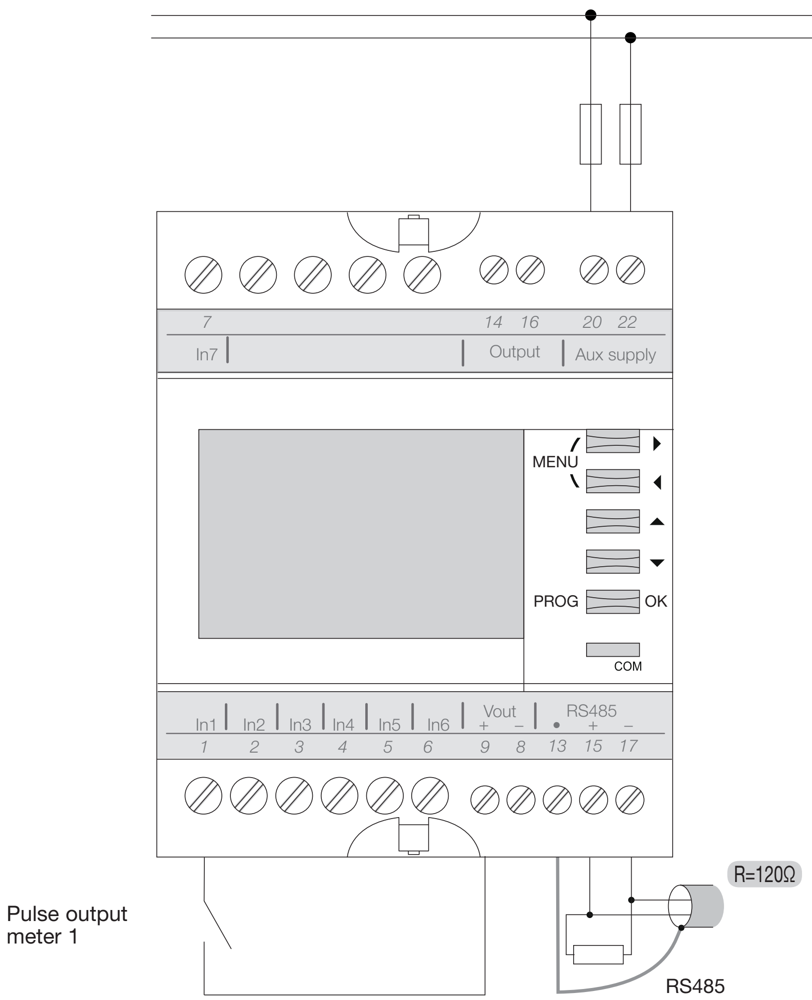
Need

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 energy meter (ECxxx) 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 minutes integration period because the electricity supplier invoices energy against 10 minute average powers. Excess power penalties are also measured over 10 minutes powers.

Retrieving a load curve using communication

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: m^3 4: Nm^3 5: J 10: kWh 11: kVarh 12: kVAh 13: km^3 14: kNm^3 15: kJ 20: MWh 21: MVarh 22: MVAh 23: Mm^3 24: MNm^3 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

Retrieving a load curve using communication

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		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

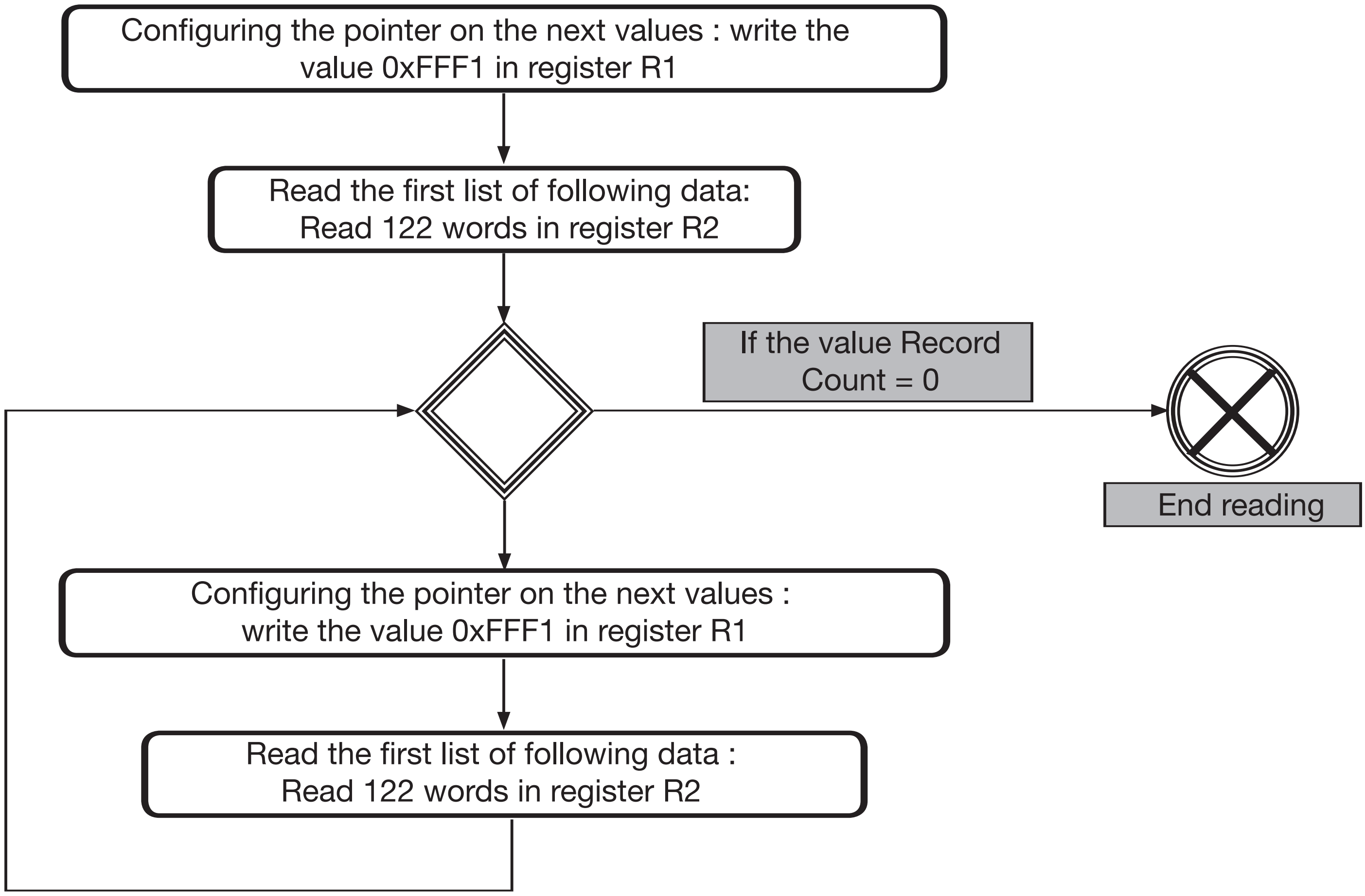
Dec. address	Hex. address	Word Count	Description	Unit	Function
57856	E200	1	Action : 0xA1 : Product Configuration storage 0xB2 : Produit reset		6

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	Nb 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: m^3
9: Nm^3
20: kW
22: kVAr
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	second 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 00h 00min. 00sec. For example, if the value is time-stamped at 1st January 2011 00h00, the value will be: [11 years x 365 days + 3 (leap years 2000, 2004, 2008)] x 24h x 60 minutes x 60 seconds = 347155200

Full/incomplete period
If the EC700 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:
Real value = Value x Numerator / Denominator x Type information

Handling an alarm for metering overrun / Explaining different alarm types

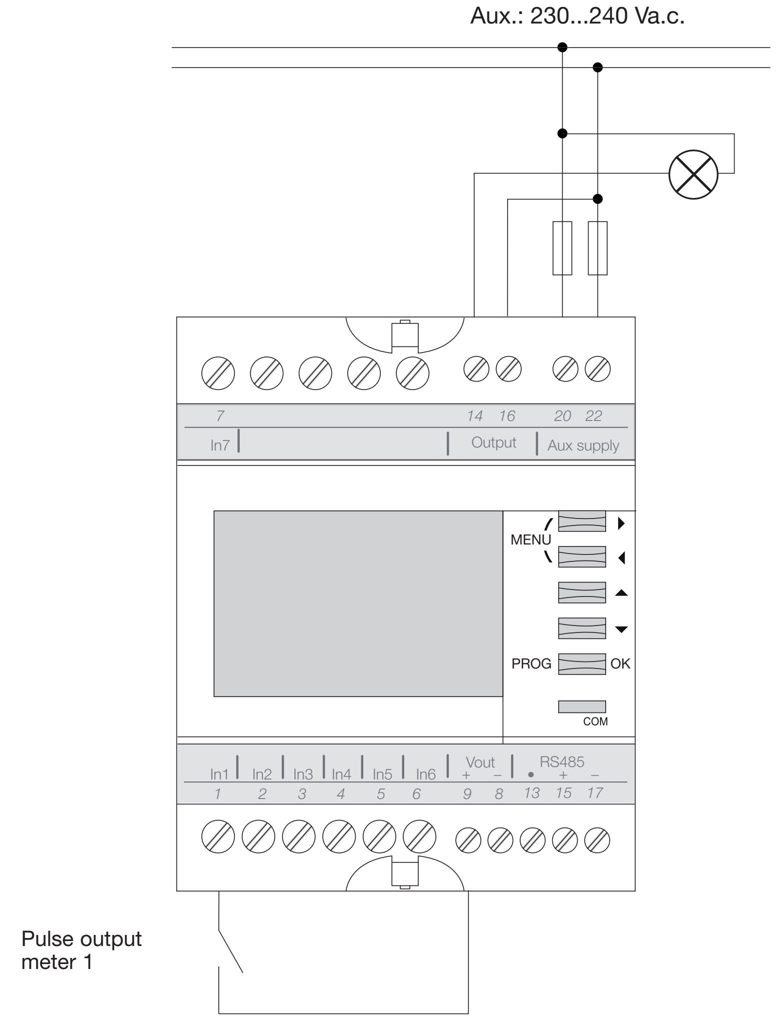
This application note will give details about the procedure for generating an alarm as soon as weekly metering on the input exceeds 100 kWh.

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 ECxxx range meters active energy consumed by the lighting circuit. The pulse output from this meter is connected to pulse input 1 of the EC700. An alarm enables this parameter to be monitored. The alarm will be associated with an output relay to illuminate an indicator light.

Procedure

Cabling



Configuration

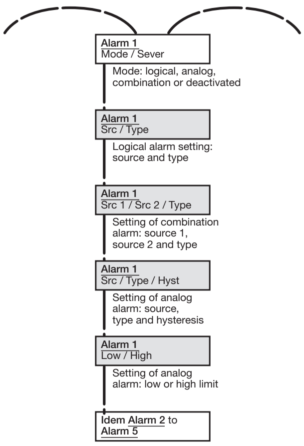
WARNING: AFTER ONE MINUTE NO KEY PRESS = AUTOMATICALLY EXIT MODE CONFIGURATION IS NOT SAVED.

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

Different steps in configuration :
- Alarm declaration
- Assign alarm to the output relay

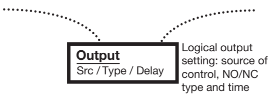
Handling an alarm for metering overrun / Explaining different alarm types

Alarm declaration



- Press PROG for 3 seconds.
- 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 1 time to select the alarm function.
- Press the down arrow 2 times to select «ANALOG».
- Accept using PROG. The choice of severity is automatically selected.
- Press the down arrow 2 times 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 3 times to reach "U LIMIT".
- Accept using PROG. The 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 5 times and the up arrow 1 time to display +0000100.
- Accept using PROG.

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



- Press the left arrow 1 time to display the "Output" menu.
- Accept using PROG to select the source
- Press the down arrow 1 time to display alarm 1. Accept using PROG. The type is selected automatically.
- Normally Open (NO) operation is correct. Accept using PROG, which selects the time limit automatically.
- If 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 ⚠ displayed on the screen and the output relay will be closed.

Appendix: different types of configurable alarms

There are 3 types of configurable alarms :

Analog alarms

These alarms monitor measured parameters: exceeding a weekly metering value on input 1, exceeding a measurement on an analog 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" alarmsl: 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.

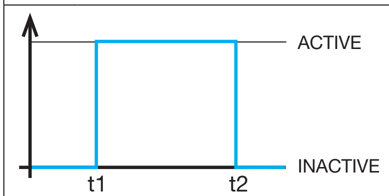
* RISING: as soon as the alarm changes from inactive state to active state (+ may take account of a configured time limit) .
* FALLING: as soon as the alarm changes from inactive state to active state (+ may take account of a configured time limit).
* FRONTS: as soon as the alarm changes state (from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

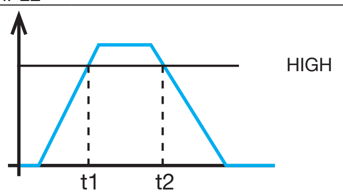
LOGICAL			ANALOG		
TYPE	STATE	HIGH LOW	TYPE	STATE	HIGH LOW
	EDGE	RISING FALLING EDGE (RISING and FALLING)		EDGE	MATCH HIGH MATCH LOW MATCH HIGH and MATCH LOW

EXAMPLE



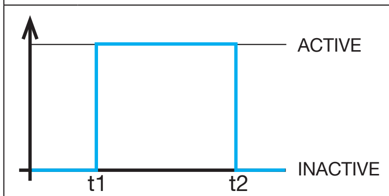
LOGICAL INPUT

t1 : the input becomes active
t2 : the input becomes inactive



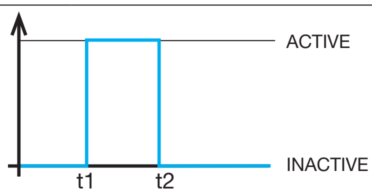
ANALOG INPUT

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 EC700.
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 analog 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 (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.

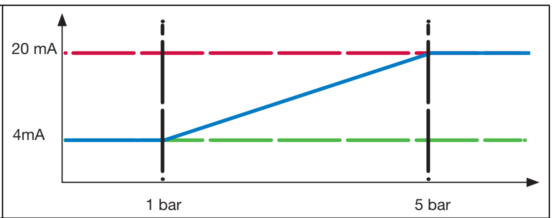
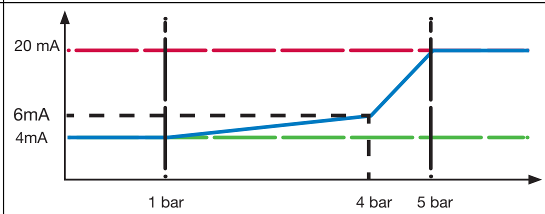
Load curve for logical and analog input

Load curves are available for logical and analog inputs. This allows you, for example, to separate a me-ter 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 analog input

A sensor can have a analog 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 analog input, using communication it is possible to use a 4-gradient analog input, which enables a more accurate approximation of a non-linear output.

Linear, 1 gradient	
Linear, 2 gradients	
Linear, X gradients	with X = 4 (max)

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.10).

Hager 01.2012 OCOM 112132

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