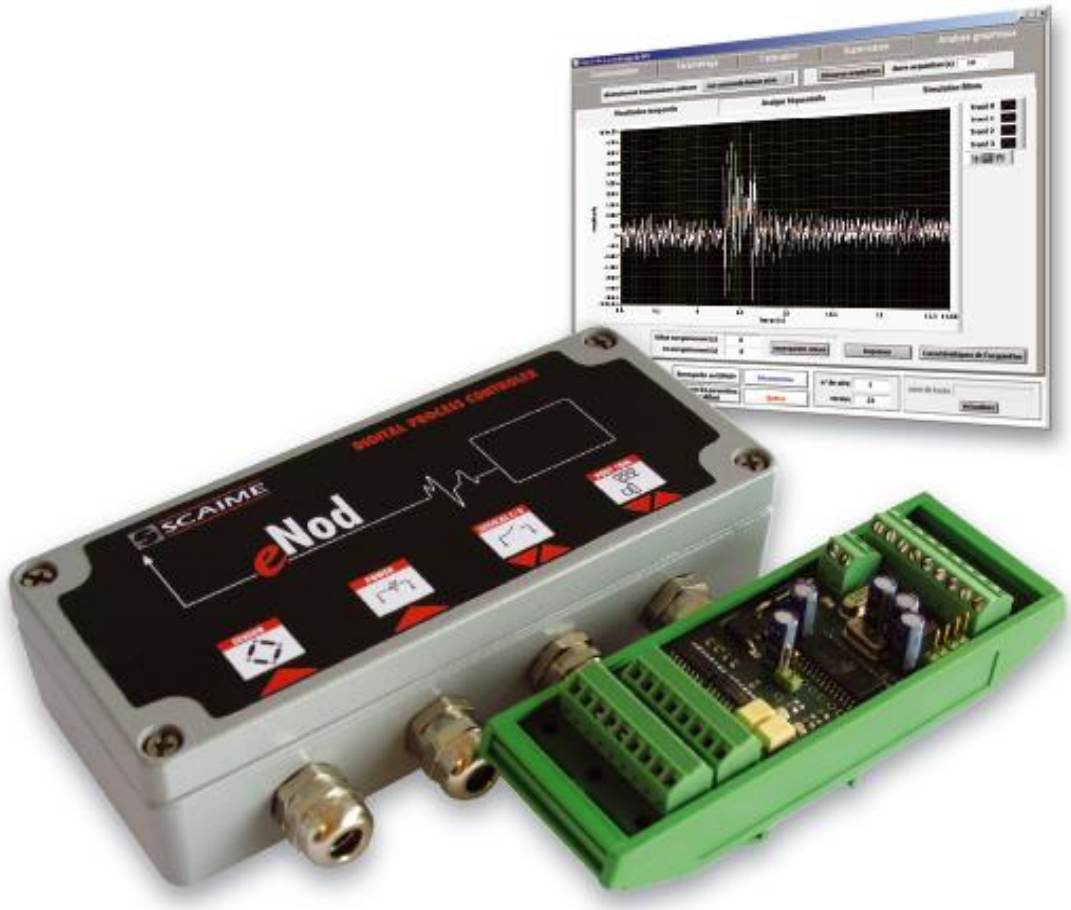
# User's instructions



| Document revisions | | |
|---|---|---|
| **version** | **date** | **description** |
| **A** | 01/07 | - creation |
| **B** | 05/07 | - layout modification |
| **C** | 11/07 | - CANopen® protocol comatibility / RS/CAN jumper |
| **D** | 02/08 | - CANopen® communication full description<br>- checkweigher statistical datas presentation |
| **E** | 04/08 | - new inputs assignement : allow new cycle and peak detection cycle decription modified |
| **F** | 11/08 | - document title modified (eNod3 => eNod3-C)<br>- band-stop filter and automatic zero correction in checkweigher descriptions added. |
| **G** | 09/09 | - new hardware design<br>- logical inputs wiring examples<br>- instructions for use in legal for trade applications added. |
| **H** | 11/09 | - document title modified<br>- reference to a use in an AWI |
| **I** | 07/11 | - Determination of the weight : Checkweigher result quality value added<br>- checkweigher zero automatic correction; |
| **J** | 10/18 | - Distance between waterproof housing version fixations (137x35mm) |

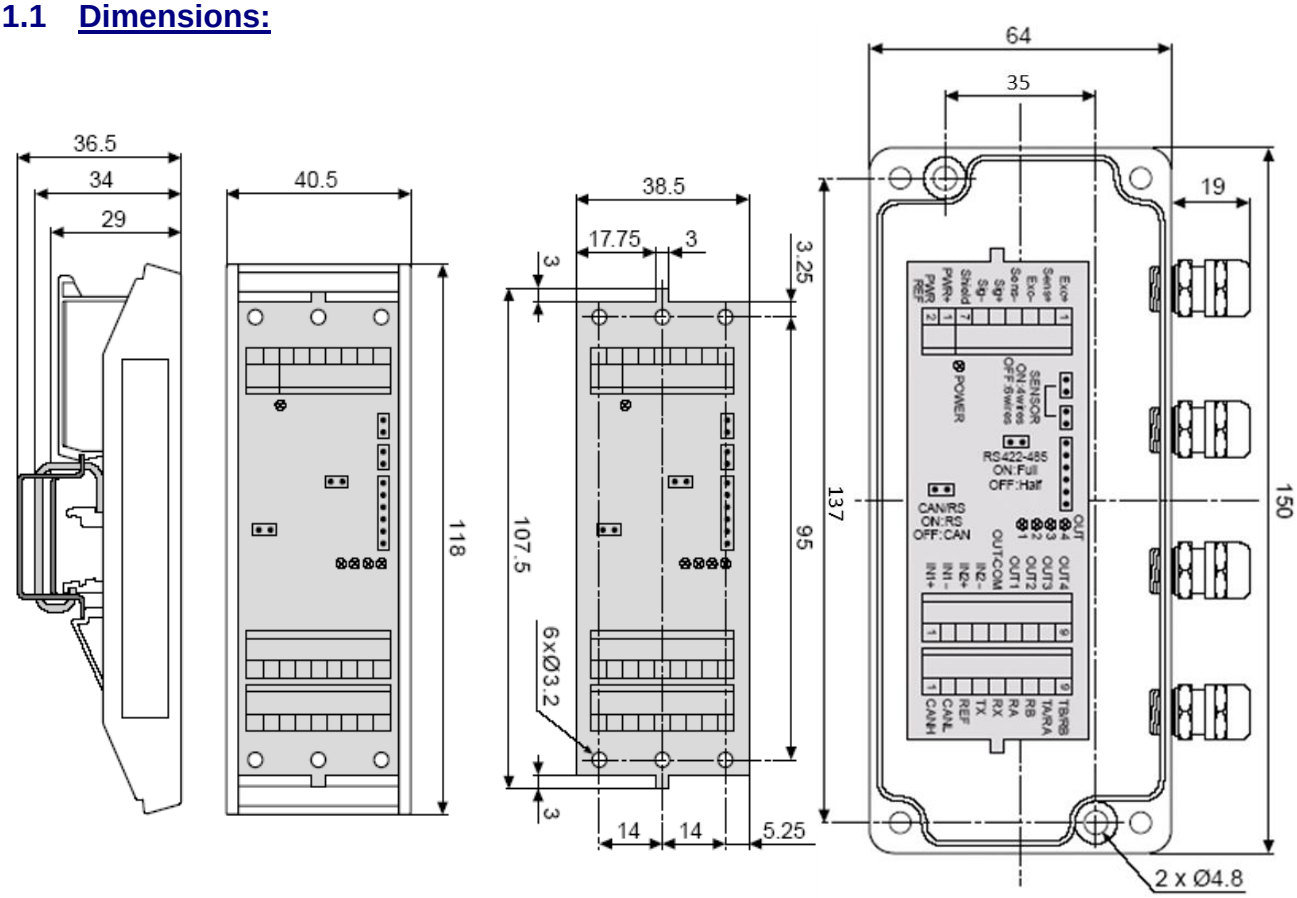
# 1 GENERAL PRESENTATION:

***eNod3-C*** provides an economic high performance solution to transform any strain gauge sensor into an intelligent digital system. ***eNod3-C*** includes three advanced operating modes for control of static and dynamic processes:

- **Measurement transmitter**.
- **Checkweigher.**
- **Peak control.**

***eNod3-C*** is provided with RS485/422, RS232 and CANbus outputs supporting the ***ModBus-RTU***, ***SCMBus*** and ***CANopen®*** protocols. Each module is provided with 2 logical inputs and 2 logical outputs, authorizing synchronization of functions with automation and alarm management. ***SCAIME*** provides the ***eNodView*** software to facilitate installation of ***eNod3-C*** to set parameters and calibrate the measurement system, for acquisition of measurements and simulation of digital filters.

## 1.1 Dimensions:




**DIN rail version** **Single board card** **Waterproof housing version**

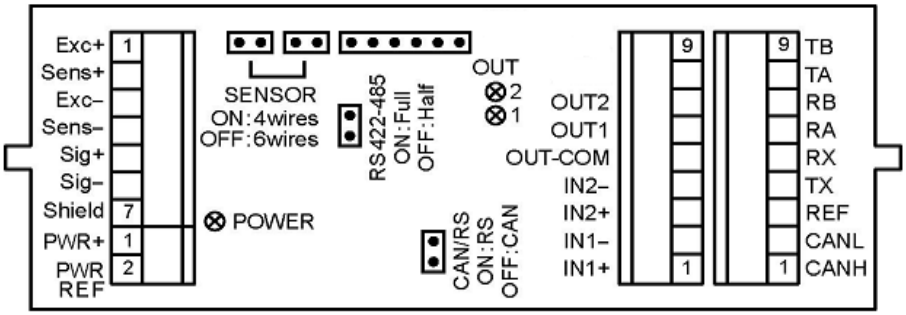
With waterproof housing version a connecting cable with a shield grounded on both sides should be used to connect peripheral devices and eNod3.
Cable gland is provided with an inside contact spring for an easy and safe EMC connection of shield cable and housing.

## 1.2 General characteristics:

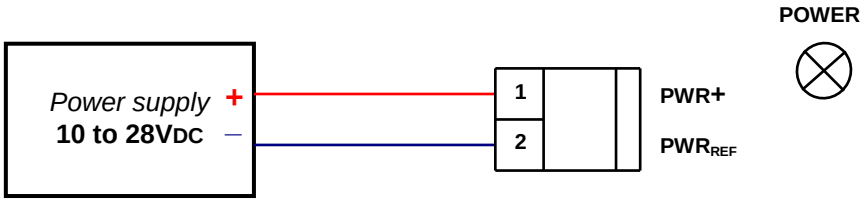
| Power supply | | Unit |
|---|---|---|
| power supply voltage | 10 ..... 28 | $V_{DC}$ |
| max consumption | 70 with 350Ω load cell<br>120 with 80Ω load cell | mA |
| **Temperature range** | | |
| storage temperature | -25...+85 | °C |
| operating temperature | -10...+40 | °C |
| **Load cell** | | |
| impedance (complete bridge) | > 80 | Ω |
| connection | 4 or 6 wires | |
| load cell power supply | 5 ± 5% | $V_{DC}$ |
| **Communication** | | |
| RS232 | | |
| RS 485/422 | Half or full-duplex | |
| RS baud rate | 9600 ... 115200 | bauds |
| Can 2.0A | 20....1000 | kbauds |
| **Logical inputs** | | |
| number | 2 | |
| type | optocoupler | |
| low-level voltage | 0 ..... 3 | $V_{DC}$ |
| high-level voltage | 9 .... 28 | $V_{DC}$ |
| current at high level | 10mA @ 24V | mA |
| insulation voltage | 2500 | $V_{rms}$ |
| **Logical outputs** | | |
| number | 2 | |
| type | opto-insulated static relays | |
| max current @ 40°C | 0.4 | A |
| max voltage in open state | 55 | V |
| resistance in ON state | 2 | Ω |
| insulation voltage | 2500 | $V_{rms}$ |
| **Metrological characteristics** | | |
| analog input signal range | 7.8 ... 500 | mV/V |
| typical temperature offset drift @ input signal range <7,8 mV/V | 1.5 | ppm/°C |
| typical slope temperature effect | 2 | ppm/°C |
| max linearity error | 0.003 | % |
| A/D conversion rate | 1920 .... 6.25 | meas./s |
| **Legal for use metrological characteristics** | | |
| Class | III or IIII | |
| Maximum number of verification scale divisions | 6000 for class III<br>1000 for class IIII | |
| Minimum voltage division per verification scale division ($\Delta U_{min}$) | 0.5 | µV |
| Maximum voltage for weighing range | 39 | mV |
| Minimum impedance for the load-cell | 80 | Ω |
| Maximum impedance for the load-cell | 1500 | Ω |
| Value of factor $P_i$ | 0.5 | |

| Programmable functions |
| --- |
| acquisition of zero, taring, zero tracking |
| physical or theoretical calibration |
| slope correction |
| non-linearity polynomial correction |
| low-pass, band-stop and self-adaptive digital filters |
| set points management |
| checkweigher functioning mode |
| peak detection functioning mode |

## 2 INTERFACES:




### 2.1 Connection to the power supply:

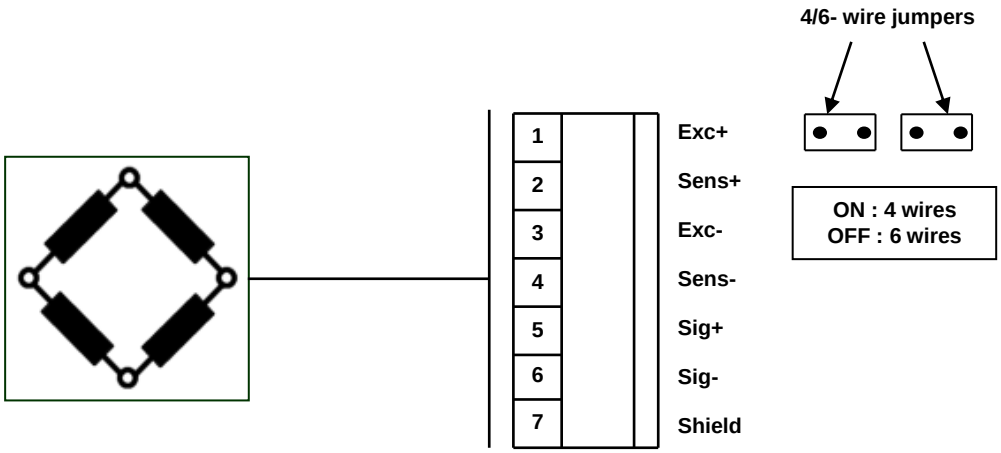



The *'POWER'* light shows whether or not the power supply is connected.

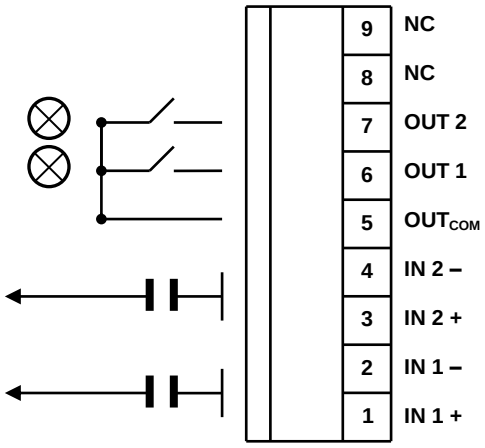
### 2.2 Connection to load cell(s):

***eNod3-C*** supplies power to the load cells (5 $V_{DC}$).
Up to four 350Ω load cells can be connected in parallel.
***eNod3-C*** allows the use of 4- or 6- wire load cells.

- 4-wire load cells: jumpers in place.
- 6-wire load cells: jumpers removed.



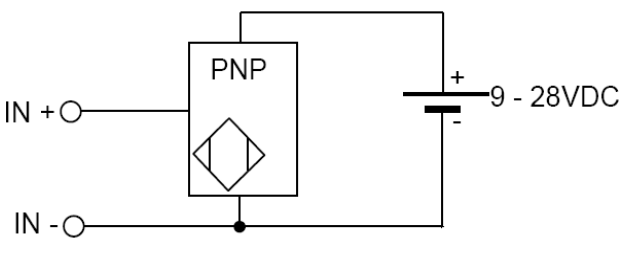
## 2.3 Connection of Inputs & Outputs:

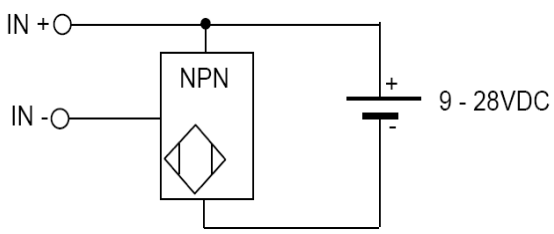



### 2.3.1 Digital inputs

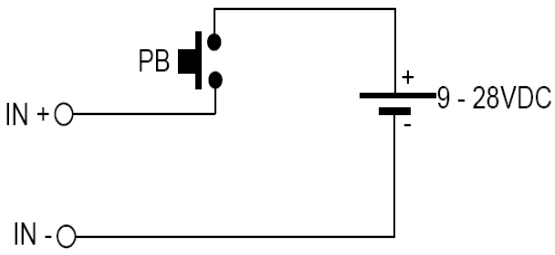
| Characteristics of opto-insulated Inputs | |
|---|---|
| High level | 9 - 28$V_{DC}$ consumption 10mA @ 24$V_{DC}$ |
| Low level | 0 to 3 $V_{DC}$ |

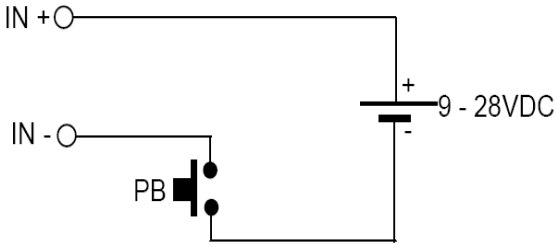
⇨ connection to a detector :




⇨ connection to a push button (PB) :

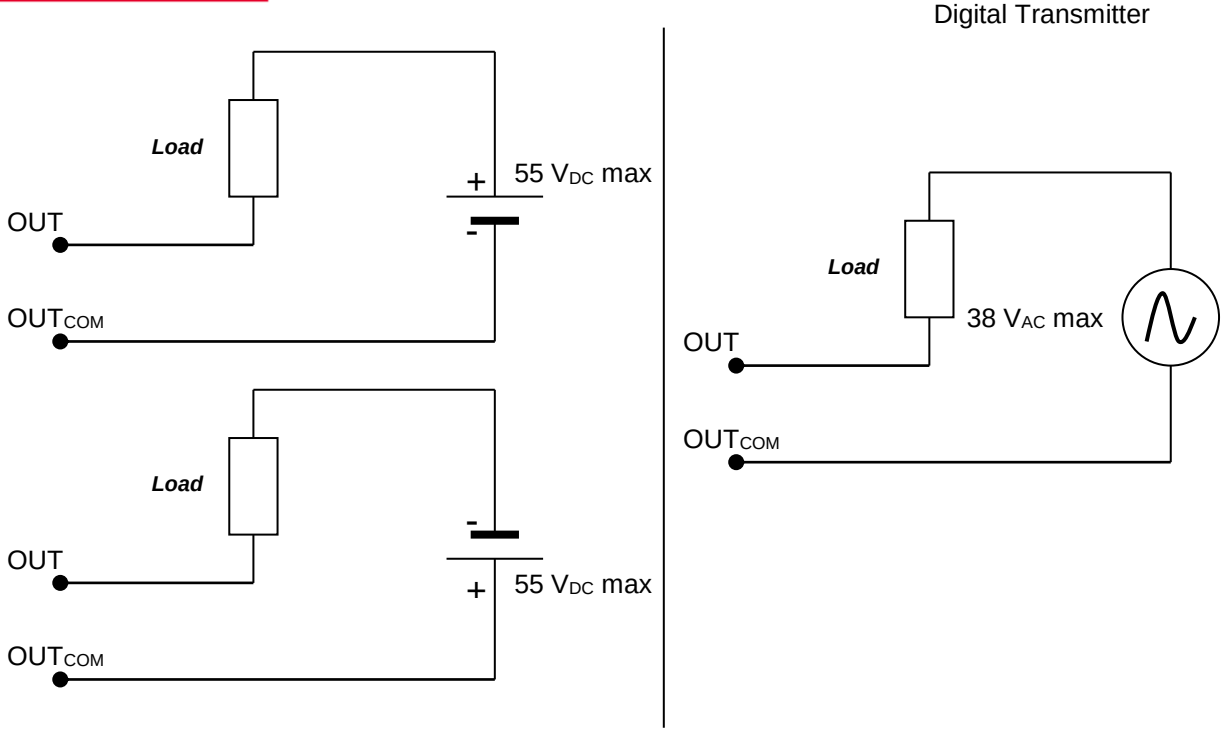


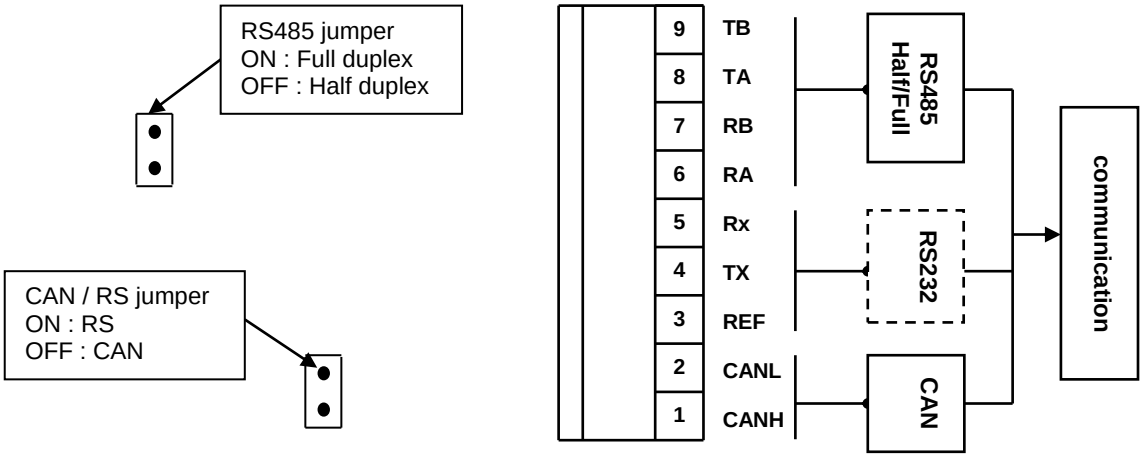

### 2.3.2 Digital outputs

| Output characteristics (opto-insulated static relays) | |
|---|---|
| Max current @ 40°C | 0.4A |
| Max voltage in the open state | 55V |
| Resistance in the ON state | 2 Ω |
| Insulation voltage | 2500 Vrms |

A light is assigned to each output.




## 2.4 COMMUNICATION INTERFACES:




***eNod3-C*** is capable of communicating with an automatic control for each connection:

- **RS485/422** } jumper CAN/RS ON
- **RS232** }
- **CAN** } jumper CAN/RS OFF

The connection to the **RS 485 / RS 422** interface is made through TA, TB and RA, RB connections on the 9-pins connector. (TA = direct transmission, TB = inverse transmission, RA = direct reception, RB = inverse reception).
For an **RS485** (half duplex) communication, just connect the TB and TA pins and remove the corresponding jumper (OFF).
For an **RS422** or **RS485** full-duplex communication, use the four TB, TA, RB and RA pins. The corresponding jumper must be in place (ON) (which is the default case on delivery).
The RS232 interface is connected using Tx, Rx and REF connections on the 9-pin connector.
The **CAN** interface is connected using the CANH, CANL and REF (not mandatory) connections on the 9-pin connector.

# 3 COMMUNICATION:

***eNod3-C*** can communicate using several protocols:

- ***ModBus RTU***
- ***SCMBus*** *standard* format or *fast* format.
- ***CANopen®***

⇨ Switching from the ***SCMBus*** protocol to the ***ModBus-RTU*** protocol (and reciprocally) can be done by software programmation.

1) *send the corresponding command*
2) *send the 'storage in EEPROM' command*
3) ***reset*** *(hardware or software)the device*

See example describing how to switch from ***ModBus-RTU*** to ***SCMBus*** protocol in the document *SCMBUS communication Ref 165 706* Appendix A.

⇨ Switching from ***SCMBus/ModBus-RTU*** protocol to ***CANopen®*** protocol (and reciprocally) can be done by setting or removing the appropriate jumper (cf. §3) then by making a ***reset***

## 3.1 ModBus RTU:

See the description of the frames and functions in the '***ModBus RTU*** communication protocol' Ref. 165 704 document.

## 3.2 SCMBus:

See the description of the frames and functions in the '***SCMBus*** communication protocol' Ref. 165 706 document.
The ***SCMBus*** protocol has got similarities with ***ModBus-RTU.*** It is based on the master/slave structure however it allows to transmit measurements continuously without collision management on the line. This operating mode is only available in ***transmitter*** functioning mode.
The measurements transmission frequency depends on the serial baud rate thus transmitting 100 meas/s is impossible at less than 19200 bauds. For fast measurement transmissions, use the ***fast SCMBus format*** with wich 1200 meas/s can be expected at 115200 bauds.

Other methods of transmitting information without any master request :

- ***transmitter mode*** : measurement transmission triggered by a digital input.
- ***whatever the functioning mode is****, physical calibration procedure :* automatic transmission when a step in the process is complete.

### 3.2.1 Fast SCMBus format:

The ***Fast SCMBus*** format is particularly useful for measurement acquisitions at the highest frequency, for example, in order to analyse dynamic phenomena.
This format should only be used for point-to-point operation in full-duplex.
To optimize the speed, in addition to using the ***Fast SCMBus*** format, it is preferable to configure ***eNod3-C*** for operation with *'no processing transmitter'*. In this configuration, filters are inactive, set-points are not managed and there is no polynomial linearization.

## 3.3 CANopen®

***eNod3-C*** supports ***CANopen®*** communication protocol and is compliant with **'CIA® Standard V301'**. See the description of the frames and functions in the '***CANopen®*** communication protocol' Ref. 165 717 document.

# 4 USE IN LEGAL FOR TRADE APPLICATIONS :

## 4.1 Introduction

***eNod3-***is a module making a part of an instrument. It is intended to be integrated :

- In a non automatic weighing instrument (**NAWI**) or
- In an automatic weighing instrument (**AWI**) of category catchweigher.

## 4.2 Legal for trade parameters

See relative sections in the following documents :

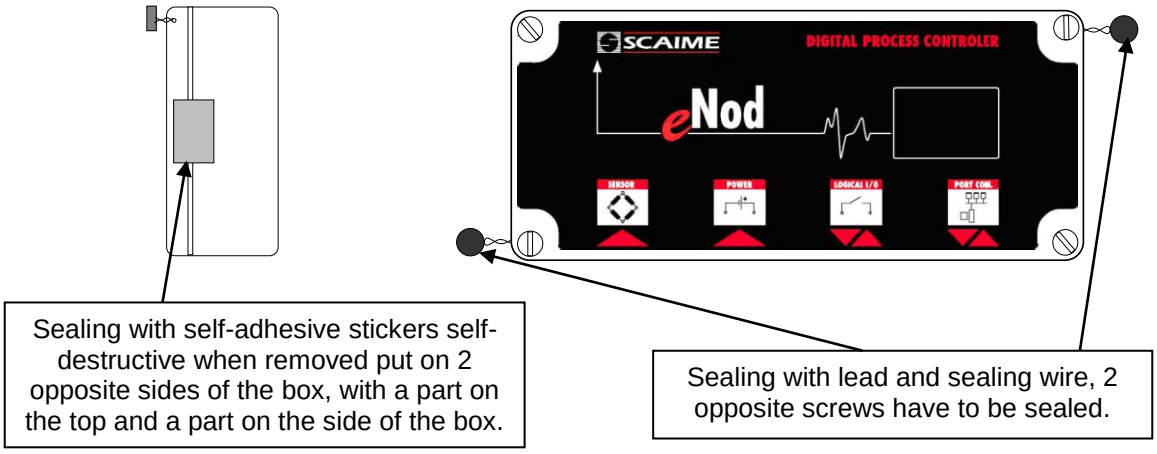
- **ModBus RTU communication** Ref. 165704
  - ⇨ § 2.11 Metrological version number
  - ⇨ § 2.12 Legal for trade
  - ⇨ § 2.37 Status register
- **SCMBus communication** ref. 165706
  - ⇨ § 4.3 Legal for trade settings
  - ⇨ § 1.4 Status bytes
- **CANOpen® communication protocol** Ref. 165708
  - ⇨ § 3.2.16 Legal for trade switch
  - ⇨ § 3.2.17 Legal for trade indicators
  - ⇨ § 3.2.32 Current measurement
  - ⇨ § 3.2.33 Current measurement status

## 4.3 Sealing

The module ***eNod3-C*** has a physical sealing device and a software sealing device.

### 4.3.1 Physical sealing :

The physical sealing is the one of the module box. It comprises two self-adhesive stickers self-destructive when removed or a device with sealing screws with lead and sealing wire.




### 4.3.2 Software sealing :

On the whole weighing instrument the value of the event counter as well as the CRC value may be displayed.
The whole weighing instrument has a marking area where the values of the event counter and of the CRC recorded after the last official verification.These marked values shall be identical to these displayed on the terminal. When these values do not match, this part of the sealing device is considered as broken.

## 4.4 Specific requirements :

The legal metrological software version may be displayed on the terminal.
There are also some characteristics in the status related to measurements that need to be displayed on the terminal too.

# 5 CALIBRATION

## 5.1 Calibration types:

There are different possible calibration types (See examples in the documents: '**SCMBus** Communication' Ref. 165 706 Appendix A and '**ModBus RTU** Communication' Ref. 165 704 Appendix A):

- Physical calibration using the load cell through a known reference. This type of calibration can be done with 1, 2 or 3 known references.
- Theoretical adjustment by setting the load cell sensitivity and capacity.
- Correction of the initial calibration value.

## 5.2 Linearization correction:

For an installation with a non-linearity:

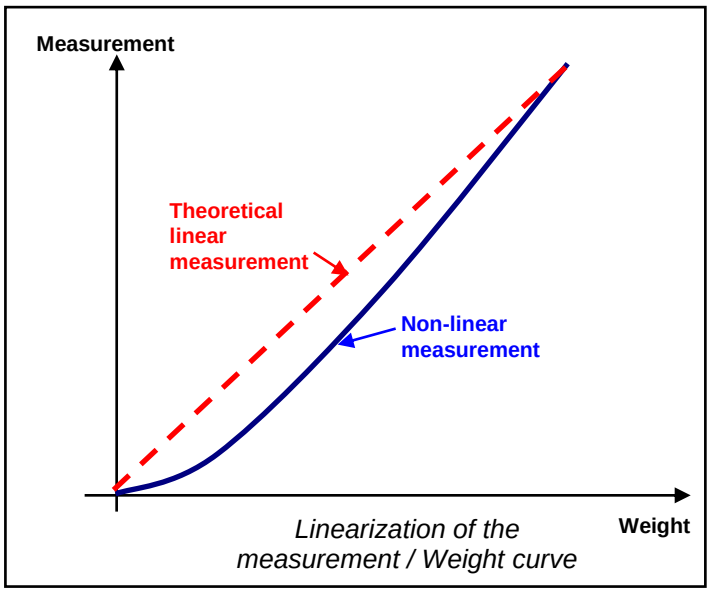



**Fig. 1**

The linearization formula is as follows:

*Corrected measurement = Meas – A (Meas)$^2$ – B(Meas) – C*
*where Meas = Current measurement*

The coefficients A, B and C are defined using the ***eNodView*** software calculation tool.

# 6 INPUTS FUNCTIONING:

Each input can function in positive or negative logic individually. A debounce time common to both inputs can be adjusted.

## 6.1 Assignment of inputs:

| Function | Operating mode | | |
|---|---|---|---|
| | Transmitter | Checkweigher | Peak control |
| none | ● | ● | ● |
| tare | ● | ● | ● |
| zero | ● | ● | ● |
| transmit measurement | ● | | |
| measurement window | ● | | ● |
| clear | ● | ● | ● |
| start cycle | | ● | ● |
| New cycle allowance | | | ● |
| stop checkweigher cycle | | ● | |
| dynamic zero | | ● | |

## 6.2 General functions:

- *none*: inputs are inoperative.

- *tare* : one or the other or both inputs may be assigned to the tare function.
The tare is affected by a stability criterion that can be parameter defined. The tare will be triggered on a rising or a falling edge, depending on the parameter defined logic (positive or negative).

- *zero*: one or the other or both inputs may be assigned to the zero function.
A new zero is only accepted if its value is within a ±10% range of the specified maximum capacity for a usage out of legal for trade and ±2% for legal for trade application. This zero value is the current zero value, and is cancelled following a reset. Stability and starting on a rising or falling edge (same as for tare control).

## 6.3 Functions attached to an operating mode:

See corresponding sections.

# 7 OUTPUTS FUNCTIONING:

Each output can function in positive or negative logic individually.

## 7.1 Assignment of outputs:

| Function | Operating mode | | |
|---|---|---|---|
| | Transmitter | Checkweigher | Peak control |
| set point | ● | ● | ● |
| motion | ● | ● | ● |
| defective measurement | ● | ● | ● |
| checkweigher result available | | ● | |
| cycle in progress | | ● | ● |
| inputs image | ● | ● | ● |
| level on request | ● | ● | ● |

## 7.2 General functions:

- *set point:* outputs can be assigned to copying the state of set points. Output 1 is assigned to set point 1 and output 2 to set point 2.

- *motion*: outputs can be assigned to copying measurement stability.

- *defective measurement*: outputs can be assigned to copying measurement faults. These faults are also coded in the status word attached to the measurements. There are 4 of them:

  * outside converter range on the positive side.
  * outside converter range on the negative side.
  * outside capacity on the positive side.
  * outside capacity on the negative side.

- *inputs image*: outputs can be assigned to copying inputs, either using the same logic or inverting the state of the input (negative logic). Output 1 is assigned to input 1 and output 2 to input 2.

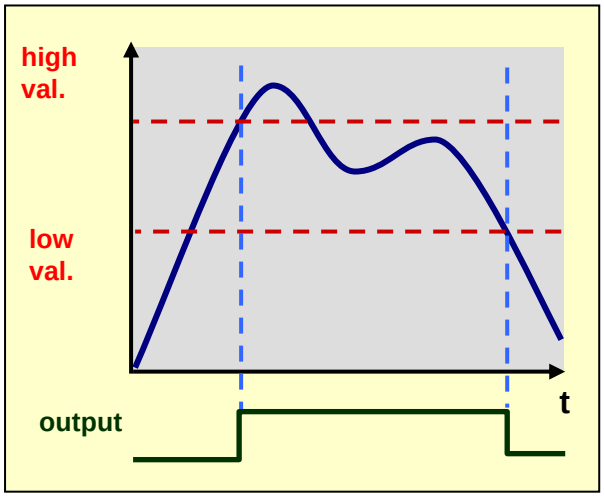
- *level on request:* outputs state is driven by master requests on the communication bus. The activation duration can be modified.

## 7.3 Functions attached to an operating mode:

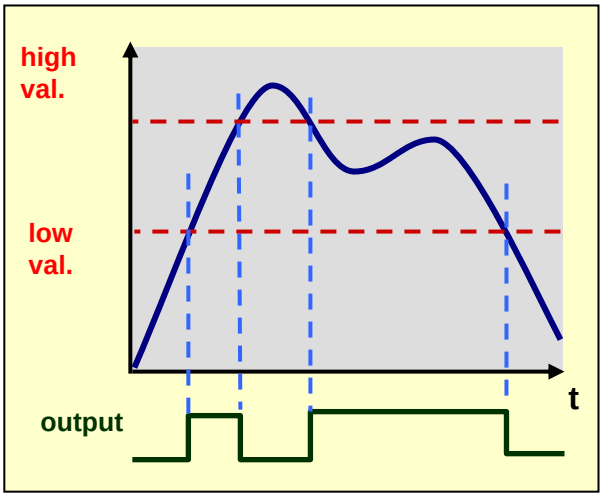
See corresponding sections for a complete description

## 8 SET POINTS:

Set points are characterized by a high value and a low value. The operating mode is either ***operation in hysteresis***, or ***operation in window.***




**Functioning in hysteresis**
**Fig. 2**




**Functioning in window**
**Fig. 3**

The values of these set points may be assigned either to:

- **gross measurement** regardless of the functionning mode
- **net measurement** regardless of the functionning mode
- **maximum value** in peak control mode
- **minimum value** in peak control mode
- **peak-to-peak value** in peak control mode
- **result** in checkweigher mode
- **running total** in checkweigher mode

# 9 FILTERS:

There are four available filtering levels:

- filtering related to the A/D conversion rate including rejection of the mains frequency (50 or 60 Hz) harmonics.
- 2nd, 3rd or 4th order low-pass Bessel/Butterworth filter
- 2nd order band-stop filter
- self-adaptive filter

- ***Filtering related to the A/D conversion rate :*** the signal resolution is related to the conversion rate. The conversion rate might be choosen as low as possible, particularly for static applications. For dynamic applications, a compromise must be found between the measurement rate and the low-pass filter cut-off frequency. The ***eNodView*** software can be used to determine appropriate filter values.
Choose a measurement rate that rejects the mains frequency harmonics according to the place of use, 50 or 60Hz.

- ***Bessel or Butterworth type low pass filter :*** a low-pass digital filter can be applied as an output of the A/D converter. The filter order is configurable (available values are 2, 3 or 4) and the coefficients that define it depend on the A/D conversion rate, the wanted cutt-off frequency and on the choosen order. These coefficients can be easily calculated by ***eNodView*** software.

- ***Band-stop filter :*** a 2nd order band-stop filter might be applied as an output of the low-pass filter (if used) or the A/D converter. It allows to attenuate the frequencies within a band defined by a high and a low cut-off frequencies. The coefficients that define it depend on the A/D conversion rate and the wanted cutt-off frequencies (that means the frequency band width). These coefficients can be easily calculated by ***eNodView*** software.

- ***Self-adaptive filter*** : this filter can be set in cascade after previous filters. It is particularly efficient for static measurements but avoid using it in dynamic or dosing processes. The aim of this filter is to eliminate erratic measurements and to average consistent measurements.

# 10 TRANSMITTER OPERATING MODE:

This basic operating mode consists of transmitting measurements on the bus, possibly after configuring them, filtering them and comparing them with set-points levels. Measurements can be transmitted individually regardless of the communication protocol or continuously at a defined period in the ***SCMBus*** (standard or fast format) and ***CANopen®*** protocols**.** Functioning may be unipolar (positive analog signal only) or bipolar (positive or negative analog signal).

## 10.1 Measurement reading request:

### 10.1.1 Single measurement transmission:

Regardless of the communication protocol in use.
The request can apply to:

- gross measurement.
- net measurement.
- tare value.
- measurement in A/D converter points.

### 10.1.2 Continuous measurement transmission:

This is possible using ***standard or fast SCMBus format***, the transmission can be started by a serial command and another one allows stopping it. Measurements are transmitted at a period defined in ms by the *'sampling period'* setting.
The request can apply to:

- gross measurement.
- net measurement.
- measurement in A/D converter points.

Note: This is very similar to operation of the *'Measurement window'* through an input command.
***CANopen®*** protocol also allows defining a period at which measurements are sent on the bus without any master request.

## 10.2 Specific commands through an input:

### 10.2.1 Transmit measurement (fig. 4)

This is only possible using ***standard or fast SCMBus*** format *or* ***CANopen®*** protocols.
The request can apply to:

- gross measurement.
- net measurement.
- measurement in A/D converter points.

A single measurement is transmitted per rising or falling edge (depending on the configured logic) on the input signal.

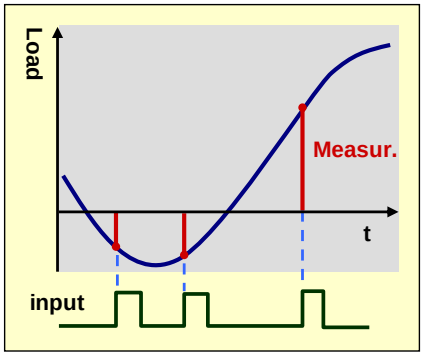



**Fig. 4**

### 10.2.2 Measurement window (fig.5)

This is only possible using ***standard or fast SCMBus***.
The request can apply to :

- gross measurement.
- net measurement.
- measurement in A/D counts.

While the input is kept at the right level, a series of measurements are transmitted at the period defined by the *'sampling period'* setting.Only input 2 is operational if both inputs are assigned to this function.

### 10.2.3 Clear

Cancels current tare (same functioning as *'cancel tare'* command).

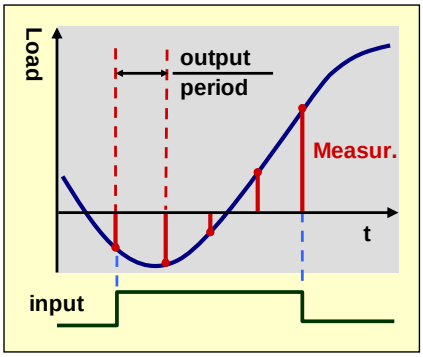



**Fig. 5**

# 11 CHECKWEIGHER OPERATING MODE:

This operating mode consists of determining the weight of an object while it is present on a conveyor portion on which a weighing system is fitted (Fig 6).
Note: The measurement is determined for net measurements only.

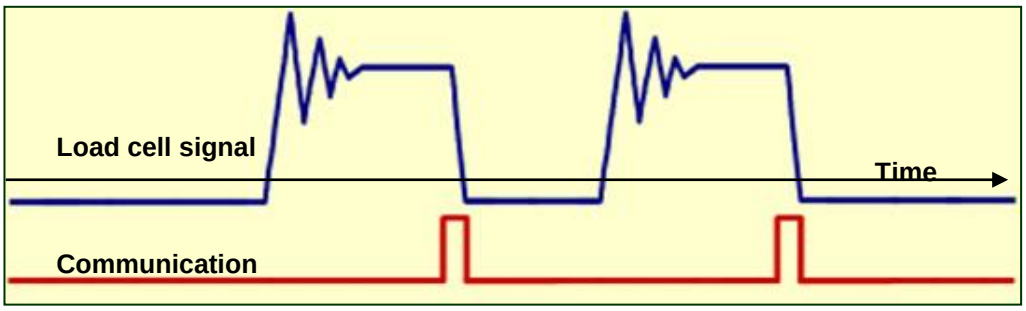



**Fig. 6**

## 11.1 Determination of the weight:

When the object arrives on the weighing system, the weight determination cycle can be started:

- by an input assigned to *'start checkweigher cycle'* (Fig. 7 & 8). Caution, only input 2 is operational if both inputs are assigned to the *'start checkweigher cycle'* function.
- by a trigger level (Fig. 9) when the load cell signal reaches the specified value.

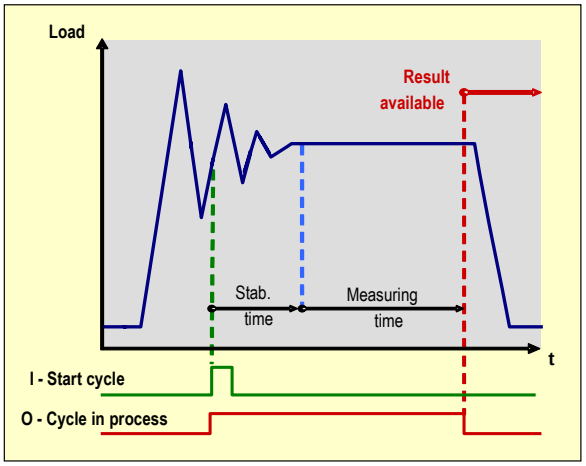



**Fig. 7**

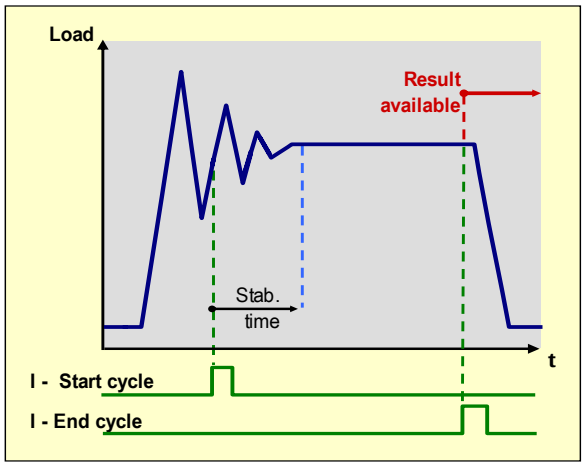



**Fig. 8**

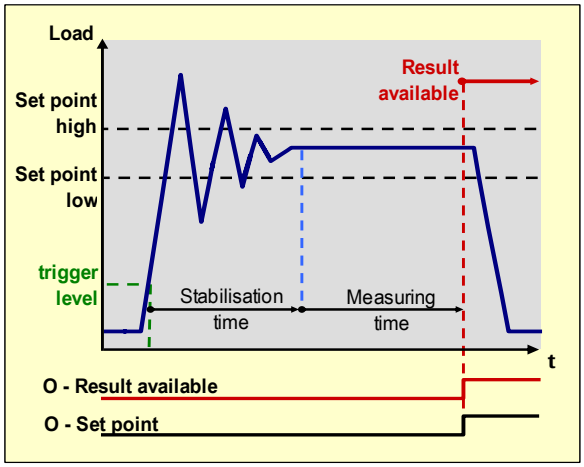



**Fig. 9**

Then, during a *'stabilization time (Ts)'*, the signal is highly disturbed so measurements are not taken into account. Finally, during a '*measuring time (Tm)*' defined by either:

- a time value (Fig.7).
- a duration prior to an edge on an input assigned to '*stop checkweigher cycle*' (Fig.8).
  Caution, only input 2 is operational if both inputs are assigned to the *'stop checkweigher cycle'* function.

***eNod3-C*** automatically calculates a result corresponding to the object weight. This result value may be weighted by a coefficient.
A value image of the quality of the result is also determined. This value is the standard deviation of the measurements acquired during the measurement time. A low value means a good checkweigher result.
Each cycle is counted and the following statistical data are updated for each new complete cycle:

- results average
- running total (results sum)
- number of cycles
- standard deviation

***eNodView*** can be used to determine stabilization and measurement times so as to optimize parameters. (See ***eNodView*** user's instructions documentation).

## 11.2 Providing the result value :

### 11.2.1 Outputs synchronization:

Two specific functions may be assigned to ***eNod3-C*** logical outputs so as to synchronize the result reading:

- *'cycle in progress'*: this function causes the output to be set active from the beginning to the end of the cycle (at the end of the *'measuring time'* or when a '*stop checkweigher cycle'* input is activated).
- *'checkweigher result available'*: this function causes the output to be set active when a cycle is complete. In **ModBus** and **CANopen®** protocols, it remains in this state until the beginning of a new cycle or until a *'clear'* request. In **SCMBus** protocol, the output state changes when it is read.

### 11.2.2 With the SCMBus protocol:

- In *'Checkweigher automatic transmission'* mode, when the cycle is finished, the result is automatically sent through the serial line. After the transmission, the measurement result is set to **????????**.
- In *'Checkweigher transmission on request'* mode, the measurement result has to be read. Reading automatically resets measurement memory to **????????**. Starting of a new cycle induces also a reset to **????????**. The measured result can also be cancelled (set to **????????**) without reading. It can be done by an input assigned to '*clear*' or by the *'clear'* command.

### 11.2.3 With the ModBus protocol:

- As soon as the measurement result is available, it can be read. Starting a new cycle cancels the previous measurement result (set to '**FF FF FF FF'**).
The measurement result can also be cancelled (set to '**FF FF FF FF'**) before a new cycle is started. It can be done by an input assigned to *'clear'* or by the '*clear'* command.

### 11.2.4 With the CANopen® protocol:

- As soon as the measurement result is available, it can be read. Starting a new cycle cancels the previous measurement result (set to '**FF FF FF FF'**).
The measurement result can also be cancelled (set to '**FF FF FF FF'**) before a new cycle is started. It can be done by an input assigned to *'clear'* or by the '*clear'* command.
- The result transmission can be triggered in different ways. It depends on the chosen trigger event (see document Ref. 165 717).

## 11.3 Management of Set-points:

Outputs may be assigned to the set-point function. Set-points are triggered by the measurement result (fig. 9). As long as checkweigher result is not available (**????????**) or (**FF FF FF FF**), it is seen like a value < to set point.
Set points can also be assigned to the checkweigher running total value (cumulated weight).

## 11.4 Dynamic zero

If an input assigned to the *'dynamic zero'* function is activated or if a *'dynamic zero'* command is received, ***eNod3-C*** calculates the measurement average value during a configurable time. This value becomes effective if it is within a ± 10% range of the specified maximum capacity or ±2% in legal for trade application. Stability is not required.

## 11.5 Checkweigher zero automatic correction

***eNod3-C*** also provides an automatic zero tracking for dynamic applications. It allows to follow the evolution of the zero in checkweigher functioning mode, for example on a conveyor belt on which there is some product accumulation

This function is efficient only when the measured signal is filtered enough with few noise and oscillations.

When this function is enabled, an average value is calculated if comprised within a configurable interval around the zero calibration and during a configurable period. Some other criteria are also taken in account, they are:

- Number of measurements complying with correction range compared with total number of measurements received during dynamic acquisition time, it must be > 75%.
- At least 10 measurements included in the interval are necessary.

In legal for trade application:

- The interval cannot exceed ±5d
- The dynamic acquisition time is 1 second minimum
- Checkweigher zero automatic correction is disabled if measurements are stable.

Recommendations:

- To avoid undesired zero correction, preferably set zero automatic correction only when weighing belt is in use.
- Dynamic acquisition time should be higher or equal to checkweigher measuring time.
- Dynamic acquisition time should be lower than free time between two measurements.
- Interval of the zero automatic correction should be lower than checkweigher trigger level.
- Interval of the zero automatic correction should be in correspondence with the variation interval due to mechanical motion. The value should be lower than 10d.

# 12 PEAK CONTROL OPERATING MODE:

This operating mode consists of determining the maximum value (Max), the minimum value (Min) and the difference between Max and Min (Peak-to-peak) of the current net signal.
*Peak control* operation may be used in unipolar (positive analog signal only) or bipolar (positive or negative analog signal - tension/compression load cells -).

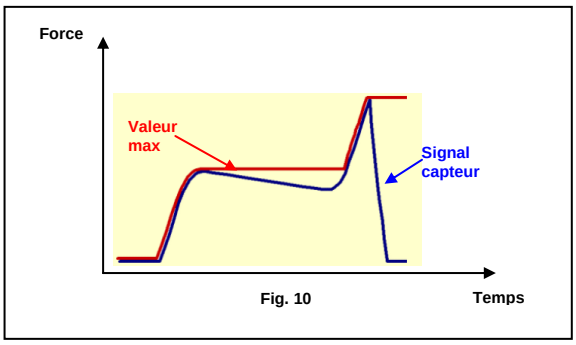



Fig. 10

## 12.1 Non-triggered operating mode:

No cycle management, Max, Min and Peak-to-peak values are detected permanently.
A '*clear*' command, either through a serial link or through an input, sets the Max and Min values to the net current value and the Peak-to-peak value to zero (Fig. 11).

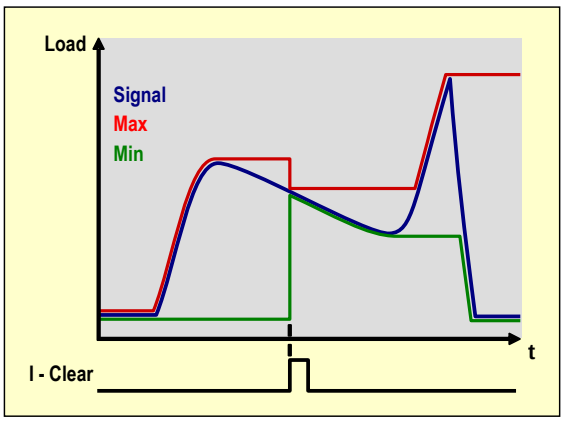



**Fig. 11**

## 12.2 Triggered operating mode:

A cycle is managed. It can be managed:
- through an input assigned to a *'measurement window*' (Fig. 13)
- through a '*trigger level'* and '*measuring time'* (Fig. 12)
- through a '*start cycle'* command (either through a serial link or through an input) and '*measuring time'* .
- through one of the options described above following an edge on an input assigned to '*new cycle allowance'.*

The '*trigger level'* is not taken into account if an input is assigned to '*measurement window'*.
Regardless of the operating mode, the *'clear'* command sets the Max and Min values to the net current value and the Peak-to-peak value to zero.
Without a cycle, the *'clear'* command sets the Max and Min and the Peak-to-peak values to zero.

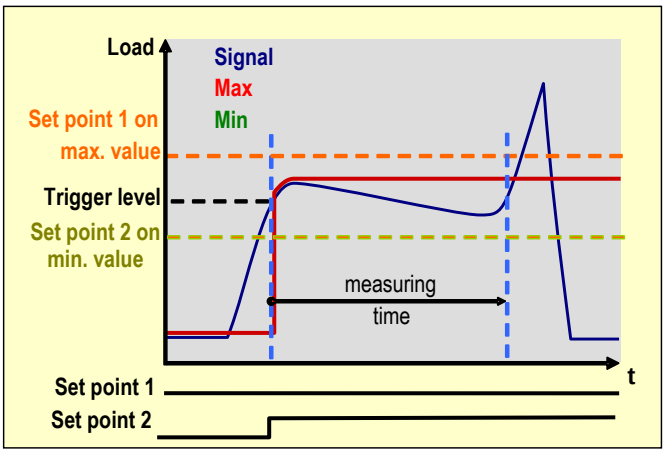



Fig. 12

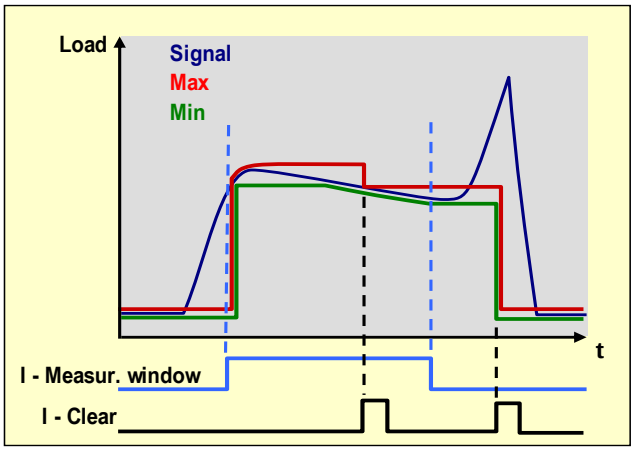



Fig. 13

## 12.3 Management of Set-points:

Outputs can be assigned to the set-point function (Fig. 12). Set-points can be assigned with either Max or Min or Peak-to-peak values or to the gross or net measurement.

## 12.4 Other possible outputs assignments:

- *cycle in progress*.
- *defective measurements*.