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COACH-II

Instruction manual

1. INTRODUCTION

COACH-II is a data logger dedicated to overhead crane (adaptable to other type of hoisting equipment).

Actual « flight recorder », COACH-II will log all crane events without need of any connected computer.

Hourly recording of following informations:

- Amount and duration of following movements : up, down, translatory mvt of the crane and direction of the trolley
- Amount and duration of “inching” for all movements
- Load spectrum
- Amount and overload values
- Sequence of last movements
- Amount of pulses transmitted to free entries (option)

Calculation of Safe Working Period, taking into account the applied load on the hoist.

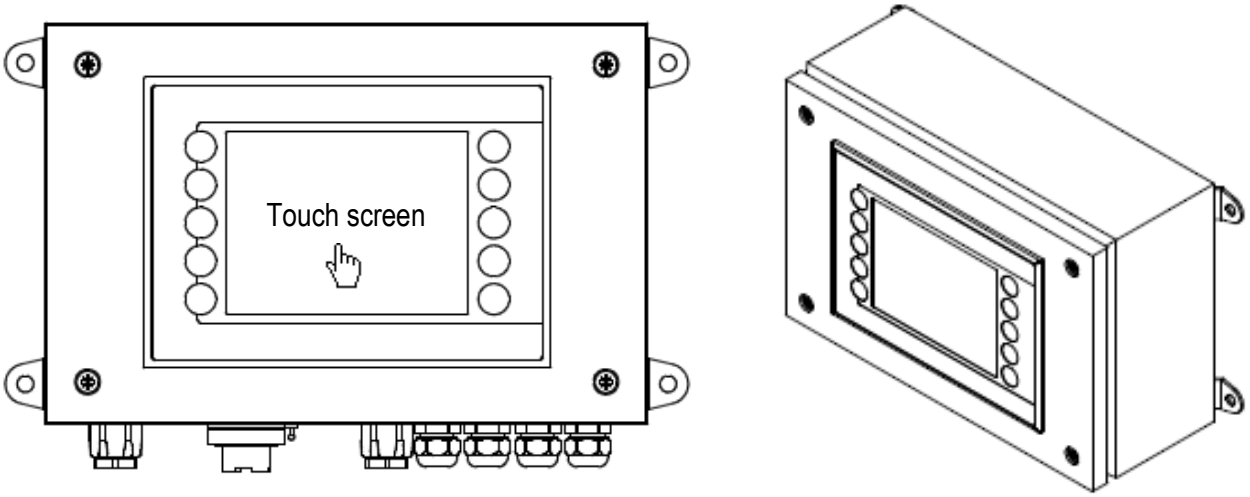
Recordings visualized via COACHVIEW **delivered along with COACH-II.**

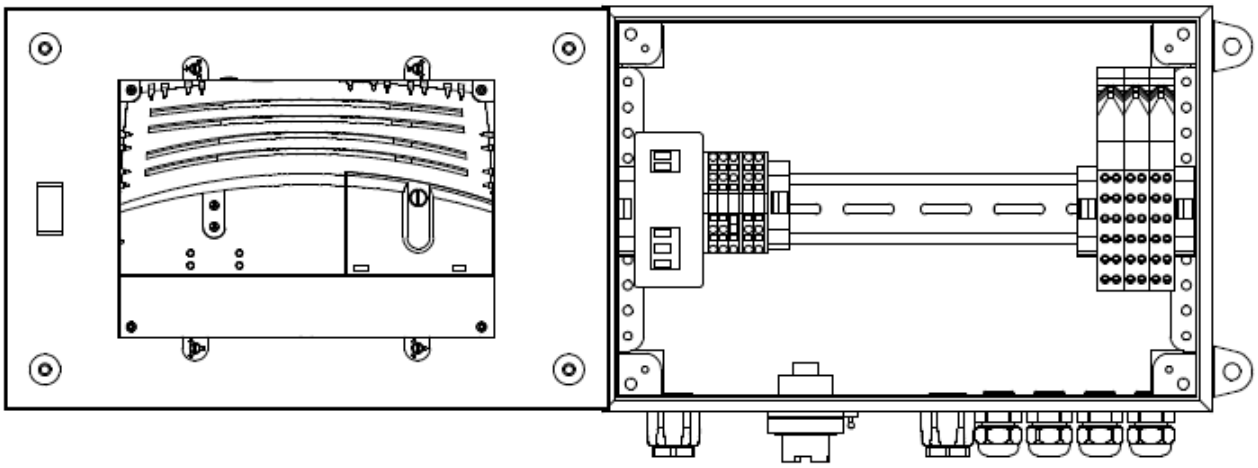
This powerful and user friendly software works under "WINDOWS" and allows visualization of the data’s through graphs and tables.

COACH-II will help to plan maintenance, detect misuses and abuses, decrements the Safe Working Period and determines the FEM classification of the crane.

Remark : it is also possible to analyze the recordings via Microsoft Excel.

2. GENERAL VIEW





Power supply (24 VDC- 48 VAC-110VAC-230 VAC)

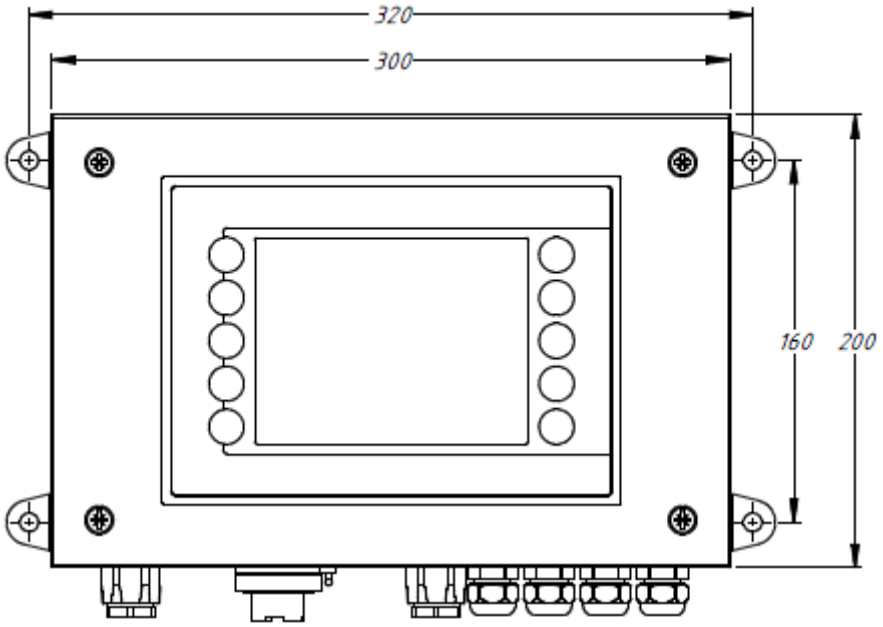
Movements (up, down, translatory, direction of trolley)

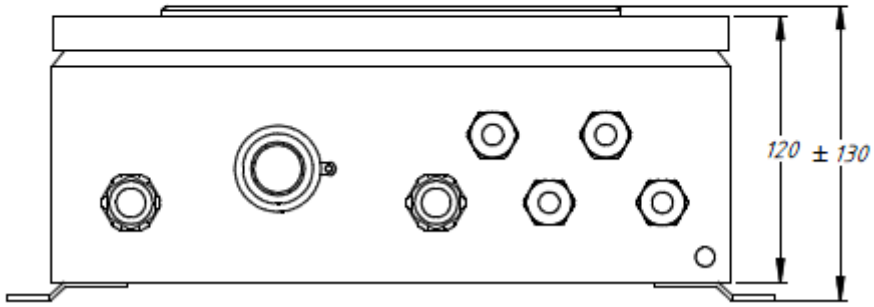
Load cell signal/analogical input (0 – 10 V ou 4 – 20 mA)

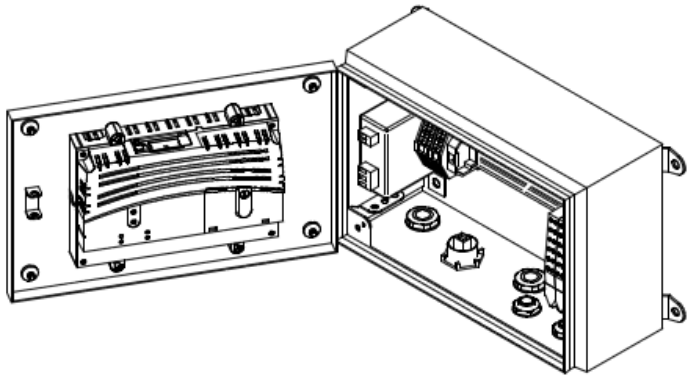
Analogical output (0 – 10V ou 4 – 20 mA)

Relay output 1 and 2

3. DIMENSIONS







4. TECHNICAL CHARACTERISTICS

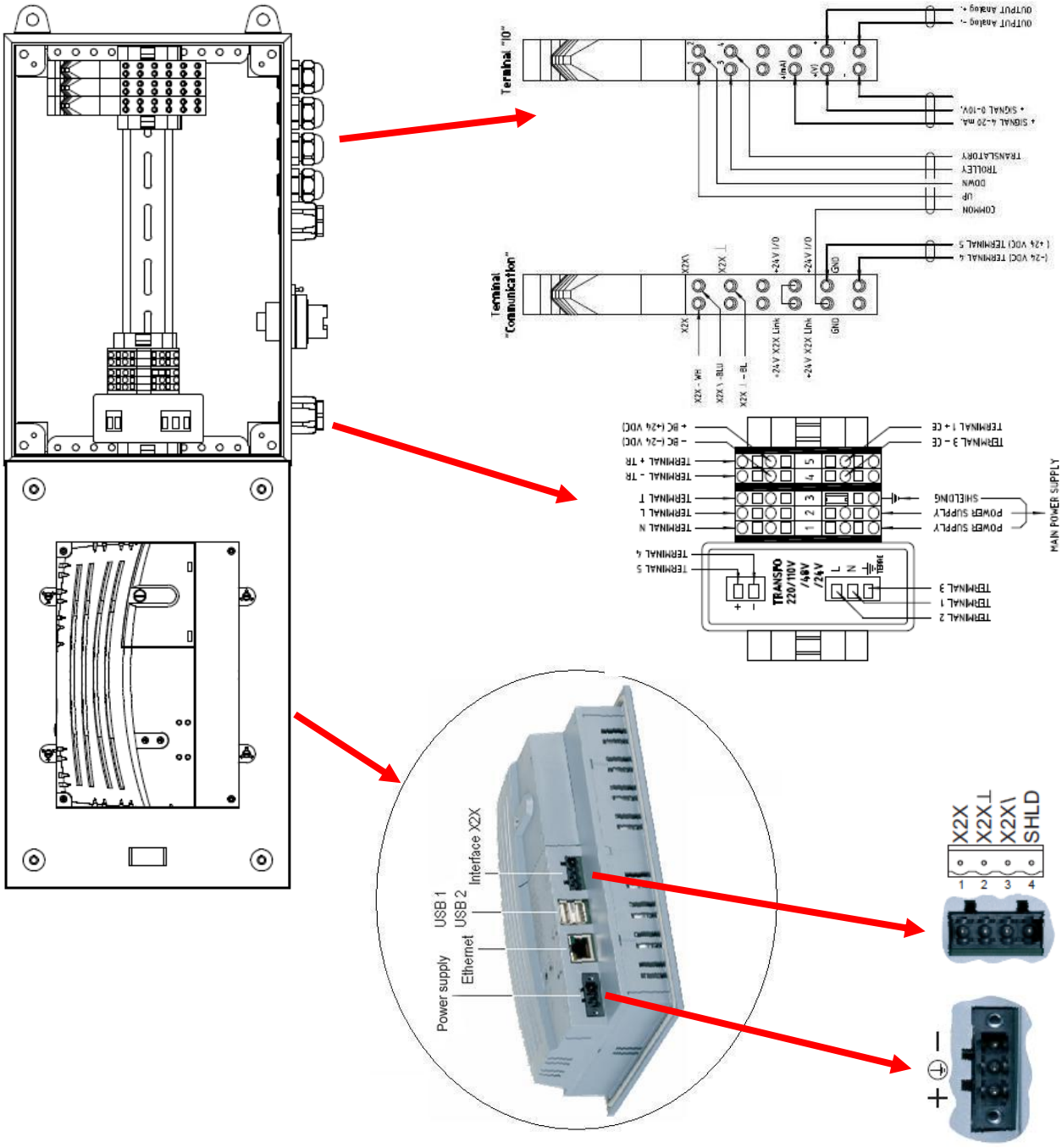
4.1. Generale

4.1.1. Screen	5.7" LCD touch screen
Type	Monochrom LCD
Color	8 levels of grey
Resolution	QVGA, 320 x 240 pixels
Diagonal	5.7"
Luminosity	140 cd/m²
4.1.2. Keys	
Amount	10
4.1.3. Interfaces	
USB	1 x USB 2.0, type A connection
Ethernet	RJ 45 Twisted Pair (10 / 100 BaseT)
4.1.4. Supply	
Power supply	24 VDC ± 15%
4.1.5. General information	
Power consumption	Max. 600 mA ou 13 W
Certification	CE, C-UL-US, GOST-R
4.1.6. Operating conditions	
Operating temperature	0 to +50°C
Humidity	10% to 90%
Ingress protection	IP65

4.2. Input/output specifications

4.2.1. Analogic input	
1 analogical entry	0 - 10 V or 0 - 20 mA
Resolution	12-bit
4.2.2. Analogic output	
1 analogical output	0 - 10 V or 0 - 20 mA
Resolution	12-bit
4.2.3. Digital entries	
4 digital entries	Type – potential free
Commutation tension	24 VDC (commutation set point)
4.2.4. Power relays	
2 power relays	Normaly open and closed(230 VA / 5A, 30 VDC / 5A)
Channel insulation	yes
Commutation capacity	Minimum : 10 mA / 5 VDC Maximum : 180 W / 1500 VA
Electrical insulation	yes

5. WIRING


Terminal "RELAY"
Terminal "IO"
Terminal "Communication"
MAIN POWER SUPPLY
Interface X2X
USB 1
USB 2
Ethernet
Power supply
X2X
X2X⊥
X2X\
SHLD
1 2 3 4

5.1. Remarks on wiring

- Digital entries (DI1 à DI4) : Change of condition when 24VDC is exceeded.
- Relay outputs : Manual relay disabling possible (if related alarm is reset) by pushing on « alarma reset » button on main screen.
- Analogical output (AO 1) : Varies in function of SWP evolution.

Reminder :

SWP = Safety Work Period

The SWP allows calculation the maintenance interval of the crane, taking into account actual lifted loads.

- Method of calculation :

$SWP = D - \Sigma\ K^{3}_{1}\ Ti$

Example

$$= 10.000\ h - \left[\frac{\text{Live load} + \text{dead weight}^{3}}{\text{Nominal load}} \right] \text{X time}$$

- Output behaviour :

Low scale (0V or 4 mA) → -11% of D
10 % of the scale (1V or 5,6 mA) → 0 of D
Full scale (10V or 20 mA) → 100% of D

- Example :

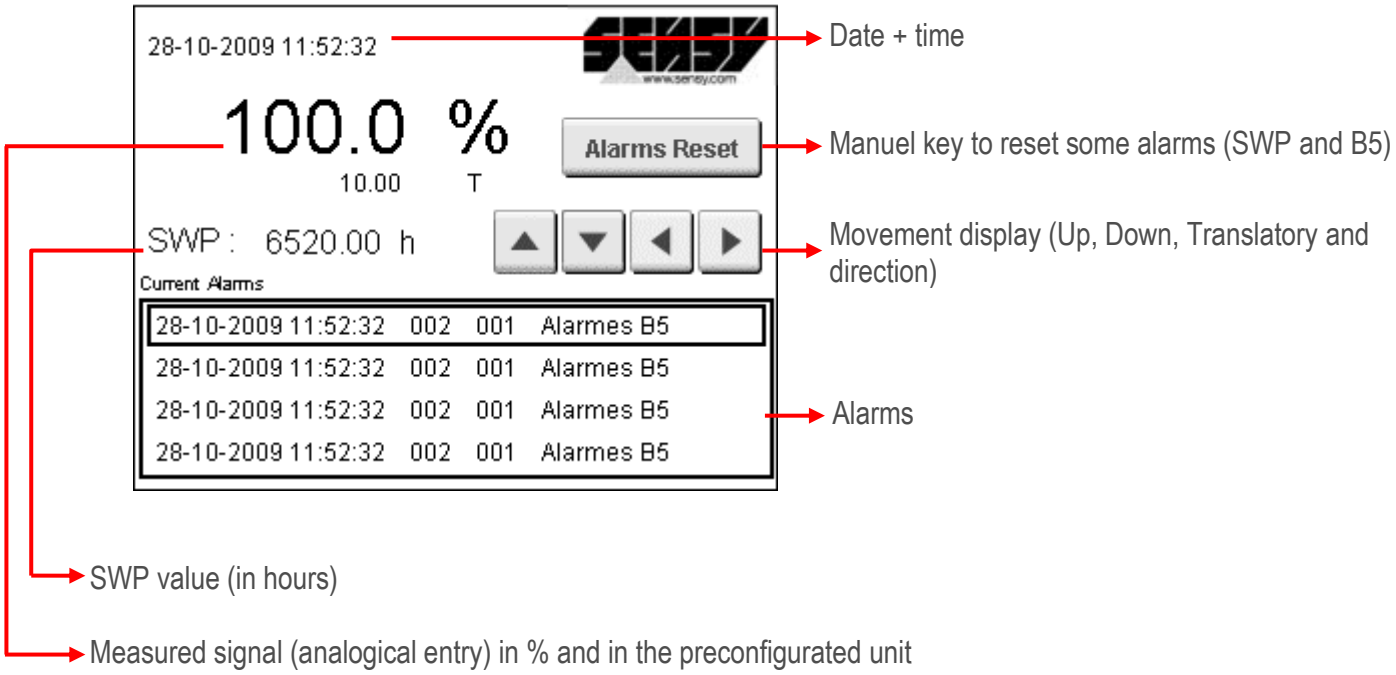
Valeur D (H)	Signal sortie analogique (V)
10000	10
0	1
-1110	0

6. FUNCTIONALITIES

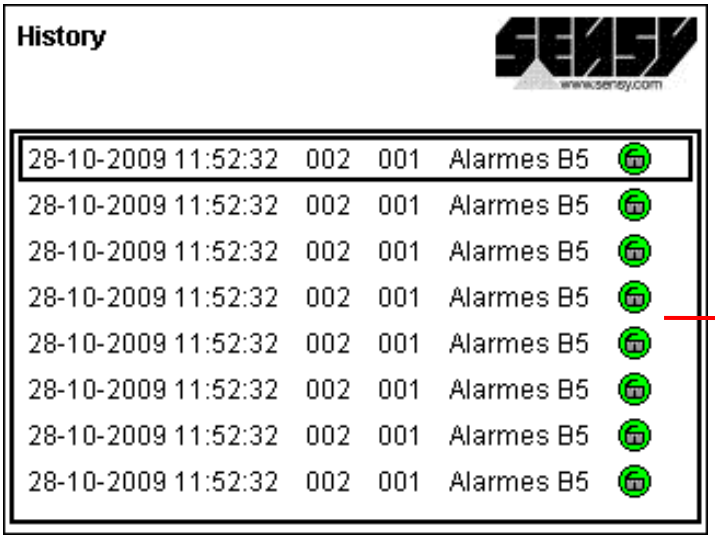
COACH-II has 10 keys :

7. SCREENS DESCRIPTION

7.1. Main screen (F1)



7.2. Alarms historic's screen (F2)



Display of the historic (alarms, files creations, restart,….)

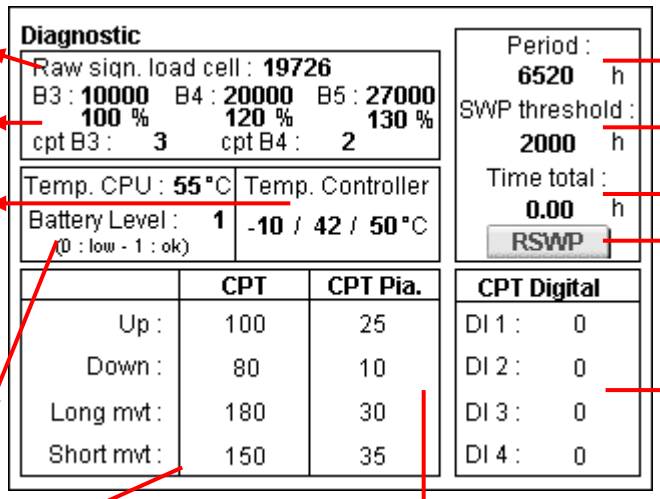
Shape : Date / Time / Action description

If displayed :

- Open padlock: Alarm reset
- Closed padlock: Apparition of the alarm

Possibility to page through the historic :
Touch the screen, this window appears
Use UP and Down arrows to page through.
Touch « X » to get out of historic.

7.3. Diagnosis screen (F3)



Load cell signal (0 – 32768)

Alarms : B3, B4 and B5 + counter B3 - B4

Temp threshold
Min : -10 C
Max : 50°C
Ambiant T° : 42°C
CPU temperature

Battery Level

Period of use - SWP

SWP threshold

Current SWP

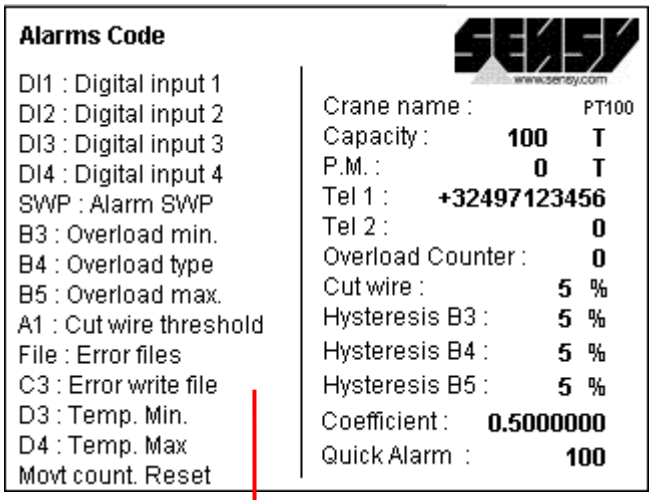
SWP reset

Digital alarms counter

Movement counter :
Up movements
Down movements
Translatory movements
Direction movements

Inching Up movements
Inching Down movements
Inching Translatory movements
Inching Direction movements

7.4. Alarms codes screen (F4)

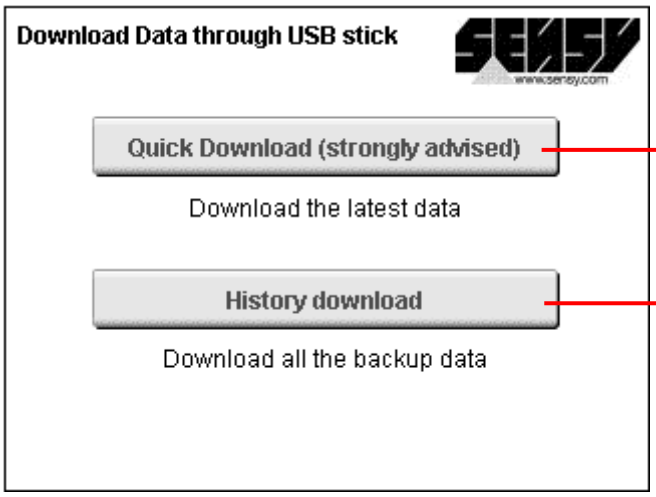


Name of the crane
Capacity (in Kg – can be T)
Dead weight (Kg)
Telephone nr. (optional)
Telephone nr. (optional)
Overload counter
Cut off threshold (ex: 4 mA)
Hysteresis

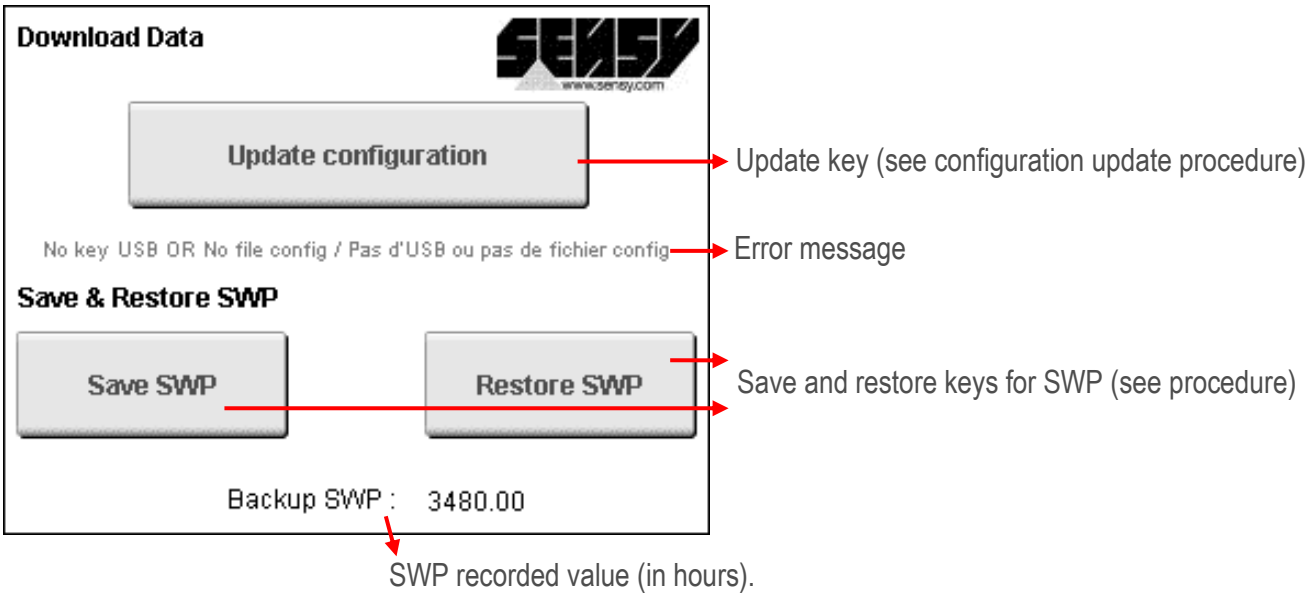
Calibration coefficient
Number of lines in the alarm file at quick download

See error codes glossary + description

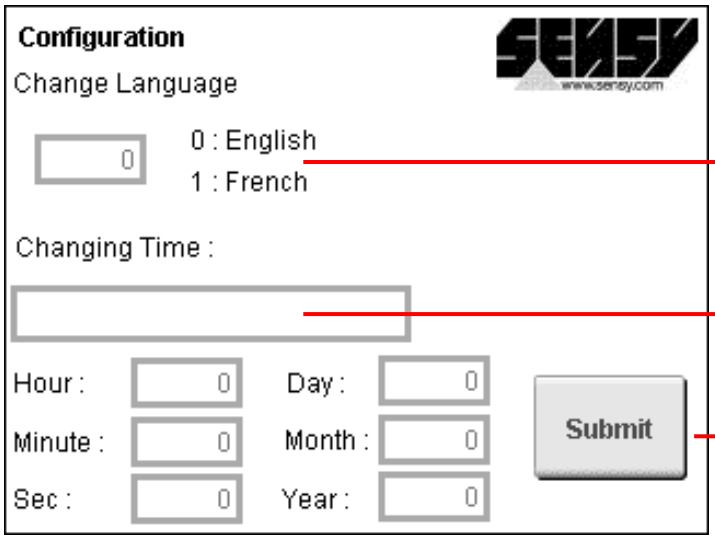
7.5. Data's download screen (F5)



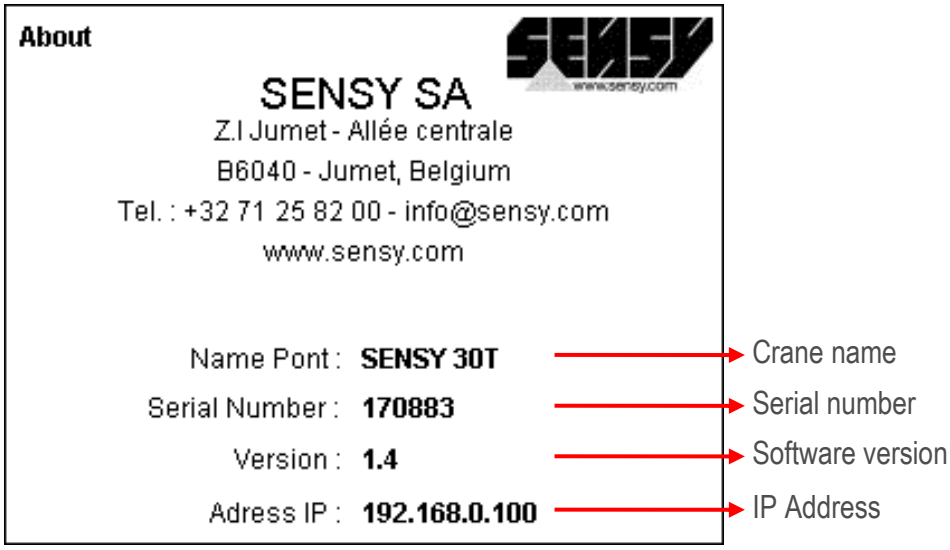
7.6. Configuration update screen (F6)



7.7. Date, time, language configuration screen (F7)



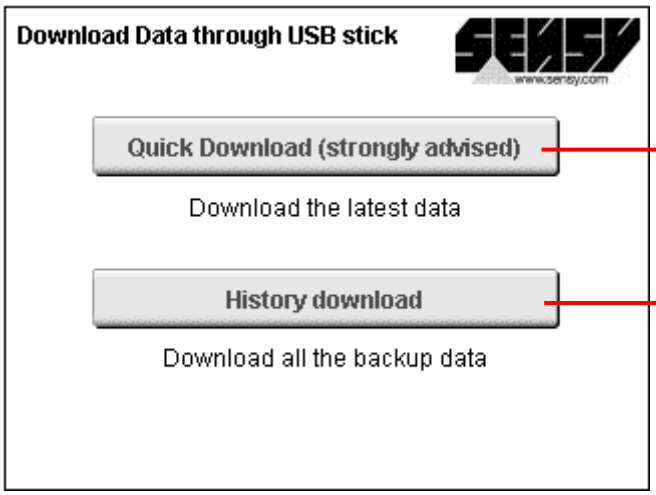
7.8. Contact/information screen (F8)



8. USB TRANSFER PROCEDURE

8.1. Data's upload/download

- Place USB stick at connection point
- push on F5
- Press key :



Quick download : Download the latest data

History download : Download all the backup data

- Wait for data's copy/ display of WAIT message
- Pull out USB stick
- Informations are on USB stick directory: DATA\ Date + recording time\.....)

Remark :

Recording is not possible in case of short movement.

8.2. Update configuration file

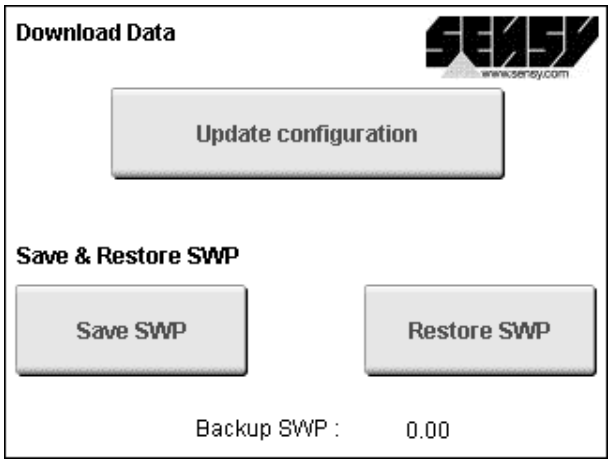
For each configuration file update through USB stick, please follow hereunder.
COACH-II searches a directory (DATA\UPLOAD\Crane name) with the same crane name as present one in the configuration file. If the directory exists, it's going to use the file under the corresponding name.
Once the update is done, power off/on to reboot COACH-II.

```
« DATA »
    « UPLOAD »
        « XD0 230605 1741 »   // Configuration file for the update
        « ALL »               // Default configuration file
```

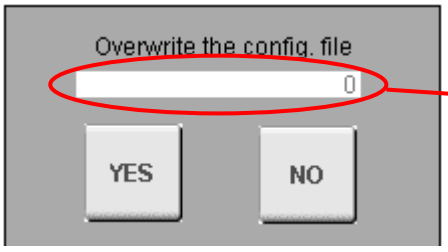
If the crane name in the configuration files matches to the corresponding crane, the configuration file will be replaced by the new one.
This way, it is possible to load the configuration files of several cranes on the same USB stick.

Remark :
If no directory with crane name is available, COACH-II will check in « ALL » directory (default configuration file).

8.2.1. Transfer procedure



- Place USB stick
- Push on F6 key
- Push on Update configuration
- COACH-II searches for a configuration file. If no file, error message. If file is detected, request for « file crushing" confirmation.



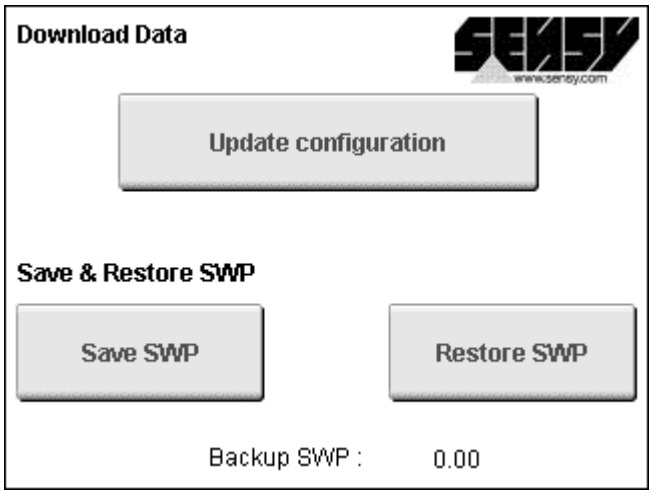
Display of crane name file or default file « ALL »

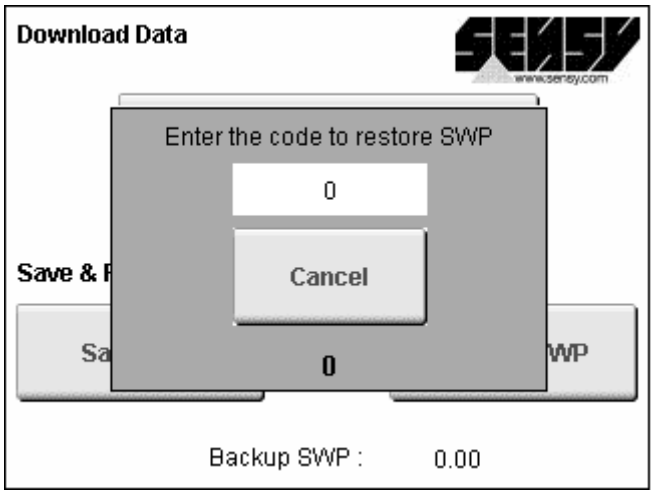
Never forget to cut off COACH-II after downloading for rebooting with new configuration.

8.3. SWP save/restore

When software is updated, some values are set back to « 0 ». In order to avoid loss of informations, it is necessary to connect USB stick and save data's. After software update, you'll need to upload saved data's to restore the values.

8.3.1. Procedure





Save :
- Place USB stick
- Push on F6 key
- Push on Save SWP key

Restore :
- Place USB stick
- Push on F6 key
- Push on Restore SWP key
- In order to avoid accidental data « crushing », password will be required.
- If password is correct, update message will appear.

Password = 7

Backup SWP: saved SWP value

Remark :
Saved data's will be recorded on the USB stick, in swp.txt and config.txt files (in root directory).

8.4. Compact Flash

128Mo Compact Flash is installed and acting like hard disk drive of COACH-II.

Remark :

- Before first start of the system or during formatting of the Compact Flash , it is mandatory creating a Config repertory and put in the different configuration files + one Quick \ Details repertory.
- For an optimal operation, we recommend changing the Compact Flash every 3 years.

8.5. Downloaded files structure

Several files will be present on the Compact Flash or the USB stick:

- Details + date: this file contains the different movements, inchings and counters of one day of operation.
- Alarms + month and year: this file contains all alarms (see alarms chapter) that occurred during the concerned month.
- Memorization + year : this file contains hour after hour recordings of movement amounts and their duration, the inchings, free entries counters, alarms amounts, overloads amounts, SWP and the different steps of the load spectrum.

« DATA »
« DOWNLOAD »
« XD0 230605 1741 » *// Creation of « Crane name + date + hour » file in the « Download » repertory*
« Alarms » files *// Files containing all alarms that occurred*
« Details » « Details » files *// Repertory with all data's file*
« Memorization » file

« CONFIG » *// Repertory with all configuration files*
Current configuration files *// copy of all configuration files*
Current « variables » files (Recovery of SWP, counters, etc.. values)

Remark :
The quantity of data's to be downloaded will determine the download duration, it can take several minutes.

9. TECHNICAL APPENDIX

9.1.1. Details file description

Example :

U	0	5683	1/09/2007 14:59	30	3000	29	3600	4976

- Movement :
  - U – Up
  - D – Down
  - G – Movement of the trolley
  - T – Translatory movement of the crane
- 0 or 1 : 0 : no inching / 1 : inching
- Movement counter:

During combined movements, this counter won't be incremented, in order to allow viewing the amount of movements from which the combined movements is made.
This counter is put back to "0" every day at midnight.

- Day and date of movement.
- Force peak.
- Peak apparition: XXX ms movement begin.
- Signal's average value.
- Movement duration.
- SWP.

Combined movements:

S	0	5773	01/09/2007 20:28:50	46	4000	0	1600	4976
S	1	5773	01/09/2007 20:29:19	46	4000	0	6800	4976
U	0	5773	01/09/2007 20:28:44	46	4000	46	99890	4976

This example of combined movement shows an Up movement (99,8 seconds) + translatorys movs (1,6 seconds + 6,8 seconds).
Remark : As translatory movements stop earlier than Up movement, they appear before the Up movement.

9.1.2. Memory files description

Example :

2/09/2007	0:00:00	19	287	30	258	14	325	0	0	5	69	6	46	7	208	0	0	0
0	0	0	0	0	0	0	0	8	4976									

- Date
- Hour memorization
- Total amount of movement : Down
- Total duration of movement : Down
- Total amount of movement : Direction
- Total duration of movement : Direction
- Total amount of movement : Up

- Total duration of movement : Up
- Total amount of movement : Translatory
- Total duration of movement : Translatory
- Total amount inchings movement : Down
- Total inching time movement : own
- Total amount inchings movement : Direction
- Total inching time movement : Direction
- Total amount inchings movement : Up
- Total inching time movement : Up
- Total amount inchings movement : Translatory
- Total inching time movement : Translatory
- TTL1 amount (optional)
- TTL1 total time (optional)
- TTL2 amount (optional)
- TTL2 total time (optional)
- TTL3 amount (optional)
- TTL3 total time (optional)
- TTL4 amount (optional)
- TTL4 total time (en op optional tions)
- B4 alarm amount
- Total alarms amount : except B3, B4, B5 alarms
- SWP

9.1.3. Alarms file description

Example 1 :

```
19.08.09 16:15:38 1      5      Alarms B3   nA     1
19.08.09 16:15:38 1      6      Alarms B4   nA     1
19.08.09 16:15:38 1      12     Alarms D4   nA     1
```

Apparition B3, B4 and B5 alarms at 16:15:38 on 19/08/2009.

Example 2 :

```
19.08.09 16:15:51 1      7      Alarms B5   nA     1
19.08.09 16:15:52 1      7      Alarms B5   nA     0
```

Apparition (1) of B5 alarm at 16:15:51 on 19/08/2009.
Reset or end of alarm B5 at 16:15:52 on 19/08/2009.

9.2. Configuration file description

File generated by CoachView assistant (config_pont.txt)

```
SENSY1              // Crane name
200000              // Nominal capacity of the crane
15000               // Not used
1500                // Dead weight (Kg)
+320497123412       // SMS sending list
+3204971234         //
0.0                 // « 0 » load signal calibration (volts or mA) or 0%
10.0                // Full capacity calibration or 100%
```

```
0                   // Display at « 0 » load
100000              // Full load display
1                   // Cut cable set point
5                   // Amount of time to cross B3 before tripping B3 alarm
2000                // Minimum SWP value before tripping SWP alarm (hours)
10000               // B3 set point (brut signal)
20000               // B4 set point (brut signal)
30000               // B5 set point (brut signal)
2000                // Hysteresis
10                  // Minimum temperature set point (°C)
50                  // Maximum temperature set point (°C)
1                   // Coefficient
10000.0             // Theoretic period of use of the crane at full load(hours)
Not used
Not used
Not used
Not used
00                  // TTL1 Alarm
00                  // TTL2 Alarm
00                  // TTL3 Alarm
00                  // TTL4 Alarm
01                  // SWP Alarm
00                  // B3 Alarm
00                  // B4 Alarm
01                  // B5 Alarm
01                  // Cut wire alarm (load signal lost)
00                  // File error alarm
00                  // Writing error alarm
00                  // Min. Temperature Alarm
00                  // Max. Temperature Alarm
00                  // Reset movement counter alarm
00                  // « Not used » Alarm
```

Remark :

00 : If alarm appears → no sms sending/ nor relay tripping.
10 : If alarm appears → sms sending/ no relay tripping.
01 : If alarm appears → no sms sending / relay tripping.
11 : If alarm appears → sms sending + relay tripping.

9.2.1. Alarms / error codes

A1 : Load cell signal not correct (lower than minimum set point)
B3 : B3 set point crossing(minimum overload)
B4 : B4 set point crossing (intermediate overload)
B5 : B5 set point crossing (maximum overload)
C3 : Files writing Error
D3 : Temperature lower than minimum set point
D4 : Temperature higher than maximum set point
DI 1, 2, 3, 4 : Free entries Alarm TTL 1, TTL 2, TTL 3 et TTL 4
E2 : SMS sending error
F5 : RS232 Communication error
FILE : File error
SWP : SWP Alarm

9.2.2. Error codes glossary

A : Load cell problem
B : Alarm
C : Software problem
D : General hardware problem
E : SMS module problem
F : Communication problem

9.3. Load spectrum

COACH-II splits analog signal entry in steps.

- Signal between 0 (ou negative) and 5 % = 1° step
- Signal between 6 and 32 % = 2° step
- Signal between 33 and 66 % = 3° step
- Signal between 67 and 100 % = 4° step
- Signal between 101 and 110 % = 5° step
- Signal between 111 and 120 % = 6° step
- Signal above 120 % = 7° step

Recorded values are times obtained by steps and given in seconds.
These values can modified in the analysis software COACH VIEW.

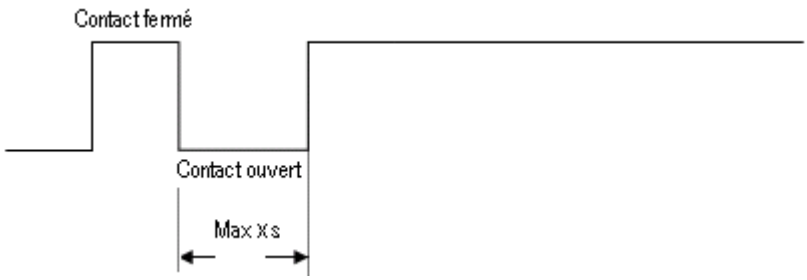
9.4. Temperature sensors

COACH-II has 2 temperature sensors :

- One for the inner temperature of the unis (screen).
- One for the CPU temperature.

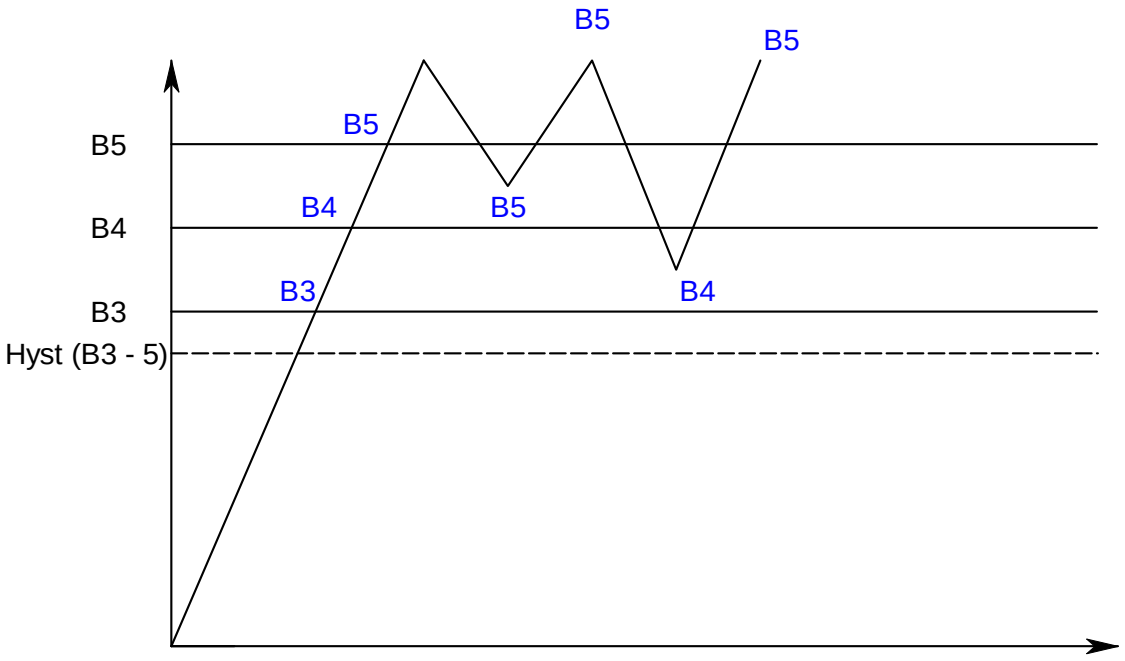
10. INCHING DEFINITION

Movement inching counters will be incremented when the period between 2 contacts is lower than 2 seconds.



11. ADVANCED FUNCTIONS

11.1. Alarm tripping mechanism



When the load cell signal crosses a set point (B3, B4, B5), related alarm trips. For resetting it, it is necessary that the signal goes below the set point. In present example, resetting B5 alarm implies that it needs to go lower than B4 set point.

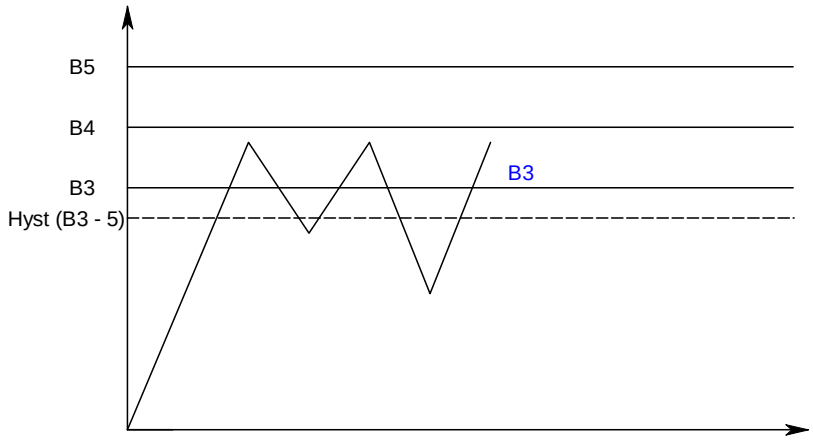
Remark :
For resetting B3 alarm, it requires to go below B3 - hysteresis.

11.2. Creation of memory file from details file

- When one hour is finished, COACH-II analyses the recording of the file. Then, it sums all recorded lines for which the movement time is before the time of analysis. When date changes, COACH-II goes back in details file of the day before.

- If COACH-II is cut off between 2 hours, when restarting, it will create the file of previous hour.

11.3. Overload counter (B3)



It is necessary, in this example, to cross B3 at least 3 times (see MaxCptSurcharge variable = 3 – config_pont file) in less than one hour to get alarm B3 tripping.

Remark :

- This counter is reset if B4 set point is crossed.

11.4. Wires connection – only 5 wires are required.

4 wires for the different movement and one common wire for grounding.

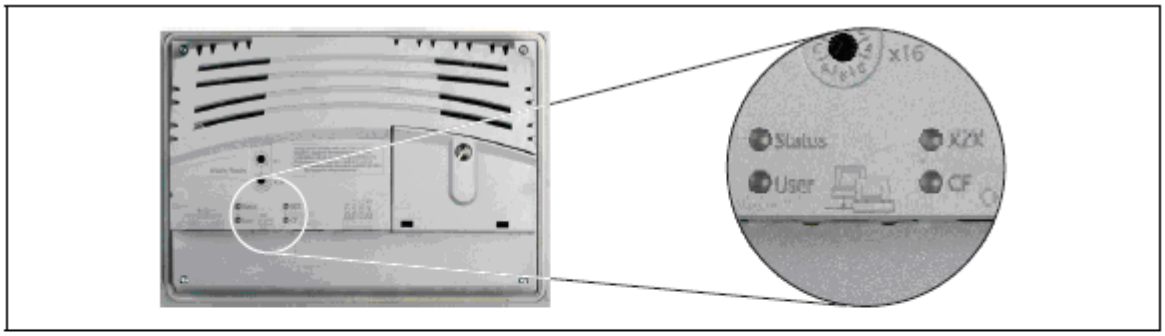
11.5. Archiving

In order avoiding Compact Flash available space saturation, COACH-II has an archiving system.

The system erases the files exceeding a precise date.

- Detail files: archiving of files above 200 days.
- Alarms file, no archiving.
- Traces file, no archiving.
- Memory file, no archiving.

12. TERMINAL BLOCKS LEDS SIGNIFICATION



LED	Color	Status	Description
Status	Red	On	Error / Reset
	Green	On	RUN
	Orange	On	Boot, Service or Diagnostics mode
	Green on / Orange blinking		RUN, battery not OK
User	Green	-	This LED can be operated by the user (with the AsHW library). This function is supported by Automation Runtime starting with Version N2.90 / A2.92.
X2X	Orange	On	The module sends data via the X2X Link interface.
CF	Orange	On	Access to the CompactFlash card

Figure	LED	Color	Status	Description
	r	Green	Off	Module supply not connected
			Single flash	Reset mode
			Blinking	Preoperational mode
			On	RUN mode
	e	Red	Off	Module supply not connected or everything is OK
			Double flash	Indicates one of the following conditions: • X2X Link power supply is overloaded • I/O supply too low • Input voltage for X2X Link supply too low
	e + r	Steady red / single green flash		Invalid firmware
	X	Orange	Off	No communication at the X2X Link
			On	X2X Link communication in progress
	I	Red	Off	X2X Link supply in the acceptable range
			On	X2X Link power supply is overloaded Solution: Use an additional feed module PS3300

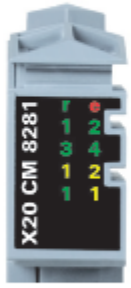
Figure	LED	Color	Status	Description
	r	Green	Off	Module supply not connected
			Single flash	Reset mode
			Blinking	Preoperational mode
			On	RUN mode
	e	Red	Off	Module supply not connected or everything is OK
			Single flash	Warning / error for an I/O channel. Level monitoring for digital outputs has been triggered.
	e + r	Steady red / single green flash		Invalid firmware
	1 - 4	Green		Input status of the corresponding digital input
	1 - 2	Orange		Output status of the corresponding digital output
	1	Green	Off	Open connection or sensor is disconnected
			Blinking	Overflow or underflow of the input signal
			On	The analog/digital converter is running, value is OK
	1	Orange	Off	Value = 0
			On	Value ≠ 0

Figure	LED	Color	Status	Description
	r	Green	Off	Module supply not connected
			Single flash	Reset mode
			Blinking	Preoperational mode
			On	RUN mode
	e	Red	Off	Module supply not connected or everything is OK
			On	Error or reset state
	e + r	Steady red / single green flash		Invalid firmware
	1 - 2	Orange		Output status of the corresponding digital output