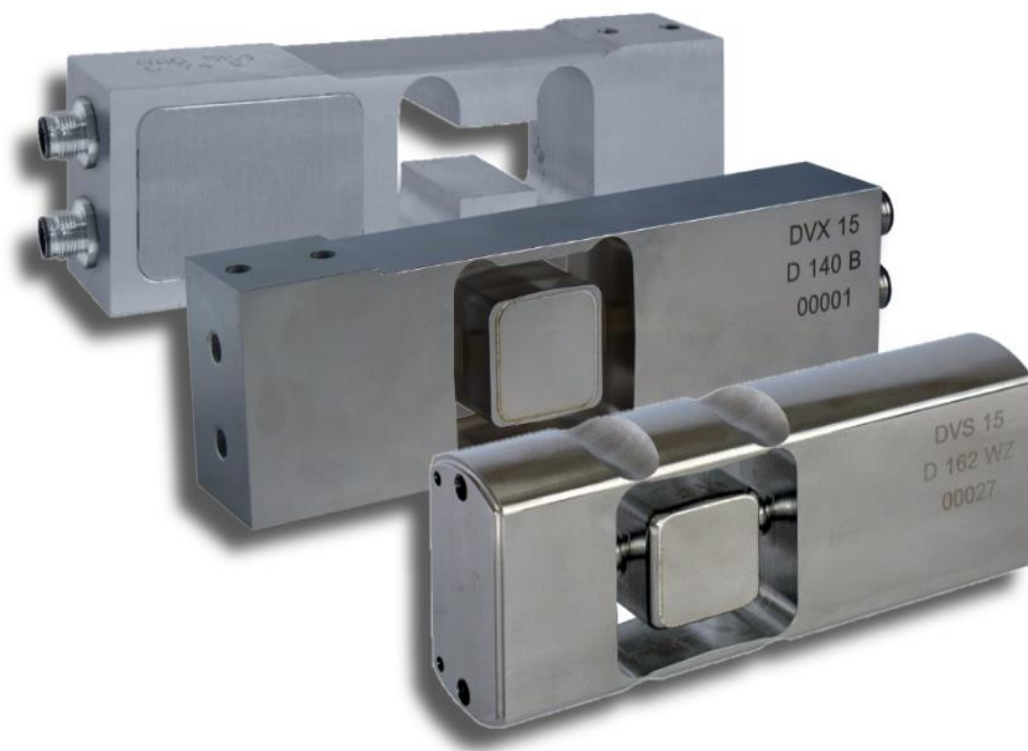


SCMBus communication protocol



Document revisions		
version	date	description
A	12/09	- Document creation
B	01/13	- Include AAD and V2.01 modifications
C	04/17	- V 2.03 firmware new Feed mode (CF / CF + FF) - Add DVX-D and DVS-D

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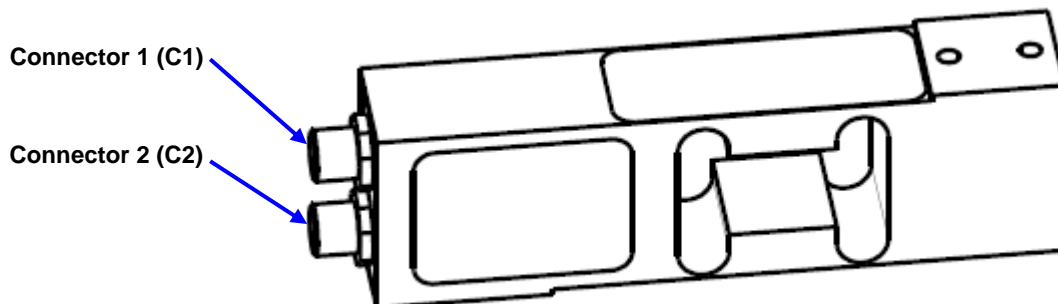
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1 INSTALLATION

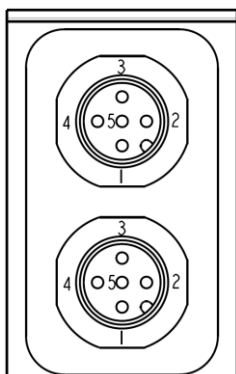
1.1 Connection to RS485 bus

Digital load-cell is equipped with a **RS485** (half-duplex) interface using **Modbus-RTU** and **SCMbus** communication protocols.

Digital load-cell can be connected to a RS485 bus using **TA/RA** and **TB/RB** connections which are differently located depending on the load-cell version :

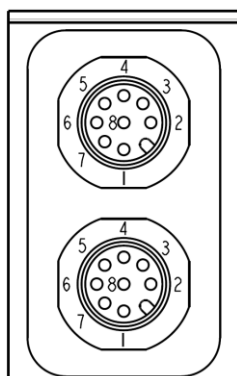


➤ 2 x 5-pins connectors version :



- **TA/RA** : pin 4 of C2 connector
- **TB/RB** : pin 5 of C2 connector

➤ 2 x 8-pins connectors version :



- **TA/RA** : pin 7 of C1 connector
- **TB/RB** : pin 8 of C1 connector

Note : Digital load-cell is also equipped with a CAN2.0A interface. After a reset (hardware or software), digital load-cell automatically communicates through the CAN interface. As soon as a Modbus-RTU or SCMbus valid frame is received on RS485 interface, digital load-cell automatically switches into RS485 communication mode.

By default, the baud rate for RS485 communication is **9600 bauds** and address is **01_H** . It can be modified during sensor setting up phase with **eNodView** software.

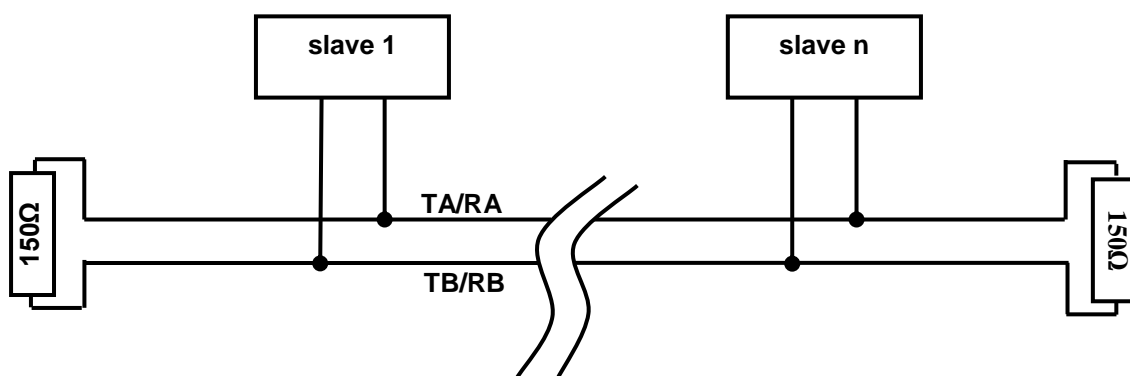
1.2 Topology, bus length and communication baud rate

Network topology is a bus topology with resistors at each end (120 Ohms preferably).
Maximal length of the bus depends on cable quality and baud rate, see following table :

Bit rate	Max bus length
115.2 kbit/s	600 m
57.6 kbit/s	1200 m
38.4 kbit/s	1200 m
19.2 kbit/s	1200 m
9.6 kbit/s	1200 m

Note :

- Table corresponds to a bus made with a shielded cable and twisted pair conductors section $\geq 0.22\text{mm}^2$ (24AWG).
- For bus whose length is greater than 200m, using optocoupler is recommended.
- Line termination :



2 USING SCMBUS COMMUNICATION PROTOCOL :

2.1 Byte format:

- Format :

- 1 start bit
- 8 data bits without parity
- 2 stop bits

- ASCII bytes:

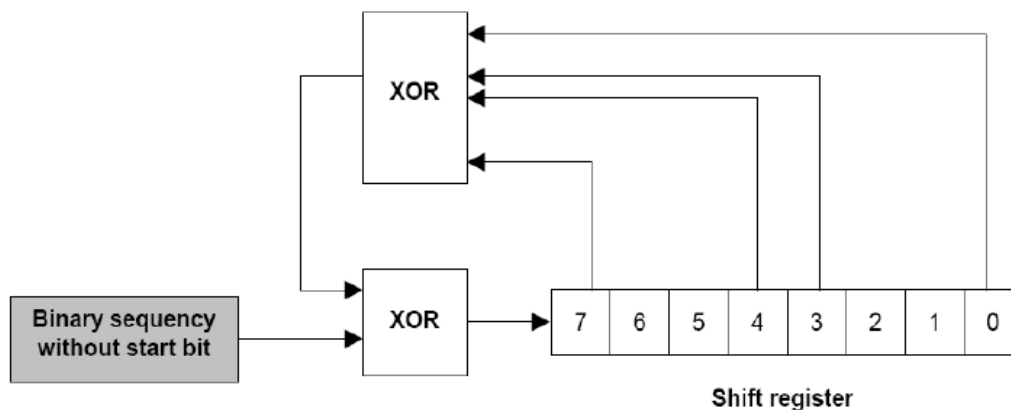
ASCII numeral characters (30_H,...39_H) and ASCII hexadecimal characters (3A_H,...3F_H).

- CRC byte :

Generated by the following polynomial :

$$G(x) = x^8 + x^7 + x^4 + x^3 + 1$$

The CRC-8 polynomial result can be determined by programming the algorithm corresponding to the following diagram :



- ❑ **Note :** The frame error detection can be ignored. Value **0xFF** of the CRC-8 always is admitted by digital load-cell and a received frame which is ended by such CRC-8 is considered as a frame without any error.

2.2 Frame format :

- Transmission organisation :

- * Frame : Address first.
- * Bytes : lsb first.
- * Multi-bytes data type : MSB first.

2.2.1 **Functioning commands, writing commands :**

Request :

Address	Command	Value	CR	CRC
1 Hex byte	1 Hex byte (command)	N ASCII hex bytes	1 ASCII byte (0D _H)	1 Hex byte

Response :

Each functioning command or writing command is acknowledged by the send back of the same frame as received or an error message.

Address	Command	Value	CR	CRC
1 Hex byte	1 Hex byte (command)	N ASCII Hex bytes	1 ASCII byte (0D _H)	1 Hex byte

2.2.2 Reading commands :

Request :

Address	Command	CR	CRC
1 Hex byte	1 Hex byte (command)	1 ASCII byte (0D _H)	1 Hex byte

Response :

Address	Command	Value	CR	CRC
1 Hex byte	1 Hex byte (command)	N ASCII Hex bytes	1 ASCII byte (0D _H)	1 Hex byte

2.2.3 Transmit measurement command :

Request :

Address	Command	CR	CRC
1 Hex byte	1 Hex byte (command)	1 ASCII byte (0D _H)	1 Hex byte

Response :

- *standard format* :

Address	Status	Value	CR	CRC
1 Hex byte	2 Hex bytes	N ASCII Hex bytes	1 ASCII byte (0D _H)	1 Hex byte

- *fast format* :

This specific format is especially dedicated to very fast measurement transmission. We recommend using the **eNodView** software with this format to save acquisition files. These files can be used for dynamic analysis. It allows the user to define the best settings in relation with his application.

This frame is specific, and it can only be applied to gross measurement, net measurement or A/D converter points in transmitter mode :

STX	Status word	Value	Cks	ETX
02 _H	2 Hex bytes	3 signed Hex bytes (2's complement)	Σ of previous bytes and b7 set to 1	03 _H

Measurements encoding : Because values are encoded in signed hexadecimal bytes format (2's complement) some bytes can be equal to **STX (02_H)** or **ETX (03_H)** or **DLE (10_H)** so before those specific bytes values a **DLE (10_H)** byte is inserted. Sensor address is not transmitted in the frame.

- ⇒ The frame starts with **STX (02_H)** byte and ends with **ETX (03_H)** byte
- ⇒ Values are encoded in **signed hexadecimal**
- ⇒ Checksum is obtained by summing every previous bytes and setting bit 7 to 1.

Status bytes :

bits b15,...b0	Function	Notes
b1, b0		
00	gross measurement	
01	net measurement	
10	A/D converter points	
11	tare value	
b3,b2		
00	measurement within the admissible range	causes an output assigned to ' <i>defective measurement</i> ' function to be set active
01	negative overloading	
10	positive overloading	
11	analog signal out of range	
bit b4		
0	motion	causes an output assigned to ' <i>motion</i> ' function to be set active
1	no motion	
bit b5		
0	measurement out of the zero ¼ of division	
1	zero in the ¼ of division	
bit b6		
0	EEPROM OK	
1	EEPROM failure	
bit b7		
1	reserved	
bit b8		
0	input 1 low level	input 1 logical state
1	input 1 high level	
bit b9		
0	input 2 low level	input 2 logical state
1	input 2 high level	
bit b10		
0	output 1 low level	output 1 logical state
1	output 1 high level	
bit b11		
0	output 2 low level	output 2 logical state
1	output 2 high level	
bit b12		
0	output 3 low level	output 3 logical state
1	output 3 high level	
bit b13		
0	output 4 low level	output 4 logical state
1	output 4 high level	
bit b14		
0	no tare	
1	At least a tare has been processed	
bit b15		
1	reserved	

2.3 Exception frame :

Address	Error code	CR	CRC
1 Hex byte	1 Hex byte (command)	1 ASCII byte (0D _H)	1 Hex byte

Error codes :

Error code	Name	Description
FE _H	unknown command	Requested command is not supported by sensor
FF _H	error during command execution	ex. : write network forbidden address

3 **FUNCTIONAL COMMANDS :**

3.1 **Functional commands with N = 0**

Command	hexa. Code	Description
reset	D0_H	⇒ similar to power-up reset
EEPROM storage	D1_H	⇒ save the whole settings table into the sensor's EEPROM
restores sensor default configuration	D2_H	⇒ WARNING : all default settings are recovered including the calibration
set to zero gross measurement	D3_H	⇒ needs measurement stability, if not reached after 5 second, command is cancelled ⇒ this new zero value is the new current value, but it is not stored into EEPROM ; limited to $\pm 10\%$ range of the maximum capacity or $\pm 2\%$ in legal for trade functioning
tare request	D4_H	⇒ needs measurement stability, if not reached after 5 seconds, command is cancelled
abort calibration	D6_H	⇒ allows to leave the calibration procedure before it ends
User's span adjustment	D7_H	⇒ must be followed by the 'save calibration' command
zero adjustment	D8_H	⇒ must be followed by the 'save calibration' command ⇒ OR by the 'physical calibration' command
save calibration	DE_H	⇒ stores the calibration parameters into EEPROM
clear	DF_H	⇒ stops current dosing cycle and resets all the calculated variables linked to dosing cycles
stop continuous transmission	E3_H	⇒ stop transmitter (see note §3.2)
start dosing cycle	E4_H	⇒ starts a dosing by filling or dosing by unloading cycle (depending on the functioning mode) if start conditions are respected
stop cycle	E5_H	* stops the current dosing cycle
cancel tare	E6_H	* erases the current tare value
force output 1 level	E7_H	⇒ transmitter functioning mode only if logical output is set to 'programmed mode'. * send this command a first time to activate the corresponding logical output (according to chosen logic), re-send this command to deactivate it and so on
force output 2 level	E8_H	
force output 3 level	E9_H	
force output 4 level	EA_H	
erase max peak value	EB_H	* max peak value is set to actual gross value
physical calibration	EC_H	⇒ must be preceded by 'zero adjustment' command ⇒ the calibration load corresponds to the number assigned to 'calibration load'
Dynamic zero	ED_H	⇒ zero determination without stability criterion calculated during the 'dynamic zero time'

Zero in specified time	F0_H	⇒ Zero set with stability criterion after a calculation time "time for tare determination / result" cf § Erreur ! Source du renvoi introuvable.
Tare in specified time	F1_H	⇒ Tare set with stability criterion after a calculation time "time for tare determination / result" cf § Erreur ! Source du renvoi introuvable.

Note: Zero in determined time: When measure is not stable, zero or tare is set dynamically within the "time for tare determination / result" cf § **Erreur ! Source du renvoi introuvable.** if superior to the value in the follow table. It depends on conversion frequency.

If motion criterion is reach before the determined time, zero or tare is set immediately.

Measures/s	Min time	Measures/s	Min time
6,5	160	7,5	133
12,5	160	15	133
25	120	30	100
50	100	60	83
100	90	120	75
200	85	240	70
400	82,5	480	68
800	81,25	960	67
1600	80,625	1920	67

EEPROM saving:

Writing command, except:

- * Address change
- * Communication rate
- * Protocol and functioning mode
- * AD converter configuration
- * Motion criterion change
- * Calibration coefficient change

are immediately effectives but not saved in EEPROM. It is mandatory to execute the EEPROM save command to save configuration.

EEPROM number of cycle is limited to 1 000 000 cycle, so it is recommended not to execute save command after each configuration change.

3.2 Functional commands with N = 5 :

Command	Hex. Code	Description
start gross measurement continuous transmission	E0_H	⇒ gross measurements are transmitted for a duration equal to the transmitted ASCII value coded on N = 5 ⇒ measurement transmission rate is defined by the ' <i>sampling period</i> ' setting
start net measurement continuous transmission	E1_H	⇒ net measurements are transmitted for a duration equal to the transmitted ASCII value coded on N = 5 ⇒ measurement transmission rate is defined by the ' <i>sampling period</i> ' setting
start A/D converter points continuous transmission	E2_H	⇒ A/D converter points measurements are transmitted for a duration equal to the transmitted ASCII value coded on N = 5 ⇒ measurement transmission rate is defined by the ' <i>sampling period</i> ' setting

Note : Each of the 3 commands theoretically can be stopped by the command '*stop continuous measurement transmission*' (E3_H) before the end time has elapsed. Because of half-duplex communication limitations, a collision is possible and the '*stop continuous measurement transmission*' command might be ignored.

4 **READING/WRITING COMMANDS LIST :**

Writing commands are generally associated to a reading command. Both are completed by a coded value up to N bytes. See the commands description the corresponding §.

Command	Writing hex codes	Note	Reading hex codes
Communication settings			
communication protocol, functioning mode and signal processing	21 _H	N = 2	20 _H
Sensor address	23 _H	N = 1 (write) N = 3 (read)	22 _H
serial & CAN bus baud rate selection	25 _H	N = 2	24 _H
Calibration settings			
calibration load	49 _H	N = 7	48 _H
span adjusting coefficient	39 _H	N = 7	38 _H
maximum capacity	41 _H	N = 7	40 _H
scale interval	43 _H	predefined values	42 _H
gravity coefficient (g)	45 _H	N = 8	44 _H
User scale coefficient	0C _H	N = 8	0B _H
User zero calibration	0F _H	In A/D converter points	0E _H
Filtering settings			
A/D converter configuration	51 _H	N = 2	50 _H
Low-pass filter order & band-stop filter activation	53 _H	N = 2	52 _H
low-pass filter 1/A coefficient	55 _H	N = 8	54 _H
low-pass filter B coefficient	57 _H	N = 8	56 _H
low-pass filter C coefficient	59 _H	N = 8	58 _H
low-pass filter D coefficient	5B _H	N = 8	5A _H
low-pass filter E coefficient	5D _H	N = 8	5C _H
band-stop filter X coefficient	89 _H	N = 8	88 _H
band-stop filter Y coefficient	8B _H	N = 8	8A _H
band-stop filter Z coefficient	8D _H	N = 8	8C _H
Logical inputs/outputs configuration			
self-adaptive filter	5F _H	N = 1 (write) N = 2 (read)	5E _H
logical inputs assignment	61 _H	N = 4	60 _H
debounce time	63 _H	N = 5	62 _H
logical outputs 1 & 2 assignment	65 _H	N = 4	64 _H

logical outputs 3 & 4 assignment	67 _H	N = 4	66 _H
set point 4 high value	69 _H	N = 7	68 _H
set point 4 low value	6B _H	N = 7	6A _H
set point 3 high value	6D _H	N = 7	6C _H
set point 3 low value	6F _H	N = 7	6E _H
set point 2 high value	71 _H	N = 7	70 _H
set point 2 low value	73 _H	N = 7	72 _H
set point 1 high value	75 _H	N = 7	74 _H
set point 1 low value	77 _H	N = 7	76 _H
set points functioning	79 _H	N = 4	78 _H
Legal for trade			
metrological version number	-	read only ; N = 5	27 _H
legal for trade switch	81 _H	N = 1	80 _H
legal for trade counter	-	read only ; N = 5	82 _H
legal for trade checksum	-	read only ; N = 5	84 _H
Zero modes	87 _H	N = 1	86 _H
stability criterion	85 _H	N = 1 (write) N = 2 (read)	5E _H
Dosing settings			
target weight	A1 _H	N = 7	A0 _H
start delay	A3 _H	N = 5	A2 _H
final stabilization time	A5 _H	N = 5	A4 _H
coarse feed effect neutralization time	A7 _H	N = 5	A6 _H
coarse feed stopping neutralization time	A9 _H	N = 5	A8 _H
emptying /reloading holding time	AD _H	N = 5	AC _H
motion time out	AF _H	N = 5	AE _H
start cycle options & reloading and emptying modes	B1 _H	N = 2	B0 _H
automatic in-flight weight correction & fine feed restarted	B3 _H	N = 4	B2 _H
in-flight weight value	B5 _H	N = 8	B4 _H
max empty weight	B7 _H	N = 7	B6 _H
min empty weight/residual weight	B9 _H	N = 7	B8 _H
high tolerance	BB _H	N = 5	BA _H
low tolerance	BD _H	N = 5	BC _H

fine feed level	BF _H	N = 7	BE _H
coarse feed level	9F _H	N = 7	9E _H
emptying end level	C1 _H	N = 7	C0 _H
reloading max. level	C3 _H	N = 7	C2 _H
reloading min. level	C5 _H	N = 7	C4 _H
minimal weight variation	C7 _H	N = 5	C6 _H
time interval	C9 _H	N = 5	C8 _H
end of cycle waiting time	CD _H	N = 5	CC _H
max in-flight value	7B _H	N = 6	7A _H
min in-flight value	7D _H	N = 6	7C _H
feed mode	CF _H	N = 1	CE _H
Other settings			
text box	93 _H	N = 2	92 _H
firmware version	-	read only ; N = 5	26 _H
sampling period	CB _H	N = 5	CA _H
Measures			
gross	-	SCMbus standard & fast format	10 _H
tare	-	SCMbus standard & fast format	11 _H
net	-	SCMbus standard & fast format	12 _H
A/D converter points	-	SCMbus standard & fast format	13 _H
dosing result	-	dosing by filling or unloading functioning mode	14 _H
number of processed cycles	-		15 _H
average value	-		16 _H
dosing running total	-		17 _H
standard deviation	-		18 _H
dosing error report	-		1D _H
dosing cycle duration	-	N = 5	9C _H
max peak value	-	N = 8	9D _H
dosing error report	-	N = 4	1D _H

5 COMMANDS DESCRIPTION

The datas accessible through SCMBus communication protocol are described below. For each one, this document specifies its reading or writing command, its particular format and if the data needs storage*.

Data storage* :



- Y : The parameter **must** be saved in EEPROM. Its new value **will be taken into account at the next reset**.
- N : The new value of the parameter is **immediately taken into account** and does not need a storage before.
- **NOTE** : The whole parameters except 'read only' data can be stored into EEPROM in all cases. Then, their values are kept if the power supply is disconnected or if a reset is requested.

5.1 Communication settings :

5.1.1 Communication protocol, functioning mode and treatment :

Reading code	Writing code	N	Data storage *
20 _H	21 _H	2	0

Format/description : Coded according to the following table :

N1, N2		Function	
N1 (W)	N1 (R)	Protocol	
30	00	SCMBus	communication protocol
31	01	Modbus RTU	
33	03	SCMBus fast format	
N2 (W)	N2 (R)	functioning mode	
31	01	dosing by filling	application
32	02	dosing by unloading	
30	00	transmitter	
38	08	fast transmitter*	

* Fast transmitter : in this kind of functioning mode, compared to the '*transmitter*' functioning mode, the digital low-pass, band-stop and self-adaptive filters as well as the set points management are not taken into account.

Note: To apply your change, you have to:

- o Save in EEPROM (command D1)
- o Reset the device(command D0)

5.1.2 Sensor address:

Reading code	Writing code	N	Data storage *
22 _H	23 _H	1Hex format Writing 3 ASCII format reading	Y

Format : Writing : All values between 01_H and FF_H.

Reading : ASCII format on 3 bytes

Default value : 01_H

Description : Sensor address on the network.

Note: 00 is broadcast address. Do not use if several addresses are connected on a network.

To apply your change, you have to:

- Save in EEPROM (command D1)
- Reset the device(command D0)

5.1.3 Serial & CANbus baud rate selection :

<i>Reading code</i>	<i>Writing code</i>	<i>N</i>	<i>Data storage *</i>
24_H	25_H	2	Y

Format/description : Coded according to the following table :

N1	RS485 baud rate	
31	9600	by default
32	19200	
33	38400	
34	57600	
35	115200	
N2	CAN bus baud rate	
32	50000	
33	1250000	by default
34	250000	
35	500000	
36	800000	
37	1000000	

To apply your change, you have to:

- Save in EEPROM (command D1)
- Reset the device(command D0)

5.2 Calibration settings

5.2.1 Calibration load :

<i>Setting</i>	<i>Reading code</i>	<i>Writing code</i>	<i>N</i>	<i>Data storage *</i>
Calibration load	48_H	49_H	from 1 to 7	N

Format : Coded in ASCII (non significant zero are not necessary), admissible values comprised between 0 and 1000000_d.

Default value : 10000_d

Description : *Digital* load-cell span can be adjusted by learning using a known standard load. The equivalence between the standard load and the corresponding number of points is set by the '*calibration load*' value used during the '*physical calibration*' procedure execution.

EEPROM saving needs D1 command.

5.2.2 Span adjusting coefficient :

Reading code	Writing code	N	Data storage *
38 _H	39 _H	7	0

Format : Coded in ASCII (non significant zero are not necessary). The unit is 1/1000000 (1E-6). It means that 1000000_d = 1. Maximum and minimum values are respectively 1100000_d and 900000_d which is corresponding to 1.10 and 0.90.

Default value : 1000000_d

Description : The original calibration value could be adjusted by the 'span adjusting coefficient'. This correction applies on the whole curve.

EEPROM saving needs D1 command.

5.2.3 Maximum capacity :

Reading code	Writing code	N	Data storage *
40 _H	41 _H	from 1 to 7	N

Format : Coded in ASCII (non-significant zero are not necessary), admissible values comprised between 0 et 1000000_d.

Default value : 500000_d

Description : The 'maximum capacity' allows to define the gross value delivered by the load-cell at its maximum capacity (ex : 30000 pts for 30 kg). The value of this setting is used as part of the 'user's span adjustment' command.

When the absolute value of the gross measurement plus 9 divisions exceeds the specified capacity, the bit b3 of the status word (see § 2.2.3) associated is set to 1.

EEPROM saving needs D1 command.

5.2.4 Scale interval :

Reading code	Writing code	N	Data storage *
42 _H	43 _H	from 1 to 3	N

Format : Coded in ASCII (non-significant zero are not necessary). Admissible values : 1, 2, 5, 10, 20, 50, 100.

Default value : 1_d

Description : minimal difference between 2 consecutive calibrated measurements.

EEPROM saving needs D1 command.

5.2.5 Calibration zero value:

Reading code	Writing code	N	Data storage *
0E _H	0F _H	from 1 to 8	N

Default value: 0_d

Zero value in A/D converter points

This value is set after a "zero adjustment" command

5.2.6 User scale coefficient :

Reading code	Writing code	N	Data storage *
0B _H	0C _H	8	N

This value is set after a "

EEPROM saving needs D1 command.

5.2.7 Gravity coefficient (g) :

Setting	Reading code	Writing code	N	Data storage *
gravity coefficient	44 _H	45 _H	8	N

Format : Coded in ASCII decimal. Actual value multiplied by one million (1000000), for example 9,805 is written 9805000_d

Default value : 9805470_d

Description : As the digital load cell is calibrated in Annemasse (France), depending on the terrestrial geographical coordinates where the load cell is used, the gravity difference can affect the measure aptness. In order to compensate this error, it is possible to modify this gravity coefficient to adjust it to the using place. It is expressed without point, and multiplied by one million (for example, 9.805 is traduced by 9805000 in the load cell). This correction is taken into account after a saving in EEPROM followed by a reset, then the span adjustment is automatic.

EEPROM saving needs D1 command.

5.3 Filtering settings

5.3.1 A/D converter configuration :

Reading code	Writing code	N	Data storage *
50 _H	51 _H	2	0

Format/description : Coded according to the following table :

N1, N2	Function		
N1	Reserved		
N2	Signal type and rejection		
31	60Hz rejection		
32	50Hz rejection		Default value
N3	A/D conversion rate in Meas/s		
	50Hz rejection	60Hz rejection	
34	6,25	7,5	
33	12,5	15	
32	25	30	
31	50	60	
30	100	120	Default configuration
3C	200	240	
3B	400	480	
3A	800	960	
39	1600	1920	

5.3.2 Digital filter order and band-stop filter activation :

Reading code	Writing code	N	Data storage *
52 _H	53 _H	2	N

Format : Coded according to the following table :

N1	Function
30	Low-pass filter disabled
32	2 nd order Bessel/Butterworth digital low-pass filter
33	3 rd order Bessel/Butterworth digital low-pass filter
34	4 th order Bessel/Butterworth digital low-pass filter
N2	
31	2 nd order digital stop-band filter enabled
30	digital stop-band filter disabled

Description : the filter recurrence relations of the filters are as follows :

- **Low-pass filter :**

$$2^{\text{nd}} \text{ order : } S_n = 1/A(e_n + 2e_{n-1} + e_{n-2} - BS_{n-1} - CS_{n-2})$$

$$3^{\text{rd}} \text{ order : } S_n = 1/A(e_n + 3e_{n-1} + 3e_{n-2} + e_{n-3} - BS_{n-1} - CS_{n-2} - DS_{n-3})$$

$$4^{\text{th}} \text{ order : } S_n = 1/A(e_n + 4e_{n-1} + 6e_{n-2} + 4e_{n-3} + e_{n-4} - BS_{n-1} - CS_{n-2} - DS_{n-3} - ES_{n-4})$$

- **Stop-band filter:**

$$2^{\text{nd}} \text{ order : } S_n = X(e_n + e_{n-2}) + Y(e_{n-1} - S_{n-1}) - ZS_{n-2}$$

Both filters coefficients depend on the A/D conversion rate and on cut-off frequencies. The determination of these coefficients can be easily achieved using **eNodView** simulation tools. The order and the coefficients are linked; please modify them at the same time.

5.3.3 Low-pass filter coefficients :

Setting	Reading code	Writing code	N	Data storage *
1/A coefficient	54_H	55_H	8	N
B coefficient	56_H	57_H	8	N
C coefficient	58_H	59_H	8	N
D coefficient	5A_H	5B_H	8	N
E coefficient	5C_H	5D_H	8	N

Format : Coded in ASCII hexadecimal. Low-pass digital filter coefficients are expressed in simple precision float variables (32 bits). They are coded by dividing the 32 bits in successive quartets (see example in Appendix A).

Default values : 1/A = 0.00267871306 ; B = -853.937317 ; C = 662.735535 ; D = -174.111755, E = 0 (these values fit to a 3rd order Bessel low-pass filter and 100 A/D conversion rate, 5 Hz cut off frequency).

Description : The determination of these coefficients can be easily achieved using **eNodView** simulation tools.

Description : The determination of the coefficients can be easily achieved using **eNodView** simulation tools. Be careful to modify the filter order and the coefficient at the same time.

5.3.4 Stop-band filter coefficients :

Setting	Reading code	Writing code	N	Data storage *
X coefficient	88_H	89_H	8	N
Y coefficient	8A_H	8B_H	8	N
Z coefficient	8C_H	8D_H	8	N

Format : Coded in ASCII hexadecimal. stop-band digital filter coefficients are expressed in simple precision float variables (32 bits). There are coded by dividing the 32 bits in successive quartets (see example in Appendix A).

Default values : X = 0.9289047 ; Y = -1.7163921 ; Z = 0.857809, these values fit to a 400 meas/s A/D conversion rate and 50Hz central frequency and a ± 10 Hz band. By default this filter is disabled, before activating it please set coefficients fitting to the application.

Description : The coefficients determination can be easily achieved using **eNodView** simulation tools.

5.3.5 Self-adaptive filter :

Reading code	Writing code	N	Data storage *
5C _H	5F _H	2 (read) 1 (write)	N

Format : although the filter activation is done with N = 1, reading its state is done with N = 2. The filter state is coded on N2. (N1 is dedicated to the stability criterion)

N2	Self-adaptive filter	
0	self-adaptive filter disabled	self-adaptive filter status
1	self-adaptive filter enabled	

Description : **self-adaptive filter** : The self-adaptive filter can be set in cascade with previous filters. The aim of this filter is to eliminate erratic values and to average consistent measurements. It is particularly useful in static measurements, avoid using it in dynamic or dosing process.

5.3.6 Stability criterion :

Reading code	Writing code	N	Data storage *
5E _H	85 _H	2 (read) 1 (write)	Y

Format ASCII ; although the stability criterion is modified with N = 1, reading is done with N = 2. The stability criterion is coded on N1 (N2 is dedicated to the self-adaptive filter activation cf. § 5.3.5)

Description : motion is indicated by bit b4 of the status bytes (b4 = 1 if no motion). The stability criterion can be set according to the following table (d = scale interval) :

N1	Stability interval	Notes
30	no motion detection	⇒ always stable (impossible if legal for trade enabled)
31	0.25 d	by default and if legal for trade enabled
32	0.5 d	⇒ impossible if legal for trade enabled
33	1 d	
34	2 d	

Current measurement is stable if X consecutive measurements following the reference measurement are included in the stability interval else the current measurement becomes the reference. X depends on the A/D conversion rate (see following table) :

A/D conversion rate (meas/s)		X
50 Hz rejection	60 Hz rejection	
6,25	7,5	1
12,5	15	2
25	30	3
50	60	5
100	120	9
200	240	17
400	480	33
800	960	65
1600	1920	129

5.4 Logical inputs/outputs configuration

5.4.1 Logical inputs assignment :

Reading code	Writing code	N	Data storage *
60 _H	61 _H	4	N

Format/description : Coded according to the following table :

The bytes N1 and N2 correspond to the logical input 1 and the bytes N3 and N4 correspond to the logical input 2.

N1 and N2 or N3 and N4		Assignment	Function
N1 ou N3			
negative logic	positive logic		
30	38	none	* logical inputs have no effect
31	39	tare	* tare command
32	3A	zero	⇒ limited to $\pm 10\%$ range of the maximum capacity or $\pm 2\%$ in legal for trade functioning.
33	3B	transmit measurement/ reset max peak value	⇒ in transmitter mode, send a measurement on the falling or rising entry edge. ⇒ in dosing mode (by filling or unloading), reset the max peak value
34	3C	measurement window or Zero dynamic	⇒ in transmitter mode, send measurements while the input is maintained ⇒ In dosing mode make a zero without motion criterion after defined time
35	3D	cancel tare / suspend cycle	⇒ in transmitter mode, cancels the tare ⇒ in dosing mode (by filling or unloading), suspends temporarily or stops the current cycle and reset the calculated variables (depending on the cycle recovery option).
36	3E	start / restart dosing cycle	⇒ in dosing mode (by filling or unloading), starts a new cycle or restarts a previously suspended cycle
37	3F	stop cycle	⇒ in dosing mode (by filling or unloading), stops the current cycle by inhibiting the different outputs involved.
N2 or N4			
30		gross	sent measurements are gross measurements
32		net	sent measurements are net measurements
34		A/D converter points	sent measurements are A/D converter points

5.4.2 Debounce time :

Reading code	Writing code	N	Data storage *
62 _H	63 _H	from 1 to 5	N

Format : Coded in ASCII (non significant zero are not necessary). Duration expressed in ms, comprised between 0 and 65535 ms.

default value : 80_d

Description : Debounce time corresponds to the minimum required stabilization time of the logical inputs before their activation. If the input level varies within this interval, it is ignored.

5.4.3 Logical outputs assignment :

Settings	Reading code	Writing code	N	Data storage *
outputs 1&2	64 _H	65 _H	4	N
outputs 3&4	66 _H	67 _H	4	N

Format : The bytes N1 and N2 correspond to the output 1 (or 3) and the bytes N3 and N4 correspond to the output 2 (or 4).

Default values : logical outputs 1 and 2 = 36313731_H (1 : positive logic, FF ; 2 : positive logic, CF); logical outputs 3 and 4 = 38313931_H (positive logic, emptying/reloading ; 4 : positive logic, result out of tolerances)

Description : Depending on the version, digital load-cell includes up to 4 logical outputs which can be configured in different way as described in the following table :

Note : Digital load-cell in its 2 x 5-pins version connectors does not include logical outputs on the connectors. Nevertheless these outputs are managed and can be accessible by the communication bus.

N1 or N3	Assignment	Notes
30	set points	⇒ Set point 1 assigned to output 1 ⇒ Set point 2 assigned to output 2 ⇒ Set point 3 assigned to output 3 ⇒ Set point 4 assigned to output 4
31	motion	⇒ recopies the status word motion bit
32	dosing result available	⇒ indicates the end of a dosing cycle
33	cycle in progress	⇒ indicates that a dosing cycle is in progress
34	defective measurement	⇒ errors description contained in the status word associated to the measurement
35	logical input1 (or2) image	⇒ recopies the input 1 on outputs 1 and/or 3 ⇒ recopies the input 2 on outputs 2 and/or 4
36	fine feed (FF) or Level on request	⇒ fine feed in dosing mode (by filling or unloading) ⇒ programmed mode (see command register)
37	coarse feed (CF) or level on request	⇒ coarse feed in dosing mode (by filling or unloading) ⇒ programmed mode (see command register)
38	emptying / reloading or level on request	⇒ in dosing by filling mode, activated during the emptying phase that follows the control of tolerances ⇒ in dosing by unloading mode, activated during the reloading phase that occurs at the end or at the start of the cycle ⇒ programmed mode (see command register)
39	result out of tolerances	⇒ in dosing mode (by filling or unloading), indicates that the dosing result is out of the specified tolerances
3A	flow rate failure	⇒ in dosing mode (by filling or unloading), indicates that a flow rate failure has occurred
3B	dosing failure	⇒ in dosing mode, indicates that a flow rate failure has occurred or that the result is out of the specified tolerances or that an error has occurred at the start of the cycle
N2 or N4	Logic	
30	negative logic	
31	positive logic	

5.4.4 Set points high & low values :

Settings	Reading code	Writing code	N	Data storage *
set point 4 high level	68 _H	69 _H	de 1 à 8	N
set point 4 low level	6A _H	6B _H	de 1 à 8	N
set point 3 high level	6C _H	6D _H	de 1 à 8	N

set point 3 low level	6E_H	6F_H	de 1 à 8	N
set point 2 high level	70_H	71_H	de 1 à 8	N
set point 2 low level	72_H	73_H	de 1 à 8	N
set point 1 high level	74_H	75_H	de 1 à 8	N
set point 1 low level	76_H	77_H	de 1 à 8	N

Format : Coded in ASCII (non-significant zero are not necessary). Value between 0 and $\pm 1000000_d$.

default values : Set point 1 high level = 80000_d ; set point 1 low level = 70000_d

Set point 2 high level = 60000_d ; set point 2 low level = 50000_d

Set point 3 high level = 40000_d ; set point 3 low level = 30000_d

Set point 4 high level = 20000_d ; set point 4 low level = 10000_d

Description : these settings give the high and low limits for each set point. The set points state also depends on functioning mode 'window' or 'hysteresis' (see § 5.4.5).

Set point 1 corresponds to output 1, set point 2 to output 2, set point 3 to output 3 and set point 4 to output 4.

5.4.5 Set points functioning

Reading code	Writing code	N	Data storage *
78_H	79_H	4	N

Format : Coded according to the following table :

The byte N1 corresponds to set point 1 (output 1), N2 to set point 2 (output 2), N3 to set point 3 (output 3) and N4 to set point 4 (output 4).

N1, N2, N3 or N4	Function
30	set point in window mode / compared to gross measurement
31	set point in hysteresis mode / compared to gross measurement
32	set point in window mode / compared to net measurement
33	set point in hysteresis mode / compared to net measurement

5.5 Legal for trade

5.5.1 Legal for trade switch :

Reading code	Writing code	N	Data storage *
80_H	81_H	1	Y

Format : the activation of the settings related to the use of sensor in compliance with legal for trade use is done by setting N :

⇒ 30 : legal for trade disabled (default value)

⇒ 31 : legal for trade enabled

Default value : 30_H

Description : The activation of legal for trade has the following consequences :

- the legal for trade counter is incremented every time a storage in EEPROM is requested if a metrological setting has been modified
- a new legal for trade CRC-16 value is calculated every time a storage in EEPROM is requested if a metrological setting has been modified
- taring is now impossible if gross measurement is negative.
- reading a measurement during 15 seconds after power-up or a software reset is impossible (digital load-cell returns ????????)
- zero acquisition range is reduced from 10% of the capacity to 2%.
- reading the net value during tare acquisition or the gross value during zero acquisition is impossible (returns ????????)

- The stability criterion is forced to $0.25d$ and can not be modified anymore. An attempt to change its value is refused, sensor transmits an error frame.

5.5.2 Zero modes :

Reading code	Writing code	N	Data storage *
86 _H	87 _H	1	Y

Format/description : Coded according to the following table :

N1	Function	Notes	
30	zero tracking disabled initial zero setting disabled	⇒ the zero acquisition is limited to a $\pm 10\%$ range of the maximum capacity or $\pm 2\%$ in legal for trade functioning ⇒ the zero tracking is limited to a $\pm 10\%$ range of the maximum capacity or $\pm 2\%$ in legal for trade functioning	By default
31	zero tracking enabled initial zero setting disabled		
32	zero tracking disabled initial zero setting enabled		
33	zero tracking enabled initial zero setting enabled		

5.5.3 Legal for trade checksum:

Reading code	Writing code	N	Data storage *
84 _H	/	5	/

Format : Coded in ASCII.

Description : If the 'legal for trade' option is switched ON, a CRC-16 is calculated and stored from the memory contents every time a storage in EEPROM is requested if one of the settings listed in §5.5.4 has been modified.

5.5.4 Legal for trade counter :

Reading code	Writing code	N	Data storage *
82 _H	/	5	/

Format : Coded in ASCII.

Description : If the 'legal for trade' option is switched ON, this counter is incremented every time a storage in EEPROM is requested if one of these metrological settings has been modified :

- A/D converter configuration
- Span adjusting coefficient
- Scale coefficient
- scale interval
- capacity
- Zero value in ADC points
- legal for trade switch
- zero modes
- Motion criterion

5.6 Dosing settings

5.6.1 Target weight :

Reading code	Writing code	N	Data storage *
A0 _H	A1 _H	from 1 to 7	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d.

Default value : 10000_d

Description : In dosing by filling or by unloading functioning modes, the target weight represents measurement to reach at the end of the dosing process (see user manual. 195702)

5.6.2 Start delay :

Reading code	Writing code	N	Data storage *
A2 _H	A3 _H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d

Default value : 200_d

Description :

- **dosing by filling** : if the 'automatic taring at start' option is enabled, this delay time stands for the stabilization time that precedes the tare execution.
- **dosing by unloading** : this delay time stands for the tank level stabilization time that precedes the reference weight acquisition (tank level before dosing).

5.6.3 Final stabilization time :

Reading code	Writing code	N	Data storage *
A4 _H	A5 _H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d

Default value : 500_d

Description : in dosing functioning modes (by filling or by unloading), the final stabilization time defines the duration that follows the fine feed stop then digital load-cell proceeds to the result determination as soon as the stability is reached.

5.6.4 Coarse feed effect neutralization time :

Reading code	Writing code	N	Data storage *
A6 _H	A7 _H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d.

Default value : 50_d

Description : during this delay, the flow rate control and the level monitoring are disabled in order to limit the impact of dynamic effects on the signal caused by the coarse feed activation.

5.6.5 Coarse feed stopping neutralization time :

Reading code	Writing code	N	Data storage *
A8 _H	A9 _H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d.

default value : 50_d

Description : during this delay, the flow rate control and the level monitoring are disabled so as to limit the impact of dynamic effects on the signal caused by the flow rate change.

5.6.6 Emptying/reloading holding time :

Reading code	Writing code	N	Data storage *
AC _H	AD _H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d.

Default value : 100_d

Description :

- **dosing by filling** : the emptying holding time defines how long the 'emptying' output remains active after that the gross value has become inferior to the 'emptying end level'

- **dosing by unloading** : the reloading holding time defines how long the 'reloading' output remains active after that the gross value has become superior to the 'reloading max level'

5.6.7 Tare determination time :

Reading code	Writing code	N	Data storage *
AE_H	AF_H	from 1 to 5	N

Format : ASCII (non-significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d

Default value : 100_d

Description :

- **dosing by filling** : if the 'automatic taring at start' option is enabled, this time defines the interval during which stability is monitored for the tare acquisition. If the stability cannot be found before this time out ends, the tare value is set to the current net measurement.

- **dosing by unloading**: this time defines the interval during which stability is monitored for the reference weight acquisition. If the stability cannot be found before this time out ends, the reference weight value is set to the current gross measurement.

- **in both functioning modes** : the motion time out is also used when the final stabilization time ends. The dosing result is acquired as soon as no motion is detected. If the stability cannot be found before this time out ends, the dosing result is set to the current measurement.

5.6.8 Start cycle options & reloading and emptying modes :

Reading code	Writing code	N	Data storage *
B0_H	B1_H	2	N

Format/description : Coded according to the following table :

N1	Function		
bit b0	Start cycle option		
0	automatic taring at start disabled	⇒ see description of dosing functioning modes in documentation ref. 195702	
1	automatic taring at start enabled		by default
bit b1	Cycle recovery		
1	allows cycle to be restart after suspension	⇒ see description of dosing functioning modes in documentation ref. 195702	by default
0	no cycle recovery allowed	Cycle stopped if suspend	
b2	Start cycle option		
1	automatic start cycle	⇒ Filling mode	
0	start cycle on order		by default
N2 (bits b8 & b9)			
30	reloading / emptying not managed		

31	reloading at the end of the cycle / emptying phase monitored	see description of dosing functioning modes in documentation ref. 195702	by default
32	reloading at the start of the cycle		

- **Tare at start of the cycle (filling mode)** : the tare takes place after the 'start delay' and before the activation of the 'fine feed' and 'coarse feed'. If a lack of stability makes the tare impossible, the current gross value is set as tare value at the end of the 'tare determination time'.

- **Cycle recovery (filling mode)** : If a cycle has been suspend it can be restarted.

- **Automatic start cycle (filling mode)** : filling cycles automatically starts if a receiver is detected at the weighing zone.

A cycle starts as soon as the gross weight value remains comprised between the 'min empty weight' value and the 'max empty weight' values during a time equal to the 'tare delay'. This time is reset if the weight gets out of the specified range.

5.6.9 automatic Inflight weight correction & fine feed restarting :

Reading code	Writing code	N	Data storage *
B2 _H	B3 _H	from 2 to 4	N

Format/description : See following tab (The ASCII value of N1 corresponds to three lsb, for example, 35 is equivalent to 101 and 33 to 011).

N1	Function		
b0			
1	automatic inflight weight correction enabled	see dosing cycle description in documentation ref. 195702	
0	automatic inflight weight correction disabled		by default
b1			
1	fine feed is restarted if dosing result is inferior to the low tolerance	see dosing cycle description in documentation ref. 195702	
0	fine feed is not restarted if the result is out of tolerances		by default
b2			
1	correction coefficient x3 if result out of tolerances	if the automatic correction is enabled	
0	correction coefficient not modified		by default
N2, N3, N4			
from 1 to 100% in ASCII	in-flight weight correction coefficient	if the 'automatic correction' option is enabled	

'in-flight weight correction coefficient' : This percentage contributes to adjust automatic in-flight weight correction.

The admissible values for this parameter are comprised between 1 and 100(%).

5.6.10 Inflight weight value :

Reading code	Writing code	N	Data storage *
B4 _H	B5 _H	from 1 to 8	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d

Default value : 250_d

Description : the in-flight value corresponds to the weight of product that carries on falling after the 'fine feed' output disabling. The in-flight value allows to define the set point (**Target weight – in-flight weight**) for which the fine feed is disabled. Its value can be automatically corrected through the in-flight correction mechanism (cf. §5.6.9 and user's instructions documentation réf. 195702)

5.6.11 Max in-flight weight & min in-flight weight

Settings	Reading code	Writing code	N	Data storage *
max value	7A_H	7B_H	from 1 to 6	N
min value	7D_H	7C_H	from 1 to 6	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d

Default value : Max in-flight weight = 750_d ; Min in-flight weight = -250_d

Description : These values are the min and max limits which the in-flight weight value can not overtake. It is particularly useful when the in-flight automatic correction is enabled. In-flight value is not modified if these values are exceeded.

5.6.12 Max empty weight & min empty weight/residual weight :

Settings	Reading code	Writing code	N	Data storage *
max empty weight	B6_H	B7_H	from 1 to 7	N
min empty weight / residual weight	B8_H	B9_H	from 1 to 7	N

ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d

Default values : max empty weight = 500_d ; min empty weight = 100_d

Description :

- **dosing by filling** : the min and max empty weight are involved in dosing by filling functioning mode. Both settings define the cycle starting conditions :

- **min empty weight < gross measurement < max empty weight**
⇒ *empty packing presence verification*
- **min empty weight = max empty weight = 0** regardless of the gross value
⇒ *no verification of packing presence*

If none of these conditions is respected, an error is reported and the cycle can not start..

- **dosing by unloading** : the 'residual weight' is used when sensor checks if the available quantity of product is sufficient to handle a complete dosing cycle. If *Gross measurement < (target weight + residual weight)* the cycle is cancelled and an error is reported.

5.6.13 High and low tolerances :

Settings	Reading code	Writing code	N	Data storage *
high tolerance	BA_H	BB_H	from 1 to 5	N
low tolerance	BC_H	BD_H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 65535_d.

Default values : high tolerance = 10_d ; low tolerance = 10_d

Description : The tolerance settings define the acceptable range for dosing results. An output assigned to the 'out of tolerances' function or 'dosing failure' is set active if the dosing result is not within the range [**target weight – (tolerance -) ; target weight + (tolerance +)**]. If the result is inferior to the default limit and if the 'restart fine feed' option (cf. §5.6.9) is enabled, then the fine feed output is restarted.

5.6.14 End of cycle waiting time :

Reading code	Writing code	N	Data storage *
CC_H	CD_H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; duration expressed in ms, comprised between 0 and 65535_d.

Description : this delay occurs either :

- **after the control of tolerances**

- **at the end of the reloading phase** in dosing by unloading functioning mode if the reloading mode is set to '*at the end of the cycle*'
- **at the end of the emptying phase** (if used) in dosing by filling functioning mode

A dosing cycle is finished as soon as this delay ends. The statistic variables (number of cycles, running total, average value and standard deviation) are then updated. If an output is assigned to the '*cycle in progress*' function it is also disabled.

5.6.15 Feed mode :

Reading code	Writing code	N	Data storage *
CE_H	CF_H	1	N

Format :

N1	Function	Description	
30	coarse feed (CF) then fine feed (FF)	see dosing cycle descriptions in user's instructions document ref. 195702	by default
31	coarse feed (CF) + fine feed (FF) then fine feed (FF)		
32	coarse feed (CF) only		
33	fine feed (FF) then coarse feed (CF) then fine feed (FF)		
34	fine feed (FF) then coarse feed (CF) + fine feed (FF) then fine feed (FF)		
35	coarse feed (CF) then coarse feed (CF) + fine feed (FF)		

Description : This command allows to define the feed mode during a dosing cycle (by filling or unloading). If only one flow rate is used, an output must be assigned to the '*coarse feed*' function.

5.6.16 Fine feed (FF) level :

Reading code	Writing code	N	Data storage *
BE_H	BF_H	from 1 to 7	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_g.

Default value : 1000_g

Description : the fine feed level expressed as a subtraction of the target weight (**target weight – FF level**) gives the level (net for filling and gross for dosing by unloading) that causes the coarse feed to be disabled and the fine feed to go on.

5.6.17 Coarse feed (CF) level :

Reading code	Writing code	N	Data storage *
9E_H	9F_H	from 1 to 7	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_g.

Default value : 8000_g

Description : the coarse feed level a subtraction of the target weight defines the transition level between the fine feed phase and the coarse feed when the used process implies a start in fine feed phase followed by a coarse feed phase followed again by a fine feed phase to finish the dosing.

5.6.18 Emptying end level (dosing by filling) :

Reading code	Writing code	N	Data storage *
C0_H	C1_H	from 1 to 7	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d.

Default value : 200_d

Description : during the emptying phase, the 'emptying' output is disabled if the gross value becomes inferior to this level and if the 'emptying holding time' has elapsed (cf. §5.6.6).

5.6.19 Reloading max level (dosing by unloading) :

Reading code	Writing code	N	Data storage *
C2 _H	C3 _H	from 1 to 7	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d.

Default value : 20000_d

Description : during the reloading phase, the 'reloading' output is disabled if the gross value becomes superior to this level and if the 'reloading holding time' has elapsed (cf. §5.6.6).

5.6.20 Reloading min level (dosing by unloading):

Reading code	Writing code	N	Data storage *
C4 _H	C5 _H	from 1 to 7	N

Format : ASCII (non significant zeros not necessary) ; admitted values between 0 and 1000000_d.

Default value : 1000_d

Description : when the reloading at the end of the cycle is used, if after the control of tolerances the gross measurement is inferior to this level an output assigned to the 'reloading' function is activated (cf. §5.6.8).

5.6.21 Minimal weight variation and time interval (flow rate control) :

Settings	Reading code	Writing code	N	Data storage *
minimal variation	C6 _H	C7 _H	from 1 to 5	N
time interval	C8 _H	C9 _H	from 1 to 5	N

Format : ASCII (non significant zeros not necessary) ; the time interval is a duration expressed in milliseconds comprised between 0 and 65535_d ; the minimal weight variation is a value comprised between 1 and 65535_d.

Default values : min variation = 1000_d ; time interval = 0_d

Description : the association of these two settings defines a flow rate. The flow rate is checked by sensor during the dosing cycle.

The flow rate control is disabled if the 'time interval' setting is set to 0. If the flow rate control is active, it is monitored every dosing cycle but is inhibited during the neutralization times.

5.7 Other settings

5.7.1 Firmware version :

Reading code	Writing code	N	Data storage *
26 _H	/	5	/

Format : Coded in ASCII.

Description : Identifies sensor firmware version.

5.7.2 Metrological version number :

Reading code	Writing code	N	Data storage *
27 _H	/	5	/

Format : Coded in ASCII.

Description : Identify the version of the part of the software that is dedicated to the metrology and the measurement exploitation.

5.7.3 Text box :

Reading code	Writing code	N	Data storage *
92 _H	93 _H	from 1 to 2	N

Format : a 16-bytes free memory area for ASCII codes storage.

Default value : 2020_H

Description : this is a user memory space that can be used to store some information like the last calibration date.

5.7.4 Sampling period (transmitter mode) :

Reading code	Writing code	N	Data storage *
CA _H	CB _H	from 1 to 5	N

Format : ASCII; duration expressed in ms, comprised between 0 and 65535_d.

Default value : 00_H

Description : the 'sampling period' setting defines the measurements transmission period on the bus when continuous transmission is active ('measurement window' or after a 'start continuous transmission' command).

If this setting is set to 0, **measurements transmissions are synchronized on the A/D conversion period** (for example at a 400 meas/s conversion rate, a measurement is transmitted every 2.5 ms).

5.8 Measurements

5.8.1 Gross :

Reading code	Writing code	N	Data storage *
10 _H	/	8 or 3	/

Format : the current gross measurement is coded on :

- 8 ASCII bytes in **SCMbus standard format**.
- 3 hexadecimal bytes in **SCMbus fast format**.

Description : Current gross measurement value.

If the 'legal for trade' option is switched ON, during the **15 seconds** that follow the power-up, this variable is set to ???????? as for a zero request.

5.8.2 Tare :

Reading code	Writing code	N	Data storage *
11 _H	/	8 or 3	/

Format : the last tare value is coded on :

- 8 ASCII bytes in **SCMbus standard format**.
- 3 hexadecimal bytes in **SCMbus fast format**.

Description : Current tare value.

5.8.3 Net :

Reading code	Writing code	N	Data storage *
12 _H	/	8 or 3	/

Format : the current net measurement is coded on :

- 8 ASCII bytes in **SCMbus standard format**.
- 3 hexadecimal bytes in **SCMbus fast format**.

Description : Current net measurement value.

If the 'legal for trade' option is switched ON, during the **15 seconds** that follow the power-up, this variable is set to ???????? as for a zero request.

5.8.4 A/D converter points :

Reading code	Writing code	N	Data storage *
13 _H	/	8 or 3	/

Format : the measurement in A/D converter points is coded on :

- 8 ASCII bytes in **SCMbus standard format**.
- 3 hexadecimal bytes in **SCMbus fast format**.

Description : Current A/D converter points value. Gives a non calibrated measurement.

5.8.5 Dosing result:

Reading code	Writing code	N	Data storage *
14 _H	/	8	/

Format : ASCII.

Description : : the dosing result determination is based on a net value in filling functioning mode and on a gross value in dosing by unloading functioning mode.

If the result is not ready (no complete cycle or cycle in progress) or after a reading transaction, it is set to ???????.

The dosing result value can be reset using the 'clear' command or an input assigned to this function.

5.8.6 Number of processed cycles :

Reading code	Writing code	N	Data storage *
15 _H	/	8	/

Format : ASCII.

Description : : in dosing functioning modes, the number of complete cycles can be read through this command. This value can be reset by the 'clear' command.

5.8.7 Average value :

Reading code	Writing code	N	Data storage *
16 _H	/	8	/

Format : ASCII.

Description : : in dosing functioning modes, the average dosing value is calculated at the end of each dosing cycle during the whole process. The average value can be read through this command. This value can be reset by the 'clear' command.

5.8.8 Dosing running total :

Reading code	Writing code	N	Data storage *
17 _H	/	8	/

Format : ASCII.

Description : The sum of obtained dosing results is calculated at the end of each cycle during the whole process. In dosing functioning modes, the cumulated value of the dosing results can be read through this register. This value can be reset by the 'clear' command..

5.8.9 Standard deviation :

Reading code	Writing code	N	Data storage *
18 _H	/	8	/

Format : ASCII hexadecimal ; the standard deviation is expressed as single precision float variables (32 bits). Its value is divided into successive quartets (cf. example in appendix A).

Description : in dosing functioning modes, the standard deviation on the results is calculated and updated after each complete cycle. This value can be reset by the 'clear' command.

5.8.10 Dosing error report :

Reading code	Writing code	N	Data storage *
1D _H	/	from 2 to 4	/

Format : Coded according the following table :

N1	Function	
30	no error	
31	flow rate failure	cf §5.6.21
32	result out of max tolerance	cf §5.6.13
34	result out of min tolerance	cf §5.6.13
38	unable to start cycle	in dosing by unloading functioning mode
N2, N3, N4		
from 0 to 255 in ASCII	dosing error counter	incremented at each error detection

Description : The error report provides an identification of the last error occurred and the number of the errors detected.

5.8.11 Dosing cycle time :

Reading code	Writing code	N	Data storage *
9C _H	/	8	/

Format : ASCII; duration expressed in ms, comprised between 0 and 65535_d.

Description : Duration of the dosing cycle.

5.8.12 Max peak value :

Reading code	Writing code	N	Data storage *
9D _H	/	8	/

Format : ASCII; admitted values between 0 and 1000000_d

Description : In dosing functioning mode only, the max gross measure is stored in this variable. It is permanently updated and can be reset by sending the command 'reset max peak value' or by assigning a logical input to this function.

6 APPENDIX A : EXAMPLE FOR CODING A SINGLE PRECISION FLOAT PARAMETER

Example of a coefficient to transmit :

- Value (floating) : 1,64780235
- Corresponding value in hexadecimal : 3FD2 EB30

⇒ Coded in SCMBUS : **333F 3D32 3E3B 3330**