In the following Cs means calibration step. N is the choice. (See B01950, software number 2320 and higher.)
At calibration, the following can be chosen for the serial outputs:
* means a default value, which is received at reset of the calibration values.

01 =0 Output 1. Display, tare and mode indicators.
=1 Output 2. Display and mode indicators.
=2 Output 3. Display, tare, setpoints, and 16 bits binary DA-value.
=3 Weight and address are sent on command via more indicators in series.
=5 Programmable continuous serial output.
=6 Programmable serial output. For printer.
*=7 Display in ASCII. Net or gross. For printer. Each line ends with CR and LF.
=8 Display in ASCII. Net & gross. For printer. Each line ends with CR and LF.
=9 OIML for printer. Display in ASCII. Net or gross. Preset Tare PT. Each line ends with CR and LF.
=10 Not used.
=11 Special protocol, WMI. Only negative values.
=12 Display in ASCII with 6 digits and increment 1, every measurement cycle. Each ends with CR.
=13 AD mean value in ASCII with 7 digits every measurement cycle. Each ends with CR.
=14 Display in ASCII every measurement cycle. Each ends with CR.
=15 Output disabled, except in calibration mode.

02 *0 The zero of the binary data refers to the display (net or gross). Synchronous output 2. Serial output 3.
+1 The zero of the binary data refers to the gross value.
+2 Synchronous output 1 refers to actual LCD (U237) instead of LED (Old U137 and U1266).
+4 Peak value mode. Max and min values are stored. Counting scale function does not work.
+8 Not used.

03 =0 300 baud.
*=1 1200 baud.
=2 2400 baud.
=3 9600 baud.
+4 Not used.
+8 Not used.

04 *=0 No address. RS232.
=01-14 Address for RS485 or in Cs1:3&4. RS485 is addressed by |(ASCII 124) 1 to 14, [CR].
No one is addressed by | and character other than 1 to 9. [CR] is recommended.
=15 Always addressed. Used for single RS485 unit without address command or RS422.

The display shows Cs NN, where Cs is two digit step and NN is the chosen function number.
In calibration mode, when {PRINT/TEST} is pushed, all calibration values are sent out.
All protocols have 8 bits, no parity and 1 stopbit.

Special serial outputs 1, 2 and 3. Common notations:

MOT	Unstable weight = 1	P2	P1	P0	
OVL	Overload (Count) = 1	0	0	0	= no decimal point.
ZER	Zero = 1	0	0	1	= xxxxx.
SGN	Sign - = 1	0	1	0	= xxxx.x
TAR	Tared (Net) = 1	0	1	1	= xxx.xx
X	Not used	1	0	0	= xx.xxx
		1	0	1	= x.xxxx

Dn:b means display digit n from 1 to 5 (5 is the most significant digit) and b the 1 ,2 ,4 or 8 bit in BCD value.
In the same way for T, which means tare value. Thus the highest bit is most significant!.
When LT (Lamp Test) = 1, the BCD value of the digits switches between 1000 (8) and 1111 (blanking).

Cs01:0. Special output 1. Display, tare and mode indicators.

Byte	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
1	0	1	1	1	X	X	X	SGN
2	D5:1	D5:2	D5:4	D5:8	D4:1	D4:2	D4:4	D4:8
3	D3:1	D3:2	D3:4	D3:8	D2:1	D2:2	D2:4	D2:8
4	D1:1	D1:2	D1:4	D1:8	ZER	TAR	OVL	MOT
5	T5:1	T5:2	T5:4	T5:8	T4:1	T4:2	T4:4	T4:8
6	T3:1	T3:2	T3:4	T3:8	T2:1	T2:2	T2:4	T2:8
7	T1:1	T1:2	T1:4	T1:8	0	P0	P1	P2

Output every measurement cycle.
Byte 1, bit 0-3 are always hexadecimal E=1110 for recognition.

Cs01:1. Special output 2. Display and mode indicators.

Byte	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7
1	D5:1	D5:2	D5:4	D5:8	0	0	1	DP
2	D4:1	D4:2	D4:4	D4:8	1	1	0	DP
3	D3:1	D3:2	D3:4	D3:8	0	1	0	DP
4	D2:1	D2:2	D2:4	D2:8	1	0	0	DP
5	D1:1	D1:2	D1:4	D1:8	0	0	0	DP
6	X	X	X	SGN	0	1	1	LT
7	ZER	TAR	OVL	MOT	1	1	1	LT

Output every measurement cycle, also non weighing mode. Bit 4-6 are the LINE address for e.g. an UART.
DP = Decimal point to the right of corresponding digit = 1.
LT = Lamp test = 1 when tested.

Cs01:2. Special output 3. Display, tare, setpoints, and 16 bits binary DA-value.
Output every measurement cycle, also non weighing mode. Byte 1, bit 0-3 are always 1110 for recognition.

Bit 0-3 in other bytes may never have the value 1110.

DA-converter value is a 16 bit binary code and it is used for e.g. a 0-20mA analog output. All bits = 0 (0mA) corresponds to zero on the display minus 4 increments.
All bits = 1 (20mA) corresponds to full scale plus 3 increments.
Normally the displayed (net or gross) value is used, but with Cs02:+1 the gross value is always used.

WGH = 1 indicates valid net or gross display.

Byte	bit 0	bit 1	bit 2	bit 3	bit 4	bit 5	bit 6	bit 7	Comments
1	0	1	1	1	X	X	X	SGN	
2	D5:1	D5:2	D5:4	D5:8	ZER	TAR	OVL	MOT	
3	D4:1	D4:2	D4:4	D4:8	B0	B1	B2	B3	B0 - B15 are the binary
4	D3:1	D3:2	D3:4	D3:8	B4	B5	B6	B7	weight value.
5	D2:1	D2:2	D2:4	D2:8	B8	B9	B10	B11	B0 = LSB (Least Signifi-
6	D1:1	D1:2	D1:4	D1:8	B12	B13	B14	B15	cant Bit).
7	T5:1	T5:2	T5:4	T5:8	X	X	X	X	
8	T4:1	T4:2	T4:4	T4:8	X	X	X	X	
9	T3:1	T3:2	T3:4	T3:8	X	X	X	X	
10	T2:1	T2:2	T2:4	T2:8	X	X	X	X	
11	T1:1	T1:1	T1:4	T1:8	WGH	P0	P1	P2	

Cs01:3 Data and address is sent via more indicators in series.

The serial output from the indicator, on which {PRINT/TEST} is pushed, is sent to the input of the next and so on to e.g. a printer or computer. Other serial input functions are disabled.
The protocol is: y±xxx.xxG<CR><LF> (10 characters). y is the hexadecimal value (1 to E) of the address in Cs04 (01 to 14). ± is sign. xxx.xx is the weight with the decimal point according to Cs17. No decimal point corresponds to a point between the value and G (Constant protocol length). The G (71) at the end means gross, but also N (78), net, and H (72), count, are sent, when adequate. Software before 2003 has no CR and LF.
The print key can activate the transmission from one indicator. N, G or H on the input of the indicator sends out the 8, (from 2003, 10), preceding characters and N, G or H. This means, that the key-activated print is sent through all following indicators.
A P (ASCII 80) on the first serial input transmits the above protocol from all indicators. It ends with a P.

Cs01:5 & 6. Programmable serial output.
By pushing {F} and then {PRINT/TEST} a sequence is entered. NNXXX is displayed, where $0 \leq NN \leq 59$ is a sequence number and XXX is the decimal value for the ASCII character or the special function code according to below. The data are executed in the order they are entered.
Cs01:05 means that the string is sent continuously and Cs01:06 that the string is sent on print command.

Function codes:

000 Last character in the string. 000 and following characters are not sent.
176 Gross weight.
177 Net weight.
178 Displayed value, net, gross.
179 AD8- and hexvalue from voltage on PE7. LOP = low power. Reset after 256 measurements. For test.
180 Tare value.
181 Weight > setpoint 1, >1 is sent, else <1. For test.
182 Weight > setpoint 2, >2 is sent, else <2. For test.
183 Sign, 6 digit value according to Cs19:=7 including decimal point.
184 Multiple range digit from 1 up to 6.
185 O/space (ASCII 79/32) for overrange/normal operation.
189 Date as dd - mm - 20yy, where yy are the two last digits of the year, mm month and dd day. Option.
190 Time as hh : mm : ss, where hh are hours, mm minutes and ss seconds. Option.
191 Date as 20yy - mm - dd, where yy are the two last digits of the year, mm month and dd day. Option.
192 Weight/unit in g.
193 5 digit value for setpoint 1.
194 5 digit value for setpoint 2.
195 Units net. Net weight/(weight/unit).
196 Displayed value without sign and decimal point, only 5 digits.
197 X (ASCII 88) is written on negative transition on IRQ, else space (ASCII 32). For test.
198 Tilt angle. Pitch on PE5. U2375. For test.
199 Tilt angle. Roll on PE6. U2375. For test.
200 Digit 4, most significant.
201 Digit 3.
202 Digit 2.
203 Digit 1.
204 Digit 0, least significant.
205 Sign, -/+ (ASCII 45/43).
206 Sign, -/space (ASCII 45/32).
207 Gross = 1 (ASCII 49), net = 2 (ASCII 50).
208 M/space (ASCII 77/32) for unstable/stable weight.
209 N/G (ASCII 78/71) for net/gross.
210 T/space (ASCII 84/32) for tare/no tare.
211 Z/space (ASCII 90/32) for zero/outside zero.

Cs01:7, 8 and 9. Weight in ASCII for printers.
Each line ends with CR (13) + LF (10).

Calibration choice.	Printer.	Comment.
Cs01:7	+222.22 kg G	Prints displayed weight.
Cs01:8	+111.11 kg N +222.22 kg G	Prints net and gross weight.
Cs01:9	+222.22 kg G +100.00 kg PT	Prints weight. Prints PT (Preset Tare), when entered, according to OIML R76-1.

Cs01:12 Display in ASCII with 10 times higher resolution, every measurement cycle.

Cs01:13 AD (Analog-Digital converter) mean value in ASCII with 6 digits every measurement cycle.

Cs01:14 Displayed weight in ASCII every measurement cycle.

Serial input.
The serial buffer in the indicator is 12 bytes.
DTR on the serial output is set low when 11 bytes are stored in the buffer.
The following codes are used: Decimal ASCII value in ( ). Small letter may also be used.

Key	F	ZERO	PRINT/TEST	TARE	NET/GROSS	COUNT
ASCII sign	F (70)	Z (90)	P (80)	A (65)	N (78)	C (67)

xxxxx P	The printed output is preceded by the entered number xxxxx.
F A x A	The tare value x is entered, and the indicator displays the net value.
B(66)	Enters always gross mode.
F fc P	The indicator transmits the value according to the two last digits of the function codes (fc) 176 to 199 above. With {F} {COUNT} the fc (two last digits) may be entered manually.
F 60 P	Program EPROM number, date, check sum, calibration sequence is sent on the serial output.
F 01 P	Tilt angle on PE5 continuously. Angle and gross weight with P. Leave with F F.
F 02 P	Tilt angle on PE6 continuously. Angle and gross weight with P. Leave with F F.

Additional serial input functions at calibration or programmable serial output sequence:

F 50 P	The indicator switches to and from transmitting the calibration sequence help text when stepping in the calibration sequence.
F n Z (or A)	Jumps to calibration step n in the sequence. Two consecutive jumps are allowed, then it restarts.
m Z (or A)	Enters value m in the step and goes to the following or preceding step. At the programmable serial output sequence, the values are also stored in the EEPROM.
V(86)	Enters programmable serial output sequence. Corresponds to {ZERO} and {TARE} simultaneously.

Connectors.

J3:	U137 series. RS232 interface connector. 9p D–sub male. RS485, option U2392.	
1	J4:1	J4 is for optional signals.
2	RD	
3	TD	
4	DTR	
5	0VD, J4:2	
6	RS485 Rx A. J4:3.	RS485 is option U2392.
7	RS485 Rx B. J4:6.	Full duplex. Use shielded cable and terminating resistors at the cable ends.
8	RS485 Tx A. J4:5.	
9	RS485 Tx B. J4:4.	Connect GND to metal hood of D-sub.

RS485 addressing by |(ASCII 124) and 1-14 and [CR] (ASCII 13). No one addressed by |[CR]. Address in Cs04.
All indicators must be given different addresses in Cs04. Max 14 indicators. Cs04:15 means always addressed and is used for single RS485 unit without address command orRS422.

Note! Never communicate to other equipment with an indicator addressed and do not use the character **|** else.

For full duplex RS485 transmission, all J3:6 shall be connected in parallel to the output of the master. All J3:8 shall be connected in parallel to the input of the master.

To minimize reflections, the line should be terminated at both ends in its characteristic impedance, typically 60 to 120 ohm. Stub lengths off the main line should be kept as short as possible. Shielded cable must be used. When this is properly done, line length of a few kilometers is no problem.

J3:	U237 series. Power/inteface connector. 9p D–sub male.	
1	0V Return for J3:2	J3:2. 11 - 26V. opt. 29V. Always connect direct to the battery, when there is a risk of parallel inductive loads. Ripple >0.1V_{pp} increases variation (slow jitter).
2	Power +V	
3	0VD	U2372, +input for battery charging voltage. +VB is +V after the internal fuse. In
4	+VB 12V	When 0VD is used for return, +VB is switched on/off by the indicator. Max 0,5A,
5	TD	1A intermittent.
6	Ground/shield.	Note! The asynchronous output is not standard in U2373 and U2379. The pin
7	RD	configuration does not correspond to RS232, but the levels are OK. Standard
8	CTS	RS232 25p D-sub option.
9	DTR	Use shielded cables.
		Connect GND to metal hood of D-sub.

J1:	Internal I/O connector except U2373.	
1	GND	
2	0VD	
3	+5V	
4	TARE	Connect to 0VD for function. R=10k
5	NET/GROSS	Connect to 0VD for function. R=10k
6	COUNT	Connect to 0VD for function. R=10k
7	F	Connect to 0VD for function. R=10k
8	PRINT/TEST	Connect to 0VD for function. R=10k
9	ZERO	Connect to 0VD for function. R=10k
10	(TD)	U237, RS232 level. U137, inverted, 5V CMOS level.
11	(DTR)	U237, RS232 level. U137, inverted, 5V CMOS level.
12	(RD)	U237, RS232 level. U137, inverted, 5V CMOS level.
13	(CTS)	U237, RS232 level. U137, inverted, 5V CMOS level.
14	SYNC D2	Synchronous data 2. HCMOS level.
15	SYNC D1	Synchronous data 1. HCMOS level.
16	SYNC CK	Synchronous clock. HCMOS level.

J1:	RS232 interface connector. 25p D-sub male. Options U17311, U2391. U2383 with cable.	
1	GND Ground/shield.	Connect GND to metal hood of D-sub.
2	TD	Transmit Data.
3	RD	Receive Data.
5	CTS	Clear To Send input.
7	0VD Digital zero.	Note! This interface is not isolated from the indicator zero.
20	DTR	Data Terminal Ready output.

J1:	RS232, synchronous outputs, optoisolated Tare and Print/Test input. 25p D-sub male. Option U1731.	
1	GND Ground/shield.	Connect GND to metal hood of D-sub.
2	TD	Transmit Data.
3	RD	Receive Data.
5	CTS	Clear To Send input.
7	0VD Digital zero.	Note! This interface is not isolated from the indicator zero.
11	+5V	Max recommended load 25mA.
12	SYNC CK	Synchronous output, clock sígnal. HCMOS level.
13	SYNC D1	Synchronous output, type 1. For displays. HCMOS level.
14	SYNC D2	Synchronous output, type 2. For setpoints, analog output etc. HCMOS level.
16	PRINT/TEST	Optoisolated input for Print/Test. 12 - 30V.
19	TARE	Optosiolated input for Tare. 12 - 30V.
20	DTR	Data Terminal Ready output.

PRECAUTIONS WHEN INSTALLING!

0VD is connected to 0VA. Both must only be connected to GND once, normally in the power supply at W1. This may be cut, when a non-isolated interface is used, e.g. RS232 in U237, to a grounded computer or printer.

Shielded, preferably double shielded, cables must always be used. The D-sub connectors must have metal or metallized hoods, and the shield must be connected to these at both ends. The plugs should be dimpled for improved earth continuity. All external connections must be made in separate grounded metal boxes.

Although only a distance of some 15m is recommended (at 19200 Baud), normally distances of up to 1000m can be covered at 300 Baud. However at long distances, a good, low impedance ground connection is important in order to protect against lightnings and other interference.

It is always tricky to set up a serial communication. Therefore first try to understand and check all parameters.