WEIGHTEC 348 – 2

High speed weigh processor

- *4 addressable setpoints*
- *Measuring speed 436 Hz*
- *Internal resolution 21 bit*
- *RS232 or CL full duplex communication*
- *Bus-system up to 15 processors*
- *EC approval and TC: $n \leq 10{,}000$*
  $e \geq 0.3\ \mu V$

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1 WEIGH PROCESSOR 348 – 2 DESCRIPTION

1.1 APPLICATION

The CE approved weigh amplifier and processor 348, with its 4 software controlled setpoints, is used as an intelligent dosing interface en co-processor between the loadcells of an electronic scale and dosing computers and controllers, like PLC's, PC's, custombuilt systems i.e.
Typical applications are recipe dosing with setpoints and filling and check weighers.
The 348 prevents for the need of complex, with high speed en large figures calculating software for controlling setpoints en dosing, in external weight controlling computers.
Dosing, using the 348's setpoints, may be operated practically direct from the recipes of the database of the external computer.

1.2 IN- and OUTPUTS

De 348 is equipped with a low level loadcell signal input, and a sine wave alternating current supply for the loadcells with 6 VAC, with sense return control. Up to 8 loadcells (with strain gauge measuring principle) from one weighing machine may be connected.
The communication port is selectable as RS232 or Current Loop, with full duplex communication and a bus option.
The 4 setpoint outputs equipped with (exchangeable) opto couplers and supported by extensive operating software functions.

1.3 OPERATING FACILITIES

Commands are available for:

- continuous comparison of the 4 setpoint values with the actual (net) weight value
- setting the setpoint values with execution program
- course / fine dosing, preceded by automatic zero setting with no motion control
- hold for each setpoint at switching off
- automatic step to the next setpoint (course / fine dosing)
- setpoint comparison with proportional speed compensation during dosing
- set tare and delete tare
- set zero
- toggle from gross to net weight data transmission
- request for the on/off status and the weight value setting of the setpoints
- request for the gross and nett actual weight value with status
- request for the zero weight value, initiated at switching on the scale
- request for transmission of the weigh speed, increasing or decreasing
- request for the no motion level, alarms i.e.

1.4 COMMUNICATION MODE

The 348 may be set at continuous transmission, or, if more processors are used in a bus (up to 15 devices via interface 848), each separate 348 may be setted at its own call number and will respond 1 time on a received command.
Standardized port settings are available, preferably speed is 19k2 Baud. The output may be installed as a RS232 or as Current Loop port. CL is advised at longer cable connections and in the bus mode.

1.5 MEASURING PRINCIPLE

The A/D converter proceeds according to the unique continuous integrating principle and converts at 436 Hz the analogue weight signal into a 21 bits digital value.
The 348 has 5 different types of filters for stabilizing the weight data. Amongst these 3 filters especial for the setpoint comparison with automatic overshoot compensation and one manual settable filter.
The 3 filters for the setpoint comparison are selected in the start command for the setpoints.

The complete A/D conversion, as well as the analogue amplifier system, operates at 218 Hz (sine wave) speed.
The loadcell excitation and the sense return system operate at the same frequency and sine wave.
The measuring system is based upon synchronic detection of the AC signal and continuous integrating ratio measurement by the A/D converter.

The big advantages of using alternating current with sine wave are the highly insensitivity for disturbances from external interferences, a very stable zero without any drift and the feature that the loadcell connections may be made with screw terminals in stead of soldered connections.

1.6 ACCURACY / SPEED

The internal resolution is 2,000,000 counts (21 bit) with a instability (noise)of max 3 count.
The EC legal approval allows for a minimum signal of 0.3 µV per scale division at 5.6 V loadcell excitation.
For a 2 mV/V loadcell this more than 37,000 counts / divisions, resulting in an accuracy of 0.003% of the measuring range of the loadcell.
The EC Metrology Legislation for Class III weighing instruments limits this value to a maximum of 10,000 counts.
On the internal calibration display the digital weight signal is presented in max. 150,000 divisions.
In the data output max. 15,000 scale divisions available.

The high speed of the complete system, the setpoint comparators included, is 436 Hz (2.3 msec.) and is independent of the setting of the amplifier (min. 0.25 mV/V full scale input).

1.7 LOADCELL CAPACITY, DEAD LOAD

The input sensitivity may be raised up to 1/8 part of the measuring capacity of a loadcell.
This does not effect the accuracy and the available resolution. The dead load on the loadcell may be compensated up to 50 % (1 mV/V) of the loadcell capacity. This too does not effect the available resolution of 15,000 external divisions over the chosen input sensitivity.

This means that loadcells with an up to 8 times higher capacity as needed may be applied, moreover with 50% dead load, without loss of speed or accuracy. This is very important for safeguarding a loadcell against heavy overload and dynamic impulses and vibrations, simply by choosing a far to high loadcell capacity.

1.8 METROLOGY LEGISLATION CE

Based upon the European Legislation, according to EN 45501 the 348-2 is EC approved and certified by Dutch NMi Certin with nr. - TC 5164 as part of a weighing machine
- T 5170 as a complete not automatic weighing machine
for max. 10,000 divisions and 0.3 µV per division at ≥ 5.6 VAC excitation and ≥ 58 Ohm input impedance.
The length of the loadcell cable is not limited. No special EMC precautions are required.
The CE marking of the 348-2 is based on EN 50081-1, EN 50082-1, EN 61000-3-2 and EN 45501.

2 WEIGH PROCESSOR 348 – 2 SPECIFICATIONS

2.1 METROLOGY CERTIFICATES

Test Certificate nr. TC 5164 and Approval nr. T 5170	: EC Metrology Legislation: n ≤ 10,000, e ≥ 0.3 µV, impedance ≥ 58 Ω, loadcell cable length is not limited, no EMC precautions are required
CE marking	: Based on 50081-1, EN 50082-1, EN 61000-3-2 and EN 45501.

2.2 LOADCELL EXCITATION

Voltage	: 4.5 - 6.5 VAC, sine wave 218 Hz, short circuit protected
Current	: 150 mA, max 8 loadcells of 350 Ω each
Sense return	: 6 wire connection, the sense signal is implemented in the A/D conversion, so no special stabilization of the excitation voltage is provided
Loadcell cable	: 6 wires, twisted pairs, low capacity, metal foil screened, article nr. 32 TPST. No cable length limitation.

2.3 LOADCELL INPUT SEE FOR CONNECTIONS PAGE 24

Impedance (dynamic)	: 20 MΩ, 10 nF parallel, short circuit protected and excitation voltage proof
Sensitivity	: 0.9 nV per division
Noise (A/D converter incl.)	: 2.7 nV pp
Sensitivity settings	: 0 . . . 0.25 mV/V up to 2 mV/V, in 8 steps of 0.25 mV/V, see table 1
Measuring range	: 0 . . . 1.25 mV up to 0 . . . 13 mV, dependent of the sensitivity setting
Dead load compensation	: Max 1 mV/V, up to 0.25% accuracy settable by switches, moreover up to 0.0007% digital with the (auto-)zero function
Linearity adjustment	: Contra parabola, effective over the net measuring range (overload setting), range 0.09% in + and -, settable per 0.006%

2.4 A/D CONVERTER, DIGITAL SYSTEM

Principle	: 21 bit continuous integrating ratio measurement
Integration time	: 2,3 msec. per complete conversion, 436 Hz
Resolution internal	: 1,501,500 counts, used at adjustment, zero setting, no motion detector, taring, internal display reading en setpoint comparators
Resolution external	Data output 15,015 divisions, setpoint data input 150,000 divisions, output A/D converter max 2,000,000 counts
Stability noise	: 3 counts pp at 150,000 counts, amplifiers and A/D converter included

2.5 DEFAULT DAMPING, FILTERS

Internal	: 4.7 Hz one pole filter in the A/D converter
Settable	: Digital two pole filter, settable from 0.13 Hz up to 4.02 Hz in 8 steps, see table 2
Auto adaptive	: Progressive increasing damping at approach of standstill, increasing up to tot 0.07 Hz

2.6 SETPOINT FILTERS

Via setpoint start command : - Inflight filter, for the setpoint comparison only, accelerates continuous and automatically the cut off of the setpoints, controlled by continuous measuring of the speed of the weight increase.
Resulting in a decrease of overshoot risks at high speed dosing
- Impulse filter, for the setpoint comparison only, up to max 5 Hz ripple

2.7 NO MOTION DETECTOR

Principle : Continuous calculation of the averages of swingings.
Out of these averages the rate of no motion is calculated. Two levels (high and low) of no motion are detected. High level is used for zero setting, low level for taring operations. The auto adaptive filter is also controlled by this calculation.
At "stand still" the adaptive filter suppresses the swingings around the calculated no motion weight value.

2.8 ZERO SETTING

switch 5: ON = automatic zero setting at switching on: "auto zero"

Range at "switching on" : - In legal mode: - 5% . .+ 15% of the nett weighing capacity (overload setting)
- In not legal mode: - 20% . .+ 80% of the nett weighing capacity (overload)
Range at "in operation" - 1.3% . . . + 2.7% of the nett weighing capacity (overload setting)
Lock up : If the zero value is outside the ranges, no zero setting will be executed.
In character 12 of the data string a warning is sent. The internal display shows a: Z .. . De last used zero value may be requested from the 348 for checking, with the string: X ? Z .
Manual zero setting : set switch 5 off / on
External zero setting : with command via data input: X ! Z CR
Delete zero memory : set switch 4 and 5 both off, the zero track will be deleted too

2.9 ZERO TRACK

switch 4: ON = continuous automatic zero setting

Range : - 1.3% . . . + 2.7% of the nett weighing capacity (overload setting)
Principle : Small deviations from the gross or net zero, < 0.5 scale division and not faster than 0.5 division per second, will be reset to zero automatically

2.10 CALIBRATION DISPLAY

Design : Internal 2- lines dot matrix LCD display with back lightning
Reading : - gross en net weight values with x 10 improved accuracy
- status indications as : no motion, taring or zero setting in operation
- error messages
- basic info during start up procedure as : serial nr, checksum, AD value, loadcell excitation voltage, internal temperature etc.

2.11 ACCURAY, STABILITY

Non linearity	: < 0.0016 % of the full measuring range (FS)
Hysterese	: none
Reproducibility	: > 0.0010 % of the full measuring range (FS)
Zero return after FS	: 0 ppm
Stability measuring range	: < 0.003 % per √ year
Stability dead load range	: < 0.003 % per √ year
Temperature effect on:	
- measuring range + dead load	: < 0.005 % / 30° C range -10° . . . +20° C
,, ,,	: < 0.005 % / 20° C range +20° . . . +40° C
- zero output	: < 0.025 µV / 5° C range -10° . . . +40° C

Signal input range	: in 8 steps of 0.25 mV/V, settable from 0 … 0.25 mV/V till 2.00 mV/V
Dead load setting	: < 0.1 scale division
Measuring range setting	: < 0.1 scale division
Overload setting	: 0.02% accuracy, at least within 9 divisions
Linearity setting	: in 15 steps of 0.006% of the nett weighing capacity (= overload setting)
Damping	: filters selectable in 8 steps from 4 Hz up to 0.13 Hz
Similarity of 348's	: 0.05 % spreading typical, max 0.1 %

2.12 EXCITATION, TEMPERATURE, HOUSING

Excitation voltage	: 230 / 24 VAC, 40 . . . 60 Hz or 24 VDC, - 15%. . . + 10% (24 V is optional)
Consumption	: 4 Watt, max 6 Watt
Environmental temperature	: with specifications: - 10° . . . + 40 °C
Idem, max, in operation	: - 25° . . . + 70°C
Idem, max, switched off	: - 30° . . . + 100°C
Temperature control	: 348 will switch off if exceeding the max. temperatures
Housing	: Coated cast aluminium case IP 65, PG 7 and PG 9 (loadcell cable) swivels
	: 4 mounting holes, distance of centres: 204 x 82 mm
Dimensions, weight	: 220 x 120 x 90 mm, weight 1.87 kg
Closing	: IP 65

3 WEIGH PROCESSOR 348 – 2 THE USE OF: SETPOINTS, TARE, DAMPING AND COMPORT

3.1 SETPOINTS

SEE FOR CONNECTIONS PAGE 24, 25

Number of setpoints : 4 , each with separate controls of weight values en execution commands, reading and writing via the RS 232 full duplex communication

Operating functions :
- send value
- read value
- (re)start setpoint(s)
- stop setpoint(s)
- anti pulse filter
- automatic inflight compensation
- after sending value yes/no direct active
- auto set zero before start setpoint(s)
- automatic step to next setpoint
- setpoint on hold after cut off

Overload setpoint : Setpoint 4 may be set as a overload control on the gross weight value, even if the other setpoints are operating in net mode

Setpoint outputs :
- per setpoint one opto-coupled output, 24 V, load max. 85 mA, not inductive, the output is in conduction to the common (GND!) as long as the really measured weight value is less than the setpoint value
- per setpoint a indicator led on the main print board of the 348:
  Led off = setpoint active (output is conductive)
  Led on = setpoint off (output is not conductive)
- per setpoint a status code (on/off) in the standard weight string, at communication speed < 19k2 Bd some delay may occur in the response time of this status. Therefore this code should not be used for direct switching off of connected dosing equipment

Tare : = set zero over the complete weighing range
(see 3.2 on next page)
In a “read” command to a setpoint may, next to the weight value, also a tare command be given. This tare command will be executed, at starting the setpoint, automatically after no motion control and before switching on the setpoint output

Start setpoints : The setpoints may be set direct active at receiving a “read” command, but also only after the special “run” command has been received.
Each separate setpoint can be stopped or started, but also combinations of setpoints and with automatic step to next setpoints.
After cut off a setpoint can be programmed to set on hold and may started again with a “run” command.

Course/ fine dosing (example) : Send the required weight values for setpoint 1 and 2 with course and fine dosing values to the 348, together with the executive code (table 7) F (= tare + step next + hold + not active). See “Command string setpoint”, page 32.
By sending a start command (table 8) ! R ! , first the reading will be set zero after no motion control, after that setpoint output nr. 1 is opened (conducting).
At attainment of the setted 1^e weight value, the 1^e output is switched off and set on hold. At the same moment the 2^e setpoint output is switched on and after attainment of the setted 2^e weight value will this be switched off en on hold.
By re-sending the start code ! R ! the cycle will be repeated.
With start code ! R # both the setpoint are started together.

3.2 TARE

Function : Digital zero setting of the gross weight value with 0.1 scale division accuracy. Allowed within the complete weighing range.

Taring : With tare command: X ! N CR (= set net), or built in into a setpoint executive code. See table 7, 2^e column on page 45.
If a tare is in operation, i.e. the weight reading is net, the gross weight value always may be requested with: X ? G CR , the tare will not be deleted.
A tare is cancelled with command: X ! G CR (set gross)

3.3 DAMPING / FILTERS

Standard filter : Digital two pole filter from 0.13 Hz up to 4.02 Hz in 8 steps. Setting by dil-switches 49 . . 52 on the main print board, see table 2 on page 40.

Adaptive filter : This progressive filter damps down the weight movements automatically with more force as the weight movement tends to decrease.
This results in a major improvement of the time necessary for achieving a "standstill" and prevents for blinking up and down of the weight reading.
The increased filtering of the adaptive filter is switched off immediately if more than ½ scale division change in the weight value is measured longer than ½ second. Pulsating changes however are neglected by integrating calculation of the weight values.
The adaptive filter is default "on", but may be disabled with command : ! E 3 (off), and reset with : ! E 2 (on).

Anti pulse filter : Effective only for the weight values sent to the setpoint comparator.
Pulsating weight changes are recalculated, based upon the steepness of the pulse and the remaining increase of weight after a pulse. In this way the kinetic energy of the pulse will be levelled, resulting in a correct weight value that is used by the setpoint comparator.
Short "overshoots" of the measured weight value is strongly prevented by this filteren, premature switching off of the setpoints is prevented.
The anti pulse filter is switched on with the start command code of the setpoints, see table 8, last column on page 46.

Inflight filter : Effective only for the weight values sent to the setpoint comparator. This filter measures continuously (426 x per second) the speed of the weight increase. From the derivatives of these range of measured values, it calculates the kinetic energy, pushing on the scale. The weight value of this energy is added to the actual value, causing a premature cut off of the setpoints.
In this way course filling may last longer, and fine dosing time will be shorter, since overshoot risk is strongly limited, it will speed up the capacity of filling.
The anti pulse filter system is incorporated in the inflight filter.
Since these filters are measuring continuously at high speed, a change in weigh speed immediately will result in correction of the setpoint cut off values.

The inflight filter is switched on with the start command code of the setpoints, see table 8, last column on page 46.

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3.4 COMMUNICATION PORT

See for connections PAGE 24, 26, 28

RS 232V24 / CL : The way of connection of the connection cable on the data in/output connector and switch 65/66 determine the transmission mode: Current Loop or V24.
See print layout and connections on page 24
The CL is opto coupled, 20 mA, shortcut proof full floating.
V24 receipt is passive, buffered up to 85 V, sending is active en buffered.

Visual transmission check : Just above the output part and the input part of the data connector red led's indicate the correct connection of the port. Blinking of a led indicates an actual transmission or receipt of data. Blinking is good visible at 1200 Bd.

Test comport (switch 67) : A slide switch (with white handle), at the right side above the data connector, switches off the external connections and connects the 348's in- and output on line with one another.
If the 348 is set on continuous transmission mode (= call number 0), both the led's will blink synchronously (visible at 1200 Bd: switch 57 and 58 off).

Baud rate : Settings available 1200, 2400, 9600 and19,200 Bd, advised speed: 19,200 Bd

Transmission mode : If set as device nr. 0 , a 348 sends continuously max. 36 x per second a string. The number of strings per second depends on the Baud rate setting, see table 4 on page 42.
If set as device nr. 1 - 15, a 348 responds on a request with one string only after at least 2 µsec up to max 27.5 msec.

Requests at continuous mode : Default transmission is the gross weight string, until a tare operation has been executed. After taring automatically the net weight string will be sent.
If, in continuous sending mode, a setpoint value is requested, the data string with setpoint info will be sent one time only. Thereafter the original transmission will be continued.

Slow down transmission speed : The speed of transmission at continuous mode may be delayed to max 1,1 string per second, by sending the command ! E A CR, see page 38, 42.

Character frame : 1 start bit, 7 data bits, 1 parity bit (odd/even) 2 stop bits,
Asynchron ASCII with always CR as last character, see table 4 on page 42.

Device (call) number : Setting with switch 61 up to 64 from nr. 0 up to 16. The 348 responds only on requests and commands with its call number in front. See table 5 on page 43.

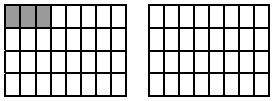
Bus mode, interface 848 : Using the 848 interface up to 15 x 348's may be connected in Current Loop.
The output of the 848 interface may be selected as CL or RS232 V24.
See also chapter 8 on page 28, 29.

4 WEIGH PROCESSOR 348 – 2 ADJUSTMENTS:

ZIE PAG 21 : SWITCH INDELING

4.1 ADJUSTING : INPUT SENSITIVITY

SWITCH 1 - 3



Amplifier factor: 1x . . 8x : De digital amplifier of the 348 may be adjusted in 8 running up steps of 0.25 mV/V each. Setting by switches 1 up to 3, see table 1:

Table 1

Switch			Input range
1	2	3	mV/V
0	0	0	0 - 0.25
0	0	1	0 - 0.50
0	1	0	0 - 0.75
0	1	1	0 - 1.00
1	0	0	0 - 1.25
1	0	1	0 - 1.50
1	1	0	0 - 1.75
1	1	1	0 - 2.00

De highest amplification (8 x) is achieved at an input sensitivity of 0.25 mV/V. Do not set the amplifier at a higher rate than necessary.
The setting is not very critical. Only at more than 15,000 scale divisions external resolution some noise may occur. The number of divisions of the selected input range is 15,000 counts, but may run up to ca. 18,000 counts.
At an improper setting of the input range it is possible to exceed the linear range and/or the calculation limits of the A/D converter.
Exceeding the calculation limits will cause a stop of the A/D converter.

Excess of the input range over 15,000 divisions is shown in the internal display with a " ! " in the first decade. In the data string a > of < appears as an overload error message in character 4 of the string.

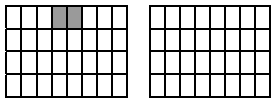
Attention ! The input sensitivity has to be adjusted before all other settings and adjustments !

Calculation example:

Required weighing capacity : 100 kg
Applied loadcells : 3 x 100 kg = 300 kg, 3 loadcells of 2.00 mV/V
Loadcell signal at 100 kg : 100 kg : 300 kg x 2 mV/V = 0.67 mV/V, round off upwards to 0.75 mV/V
Number of divisions : 0.67 mV/V : 0.75 mV/V x 15,000 counts = 13,400 scale divisions available
Scale division will be (1,2 of 5) : 100 kg : 13,400 divisions = 7.5 gram, round off upwards to 10 gram

4.2 ADJUSTING : ZERO SETTINGS

SWITCH 4 - 5



Automatic zero setting with the 348 in operation : Switch 4 "on" sets the so called "zero track" active. This zero track keeps, automatically and continuously in gross and net mode, the zero reading exact at zero, as soon as the weight measuring deviates ≥ 0.1 scale division from the zero, with a maximum of 0.5 division and a maximum speed of 0.5 division per second. Switch 5 too has to be "on".
The zero track is based upon a separate digital memory, and has no connection with the dead load compensation of the dil switches 6 - 16.
The range of the zero track is limited within - 1.3% . . . + 2.7% of the weighing capacity, as set by the overload switches, see chapter 4.5.
These limits are valid too for the external "set zero" command: ! Z .

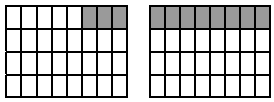
Automatic zero setting at switching on the 348 : With switch 5 "on" at switching on the 348, the reading will be automatically set zero, after no motion control (high level S2), with 0.01 division accuracy.
This zero setting is based upon a separate digital memory, and has no connection with the dead load compensation with the dil switches 6 - 16.

The range of this initial zero setting is at legally stamped scales limited from - 5% . . + 15% of the weighing range as set by the overload switches.
For not stamped scales (switch 60 "off") the zero setting range is extended from -20% . . +80%.

Exceeding the zero limits : As soon as a zero setting should exceed the limits, the zero setting is not executed. In the data string, in digit 12, an error message appears : > or = , as well as on the internal display in the last two characters : Z > or Z = . The previous zero value is maintained and may be requested for with command : ? Z .

Delete zero memory : Both the zero memories of the zero track en initial zero setting are deleted by setting both switch 4 and 5 off.
The zero memories are not deleted by switching off the 348.

4.3 ADJUSTING : DEAD LOAD COMPENSATION

SWITCH 6 - 16 

System : Dead load compensations used for suppressing permanent loads on a weighing scale. F.e. a weigh hopper, platform, conveyor etc.
Here the dilswitches 6 up to 16 are used as hardware memory. The setting of these switches is continuously transferred to a digital memory and is subtracted from the actual A/D conversion value.
At any moment the setting of the switches may be changed, the weight reading is adapted immediately.

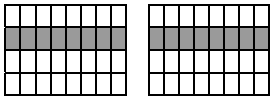
Range : The 11 dilswitches have a total range of 1 mV/V, that is 50 % of the capacity of 2 mV/V loadcells. If this proves to be not enough a higher capacity of loadcells should be applied.

Accuracy : The first switch at the left: switch 6, has the highest value: 50% of the range, the next has 25% and so on until switch 16 with 0.05% effect, which is 0.1% of the weighing capacity. These lasting 0.1% is set zero with switch 5 . See 4.2.

Procedure : Start with all the switches down (off), 4 and 5 included. Set switch 6 “on” and check the effect on the internal display. If the weight value still is positive leave the switch “on”. If the value is negative set the switch back “off”.
Proceed with switch 7 a.s.o. until switch 16. Finally switch 5 is set “on” resulting in an exact zero reading.
Attention: during this procedure all the span switches 17 t/m 32 should be “on”, the division selector switches preferably at x 1: switches 53 up to 56 op 1 0 0 1 (on -off - off - on). Not all the overload switches 38 up to 48 should be “off” , preferably all “on” .

No interference with span adjustment : Setting or changing the dead load settings and the digital zero memories does not effect in any way the span adjustment.

4.4 ADJUSTING : SPAN

SWITCH 17 - 32 

Weight adjustment : Using switch 17 up to 32 the scale may be adjusted, based upon an accurate weight mass placed upon the scale, preferably 100% of the weighing capacity. These switches determine the number of scale divisions that are applied on the selected input sensitivity range. See 4.1
F.e. at an selected input range of 1 mV/V, the input signal of 1 mV/V is divided into 15,000 divisions if all the switches are “on”. Setting back the switches one by one will reduce this number, finally to 0 divisions.
At any moment the setting of the switches may be changed, the weight reading is adapted immediately.

Number of divisions

The leftmost switch has the highest value: 50% of 15,000 divisions, with each following switch to the right this value halves : 25%, 12.5% …a.s.o.
From the number of switches at “on” the selected number of divisions may be determined . And, with the other way around, a pre-calculated number of divisions may be selected (adjusting based upon calculated values).

Divisions per span switch

The next table indicates the exact number of divisions per switch.

Span switches 17 up to 32, in total 15,000 divisions				
sw. nr.	number of divisions		sw. nr.	number of divisions
17	7500.00		25	29.30
18	3750.00		26	14.65
19	1875.00		27	7.32
20	937.50		28	3.66
21	468.75		29	1.83
22	234.38		30	0.92
23	117.19		31	0.46
24	58.59		32	0.23

In the actual production of the 348 the real number of divisions is 0.1% higher at 15,015 divisions, + or - max. 10 divisions.

Accuracy : The last switch 32 (LSB) achieves an accuracy of the span setting of + or - 0.11 division at full 15,000 selection. At a lower number of divisions selected, this accuracy improves: at 3,000 divisions it is + or - 0.023 division.

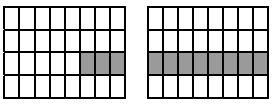
Procedure : Start with all the switches at “on”. Load the scale with an accurate known weight. The weight reading on the internal display will too high.
Set the leftmost switch (nr.17) down at “off” and check whether the reading still gives a too high value.
If too high, leave the switch “off”, if too low already, set back the switch “on”.
Go to the next switch (18) and repeat the procedure, and so on up to switch 32 until the required weight reading is achieved.

Attention: before starting the span adjustment procedure an accurate zero setting procedure (4.3) and adjustment of the scale division value (4.8) has to be accomplished first. The overload switches 38 t/m 48 should all be “on” .

No interference with zero/dead load adjustment : Setting or changing the span settings does not effect in any way the zero and dead load adjustments.

4.5 ADJUSTING : OVERLOAD

SWITCH 38 - 48



System : The effective total weighing range is limited up to the with switch 38 t/m 48 selected maximum weighing capacity: “Max”. Some of the error reports and the linearity compensation are based upon this overload value.
Also the legal limit of “Max” + 9 e are based upon the selected overload setting.

Accuracy : Plus or minus 0.025% van de selected input sensitivity.

Value per overload switch : In the table below the value of each switch is indicated in percentage of the selected input sensitivity.
F.e. at a 1 mV/V input selection, switch 1 has the value of: 54.61% x 1 mV/V = 0.5461 mV/V. With a loadcell of 200 kg and 2 mV/V output signal, switch 1 has a value van 54.61 kg.

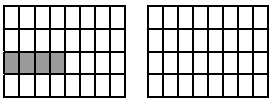
Overload range switches 38 up to 48				
sw.nr.	% of input sensitivity		sw.nr.	% of input sensitivity
38	54.61		44	0.85
39	27.31		45	0.43
40	13.65		46	0.21
41	6.83		47	0.11
42	3.41		48	0.05
43	1.71		Total	109.17

Indication of overload : A weight value exceeding the selected overload value is shown on the internal display with a " ! " in the 4^e digit, immediately in front of gross weight reading, and in the data string too, in the 4^e digit.

Attention : The linearity compensation is calculated based upon the weight value between the selected zero value and the selected overload value. Therefore it is important to adjust an accurate overload value before starting with the linearity adjustment !

4.6 ADJUSTING : LINEARITY

SWITCH 33 - 37

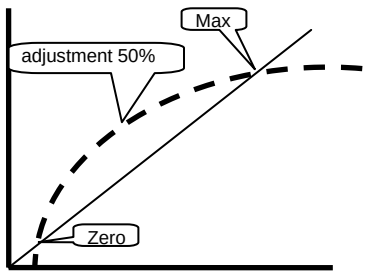


Parabolic principle : After adjusting the zero, span and overload, probably the weight reading, at decreasing the weight value on the scale, will show a not linear curve.
By unloading the scale down to 50% of its weighing capacity, the deviation may be read on the internal display.
From here it is possible to compensate for this deviation.
Not linear effects are most of the time caused low quality of loadcells or by bending of the scale's mechanical structure. They are of parabolic shape.
With the 348's selectable contra parabola this deviation may be compensated in 15 steps of 0.006% each. Maximum range is 0.09% in + of - .

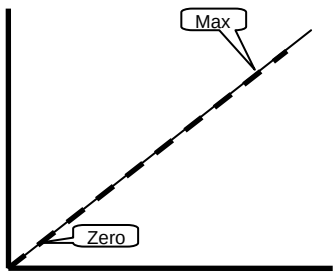
Procedure : Same procedure as at the zero and span adjustment procedures
The value of the switches counts as binary values. Switch 34 has the highest value (MSB)

System deviation : The not linearity of a 348 itself is < 0.0016% at FS = 2 mV/V input selection

Effect :



Before adjustment



After adjustment

Switch functions and values : Switch 33 determines the direction of the correction: positive of negative.

Switch					Correction negative
33	34	35	36	37	%
0	0	0	0	1	- 0.006
0	0	0	1	0	- 0.012
0	0	0	1	1	- 0.018
0	0	1	0	0	- 0.024
0	0	1	0	1	- 0.030
0	0	1	1	0	- 0.036
0	0	1	1	1	- 0.042
0	1	0	0	0	- 0.048
0	1	0	0	1	- 0.054
0	1	0	1	0	- 0.060
0	1	0	1	1	- 0.066
0	1	1	0	0	- 0.072
0	1	1	0	1	- 0.078
0	1	1	1	0	- 0.084
0	1	1	1	1	- 0.090

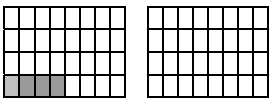
Switch					Correction positive
33	34	35	36	37	%
1	0	0	0	1	+ 0.006
1	0	0	1	0	+ 0.,012
1	0	0	1	1	+ 0.018
1	0	1	0	0	+ 0.024
1	0	1	0	1	+ 0.030
1	0	1	1	0	+ 0.036
1	0	1	1	1	+ 0.042
1	1	0	0	0	+ 0.048
1	1	0	0	1	+ 0.054
1	1	0	1	0	+ 0.060
1	1	0	1	1	+ 0.066
1	1	1	0	0	+ 0.072
1	1	1	0	1	+ 0.078
1	1	1	1	0	+ 0.084
1	1	1	1	1	+ 0.090

Adjusting : In daily praxis the compensation is done on empiric bases. After span and overload adjustment with 100% load on the scale, the scale is unloaded down to 50% . De deviation that now is read may be linearised by starting with the rightmost switch setting at “on” (37). The next larger effect is sw. 37 “off” and sw. 36 “on”, followed by both the switches “on”. According to this binary programmed values may be continued with sw. 35 and sw. 34 until the required compensations is achieved

4.7 ADJUSTING: DAMPING FILTERS

SWITCH 49 - 52

SEE TABLE 2



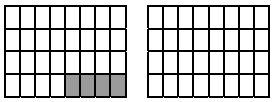
System : A settable two pole integrating filter may improve the stability of the weight presentation.
Selectable in 8 binary steps from 0.13 Hz up to 4.03 Hz. Since the A/D converter already is equipped with basic active damping, this selectable filter is meant for use in less favourable conditions of a scale.
Under good conditions and with a properly built scale it should not be necessary to bring these filter into action.

Switch functions : The switches 50 up to 52 have binary values and may be adjusted in the same way as the non linearity switches (ze table above and Ccapter 11.2 table 2).
Switch 50 (MSB) has the highest value, followed by sw.51 and sw. 52 .
With all switches “off” there is not damping.

Calibration switch 49 : With switch 49 “on” the 348 is brought into the calibration mode, that causes a 2 x higher damping of the filters to achieve a extra stabilised reading, as well as switch on of the back lightning of the internal display.

4.8 ADJUSTING : SCALE DIVISION, DECIMAL

SWITCH 53 - 56
SEE TABLE 3

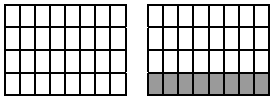


System : The weight value of each count from the A/D conversion is determined by the setting of switch 53 up to 56.
At the same time the place of the decimal point is established.
Selectable are values from x 0.001 up to x 50, see table 3 on page 41.

Example : With a span setting (see 4.4) of only switch 17 “on” = 7,500 counts, and a scale division setting with only switch 55 “on” (= x 0.005), the weight reading will be at full load: 7,500 counts x 0.005 = 0 - 37.500 with steps per 0.005.
On the internal display these value can be read in full extend, the decimal point and an extra decade (reading x 10) to the right included. In de datastring the decimal point is neglected, but can be determined in digit 14 of the string.

4.9 ADJUSTING : COMPORT SETTINGS

SWITCH 57 - 67
SEE TABLE 4



CL / V24 : Current Loop or RS 232 transmission mode is determined by the way the transmission cable is connected to the data output connector and by setting of switch 65 and 66.
See “Lay out and connections” on page 24.
Current Loop is opto coupled, 20 mA , short cut proof and fully floating.
V24 receipt is passive, buffered up to 85 V. V24 sending is active en buffered.

Baud rate : Settings are 1200, 2400, 9600 en 19200 Bd with switch 57 and 58, see table 4 on page 42

Slow down transmission speed : The speed of transmission at continuous mode may be delayed to max 1,1 string per second, by sending the command : ! E A CR, see page 38, 42.

Character frame : 1 start bit, 7 data bits, 1 parity bit (odd/even selectable with switch 59),
2 stop bits,
Asynchron ASCII with always CR as last character, see table 4 on page 42.

Device (call) number : Setting with switch 61 up to 64 from nr. 0 up to 16. The 348 responds only on requests and commands with its call number in front. See table 5 on page 43.
Selected as device nr. 0, the 348 will send continuously.
In the answer messages the call number is always sent back, in the first digit of the string.

4.10 ADJUSTING : BUS MODE INTERFACE TYPE 848

Bridge	: Up to 15 weigh processors 348 may be connected to one computer input in CL mode, via interface type 848. By selecting for each 348 a unique call number, all processors can be approached individually. Because of the short response time of max 27,5 msec, all the connected 348's are with high speed accessible.
Interface 848	: Connecting more than two 348's on one comport of a connected host computer, requires the use of interface Weightec 848. Four groups of four 348's may be connected in Current Loop (max 15). The 848 interface prevents for too high voltages of the RS232 CL connection. The data output as well as the 4 data inputs may be separately selected as CL or as RS 232V24 .
Connection	: See connection diagrams on page 24, 26, 28 and 29.

5 WEIGH PROCESSOR 348 – 2 ADJUSTING PROCEDURE SUMMARY:

- SEE PAGE 21 : SWITCHES ON THE MAIN PRINT BOARD
- SEE PAGE 24 : LAY OUT AND CONNECTIONS OF THE MAIN PRINT BOARD

1 - Switch on the 230 VAC (or 24VDC) excitation at connector 31 with calibration switch 49 off (low)

2 - Advised setting of the switches before starting the adjusting procedure:

- Span	17 … 32	ON	(high)
- Overload	38 … 48	ON	(high)
- Calibration mode	49	ON	(high = stronger damping, display back lit on)
- (Auto) zero	4 and 5	OFF	(low)
- Dead load	6 … 16	OFF	(low)
- Non linearity	33 … 37	OFF	(low)
- Damping	50 … 52	OFF	(low)
- Legal mode	60	OFF	(low)

3 - Select the input sensitivity with switch 1 ../ 3 in mV/V effective use van de loadcell.
See 4.1 on page 13 en table 1 on page 39.

4 - Select the value of the scale division and the position of the decimal point with switch 53 … 56.
See 4.8 on page 18 en table 3 on page 41.

5 - Compensate the dead load (reading on the internal display) back to zero, first with switch 6 … 16. Start with setting switch 6 (MSB) high. If the reading goes negative (- or < sign in front of the value), set down this switch again. If the reading stays positive, leave it high. Continue in the same way with all the next switches one by one. A small weight value will remain.
This value is set to an exact zero by switching switch 5 “on”.

6 - Load the scale with certified weights, preferably up to the Max. weighing capacity.
The reading now will show a too high weight value. Reduce this value with switch 17 … 32 until the reading gives the correct value. Start with switching down switch 17 (MSB), the procedure is identical to the dead load compensation procedure.

7 - With full load on the scale now the overload setting has to be selected with switch 38 … 48 until the display reading changes from G + …. into in G ! …. This G ! … means: there is overload now. Make the setting of the switches in such a way that G ! … just does not comes up. Start with switching down switch 38 (MSB), the procedure is identical to the dead load compensation procedure.

8 - Unload 50% of full load from the scale. The display reading should present now exactly half the weight value of the Max. capacity. If not, this deviation may be linearized with switch 33 … 37. The direction of this linearity compensation : up or down, is selected with the leftmost switch 33. The other switches determine the value of the compensation. Start with the rightmost switch 37 (LSB). The value setting of these switches is binary, see the table in chapter 4.6 on page 16, 17.
Attention! If the overload setting is not done correctly, the linearity compensation will not be correct too !

9 - Select if required:

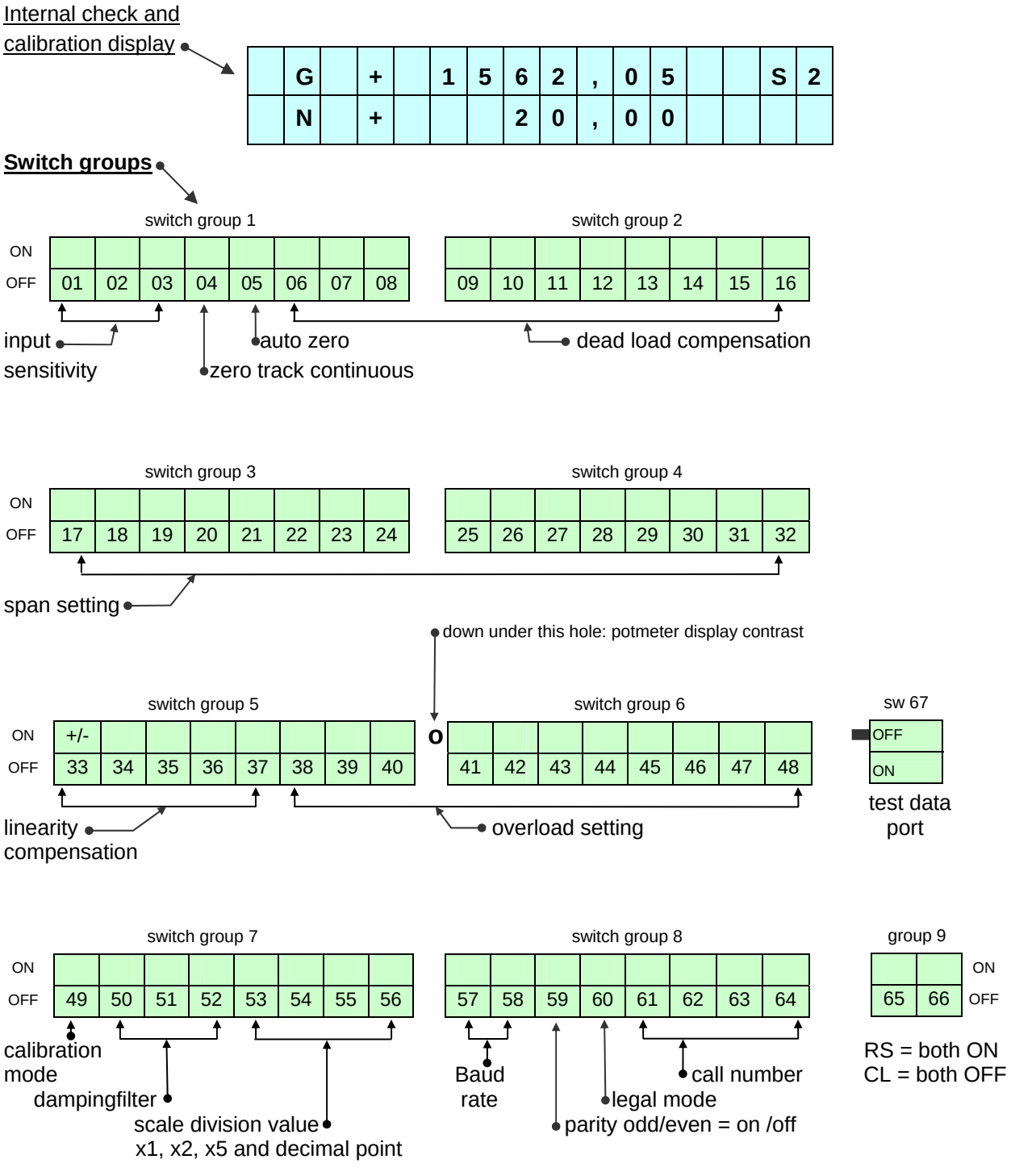
- Auto zero	: switch 4	high = zero track “on”
- Baud rate, parity	: switch 57, 58, 59	see table 4 on page 42
- Legal mode	: switch 60	high = legal mode “on”
- Call number	: switch 61 t/m 64	see table 5 op page 43

10 - Set down switch 49. The strong damping for calibration purposes will be switched off.

11 - Increase, if necessary, the damping of the weigh presentation with the filter switches 50 … 52 on an empiric bases. The value setting of these switches is binary, start with switch 52 (LSB). See chapter 4.7 on page 17 and table 2 on page 40.

6 WEIGH PROCESSOR 348 – 2 SWITCHES, CALIBRATION DISPLAY:

6.1 SWITCHES ON THE MAIN PRINT BOARD



Attention: Always switch on a 348 with switch 49 in OFF position, or, after switching on, at least one time set switch 49 down to the OFF position.
If a 348 is switched on with switch 49 in ON position, some switches will have different functions.

6.2 INTERNAL CALIBRATION DISPLAY

The small dot matrix display on the main print board has 2 lines with 16 alpha numerical characters each. Setting switch 49 (calibration mode) high will switch on the back lightning and will double the damping of the weight reading in order to create a very stable reading of the weight value.

After start up (see 6.3) both the gross and net weight values are displayed on the two lines of the display, with a 10 x higher accuracy.
This makes it possible to adjust a weighing scale with 0.1 scale division accuracy.

Next to the weight values a number of important status reports are shown, as they are sent in the data string too.

Reading:

G : gross weight (x 10)
N : net weight (x 10)

#	**G**		**+**		**1**	**5**	**6**	**2**	**,**	**0**	**5**			**S**	**2**
	N		**+**				**2**	**0**	**,**	**0**	**0**				

! : A/D converter overload (value > 55900)
: calibration mode (sw.49 “on”)

M +/- : weight goes up (+) of down (-): **M**otion
S 1 : **S**tandstill within +/- 0.2 scale division
S 2 : **S**tandstill within +/- 0.1 scale division
T +/- : **T**are operation is in execution
Z +/- : **Z**ero operation is in execution
Z > : **Z**ero value is too big
Z = : **Z**ero value is too big at initial switch on
Z ? : **Z**ero setting is disabled at switch 5 “off”

More info about these digits 11 and 12 on page 30

\+ : weight value is positive
\- : weight value is negative
□ : weight value is 0 , + of - 0,1 scale division (□ is blank)
/ : weight value is negative > 0,5 scale division (in legal mode only = switch 60 ON)
! : weight value is > selected overload value
> : input loadcell signal is too high
< : input loadcell signal is too low

More info about these digits 4 and 5 on page 30

The contrast setting of the calibration display may be adjusted by a potmeter.
This potmeter is situated direct under the hole in between switch groups nr. 40 en 41.

6.3 INFORMATION ON THE CALIBRATION DISPLAY

The calibration display gives the actual weight reading of both the gross and net weight values.
The accuracy of the reading is 10 x higher as the selected scale division.
Moreover there are important and useful supplementary reports displayed, see chapter 6.2 on page 22.

Consecutive readings during initial start up of 348:

After power on of a 348 each line of the display shows a running down row of black squares.
This enables the check of all the dots of each separate digit.
The display shows with 2 seconds interval:

Reading:	Function:
■■■■■■■■■■■■ ■■■■■■■■■■■■	Check display characters
WEIGHTEC 348 - 2 SNR. 1701 V01.01	Brand Type number Serial nr. Software version
C.SUM 0726 IJK C.SUM - - - - - USER	Checksum : on the setting of all the programming switches Checksum : in use with the model 349 only
EXC. 6.0V T+27°C A→D 2.000.000 M	Actual loadcell excitation voltage Internal temperature Direct output A/D converter in mV/V (max 2,000,000 mV/V) M = motion
G + 28,6 Z +/- N + 28,6	G + = positive gross weight x 10 Z = set zero function in operation *) N + = positive net weight x 10 +/- = in- or decrease weight value

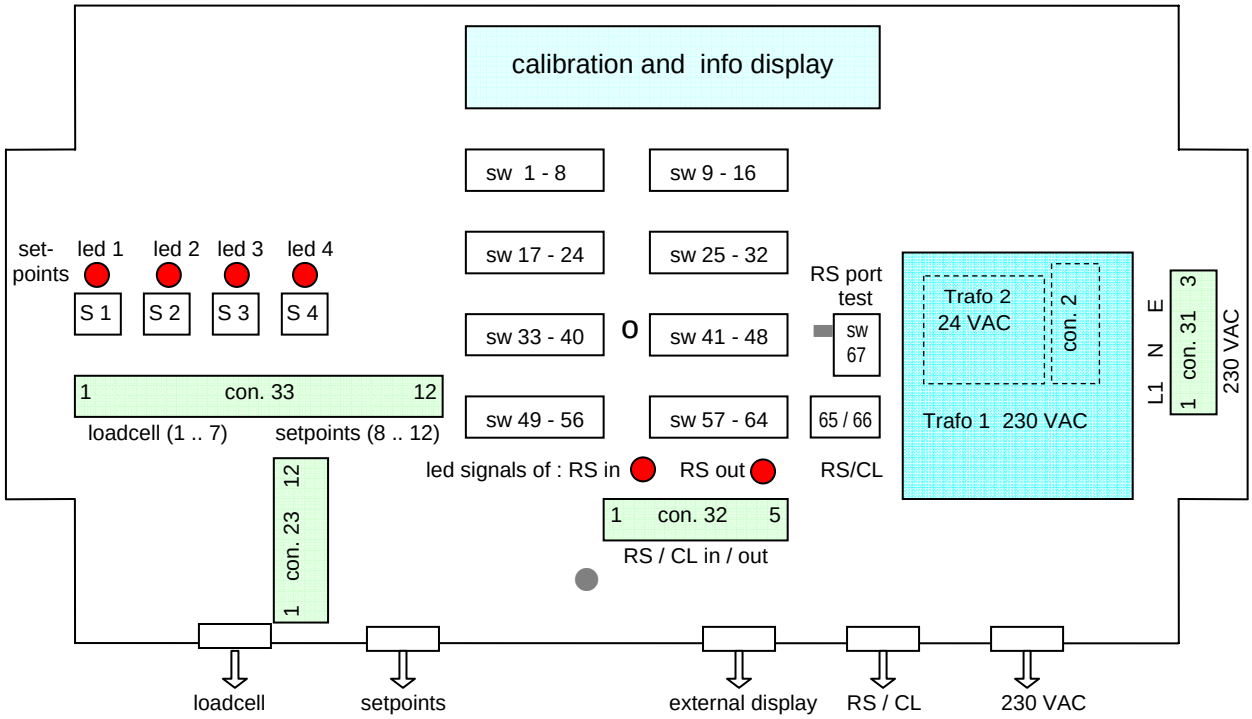
After: Z 1 followed by: Z 2 (increasing level of no motion) the zero setting is executed *):

G 0,0 S2 N 0,0	G = gross weight x 10 S2 = high level of standstill: 2 N = net weight x 10

*) If switch 5 (auto zero at initial power on) is in OFF position, no zero setting is executed after switching on the 348. However the dead load compensation via dil switches 6 …16 is always applied on the weight signal.

7 WEIGH PROCESSOR 348 – 2 PRINT LAYOUT, DIAGRAMS:

7.1 LAYOUT AND CONNECTIONS MAIN PRINT BOARD



Loadcell / setpoint connector 33

(cable type 32 TPST)

Loadcell input	1	Shield	
	2	- signal	(orange)
	3	+ signal	(red)
	4	+ excitation	(brown)
	5	+ sense	(green)
	6	- sense	(yellow)
	7	- excitation	(black)
Setpoint output	8	Setpoint 1	(+24 VDC in)
	9	Setpoint 2	(+24 VDC in)
	10	Setpoint 3	(+24 VDC in)
	11	Setpoint 4	(+24 VDC in)
	12	Common setpoints = GND	

Data connector 32

(cable type 22 TPST)

RS 232 mode	1	RXD	(black)
	2	Short cut with pin 1	
	3	TXD	(red)
	4	Short cut with pin 3	
	5	Common	(orange + brown)

switch 65 and 66 high (on)

Shield only one side connected

CL mode	1	+ RXD	(black)
	2	- RXD	(brown)
	3	+ TXD	(red)
	4	- TXD	(orange)
	(5)	Shield	(one side only)

switch 65 and 66 down (off)

RXD = passive TXD = active

Connector 31 power supply

230 VAC
6W
50 / 60 Hz

1	Line
2	Neutral
3	Mass

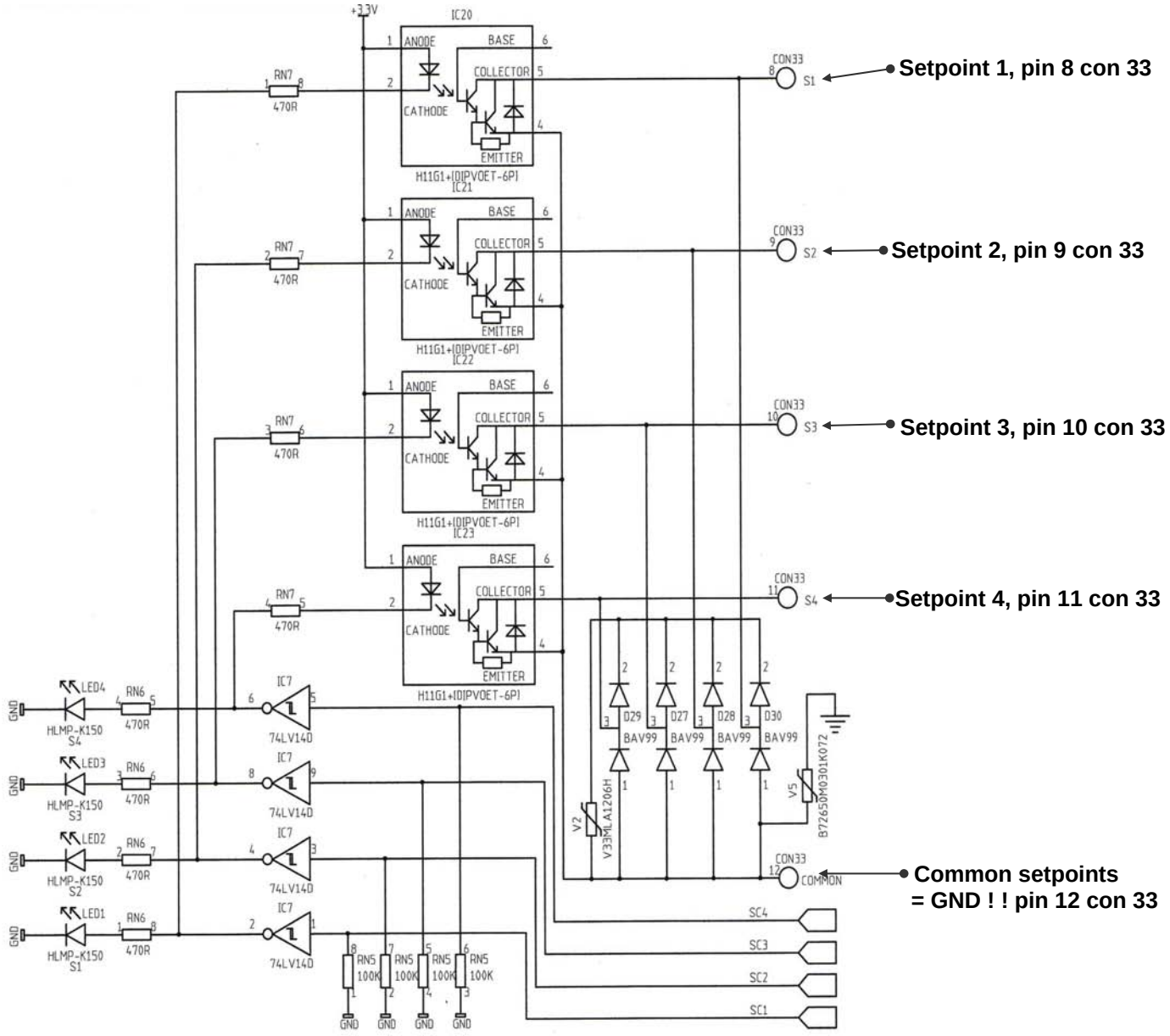
Connector 23 external display

Pin 1 … 12 to be connected with the equal pin numbers of the external display type Weightec 248.
Cable type 112 TST

S 1 … 4 : opto couplers of the setpoint outputs (exchangeable)
Led 1 … 4: : status setpoints: led on = setpoint off
Led RS in / out : blinking off, during receipt and transmission (visible at 1200 Bd)
Transmission test : test of the comport with switch 67 down, using the test led's and:
- switch 57 and 58 : off (1200 Bd)
- switch 61 … 64 : off (call nr. 0 = continuous transmission)

With the test switch down, both the led's should blink synchronous
External connections are disabled during this test, the 348 is at 1200 Bd and in continuous sending mode connected to its own receiving port.

7.2 DIAGRAM SETPOINT OUTPUTS

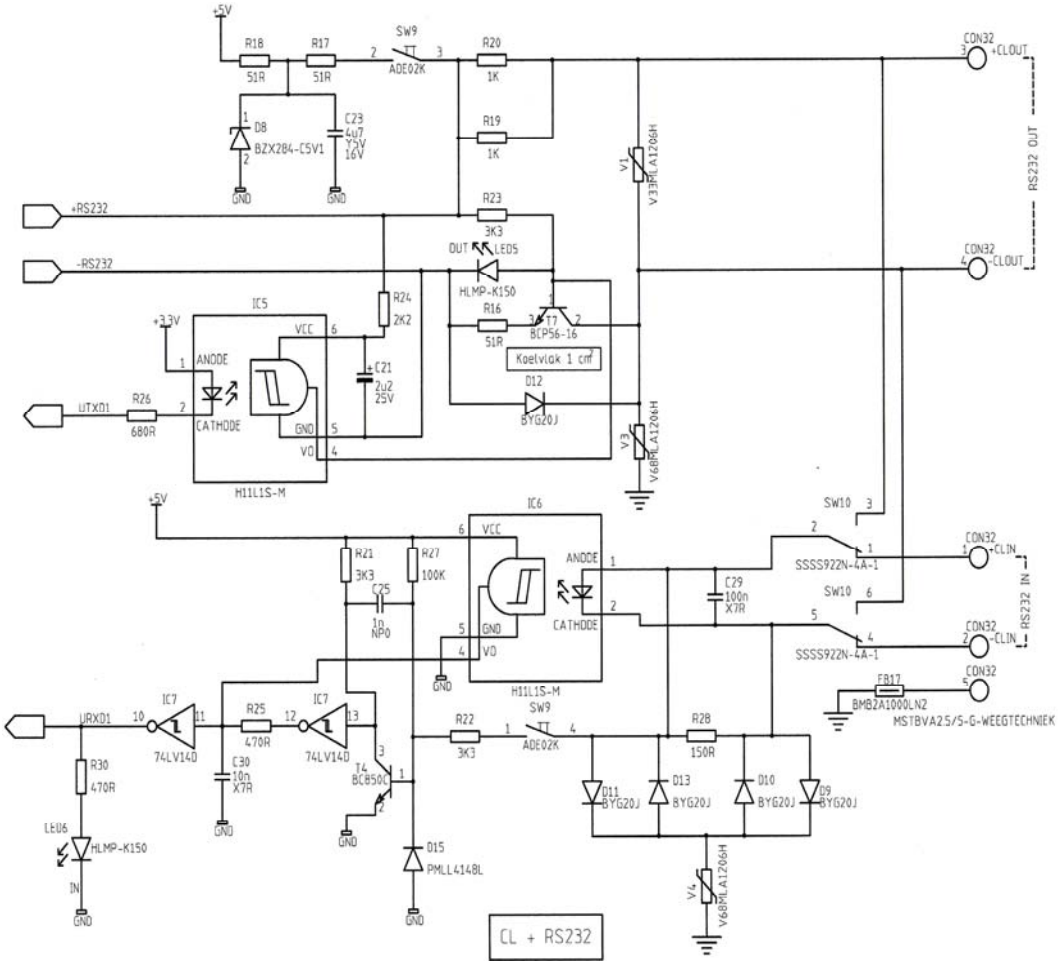


See for connections of connector 33 chapter 7.1 on page 24

Attention:

- The Common has 0 V potential.
- De Common is separated from the device's ground by a varistor.
- Only with a properly connected 348 the Common my be connected to ground (not advised).
- Max load per setpoint output is max. 30 VDC and 70 mA not inductive.
- De opto couplers are mounted in feet and are exchangeable

7.3 DIAGRAM RS232 / CL DATAPORT

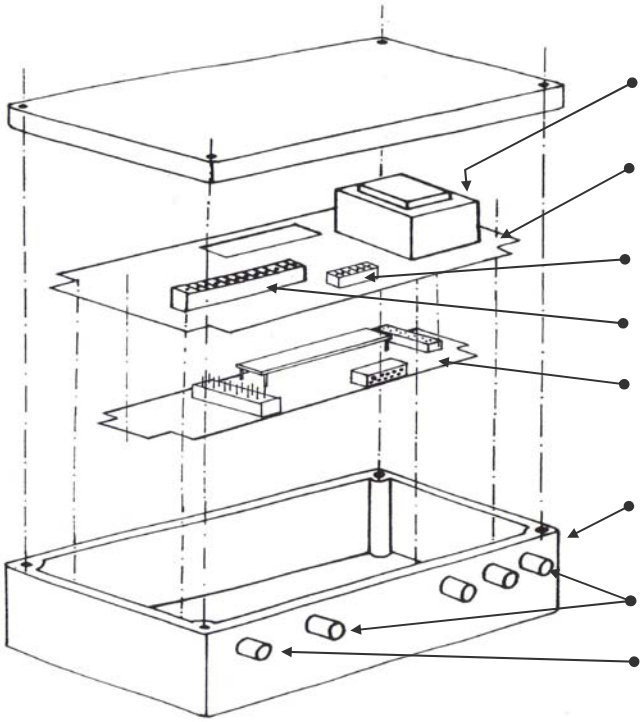


See for connections of the data connector 32 chapter 7.1 on page 24

Attention:

- Using RS 232 V24 communication: pin 1/2 interconnected and pin 3/4 interconnected.
- Using RS 232 V24 communication: switch 65 and 66: ON (high), at Current Loop: OFF (low)
- Apply foil shielded, low capacity cable with 2 x 2 twisted pairs, type 22 TPST as data cable.
- Using RS 232, in each pair one wire should carry a signal and the other wire has to be connected to the ground of pin 5.
  In this way the 348's communication per RS 232 may be as long as 100 m.

7.4 EXPLODED VIEW



Excitation 230 VAC connector, next to trafo

Main print board Weightec 348-2

RS /CL comport connector

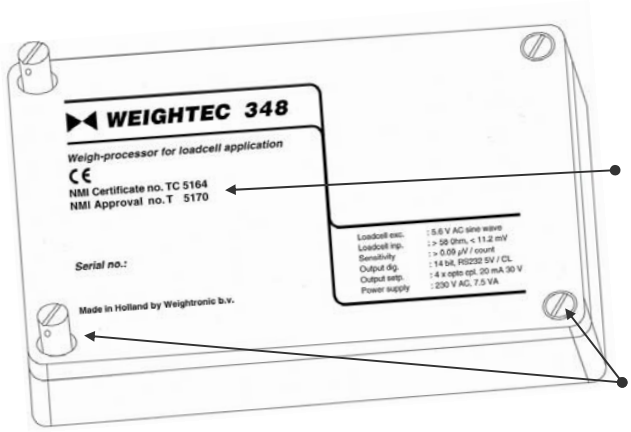
Loadcell and setpoint connector

Weightec 349 sub print board

Housing, coated cast aluminum, IP 65

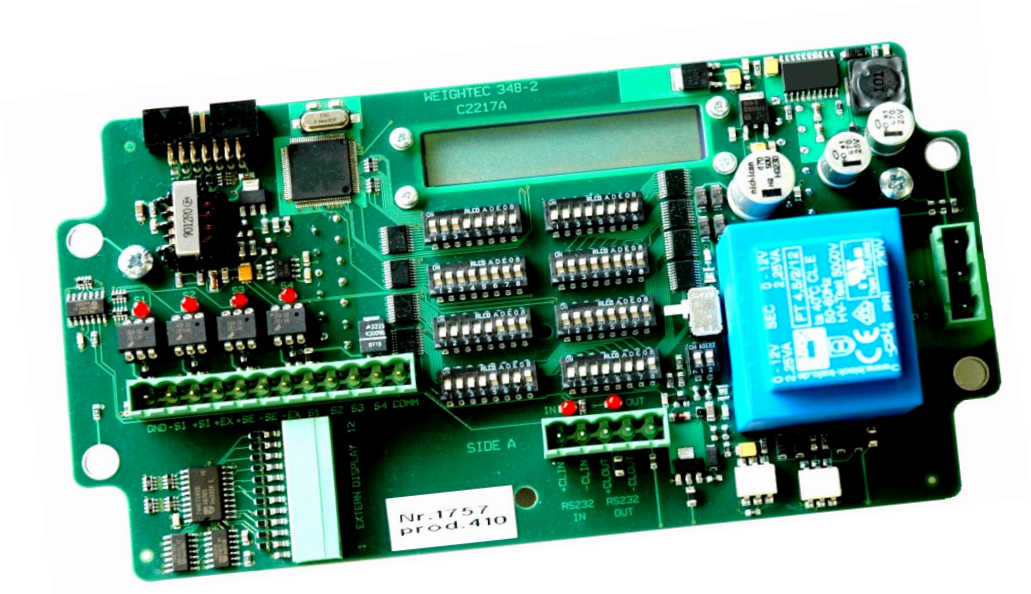
Max 4 swivels PG 7

Swivel PG 9 : loadcell cable entrance



Legends: Legal approval and Certificate numbers

Sealing by 2 sealing bolts or sealing labels



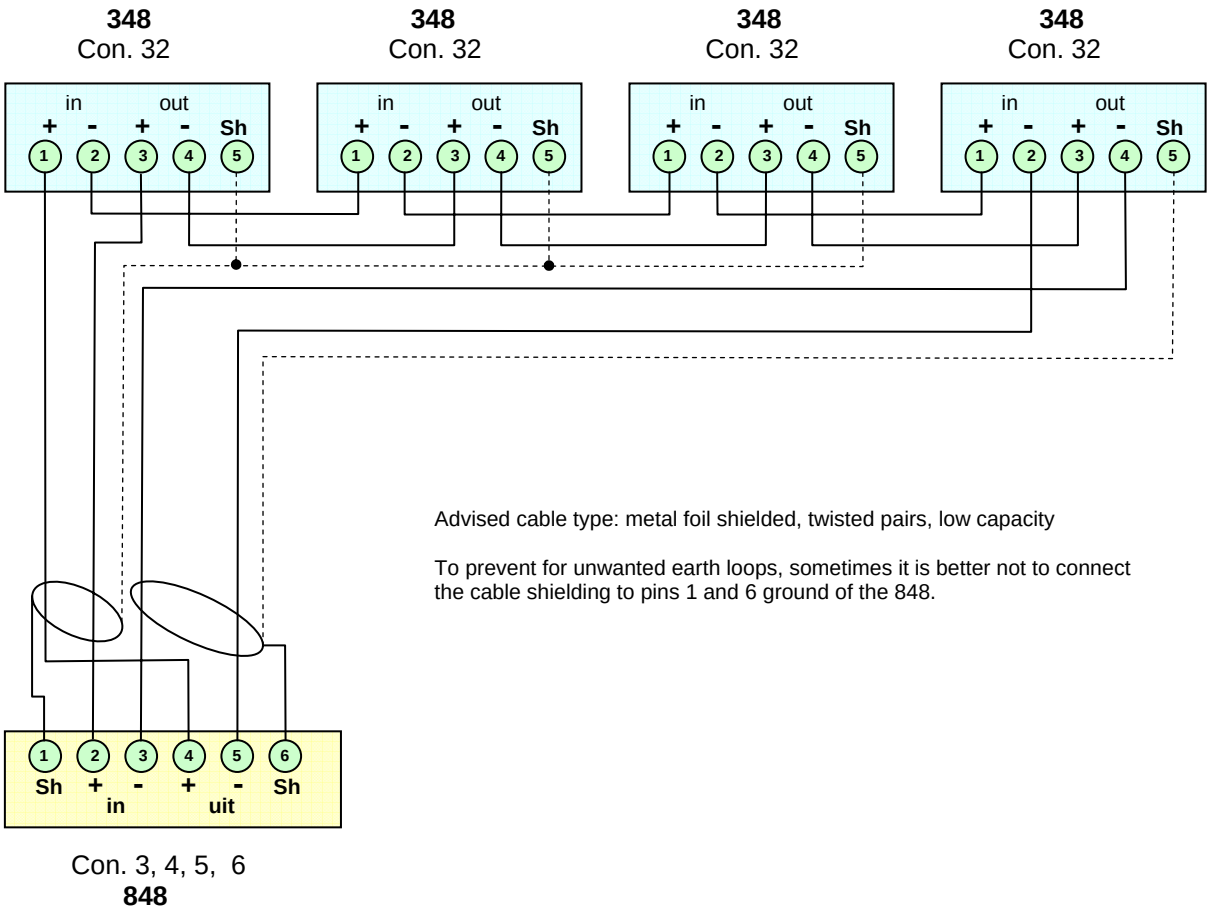
Main Printboard

8 INTERFACE 848

8.1 INTERFACE 848 DIAGRAM BUS CONNECTION in CURRENT LOOP

Using interface type 848 4 groups of max. 4 x 348's may be connected in CL mode.

Example of 1 group van 4 connected 348's upon one of the 4 input connectors of an 848 interface:



Advised cable type: metal foil shielded, twisted pairs, low capacity

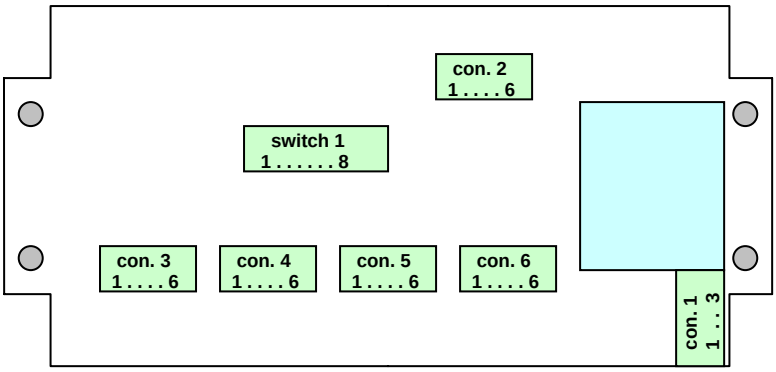
To prevent for unwanted earth loops, sometimes it is better not to connect the cable shielding to pins 1 and 6 ground of the 848.

Since the 348's in discontinuous sending mode can be numbered from 1 to 15 only, it is not possible to connect more than 15 x 348's to the interface 848.

It is advised to spread the 348's proportional over the 4 available input connectors of the interface 848.

The output of interface 848 may be set as RS232 V24 or as Current Loop by the way of connecting the cable.

8.2 INTERFACE 848 PRINT LAYOUT , CONNECTIONS, HOUSING



Connector 1
(power supply)

: pin 1 = L1 230 VAC
pin 2 = N - 15% . . +10%
pin 3 = PE 40 . . 60 Hz

Connector 2
(Output)

Output	+/- 12 V	20 mA	20 mA
to computer	RS 232	CL passive	CL active
pin 1	IN		
pin 2		- IN	+ IN
pin 3	GND	+ IN	- IN
pin 4		+ OUT	- OUT
pin 5	OUT	- OUT	+ OUT
pin 6	Shield	Shield	Shield

Connector 3 t/m 6
(input 348's)

: max. 4 x 348 on one connector, to be spread proportionally over the 4 connectors

Ingang	
max 15 x 348	Current Loop
pin 1	Shield
pin 2	+ IN
pin 3	- IN
pin 4	+ OUT
pin 5	- OUT
pin 6	Shield

Switch 1
(not used inputs)

: Input connectors (con 3 … 6) without a connected 348 have to be short cut by setting the corresponding switch ON (high):

Switch 1	corresponds with input connector:	
switch nr.	connector	pin
1	Con 3	2 en 3
2	Con 3	4 en 5
3	Con 4	2 en 3
4	Con 4	4 en 5
5	Con 5	2 en 3
6	Con 5	4 en 5
7	Con 6	2 en 3
8	Con 6	4 en 5

Housing

: identical to Weightec 348: 220 x 120 x 90 mm
cast aluminum coated grey, IP 65

9 WEIGH PROCESSOR 348 – 2 DATA TRANSMISSION

There are 4 different kind of strings that may be transmitted from a 348:

- Data string:	WEIGHT	(standard string)	length 16 digits, with zero value 11 digits
- Data string:	A/D VALUE	(after received command)	length 16 digits
- Data string:	SETPOINT	(after received command)	length 12 digits
- Data string:	INFO	(temp. en Volt, after command)	length 12 digits

9.1 DATA STRING: WEIGHT

REQUEST with:

X	?	see digit 3	CR

see table:	5												6	3	9	
on page:	43												44	41	47	

digit:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
data:	X	#	G	+	W	W	W	W	W	W	M	+	@	@	@	CR
			N	□							S	-	↕	↕	↕	
			T	-							T	?	O	O	{	
			Z	!							Z	1				
				/								2				
				>								>				
□ = blank				<								=				
				E								<				

Specifications per digit:

Digit 1	X	=	Identification / call number, settable with switch 61 … 64. See table 5 on page 43 Nr. 0 (=@) is always sending continuously
Digit 2	#	=	Code # identifies this string as a transmission from a 348. In a received string (commands and questions) this may be a ! or a ?
Digit 3	G	=	Transmitted string contains the : **G**ross weight
	N	=	Transmitted string contains the : **N**et weight
	T	=	Transmitted string contains the : **T**are weight
	Z	=	Transmitted string contains the : **Z**ero value, as subtracted at power on
Digit 4	+	=	Weight value is : positive
	□	=	Weight value is : exact zero, + of - 0,2 scale division
	-	=	Weight value is : negative
	!	=	Weight value is : in overload (as selected with switches 38 … 48)
	/	=	Weight value is : more negative as - 0,5 scale division This sign is sent in the legal mode only (switch 60 = ON). The sign < ranks prior to the sign / , see < at digit 12. Taring, zero setting and start setpoints is blocked during a ! or / status.
	>	=	A/D converter is : in overload
	<	=	A/D converter is : in underload
	E	=	Error report : system error and during auto reset.
Digit 5 t/m 10	W	=	Weight value : 10^5, 10^4, 10^3, 10^2, 10^1, 1, no decimal point
Digit 11	M	=	Weight value is in motion : **M**otion
	S	=	Weight value no motion : **S**tandstill
	T	=	Tare command in execution : **T**are, waiting for no motion, level S1
	Z	=	Zero command in execution : **Z**ero, waiting for no motion, high level S2

Digit 12	+	=	Weight value increases : speed of motion see digit 15
	-	=	Weight value decreases
	1	=	Weight value no motion : base level < 0,2 division in 0,8 sec.
	2	=	Weight value no motion : high level < 0,1 division in 1,8 sec.
	?	=	A “set zero” command is received but the zero function is disabled with switch 5. This command will not be executed.
	>	=	A “set zero” command is received (zero track incl.) that, if executed, will exceed the zero setting range . This command will not be executed.
	=	=	The auto zero at power on will exceed the initial zero limits (-5%. .+15%, in not legal mode -20%. .+80%). The zero setting will not be executed, the previous zero value is not deleted and may be transmitted after the command: X ? Z . This = sign ranks prior to all other reports in this digit. This report will be deleted as soon as zero setting is possible or by the command X ! E 6, see “ E “ commands on page 38.
	<	=	A “set net” command (tare to zero) is received (auto tare in setpoint commands too) but the gross weight value is negative. This command will not be executed, and a setpoint start with tare included will be blocked . See digit 4 also. Not executable zero and tare commands stay active until execution is possible, or are deleted after the receipt of another command.
Digit 13		=	Status of the setpoints, see table 6, page 44.
Digit 14		=	Decimal point and scale division multiplication factor, as selected with switch 53 t/m 56. The multiplication factor is integrated already in the transmitted weight value. However the position of the decimal point should be derived from digit 14, see table 3 on page 41.
Digit 15		=	Speed of the in- or decrease of the weight value in divisions per second (0 . . 58 d/sec.). See table 9 on page 47.
Digit 16		=	End of string code: Carriage Return.

9.2 DATA STRING: A / D VALUE

REQUEST with:

X	?	S	@	CR

digit:	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
data:	X	#	A	+	2	.	0	0	0	.	0	0	0	S	2	CR

Function : With this special command the rough output of the A/D converter may be requested for.
Neither zero, tare nor divisions multiplication factor is accounted in this figure.
This 21 bits value corresponds direct with the actual loadcell signal at the input.
That means that with a 2 mV/V signal on the input, the A/D value will be 2,000,000.
So this figure may be interpreted too as the real loadcell signal, expressed in mV/V, with a accuracy of 1 nano Volt (= 0,000.000.001 Volt)

Digit 3 : Code A identifies this string as the A/D value from a 348

Digit 4 t/m 13 : Measured value 21 bit

Digit 14, 15 : No motion level S 1 or (high) S 2

9.3 DATA STRING : SETPOINT

REQUEST with:

X	?	see digit 11	CR

see table:	5									7	6	
on page:	43									45	44	

digit:	1	2	3	4	5	6	7	8	9	10	11	12
data:	X	#	S	W	W	W	W	W	W	@	A	CR
										↕	B	
										o	D	
											H	

In the continuous sending mode (call nr. 0) a requested setpoint string will be transmitted one time only.
Thereafter the previous sending mode will be continued.

Specifications per digit:

Digit 1	X	=	Identification / call number, settable with switch 61 … 64. See table 5 on page 43 Nr. 0 (=@) is always sending continuously
Digit 2	#	=	Code # identifies this string as a transmission from a 348. In a received string (commands and questions) this may be a ! or a ?
Digit 3	S	=	This string contains the : **S**etpoint weight value, without decimal point and with an extra (x10) decade: 10^{-1}
Digit 4 t/m 9	W	=	Setpoint value : 10^4, 10^3, 10^2, 10^1, 1, 10^{-1}, without decimal *)
Digit 10		=	Executive code and status (on / off) of the setpoint output. See table 7 on page 45
Digit 11		=	Setpoint number (ASCII) : A, B, D or H (= 1, 2, 3 of 4). See table 6 on page 44
Digit 12		=	Carriage Return

*) The comparison of the setpoint values against the actual (net) weight value is internal 10 x more accurate as the value of the scale division itself, so: 1 : 150,000.
Therefore setpoint values should be sent with 10 x higher accuracy, by adding one extra decade to the right of the setpoint value. Accuracy will be than: $(10^{-1}) = 1/10^e$ scale division.
The accuracy of dosing may be controlled very precise with this feature.

Example:
At a weighing scale with 0.1 kg divisions, a required setpoint value of 50.0 kg should sent in (x 10) as 005000.
That means 5000 x 0.01 kg = 50.00 kg, and selectable per 0.01 kg.

9.4 DATA STRING : SYSTEM INFO

REQUEST with:

X	?	H	CR

digit:	1	2	3	4	5	6	7	8	9	10	11	12
data:	#	H	+	.	T	T	T	.	V	V	V	CR

In the continuous sending mode (call nr. 0) a requested setpoint string will be transmitted one time only.
Thereafter the previous sending mode will be continued.

In this string no call (identification) number is sent.

Specifications per digit:

Digit 2	H	=	Code H identifies this string as a transmission of the internal temperature and actual voltage of the loadcell excitation. Values are without decimal point.
Digit 3	+/-	=	+ of - sign of the indicated temperature value
Digit 5, 6, 7	T	=	Temperature internal in °C per 0,1° (f.e. 412 = 41,2° C)
Digit 9, 10, 11	V	=	Actual excitation voltage of the loadcells in VAC per 0,01V (f.e. 562 = 5,62 VAC)

10 WEIGH PROCESSOR 348 – 2 DATA RECEIPT (full duplex)

There are 2 different kind of strings that may be sent to a 348:

- A QUESTION index: always a ? in the 2nd digit
- A COMMAND index: always a ! in the 2nd digit

10. 1 MAKE UP DATA STRING RECEIPT

at least 4, max 12 digits long

see table:	5			E, 6, 8						7	6	
on page:	43			38, 44, 46						45	44	

digit:	1	2	3	4	5	6	7	8	9	10	11	12
	X	? / !	G	CR								
	X	? / !	N	CR								
	X	?	T	CR								
	X	? / !	Z	CR								
	X	?	S	*	CR							
	X	!	S	W	W	W	W	W	W	**	*	CR
	X	!	R	***	CR							
	X	?	S	@	CR							
	X	!	E	****	CR							
	X	?	H	CR								

Specifications per digit:

Digit 1	X	=	Identification / call number, settable with switch 61 … 64. See table 5 on page 43 Nr. 0 (=@) is always sending continuously
Digit 2	?	=	This string is a question, after receipt the requested information is transmitted
	!	=	This string is a command that will be executed immediately
Digit 3	G	=	Gross weight
	N	=	Net weight
	T	=	Tare weight
	Z	=	Zero value that has been subtracted at power on, stored in non volatile memory, (not the dead load dil switch settings) Zero command: " ! Z " (set zero) is limited within -1.3%...+2.7% of scale capacity. A wider zero range is available at (re)start of the 348 with command: X ! E 1. In legal mode initial zero limits are: -5% . . +15%, not legal mode: -20% . . + 80%
	(?) S	=	Request for transmission of the data string: "setpoint" for the setpoint number as selected in the next digit. Setpoint numbers see table 6 on page 44
	(!) S	=	Command for a setpoint, entering weight value, setpoint nr. and executive code. Executive codes see table 7 on page 45
	R	=	Start (Run) command for one or more setpoints, see table 6 on page 44
	S (@)	=	Request for transmission of the rough A/D value 1: 2,000,000
	E	=	Special commands, see page 38
	H	=	Request for transmission of the data string INFO
Digit 4	*	=	Setpoint number, see table 6 on page 44
	W	=	Digit 4 t/m 9 carry the setpoint weight value as transmitted to the 348
	@	=	A/D value, see digit 3
	***	=	Start (Run) code, indicating which setpoint(s), and with what kind of filter, they will be started. See table 8 for setpoint numbers, combinations of these + filter selection.
	****	=	Error table numbers, special commands see digit 3
Digit 10	**	=	Execution code per setpoint, see table 7 on page 45
Digit11	*	=	Setpoint nummer, see table 6 on page 44

10. 2 EXPLANATION DATA STRING RECEIPT

The comport is full duplex: receipt and transmission may occur at the same time.
A new command for the same activity deletes the previous one if that one not yet had been executed.
It is advised to send some spaces (f.e. CR's) in between strings that are sent direct after one another.
This may happen f.e. by sending several setpoint values for different (course - fine dosing) setpoints.
After sending a setpoint value, this value may be requested to be send in return, in order to check the correct receipt of the command (echo). The same command as sent should be returned by the 348 with only a "#" in digit 2 as difference. Code"#" means this is a transmission from a 348.

There are 2 different kind of strings that may be sent to a 348: :

10. 2. 1 QUESTION

Index: Always a ? in the 2nd digit

The receipt of a question does not start any action of the 348, but creates an answer only.
In continuous sending mode (call nr. 0=A) a 348 sends continuously with the string "weight data" the gross or the nett weight + standard data.
If in this mode a "setpoint" or "info" request is received, the required information is sent one time only, thereafter the previous transmission is continued.

Available questions are:

X ? G	What is the gross weight ?
X ? N	What is the net weight ?
X ? T	What is the tare weight ? (= gross -/- net)
X ? Z	What is the zero value compensation ? (= the weight selected at power on, subtracted from signal input to create an exact zero, dead load switch settings excluded)
X ? S ..	What is the weight value and status of setpoint nr. .. (A, B, D or H = 1, 2, 3, or 4)
X ? S @	What is the gross A/D converter output (in high resolution 1:2,000,000) ?
X ? H	What is the 348's internal temperature, and excitation voltage of the loadcells ?

10. 2. 2 COMMAND

Index: Always a ! in the 2nd digit

A received command will cause immediate action of the 348.
If the required action is not possible to execute, the 348 will show a status report in digit 3, 4, 11 or 12 of the string "weight", indicating why the action is not, or later will be executed.

Available commands are:

X ! G	Set gross = cancel tare
X ! N	Set nett = start tare operation to zero, after -waiting for- no motion of the weight value *) After the tare operation, a 348 in continuous sending mode (nr. 0) will automatically switch over to transmit the nett weight in data string "weight".
X ! Z	Set zero, executable only within the -1.3%...+2.7% of scale capacity.
X ! S W--W..	Set the setpoint value (x10) W--W, and the executive code for setpoint nr. ..
X ! R	Start of stop one or more setpoints nr(s) .. with filter code ..
X ! E	Special commands and resets

*) Attention! The command X ! T does not exist. The tare command is : X ! N

10. 3 RECEIPT STRINGS EXAMPLES see page 33, 34 too

10. 3 .1 QUESTIONS

"Set .." indicates the call / identification nr. of a 348

A	?	G	CR	(gross weight ?)	= Set 1 -- transmit -- gross weight
B	?	N	CR	(net weight ?)	= Set 2 -- transmit -- net weight
J	?	T	CR	(tare weight ?)	= Set 10 -- transmit -- tare weight
D	?	Z	CR	(zero value ?)	= Set 4 -- transmit -- weight value (software) zero memory
A	?	S	A	CR	(value and on/off status setpoint A ?) = Set 1 -- transmit -- setpoint value and status -- of setpoint nr. A (setpoint numbers see table 6 on page 44)

10. 3 .2 COMMANDS

A	!	N	CR	(tare to zero)	= Set 1 -- execute -- set net = tare to zero after no motion In continuous mode (set nr. 0) automatically after taring the nett weight value will be sent
A	!	G	CR	(delete tare)	= Set 1 -- execute -- set gross = delete the tare
A	!	Z	CR	(set zero)	= Set 1 -- execute -- zero setting of the gross weight value
A	!	S	0	0	2 3 8 6 F A CR (enter setpoint value + functions) = Set 1 -- enter -- setpoint -- 23.86 kg -- executive code F (= first tare to zero, after cut off auto step to next setpoint and set on hold, setpoint not yet active) -- A = setpoint nr.1
A	!	R	!	CR	(start setpoint 1) = Set 1 -- execute -- start (Run) setpoint -- code ! (= setpoint nr. 1 with standard filter, see table 9)
A	!	R	C	CR	(start setpoint 1+2) = Set 1 -- execute -- start (Run) setpoints -- code C (= both the setpoints nr. 1 en 2 "on", with inflight filter, see table 9)
A	!	R	@	CR	(stop all setpoints) = Set 1 -- execute -- Run code @ (= stop all the setpoints)
A	!	E	!	CR	(special commands) = Set 1 -- E code -- delete zero memory (-1,3% . . +2,7%) (E-codes see page 38)

10. 4 COMMUNICATION EXAMPLES

These examples show how a 348 in general may be used.

A data string, sent from a 348, is indexed by a # in digit 2.

1 Question:

Set 1, what is the gross weight ?

A	?	G	CR

Answer:

Set 1 -- transmits -- gross -- positive -- weight value 1253 -- Standstill -- standstill level 1 -- no active setpoints -- scale division x 0.1 -- weight speed 0 div./sec.

A	#	G	+	0	0	1	2	5	3	S	1	@	F	@	CR

2 Question:

Set 2, what is the net weight ?

B	?	N	CR

Answer:

Set 2 -- transmits -- net -- positive -- weight value 1105 -- weight is in Motion -- value increases (+) -- setpoint 2 (B) is active -- scale division x 0.5 -- weight speed 34 div./sec.

B	#	N	+	0	0	1	1	0	3	M	+	B	H	b	CR

3 Question:

Set 4, what is the gross weight ?

D	?	G	CR

Answer: *Obviously here is something going terribly wrong !*

Set 4 -- transmits -- gross -- overload -- weight value 17214 -- weight is in Motion -- value increases (+) -- setpoints 1 + 2 (C) are active -- scale division x 2 -- weight speed > 58 div./s

D	#	G	!	0	1	7	2	1	4	M	+	C	J	{	CR

4 Dosing command:

Fill 20,00 kg with 2 setpoints course/ fine, first enter values, followed by start command .

(Scale 30 kg x 10 g divisions)

- command course filling setpoint 1:

Set 1 -- enter -- setpoint -- 18500 -- executive code F (= after start first a zero tare (no motion controlled), then setpoint output active, after achieved weight close output, set on hold, step to next setpoint and start this) -- setpoint nr. 1 (A).

A	!	S	0	1	8	5	0	0	F	A	CR

- command fine filling setpoint 2:

Set 1 -- enter -- setpoint -- 19853 -- executive code A (= after achieved weight close output, set on hold) -- setpoint nr. 2 (B).

A	!	S	0	1	9	8	5	3	A	B	CR

- start command : (course and fine in succession)

Set 1 -- command -- start (Run) -- setpoint nr.1 with inflight filter
For “Run” code see table 8 on pag. 46

A	!	R	A	CR

- start command : (course and fine simultaneous)

Set 1 -- command -- start (Run) -- setpoint nr. 1 and 2 with inflight filter. For “Run” code see table 8 on pag. 46

A	!	R	C	CR

5 Command overload safeguard:

Controls overloading with the 4th set-point monitoring the gross weight

Set 1 -- command -- setpoint -- 25000 -- executive code b (= at setpoint nr. 4 only : always compare with gross weight value, after achieved weight set on hold, active at once) -- setpoint nr. 4 (H)

A	!	S	0	2	5	0	0	0	b	H	CR

5 Command stop setpoints:

Switching off one or more setpoints is done with the same Run command, but inverse:

setpoints that are not switched on, are switched off

Set 1 -- command -- start setpoint (Run) -- code N (= stop setpoint nr. 1, continue or start setpoints nr. 2, 3, 4)

A	!	R	N	CR

Set 1 -- command -- start setpoint (Run) -- code @ (= stop setpoint nr. 1, continue or start setpoints nr. 2, 3, 4

A	!	R	@	CR

Run code's: see table 8 on page 46.

10. 5 USE OF THE SETPOINT TABLES

Operation of setpoints makes use of the next tables:

Table 3 (page 41)
Position of the decimal point

The decimal point is not used in the setpoint weight strings. The position of the decimal may be derived from table 3.

Table 6 (page 44)
Setpoint numbers

A letter code is chosen in order to control all possible combinations of setpoint (16) in one digit only.

Table 7 (page 45)
Executive codes of the setpoints

All the setpoint functions: set net, set gross, hold, hold + step next and yes / no direct active may be selected here in all the possible combinations.
Above this is selectable: set zero instead of tare before setpoint start, delay of auto step to next setpoint, select setpoint nr. 4 as safeguard overload control on the gross weight value.

Table 8 (page 46)
Run (start) codes for the setpoints

The selected sign determines which (combination of) setpoints will be started or stopped.
The special filter modes for the setpoint comparator are selected here too.

10. 6 E - CODES COMMANDS

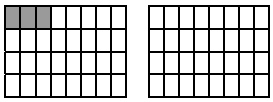
X	!	E	0	CR	=	Switch off the Error mode
X	!	E	1	CR	=	Complete reset, identical to “power on”
X	!	E	2	CR	=	Switch on the adaptive filter (default is: on)
X	!	E	3	CR	=	Switch off the adaptive filter
X	!	E	4	CR	=	Not used
X	!	E	5	CR	=	Not used
X	!	E	6	CR	=	Reset zero error report
X	!	E	7	CR	=	Enable the keys of the external display
X	!	E	8	CR	=	Disable the keys of the external display
X	!	E	9	CR	=	Reset zero memory (-1,3% . . +2,7%) to zero
X	!	E	A	CR	=	Switch on: delayed transmission at device nr. 0 (= continuous sending mode) Specifications of transmission speed, see: table 4 on page 42
X	!	E	B	CR	=	Switch off: delayed transmission at device nr. 0

11 WEIGH PROCESSOR 348 – 2 TABLES

11.1 INPUT AMPLIFIER SETTING

TABLE 1

1 = ON (switch high) 0 = OFF (switch down)



Dil switch nr.			Input range in mV/V
1	2	3	
0	0	0	0 - 0.25
0	0	1	0 - 0.50
0	1	0	0 - 0.75
0	1	1	0 - 1.00
1	0	0	0 - 1.25
1	0	1	0 - 1.50
1	1	0	0 - 1.75
1	1	1	0 - 2.00

The 348 permits the change off dil switch settings without causing differences in the other adjustments.

Of course the value of the scale division will change, exact in relation to the change of the input amplification.

If required the table on page 15 may be used to re-calculate the number of these new scale divisions.
In this way readjusting of the scale with stamped weight can be avoided.

Example calculation input sensitivity setting:

A 2 mV/V loadcell of 200 kg is applied in a scale with 100 kg weighing capacity and 50 kg dead load.

The dead load is 1/4th of the total 2 mV/V signal = 0.5 mV/V. This dead load signal is set back to zero with the switches for dead load compensation (6 t/m 16). This setting has no influence on the input setting.

The remaining net weigh signal representing 0 . . 100 kg load = 0 . . 1.0 mV/V

Best choice now is to select an input setting a little bit higher as this 1.0 mV/V net signal : 1.25 mV/V, so a reserve of 25% stays available.

With all span switches in “on” position (100 % amplification), there now are 15,000 counts available for the selected input sensitivity of 1.25 mV/V.

From these 15,000 counts at 1.25 mV/V only 12,000 counts will be used for 1,00 mV/V signal (1.00 : 1.25) x 15,000 = 12,000 counts.

The weighing capacity of 100 kg is divided by 1,2000 counts = 0.008 kg = 8 gram per count.
For setting the real scale division this 8 gram is rounded off upwards to 10 gram by selecting the scale division (table 3) as: x 0.01 kg.

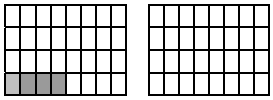
Important !

This input amplifier with up to 8 x enlarging of the input signal, offers the opportunity to apply loadcells with an 8 x larger capacity as required, without effecting the measuring accuracy.

Especially for weighing machines with high risks of (dynamic) overloads this is a feature that prolongs the lifetime of the loadcells substantially.

11.2 DAMPINGS FILTER (from nr. 1700 upwards)

TABLE 2



1 = ON (switch high) 0 = OFF (switch down)

Dil switch nr.				Filter	Filter inclusive increasing adaptive filter (proportional increasing damping at approaching standstill)	Effect
49	50	51	52	Hz	Hz	
0	0	0	0	4.02	→ 1.37	damping low
0	0	0	1	2.47	→ 0.84	
0	0	1	0	1.52	→ 0.52	↓
0	0	1	1	0.93	→ 0.32	↓
0	1	0	0	0.57	→ 0.20	↓
0	1	0	1	0.35	→ 0.12	↓
0	1	1	0	0.22	→ 0.07	damping high
0	1	1	1	0.13	→ 0.07	
1	0	0	0	2.03	→ 0.69	doubled damping in calibration mode with switch 49 ON
1	0	0	1	1.25	→ 0.43	
1	0	1	0	0.77	→ 0.26	
1	0	1	1	0.47	→ 0.16	↓
1	1	0	0	0.9	→ 0.10	↓
1	1	0	1	0.18	→ 0.07	↓
1	1	1	0	0.11	→ 0.07	↓
1	1	1	1	0.07	→ 0.07	extra high

↑

→ Switch 49 “ON” selects the calibration mode. The filtering effect is doubled to achieve a more stabilized weight reading during adjustment of a scale.
Besides that, the back lightning of the internal display is switched on.

Comparison table with filter settings in 348’s previous to nr. 1700

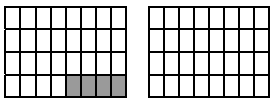
Damping effect up nr nr. 1700					Damping upwards nr. 1700				
49	50	51	52	old	new	49	50	51	52
					4,02 Hz	0	0	0	0
0	0	0	0	2,42 Hz	2,47 Hz	0	0	0	1
					1,52 Hz	0	0	1	0
0	0	0	1	1,33 Hz					
0	0	1	0	0,92 Hz	0,93 Hz	0	0	1	1
0	0	1	1	0,70 Hz					
0	1	0	0	0,57 Hz	0,57 Hz	0	1	0	0
0	1	0	1	0,48 Hz					
0	1	1	0	0,41 Hz					
0	1	1	1	0,36 Hz	0,35 Hz	0	1	0	1
					0,22 Hz	0	1	1	0
					0,13 Hz	0	1	1	1

Starting with serial nr. 1700 the filter settings are extended with stronger damping at the highest setting and still lower damping at the lowest setting.

This table may be used to compare filter settings from older 348’s if exchanged with a newer version.

11.3 SCALE DIVISION , DECIMAL POINT

TABLE 3



1 = ON (switch high) 0 = OFF (switch down)

In the data strings "weight" and "setpoint" the weight value is expressed without the decimal point.
However the selected value of the scale division has been integrated.
The position of the decimal point can be extracted from digit 14 of the "weight" string according to the next table:

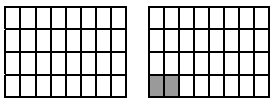
Dil switch nr.				Code in digit 14 of the "weight" string	Adjusted number of span counts will be multiplied by:
53	54	55	56		
0	0	0	0	@	x 0,001
0	0	0	1	A	x 0,002
0	0	1	0	B	x 0,005
0	0	1	1	C	x 0,01
0	1	0	0	D	x 0,02
0	1	0	1	E	x 0,05
0	1	1	0	F	x 0,1
0	1	1	1	G	x 0,2
1	0	0	0	H	x 0,5
1	0	0	1	I	x 1
1	0	1	0	J	x 2
1	0	1	1	K	x 5
1	1	0	0	L	x 10
1	1	0	1	M	x 20
1	1	1	0	N	x 50
1	1	1	1	O	A/D converter 1 : 150.000

Example scale division selection:

The weight reading of a 1500 kg scale requires a scale division of 0,5 kg.
So the switch selection of 53 till 56 has to be selected as : 1 . 0 . 0 . 0
In the data string "weight" in digit 14 the letter H will be transmitted.

11.4 BAUD RATE, CHARACTER FRAME

TABLE 4



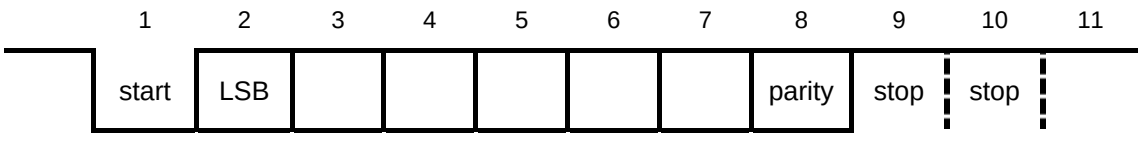
1 = ON (switch high) 0 = OFF (switch down)

Baud rate:

Switch nr.		Baud rate	Continuous transmission (at call nr. 0)	Pause	Slowed down continuous transmission with command ! E A	Pause
57	58		number of strings per second	m sec.	number of strings per second	m sec.
1	1	19200	36	18	9	100
1	0	9600	36	9	4,5	201
0	1	2400	12	9	2,3	367
0	0	1200	6	18	1,1	730

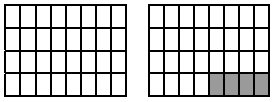
Character frame:

start bit	1	fixed
data bits	7	ASCII
parity	1	odd / even (switch nr. 59)
stop bit	2	fixed
	11	bits total



11.5 CALL / IDENTIFICATION NUMBER

TABLE 5



1 = ON (switch high) 0 = OFF (switch down)

Dil switch nr.				Code in digit 1 of the data strings	Device number	Data transmission
61	62	63	64			
0	0	0	0	@	0	continuous
0	0	0	1	A	1	on request
0	0	1	0	B	2	↓
0	0	1	1	C	3	↓
0	1	0	0	D	4	↓
0	1	0	1	E	5	↓
0	1	1	0	F	6	↓
0	1	1	1	G	7	↓
1	0	0	0	H	8	↓
1	0	0	1	I	9	↓
1	0	1	0	J	10	↓
1	0	1	1	K	11	↓
1	1	0	0	L	12	↓
1	1	0	1	M	13	↓
1	1	1	0	N	14	↓
1	1	1	1	O	15	on request

Example :

If digit 1 of a data string shows a: G , this string is from or for 348 nr. 7 .
Inside 348 the switches nr. 61 till 64 have been selected as: 0 . 1 . 1 . 1

11.6 SETPOINT : NUMBERING, ON / OFF STATUS TABLE 6

1 = setpoint active 0 = setpoint switched off

S1 till S4 are the 4 setpoints

Setpoint nr. and combinations of setpoints				Code in digit : 13 in string "gewichts" 11 in string "setpoint"	The separate setpoint numbers
S 4	S 3	S 2	S 1		
0	0	0	0	@	
0	0	0	1	A	A = setpoint nr. 1
0	0	1	0	B	B = setpoint nr. 2
0	0	1	1	C	
0	1	0	0	D	D = setpoint nr. 3
0	1	0	1	E	
0	1	1	0	F	
0	1	1	1	G	
1	0	0	0	H	H = setpoint nr. 4
1	0	0	1	I	
1	0	1	0	J	
1	0	1	1	K	
1	1	0	0	L	
1	1	0	1	M	
1	1	1	0	N	
1	1	1	1	O	

Example :

If in digit nr. 13 of the string "weight" the letter C is shown, this means that:
setpoints nr. 1 and 2 both are active. Their opto couplers are conductive.

On the main print board of the 348, above the loadcell connector, both the led's S1 and S2 are **off**, thus indicating that these setpoints are "**on**".

Attention:

If a low communication speed is selected (< 19k2 Bd), this will result in a time delay between the moment a setpoint actually switches over and the moment that this can be read from character 13 of the string "weight".

Therefore it is strongly advised to operate the actual switching of the setpoints always using the opto coupled outputs of the setpoints.
Time delay here will be max. 2.4 msec.

11.7 SETPOINT EXECUTIVE CODE TABLE 7

1 = function ON 0 = function OFF

Set gross	Set net	Hold + step to next	Hold	Setpoint : not active (at receipt)	Setpoint : immediately active (at receipt)
(= if applicable delete tare)	(= tare to zero)	(next setpoint will be set active)		Code in digit string	10 of the ”setpoint”
0	0	0	0	@	`
0	0	0	1	A	a
0	0	1	0	B	b
0	0	1	1	C	c
0	1	0	0	D	d
0	1	0	1	E	e
0	1	1	0	F	f
0	1	1	1	G	g
1	0	0	0	H	h
1	0	0	1	I	i
1	0	1	0	J	j
1	0	1	1	K	k
1	1	0	0	L	l
1	1	0	1	M	m
1	1	1	0	N	n
1	1	1	1	O	o

Attention:

1 “Set net” (tare to zero after no motion) en “Set gross” are automatically executed before the started setpoint’s output is switched to “active “.

2 “Hold” (of the setpoint output) en “Step to next setpoint” are executed automatically after switching off a setpoint that has achieved its selected weight value.

3 If “Hold” and “Hold + step next” both are selected, the “Hold” is executed after a time delay of 0.3 seconds .

4 If “Set net” and “set gross” both are selected, a “set zero” will be executed instead of a tare operation. However if zero setting is not possible because of the gross weight value is outside the zero limits (-1,3% . . +2,7%) , the setpoint will not start up until zero setting is possible.

5 If a setpoint was entered as “not active”, it may be started with a “Run” command (table 8).

6 If the 4th setpoint is selected with “hold + step next”, it will not execute the “step next” function, but will continuously be compared with the actual gross weight value, independent of an active tare value by “set net” = net weight reading for the setpoint comparator. The “hold” function however stays active.

Example :

If digit nr. 10 of a transmitted string of one “setpoint” shows the letter a , this means:
this setpoint is active now. If this setpoint is switched “off” digit 10 shows a A.

If digit nr. 10 of a received command string of one “setpoint” shows the letter F, the 348 waits with starting this setpoint until a “Run“ command is received. At receipt of this “Run” command the 348 starts no motion control and, after standstill, it will tare to zero and set the setpoint’s output “on” (in conduction). After achieved weight value the output is switched “off” en set on “hold” and the next setpoint is started up.
See too chapter 10.4 : communication examples.

11.8 RUN CODE START / STOP SETPOINTS, FILTER SELECTION TABLE 8

1 = start setpoint 0 = stop setpoint

Setpoint nr.				Filter selection		
S 4	S 3	S 2	S 1	standard	inflight	pulse + inflight
0	0	0	0	□	@	`
0	0	0	1	!	A	a
0	0	1	0	“	B	b
0	0	1	1	#	C	c
0	1	0	0	$	D	d
0	1	0	1	%	E	e
0	1	1	0	&	F	f
0	1	1	1	‘	G	g
1	0	0	0	(	H	h
1	0	0	1	)	I	i
1	0	1	0	*	J	j
1	0	1	1	+	K	k
1	1	0	0	,	L	l
1	1	0	1	-	M	m
1	1	1	0	.	N	n
1	1	1	1	/	O	o

= stop all setpoints
= start S1, stop S2, 3, 4
= start S2, stop S1, 3, 4
= start S1,2, stop S3, 4
= start S3, stop S1, 2, 4
and so on ...

Example:

A	!	R	“	CR

Start setpoint 2 with standard filter (setpoint 1, 3 and 4 will be stopped)

A	!	R	C	CR

Start setpoint 1 and 2 with inflight filter (setpoint 3 and 4 will be stopped)

Code:

The execution code selects the setpoint(s) to be started or stopped, and the filter that will be used in the weight comparison with the actual weight value.

Inflight filter:

If using high dosing speed the best choice will be the inflight filter.
This filter continuously calculates the gravity energy of the falling material and uses this to adapt the weight value that is used for the weight comparison. This differential calculus is effective as well for increasing speeds as for decreasing speeds. The effect will be that -temporarily- “overshoot” of the setpoint weight value is prevented for.

The real effect is: the higher the filling speed, the earlier the setpoint output is switched down,
Thus strongly reducing the risk of overshoot it now is allowed to continue with gross dosing speed much longer and make the fine filling time much shorter.
This results in a substantial capacity increase of the total dosing capacity.
The effect of the inflight filter may be reduced by selecting a higher value of the damping filter with switch 50 till 52.

Pulse filter:

The anti pulse filter limits the effect of very high speed changes of the weight value, caused by f.e. down falling of articles. It switches on a separate limiting window around the increasing factor of the weight value The width of the filter is constantly adapted to the changes in the weigh speed.

11.9 WEIGH - SPEED CHARACTER TABLE 9

Digit 15	d /sec.
@	0
A	1
B	2
C	3
D	4
E	5
F	6
G	7
H	8
I	9
J	10
K	11
L	12
M	13
N	14
O	15
P	16
Q	17
R	18
S	19

Digit 15	d / sec
T	20
U	21
V	22
W	23
X	24
Y	25
Z	26
[	27
\	28
]	29
^	30
-	31
`	32
a	33
b	34
c	35
d	36
e	37
f	38
g	39

Digit 15	d / sec.
h	40
i	41
j	42
k	43
l	44
m	45
n	46
o	47
p	48
q	49
r	50
s	51
t	52
u	53
v	54
w	55
x	56
y	57
z	58
{	> 58

Digit 15 of the string “weight” shows the speed of in- or decrease of the actual weight value.
It is expressed as an ASCII character, as in the first column of the table above.
The value is recalculated every 28 msec, based upon the last 12 weight conversions.
The value is expressed in scale division per second: d / sec.
Increase or decrease of the weight value may be deducted from digit 12 : a + or - sign.

The speed calculation is done on the high resolution level of the A/D conversion output.
Rounding offs are not neglected but entered into the next measurement.
It is advised to select the communication speed at at least 9800 Bd. The accuracy is that speed 100 %.

Example:

A 300 kg weighing machine has 0.1 kg scale divisions.
If digit 15 shows character G (= 7, see table), the increase of weight is 7 x 0,1 kg = 7,0 kg per second exact.
Running on for 1 minute it indicates: there has been an increase of weight of 60 x 7,0 kg = 420 kg exact.

Applications:

- Loss in weight systems
- Control of the dosing speed at continuous dosing systems
- Check whether a started dosing really results into increase of weight
- Check whether the dosing speed comes up to the expected speed of weight increase
- Check on undesired weight changes (f.e. a not closed or leaking valve)
- Presentation of the actual dosing speed on the operators control screen

12.1 EC TYPE - APPROVAL CERTIFICATE

Nederlands Meetinstituut

EC type-approval certificate

Number **T5170** revision 2
Project number 801785
Page 1 of 3

Issued by	NMi Certin B.V. Hugo de Grootplein 1 3314 EG Dordrecht The Netherlands Notified Body Number 0122
In accordance with	The Council Directive 90/384/EEC on non-automatic weighing instruments.
Applicant	Weegtechniek Holland B.V. Patroonsweg 23 3892 DA Zeewolde The Netherlands
In respect of	A class (III) or (IIII), electronic **non-automatic weighing instrument**. Manufacturer : Weightronic B.V. Type : Depending on the configuration
Characteristics	n ≤ the number of verification scale intervals mentioned in the test certificates involved. In the description T5170 revision 2 further characteristics are described.
Valid until	7 April 2018
Description	The instrument is described in the description number T5170 revision 2 appertaining to this EC type-approval certificate.
Remarks	This revision EC type-approval certificate replaces the earlier versions.

Dordrecht, 7 April 2008
NMi Certin B.V.

Ing. C. Oosterman
Manager Product Certification

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3314 EG Dordrecht
Telephone +31 78 6332332
Telefax +31 78 6332309

Form. 525

12.2 TEST CERTIFICATE

Nederlands Meetinstituut

Test certificate

Number **TC5164** revision 1
Project number 405858

Issued by	NMi Certin B.V. Hugo de Grootplein 1 3314 EG Dordrecht The Netherlands Notified Body Number 122
In accordance with	Paragraph 8.1 of the European Standard on Metrological aspects of non-automatic weighing instruments EN 45501:1992/AC:1993. The applied error fraction p_i, meant in the paragraph 3.5.4 of this standard is 0.5.
Applicant	Weegtechniek Holland B.V. Patroonsweg 23 3892 DA Zeewolde The Netherlands
In respect of	The model of an **analog data processing unit**, tested as a part of a weighing instrument (for non-automatic weighing instruments class (III) and (IIII)). Manufacturer : Weightronic B.V. Types : Weightec 348 / Weightec 348-2
Characteristics	Electronic, self-indicating device, with single-interval indication. The maximum number of verification scale intervals will be: $n \leq 10000$ for class (III) instruments or $n \leq 1000$ for class (IIII) instruments. In the description TC5164 revision 1 further characteristics are described.
Description and Documentation	The instrument is described in the description number TC5164 revision 1 documented in the documentation folder TC5164-2, appertaining to this test certificate.
Remarks	Summary of the test involved: see Appendix number TC5164 revision 1. This revision test certificate replaces the earlier versions, including its documentation folder.

Delft, 15 September 2004
NMi Certin B.V.

Ing. C. Oosterman
Manager Product Certification

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Nederlands Meetinstituut

Description

Number **TC5164** revision 1
Project number 405858

1 General information about the analog data processing unit

All properties of the analog data processing unit, whether mentioned or not, may not be in conflict with the standard mentioned in the test certificate.

1.1 Essential parts

Description	Drawing number	Rev.	Remarks
Blokschema principe Weightec 348	WTC 300797-01	-	Block diagram 348
348 MOTH. BOARD C642	WTC 281188-03B WTC 300797-02	- -	Layout 348 Part list
Bestukking modulen 348	WTC 110189-01B WTC 300797-03 WTC 100398-01	- - -	Layout 348 Part list Part list
Blokschema principe Weightec 348 (1e REVISIE) 349	WTC 030504-01	-	Block diagram 348-2
Bovenste printplaat Weightec 348 (1e revisie)	100501-01 100501-02 100501-03 100501-04	- - - -	Layout 348-2 Layout 348-2 Part list Part list
Componenten opstelling onderste print	100501-05 100501-06 100501-07 100501-08	- - - -	Layout 348-2 Layout 348-2 Part list Part list

EMC protective measures (Weightec 348 only):
- Load cell and setpoint cables connected via emi barrier print;
- Either the screen of the cable to the display(s) connected to its metal entrance, or the cable carried through a ferrite core directly inside the housing.

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Description

Number **TC5164** revision 1
Project number 405858

1.2 Essential characteristics

Devices:
- determination stability of equilibrium;
- indication of stable equilibrium;
- calibration / set-up mode via switches on the main board;
- initial zero setting;
- semi-automatic zero-setting;
- zero-tracking;
- zero indicating;
- semi-automatic subtractive tare balancing;
- preset tare (Weightec 348 only);
- setpoint comparators;
- linearity compensation.

Connections Weightec 348:
- power supply of 110 / 125 / 230 V AC 50/60 Hz;
- the minimum value allowed for the signal voltage per verification scale interval is 0.56 µV;
- the excitation power supply for the load cell is 5.6 V AC, 18.75 Hz sine wave;
- the minimum input impedance of the load cell is 58 Ω.
- "Remote-sensing" is used;
- no special cable length has to be provided or the connection between the analog data processing unit and the junction box or load cells.

Connections Weightec 348-2:
- power supply of 110 / 125 / 230 V AC 50/60 Hz or 24 V AC/DC;
- the minimum value allowed for the signal voltage per verification scale interval is 0.3 µV;
- the excitation power supply for the load cell is 5.6 V – 6.5 V AC, 218 Hz sine wave;
- the minimum input impedance of the load cell is 58 Ω.
- "Remote-sensing" is used;
- no special cable length has to be provided or the connection between the analog data processing unit and the junction box or load cells.

Software:
- the software for the Weightec 348 has the identification number: 888888
- the software for the Weightec 348-2 has the identification number: V01.01
- the identification number will be displayed at start-up.

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Description

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Project number 405858

1.3 Essential shapes

The analog data processing unit is built according to the drawings:
- Weightec 348 exploded view, drawing number WTC 280198-01;
- Weightec 348 exploded view revision 1, drawing number 100501-09.

The data plate is secured against removal by sealing or will be destroyed when removed and contains the following information:
- this test certificate number TC5164;
- manufacturers name or mark.

To secure components that may not be dismantled or adjusted by the user, the analog data processing unit has to be secured in a suitable manner on the locations indicated in the drawing Front behuizing 348 verzegeling, drawing number WTC 300198-01.
The securing component has to bear either:
- a mark of the manufacturer laid down in a notified body approved quality system (Annex II of the Directive 90/384/EEC), or;
- an official mark of a Member State of the EEC, or an other party to the EEA agreement.

1.4 Conditional parts

The analog data processing unit may be equipped with the following protective interfaces that have not to be secured:
- serial RS232;
- serial current loop;
- parallel display output;
- setpoint outputs;
- outputs for: under/overload, minus sign and stability of equilibrium;
- inputs for zero and tare functions.

1.5 Non-essential parts

Bufferprint 248;
Internal display;
Interface 848;
Display(s);
Keyboard.

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Appendix

Number **TC5164** revision 1
Project number 405858

Tests carried out for this test certificate on the Weightec analog data processing unit, type 348:

Test	Type or version	Institute
Temperature effect on the sensitivity with minimum weighing range and input impedance of 58 Ω. (20, 40, -10, 5 and 20 °C)	348, 348-2	NMi Certin B.V.
Temperature effect on the no load indication with minimum weighing range and input impedance of 58 Ω. (20, 40, -10, 5 and 20 °C)	348, 348-2	NMi Certin B.V.
Damp heat, steady state	348, 348-2	NMi Certin B.V.
Repeatability	348, 348-2	NMi Certin B.V.
Checklist	348, 348-2	NMi Certin B.V.
Cable length between the analog data processing unit and load cell	348, 348-2	NMi Certin B.V.
Stability of equilibrium	348, 348-2	NMi Certin B.V.
EMC tests are performed with a load cell impedance of 350 Ω		
Voltage variations	348, 348-2	NMi Certin B.V.
Short time power reductions	348, 348-2	NMi Certin B.V.
Electrical bursts	348, 348-2	NMi Certin B.V.
Electrostatic discharges	348, 348-2	NMi Certin B.V.
Immunity to radiated electromagnetic fields	348, 348-2	NMi Certin B.V.