G6 Program Description
G6-BCS

Program version 104.0.x

Program for Belt Conveyor Scale
PM type

BLH NOBEL
A VPG Brand

This description is valid for:

G6 Weighing Instrument with application program **104.0.x**

It is a supplement to the following instruments:

- **G6 Multi Channel Weighing Instrument program version 2.4.x**
  Technical Manual,
  Panel mounted, type PM
  Publication no. 601675

If these documents in any case are contradictory, this program description is valid.

Application Program Option:

Program options for Batching and Flow is Not enable in this program.

Hardware Requirements

This application program requires to have a module type with digital inputs in slot 1, where input 14 (I4 at module in slot 1) is dedicated for the pulse encoder and is not available for other configurations.

This application program requires to be used in G6 weighing instrument with graphical display (PM).

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1 Introduction

General

This software is developed for belt conveyor scale applications and calculates Belt flow rate, Belt speed rate and Total weight of the material that have passed the belt conveyor scale. The program can only be used in G6 weighing instrument with graphical display (PM). All belt scale functions are based on the weight from the sum scale, which can consist of any scales from 1-8 (scale 1 is always used and you choose how many additional scales that should be included).

Following functions are added in this program:

- Summation of 1 - 8 weighing scales (If only one channel is used for belt scale, the sum consists of only channel 1). The number of weighing scales that should be used in the sum is selectable in the set-up.
- Level supervision of the sum weight with any of the 32 possible level functions.
- Replace an erroneous scale with a Replacement scale function.
- Communicate the sum weight via serial communication, fieldbus or any of the analog outputs.
- Print the sum weight is possible with the PRINT button at the instrument, via digital input signal or via communication. This will also accumulate the sum weight to an accumulated weight register.
- The ‘SUM’ weight can be tared by pressing the TARE key, via a digital input or via Modbus command.
- The ‘SUM’ weight can be zeroed by pressing the ZERO key, via a digital input or via Modbus command.
- Using an external display to show the sum weight.
- A configurable digital output (‘Scale OK’) can be used to monitor that individual scales do not have any errors.
- Operating display for belt conveyor that shows Belt flow rate, Gross weight of summed channels, Total weight and Belt speed rate.
- Select Belt flow rate, Belt speed rate or Accumulated weight as level supervision source, which can be used for digital outputs.
- Level status indication of the four first level supervisions selected as scale 1 in the display.
- Communicate Belt flow rate, Total weight and Belt speed rate via Modbus register and/or Fieldbus.
- Communicate Belt flow rate and Belt speed rate via analog outputs.
- Modbus command to set Total weight to zero.
- Dynamic Zeroing as average for one complete cycle of the belt.
- Zeroing Limits are extended to +-10 % of scale capacity.

2 Views

Operating display for the Belt conveyor

The G6 will start up showing the ‘BeltConv’ operating display, where the Belt flow rate, Gross weight, Total weight and Belt speed rate are shown.

Four level indicators shows level number and level status.

If the weight on the belt conveyor is less than ‘Min. Weight Flow Calc.’ a status ‘Min. Weight’ will be displayed.

If the pulse frequency is lower than 1/’ Max Time Between Pulses’ a status ‘LowPulseFreq’ will be displayed.

If an error is detected the error codes will be displayed.

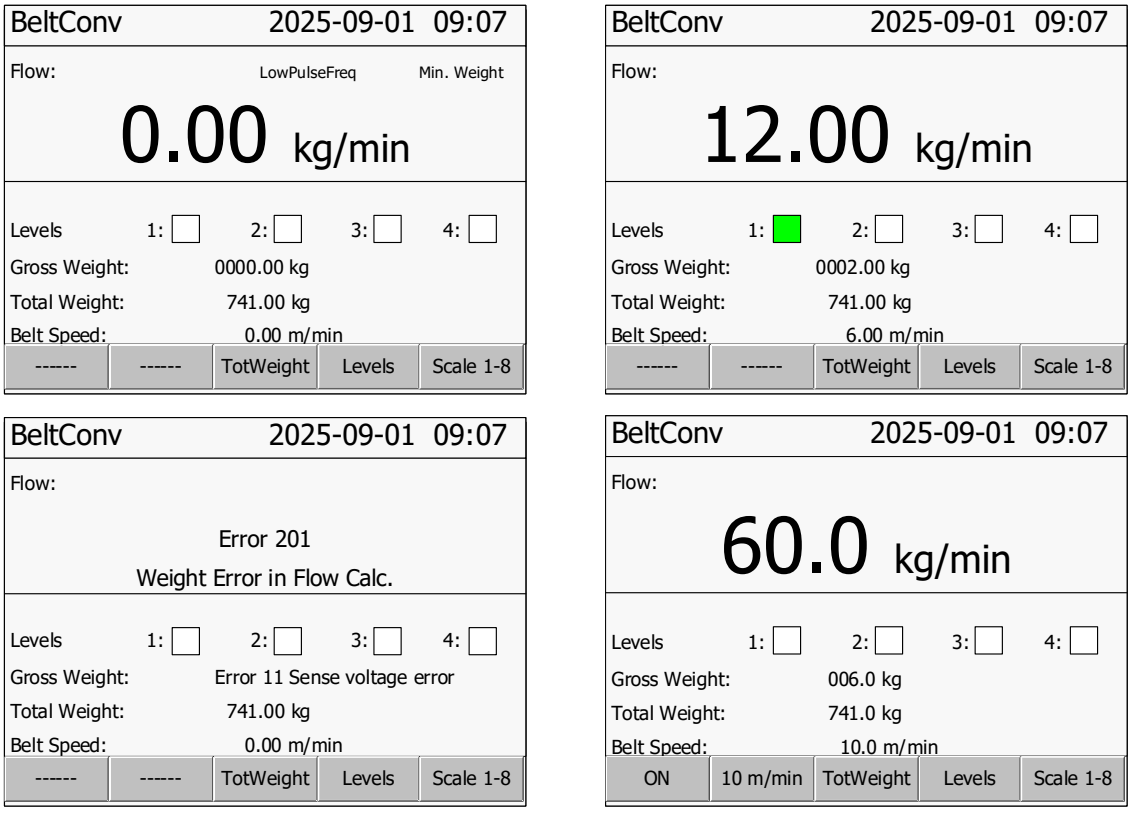

Figure: *Operating Window for Belt conveyor.*

By pressing the key ‘TotWeight’ (F3) a new window for Total Weight is displayed. In this window it is possible to zero Total weight by pressing the key ‘Zero’ (F3) or set Total weight to any value by pressing the key ‘Edit’ (F1) and write the value.

By pressing the key ‘Levels’ (F4) a window opens where all the configured levels for the sum scale are shown.

By pressing the key ‘Scale 1-8’ (F5) a window opens where scales are shown in the same way as in a normal weight indicator. The main menu is reached by pressing the ‘Info’ button when this window is displayed.

In the window for normal weight indicator there is a key ‘BeltConv’ (F1) that return to the ‘BeltConv’ operating display. This key and the belt conveyor scale operating display

get the same name as the ‘Instrument name’. If the ‘Instrument name’ is not assigned the key and belt conveyor operating display will be ‘BeltConv’.

If the constant mode is set to On, the key in position F2 will display the current speed value. F2 can be pressed and a window to set a new value will be shown. If the Constant Belt parameter is set, the F1 key will display if the belt flow calculations are active or not. Pressing F1 will toggle the calculations between on and off.

Sum view

The sum of the configured number of scales is displayed, with both gross and net value. The weight marked in yellow (G6 PM) is called ‘active weight’ in the document. Indicators, indicating the level number and the status for the levels, are also shown. If the weight is above the limit, the indicator is green, if it is below the limit, it is white. The indicators shown are the first eight that is supervising ‘SUM’ value.
For both weights, there are also indications for ’motion’ and ’Zero’ (good zero).

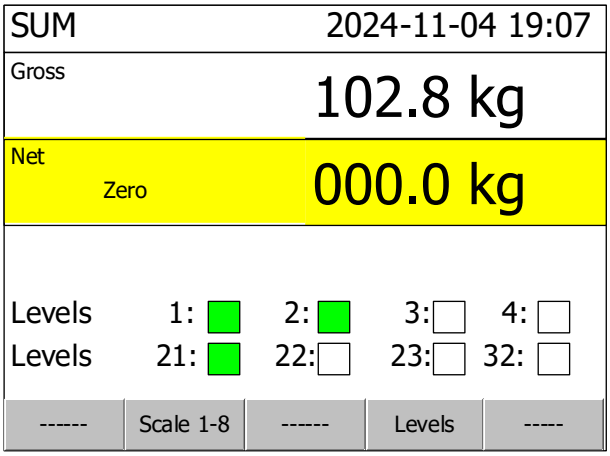

Figure 1: SUM window in the graphical display.

Function keys

Pressing the ‘TARE’ button in the ‘SUM’ window causes a tare command to all scales used in the sum. If all scales were able to perform a tare, the result of the command is indicated in the net value that will change to zero. All scales included in the ‘SUM’ scale will also change to Net-mode. If one or more scales could not be tared, no scale will be tared and the individual scales will remain in their previous mode (net or gross).

Pressing the ‘TARE’ button when viewing any of the individual scales will only cause that scale to be tared. However, this will affect the sum if the scale is used for summarization. A warning message will appear in such case, but that will not be the case if tare is performed via communication or a digital input.

’GROSS/NET’-button is used to active weight (gross or net).

Pressing the ‘ZERO’ button in the ‘SUM’ window and ‘active weight’ is gross weight, causes a zero command to all scales used in the sum. If all scales were able to zero (the gross weight) this is indicated in the gross and net value that could change to zero.

Pressing the ‘PRINT’ button, when the ‘SUM’ window is shown, causes a printout at the serial port in the same manner as for individual scales. The active weight (highlighted in yellow), gross or net will be printed if ‘Display Weight’ is used for any of the four

printing positions. The printout of the displayed weight begins with the number '9', which indicates that it is the sum weight, and the scale name is always 'SUM'. The weight will also be written to the accumulated weight register. By pressing the soft key ‘Levels’ (F4) a window opens where all the configured levels for the sum are shown.

By pressing the soft key ‘Scale 1-8’ (F2) a window opens where all the separate scales are shown in the same way as in a normal weight indicator. Here all scales that are used for sum is shown, as well as other configured scales. In the opened window the soft key ‘SUM’ (F2) is used to return to the ‘SUM’ window.

Remote access

With remote access, it is possible to choose a ‘SUM live view’ by pressing the soft key ‘SUM’ when an individual scales menu is shown in the live view. The belt conveyor view is not available through the built in web-server.

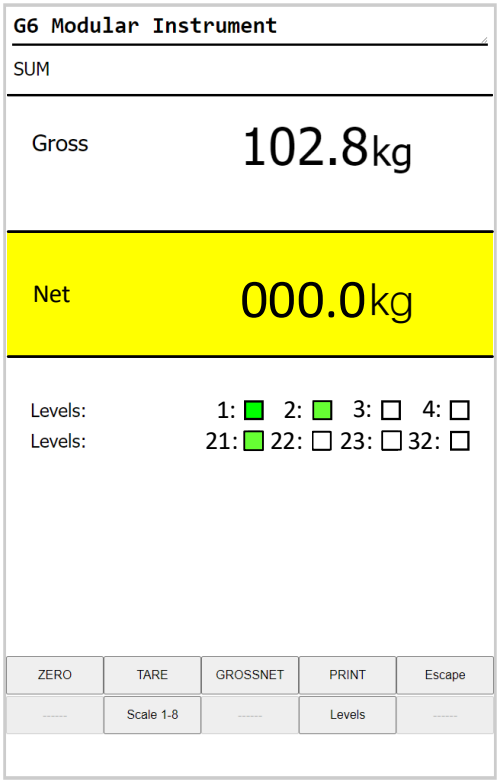

Figure 2: SUM window in the ‘live view’.

3 Setup

Setting up scale parameters

The sum value is calculated by summing individual scales. To ensure a correct sum value, all scales included in the ‘SUM’ scale must have the same settings, except ‘Scale name’ and calibration.

If the parameters ’Measurement Unit’ or ’Resolution’ is different for the individual scales, the settings from Scale 1 will be used for the ‘SUM’ scale.

The parameter ’Zero Tracking’ should always be set to ’Off’ and ’Tare Corr.Mode’ to ’Auto’.

The parameter ’Min Weight Print’ does not affect printing of the ‘SUM’ weight.

Setup of the scale parameters is performed in the menu
‘Parameter Set-up/Calibration/Scale x’.

Calibration of individual scales included in the ‘SUM’-scale

Individual scales included in the ‘SUM’ scale should be calibrated with the calibration type **Data Sheet** as described in the standard technical manual for the G6.

Calibration of the scales is performed in the menu
‘Parameter Set-up/Calibration/Scale x/Scale x Calibration’.

Replacement scale function

If a scale used in the sum detects an error, the weight values (gross and net) in the ‘SUM’ window will be replaced with an error text ‘Error 15’. In this case the erroneous scale can be replaced with the weight from another scale, by setting the set-up parameter ‘Replacement scale’ to another valid scale (see below). This will be indicated with the text ‘WARNING: Replacement scale used’ in the graphical display and with ‘R’ in the VIEWPAN. The replacement function should only be used temporary. Bit 9 in status register indicates if Replacement scale is activated or not.

Principle of calculation

Some idlers or a mechanically separated section are supported on load cells to get information of how much material that is on the belt. To know if, and how fast, the belt is running a pulse encoder assembled with a measuring wheel is installed and connected to the G6 instrument. For each input pulse the instrument adds gross weight divided by number of pulses per ‘Effective Scale Length’ to the Total weight. The Belt flow rate is then calculated as the difference in Total weight (Δw) during a derivation time divided by the Derivation time (Δt).

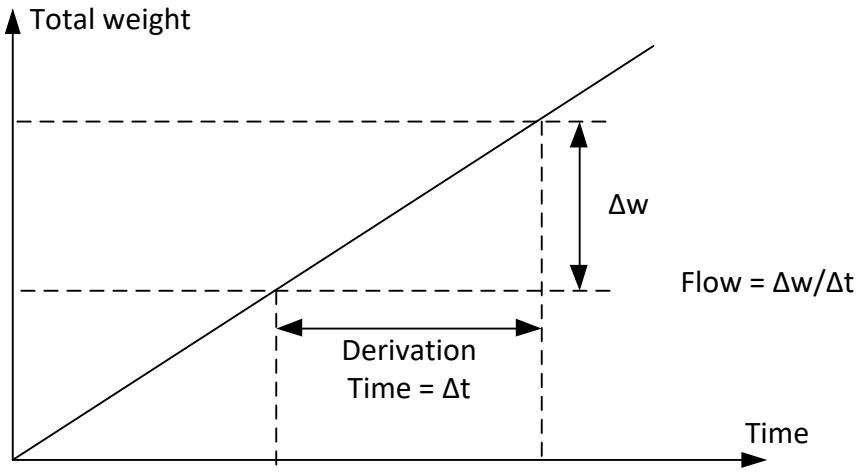

Figure: *Total weight over time.*

Belt conveyor scale mechanically types

There are different types of mechanically installations regarding Belt conveyor scales and for each type the load cells are affected by material on the belt different length. The length where the material on the belt is affecting the load cells is called 'Effective scale length'. Some examples are shown below.

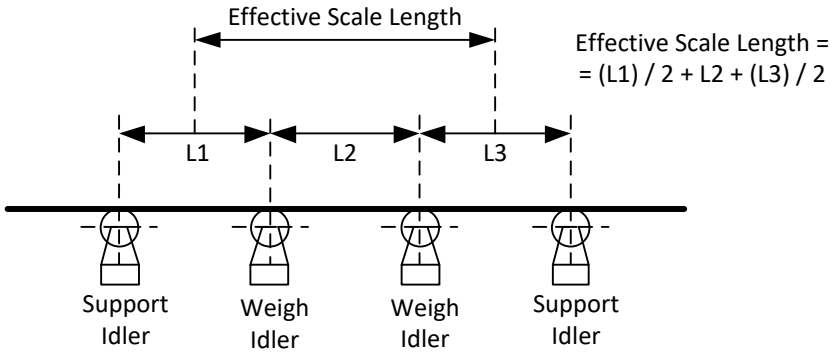

Figure: *Belt conveyor scale with load cells on idlers.*

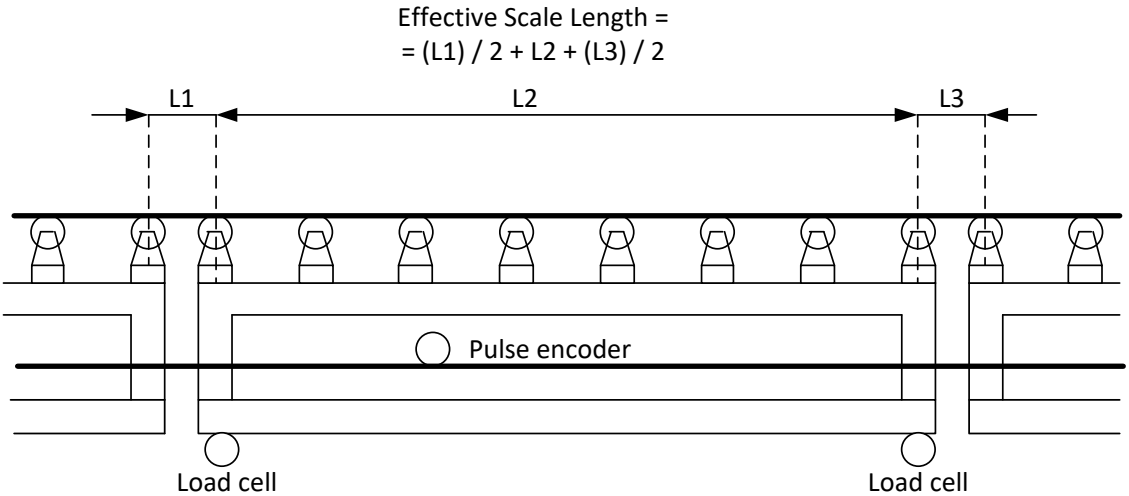

Figure: *Belt conveyor scale with mechanically separated section.*

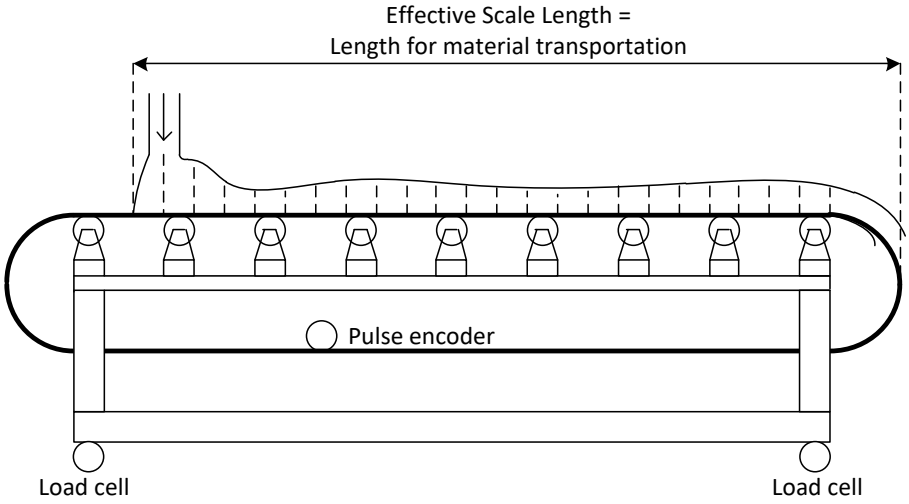

Figure: *Fully supported Belt conveyor scale.*

Connection of load cells

The application program for belt conveyor scale uses the weighing channel that is selected as Scale 1 in the Hardware config. The load cells shall be connected according to the G6 standard manuals.

Pulse Encoder

The pulse encoder shall be installed with a measuring wheel at the belt. When the belt is moving the measuring wheel and the pulse encoder shall rotate. When the pulse encoder is rotating it shall give 24VDC pulses (50% duty cycle) as a signal output. This signal output shall be connected to digital input I4 at slot 1 according to the figure below.

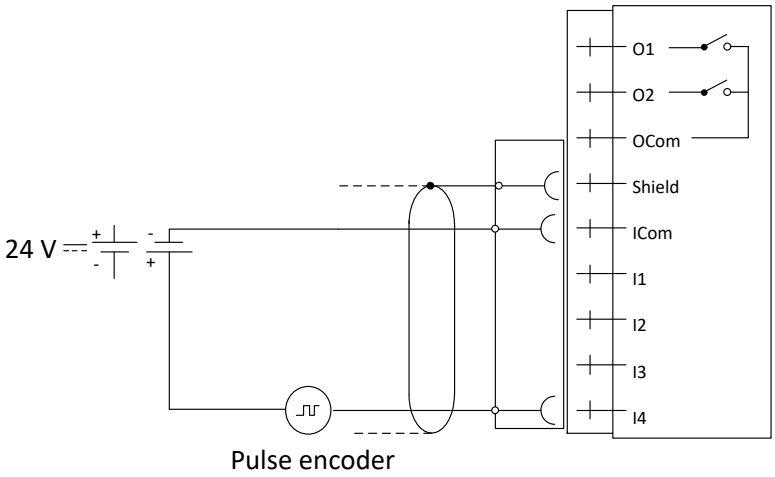

Figure: *Example of pulse encoder connection.*

The pulse encoder should be arranged to give max 80 Hz (50% duty cycle) at maximum belt speed.

Note: The instrument will give error code at frequencies over 80 Hz.

Example to Calculate Max Pulse Encoder PPR

Max Belt speed: 1 m/s

Select Measuring Wheel Circumference: 0,5 m

Pulse Encoder Frequency at max belt speed shall be around: 75 Hz (must be less than 80 Hz)

$$\boldsymbol{Max\ Pulses\ per\ Revolution\ (PPR)\ in\ Pulse\ Encoder} =$$

$$= \frac{\text{Encoder Frequency at max belt speed [Hz] x Measuring Wheel Circumference [m]}}{Max\ Belt\ speed\ [m/s]} =$$

$$= \frac{75\ Hz\ x\ 0{,}5\ m}{1\ m/s} = 37{,}5$$

Select a Pulse Encoder with for example 37 PPR.

Total Weight

Total weight is updated at every pulse (positive flank), if the weight is greater than ‘Min. Weight Flow Calc.’ and if there are no errors:

$$Total\ weight\ = Total\ weight\ + \frac{Gross\ weight\ on\ belt\ conveyor\ scale}{No\ of\ pules\ at\ Effective\ scale\ lengt}$$

The unit for Total Weight is the same as ‘Measurement Unit’ for scale 1. The instrument is capable of storing Total Weight values up to 10 000 000 000 units with 3 decimals. When the limit is passed 10 000 000 000 will be subtracted from the value.

It is possible to zero or set any value to the Total Weight through the graphical display or via Modbus register. Total Weight can also be set to zero by a Modbus command written to the command register.

Belt Flow Rate

The belt flow rate is calculated as the difference in total weight during a derivation time divided by the derivation time and can be displayed in different units and resolutions see parameter set-up. The response time is equal to the derivation time and the belt flow rate value is updated ten times every derivation time.

Belt Speed

The belt speed is calculated through the pulses from the pulse encoder. The unit of measurement is m/min and the resolution is 0.05. The response time is 5 seconds and the value is updated every second.

Static Calibration of scales in belt scale

The Belt conveyor scale has Summing scale as weight source. Scales included in the sum shall be static calibrated according to G6 technical manual (Pub. No. 601675).

Filter Window should be set to 999999.

Zero should be done when the belt conveyor is completely installed and without any material on the belt.

It is recommended to do a Dynamic Zeroing after the static calibration, see next section.

Dynamic Zeroing

This section does not apply when constant mode is ON.

After the static calibration a Dynamic zeroing can be done to set an average zero for a complete cycle of the belt. The belt must be empty and running at normal speed during the complete Dynamic zeroing.

Press the ‘Zero’ key when viewing the Belt Conveyor operator display.
Note that ‘Zero Key’ must be ‘On’ in Parameter Set-up\General menu.

A question “Start Dynamic Zeroing of Belt Scale?” will come up. Press Yes or No.

If Yes, the Dynamic zeroing will start and a progress window will be shown (% of total pulses, actual pulse counter and total number of pulses for one complete cycle).

When the progress is 100% the instrument will try to save the gross weight average for all pulses as a Zero correction. A message will be shown in the display if the value can be saved or not.

If the gross average value is within zeroing limits of +-10% of capacity (parameter) and the instrument is not in calibration mode the value will be saved. Press Ok to close the window.

If the average value is out of zeroing limits of +-10% of capacity (parameter) or in calibration mode it will fail. Press Ok to close the window.

The Dynamic Zeroing can be stopped when the Dynamic Zeroing is running by pressing Cancel.

An error message will be shown directly if a weight error or belt conveyor error will occur when a pulse is detected.

The Zero Correction Value in % can be shown in
Main menu\Maintenance\Diagnostic\Scales for each scale.

Following parameters needs to be configured for the actual pulse encoder and belt conveyor before a Dynamic Zeroing can be done correctly:

- Total belt length
- Encoder Pulses Per Revolutions
- Encoder Wheel Circumference

Note:

The value of Dynamic Zeroing (zero correction) will not be included in the Restore and Backup function.

Correction Factor

After the static calibration and the recommended Dynamic Zeroing the belt conveyor scale can be calibrated dynamically with a Correction factor.

The correction factor is the factor between the belt conveyor scale mechanics when the belt is running and the static calibration.

Run a known amount of material over the belt conveyor scale and then read the 'Total weight' value in the G4 instrument after all material have passed.

The correction factor is then calculated manually.

If actual correction factor is equal to 1 (one) the Correction Factor can be calculated as:

$$Correction\ Factor\ = \frac{Known\ amount\ of\ material}{Total\ weight\ value}$$

If the actual correction factor is Not equal to 1 (one) the Correction Factor can be calculated as:

$$New\ Corr.Factor\ = \frac{Known\ amount\ of\ material}{Total\ weight\ \ value}\ x\ Actual\ Corr.Factor$$

It is recommended to set Total Weight to 0 (zero) before running material over the belt scale, otherwise a differential between End value and Start value needs to be calculated.

It is also recommended to write down the old Correction Factor from earlier calibration to be able to go back to the same settings as before.

Parameter Set-up

To configure the belt conveyor functions some new parameters have been added in Parameter Set-up. The Parameter Set-up is reached with the ‘Info’ button when the instrument displays the weighing scales ‘Scale 1-8’ (not possible from the ‘BeltConv’ operating display).
From ‘BeltConv’ operating display, press key ‘Scale 1-8’ or ‘Esc’ and then key ‘Info’ (or key F11 on a connected USB keyboard.

New and changed parameters in Parameter Set-up

Menu ‘Program Options’

Options 01: Flow and 02: Scale Batching have been deleted in the menu for program options.

Program Options

03: EtherNet/IP

Menu ‘Calibration/Belt scale parameters’

No of scales in Sum

Range: 1 – 8 <1>	**Defines** the number of scales that should be used for the Sum. Scales that are used starts with scale no. 1 up to the scale set in this parameter.

Menu ‘Calibration/Scale X’

The configured scales (1 - 8) in the menu ‘Calibration’ that are included in the ‘belt scale’ has been expanded with one more parameter each.

Replacement scale

Choices: Not in use 1 2 3 4 5 6 7 8 <Not in use>	**Defines** if the scale should use data from another scale. Normally this parameter should be set to ‘Not in use’. It can be used if e.g. a load cell is broken and must temporary be removed. This scale can then use the data from another scale by setting this parameter to the scale that should be used. If these scales normally had the same load, the operation can continue until the load cell is replaced. The use of this is clearly indicated in the ‘Sum’ window, with the message ‘WARNING: Replacement scale used’

Parameter 'Calibration/Scale 1\Filter Window'

Parameter Filter Window for Scale 1 has changed default value to use unfiltered weight values all the time.

1:Filter Window

Range: 0 to 999999 Unit: Measurem. unit <999999>	The instrument produces unfiltered and filtered weight internally. If the difference between the filtered an unfiltered weight is less than 'Filter window' the filtered weight is used. This parameter value has one decimal more than parameter Resolution, to allow 'Filter window' to be smaller than the resolution.

Menu 'Communication/Serial com.'

The number of choices in the menu 'Serial Com/Ext. Disp. X Mode'' has been expanded with three more choices if serial communication 'Mode' is set to 'External Display'.

Ext. disp. X mode

Choices: Net Weight Gross Weight Display Weight Flow Rate SUM Gross Weight SUM Net Weight SUM Disp. Weight < Display Weight >	Three new choices: **SUM Gross Weight:** The display represents SUM gross weight. **SUM Net Weight:** The display represents SUM net weight. **SUM Disp. Weight:** The display shows the same SUM weight as the instrument display (active weight). **Note**! If the user selects any of the three new choices (related to SUM), the parameter 'Ext. Disp. X Scale' are hidden.

Menu 'Level Supervision'

The sub menus, 'Level 1' to 'Level 32', has a parameter 'Level X Source' which has been expanded with six new choices.

Level 'X' Source

Choices: Not in use Net Weight Gross Weight Display Weight Flow Rate Abs.Net Weight Abs.Gross Weight Abs.Disp.Weight Abs.Flow Rate SUM Gross Weight SUM Net Weight SUM Disp. Weight SUM Abs Gross W SUM Abs Net W. SUM Abs Disp W. Belt Flow Rate Belt Speed Rate	Eight new choices: Defines the signal to be supervised by the level. **SUM Gross Weight:** The level operates on the SUM gross weight. **SUM Net Weight:** The level operates on the SUM net weight. **SUM Disp. Weight**: The level operates on the active 'SUM' weight (gross or net) that the instrument shows. **SUM Abs Gross W** **SUM Abs Net W.** **SUM Abs Disp W.** **Sum Abs.:** Stands for the Absolute value of the sum value. The level operates on the absolute SUM value of net weight, gross weight or displayed weight. **Belt Flow Rate:** The level operates on the Belt Flow Rate. **Belt Speed Rate:** The level operates on the Belt Speed

< Not in use >	Rate. **Note**! If the user selects any of the six new choices (related to SUM), the parameter 'Level 'X' Scale' is hidden. Belt Flow Rate and Belt Speed Rate are always dependent on Sum scale.

Menu 'Inputs'

The sub menus 'Input Slot X' have a number of parameters 'Input 'XX' Use' which have been expanded with six new choices.

Input XX Use

Choices: Not in use Tare Gross/Net Gross Net Zero Flow/Weight Flow Rate Weight Print Reset Max(G) Reset Max(N) Reset Min(G) Reset Min(N) Reset all MaxMin SUM Tare SUM Gross/Net SUM Gross SUM Net SUM Zero SUM Print < Not in use >	Six new choices: **SUM Tare:** Input used for SUM taring command. **SUM Gross/Net:** Input used for changing between SUM Gross and SUM Net. **SUM Gross:** Input used to switch to SUM Gross mode. **SUM Net:** Input used to switch to SUM Net mode. **SUM Zero:** Input used for SUM Zero command. **SUM Print:** Input used for SUM print command.. **Note**! If the user selects 'Not in use', 'Reset all MaxMin ' or any of the six new choices (related to SUM), the parameter 'Input 'XX' Scale' is hidden.

Menus 'Outputs'

The sub menus 'Outputs slot X' has a number of parameters, 'Output XX source', that has been expanded with four new choices.

Output XX Source

Choices: Not in use In Process Level Setpoint Net Mode Good Zero Stable Weight Flow R.Disp	Four new choices: **Scale OK:** The output is active (On) when 'Output XX Scale' error code is equal to 'No Error' (000). **SUM Net Mode:** The output is activated when SUM is in net mode **SUM Good Zero:** The output is activated when SUM has a 'good zero'.

Scale OK SUM Net Mode SUM Good Zero SUM Stab. Weight < Not in use >	**SUM Stable Weigh:** The output is activated when SUM has stable weight. **Note**! If the user selects any of three new ‘SUM’ choices the parameter ‘Output XX Scale’ is hidden.

Menu 'Calibration/Belt scale parameters'

This menu has been extended with new parameters for the belt conveyor.

1:Effective Scale Length

Range: 0.001 – 1000 Unit: m <1>	'Effective Scale Length' is the length where material at belt conveyor affects the load cells, see figures in section Belt conveyor scale mechanically types.

1:Encoder Pulses Per Rev.

Range: 0.01 – 10000 <50>	'Encoder Pulses Per Rev' is the number of pulses Per Revolutions (PPR) at the Pulse Encoder. PPR will normally be written on the Pulse Encoder or in the encoder specification.

1: Belt Flow Rate Resolution

0.001 0.002 0.005 0.01 0.02 0.05 1 2 5 10 20 50 <0.02>	Defines the decimal point position and resolution format for the belt flow rate value.

1: Belt Flow Rate Unit

Unit/s Unit /min Unit /h Unit *1000/m Unit *1000/h < Unit /min>	Defines the engineering unit that should be used for the belt flow rate value and for related set-up parameters. Unit is equal to the 'Measurement Unit' for scale 1.

1:Max Time Between Pulses

Range: 0.01 – 1 Unit: s <1>	'Max Time Between Pulses' decides when the instrument gives status for Low Frequency (low belt speed rate). If the parameter is set to 0.5 second, the instrument gives Low Pulse Frequency status when the pulse

	frequency is less than f=1/'Max Time Between Pulses' = 1/0,5 = 2 Hz. Low pulse frequency status will be shown on the Belt conveyor operating display and in the status register

1:Belt Correction factor

Range: 0.01 – 4 <1>	The correction factor is calculated manually by running a known amount of material over the belt conveyor divided by the difference in total weight value when the material has passed the belt conveyor. See also section Correction Factor.

1: Min. Weight Flow Calc.

Range: 0 – 1000 Unit: Measurement Unit' for scale 1. <2>	'Min. Weight Flow Calc' decides when the Total Weight should be accumulated, and thereby the belt flow rate calculation. If the gross weight on the belt conveyor is less than 'Min. Weight Flow Calc' the instrument indicates 'Min Weight' on the graphical display and in the status register It is possible to get signal for min weight on a digital output by setting the same Level as 'Min. Weight Flow Calc' at Level Supervision for Gross Weight and Sum scale

1: Belt Speed Rate Resolution

0.01 0.02 0.05 1 2 5 10 20 50 <0.05>	Defines the decimal point position and resolution format for the belt speed rate value.

1: Belt Speed Rate Unit

Unit/s Unit /min Unit /h Unit *1000/min Unit *1000/h < Unit /min>	Defines the engineering unit that should be used for the belt speed rate value and for related set-up parameters.

1:Encoder Wheel Circumfer.

Range: 0.001 – 10 <0.5>	'Encoder Wheel Circumfer.' is the circumference of the measuring wheel assembled with the pulse encoder. Measuring wheel circumference will normally be written in the encoder specification.

1:Total Belt Length

Range: 0.001 – 100000 Unit: m <100>	'Total Belt Length' is the length for one complete cycle of the belt. This parameter is used during the Dynamic Zeroing. The instrument will calculate the number of pulses for one complete cycle based on this and other parameters. Total belt length will normally be written in belt conveyor specification or can be measured at the belt conveyor.

1:Deriv. Time Belt Flow

Range: 1 – 3600 Unit: s <10>	'Deriv. Time Belt Flow' is an abbreviation for Derivation Time Belt Flow. The belt flow rate is calculated as the difference in total weight during a derivation time divided by the derivation time. Longer derivation time gives a more stable and accurate belt flow rate value, but it will also give longer response time. The belt flow rate calculation will perform ten times every derivation time.

1:Constant belt

Choices: Off On <Off>	Defines how the belt speed should be generated. Off allows calculations as previously described in this document. On allows to set a constant belt speed without needing any physical input signal to determine belt speed.

Menus 'Outputs'

The sub menus 'Outputs slot X' has a number of parameters, 'Output XX source', that has been expanded with four new choices.

Output XX Source

Choices: Not in use In Process Level Setpoint Net Mode Good Zero Stable Weight Flow R.Disp Scale OK SUM Net Mode SUM Good Zero SUM Stab. Weight < Not in use >	Four new choices: **Scale OK:** The output is active (On) when 'Output XX Scale' error code is equal to 'No Error' (000). **SUM Net Mode:** The output is activated when SUM is in net mode **SUM Good Zero:** The output is activated when SUM has a 'good zero'. **SUM Stable Weigh:** The output is activated when SUM has stable weight. **Note**! If the user selects any of three new 'SUM' choices the parameter 'Output XX Scale' is hidden.

Menu 'Analog outputs'

The menu 'Analog Outputs' has one or more parameters, 'AOUT X Source', which has been expanded with three new choices. Flow has been deleted.

AOUT X Source

Choices: Not in use Gross Weight Net Weight Disp. Weight Max Value Gross Max Value Net Min Value Gross Min Value Net SUM Gross Weight SUM Net Weight SUM Disp. Weight Belt Flow Rate Belt Speed Rate < Not in use >	Five new choices: **SUM Gross Weight:** The output represents the SUM gross weight. **SUM Net Weight:** The output represents the SUM net weight. **SUM Disp. Weight:** The output represents the SUM gross weight or the SUM net weight (active weight). **Belt Flow Rate.** **Belt Speed Rate.** **Note:** If the user selects any of the three new choices (related to SUM), the parameter 'AOUT X Scale' is hidden. Belt Flow Rate and Belt Speed Rate are always dependent on Sum scale.

Menu 'Fieldbus Data Block XX Type'

The sub menus 'Data Block 1 Type' to ' Data Block 12 Type' have been added with six new choices.

Data Block XX Type

Not In Use Gross Weight Net Weight Disp. Weight Flow Rate Input Signal Level Status Setp. Status Input Status Output Status Inp./Outp Status Lev./Setp Status AOUT1-4 Value AOUT1-2 Value AOUT3-4 Value SUM Gross Weight SUM Net Weight SUM Disp. Weight Belt Flow Rate Belt Speed Rate Total Weight < Not In Use >	Six new choices: **SUM Gross Weight:** The SUM gross weight is transferred in this data block. Floating point or Integer format. **SUM Net Weight:** The SUM net weight is transferred in this data block. Floating point or Integer format. **SUM Disp. Weight**: The active 'SUM' weight (gross or net) that the instrument shows is transferred in this data block. Floating point or Integer format. **Note**! If the user selects any of the choices related to SUM, the parameter 'Data block 'X' Scale' is hidden. ***Belt Flow Rate:*** *The belt flow rate is transmitted in this Data Block. Floating point or Integer format.* ***Belt Speed Rate:*** *The belt speed rate is transmitted in this Data Block. Floating point or Integer format.* ***Total Weight:*** *The Total weight is transmitted in this Data Block. Floating point or Integer format.* Note: These parameters are only shown if parameter 'No Of Data Blocks' is set to 1 or greater.

Parameter 'Inputs/Inputs Slot 1\'

1:Input 11 Action (added parameter)

Belt Toggle	Specifies a digital input to toggle constant belt flow calculations on positive flank. (Use a button)

4 Communication

New Modbus registers

New Modbus registers for Belt Conveyor scale have been added.

Data type: Integer	Data type: float (2 reg./value)	Explanation	R/W
41800 (1 reg)	45800	Belt Conveyor: Error Code	R
41801 (1 reg)	45802	Belt Conveyor: Status	R
41802 (3 reg)	45804	Belt Conveyor: Belt Flow Rate	R
41805 (3 reg)	45806	Belt Conveyor: Belt Speed Rate	R
41808 (2 reg)	45808	Belt Conveyor: current pulse for dynamic Zeroing	R
41810 (2 reg)	45810	Belt Conveyor: pulses for one belt revolution.(100% of pulses, dynamic zero)	R
41820 (1 reg)	45820	Summed value: Error	R
41821 (1 reg)	45822	Summed value: Status	R
41822 (3 reg)	45824	Summed value: Gross weight	R
41825 (3 reg	45826	Summed value: Net weight	R
43800 (3 reg)	47200	Belt Conveyor: Total Weight LOW	R/W
43803 (3 reg)	47202	Belt Conveyor: Total Weight HIGH	R/W

Total Weight is represented by two values (HIGH, LOW). To get the resulting value multiply value HIGH by 10000 and add value LOW. LOW is a value between ±9999.999 with 3 decimals. HIGH is a value without decimals between ±999999. To zero Total Weight, send 0 to both HIGH and LOW.

NOTE!

Both HIGH and LOW must be written in ONE Modbus message on order to change the value.

Accumulated weight registers

New registers are added for the accumulated SUM values.

Data type: Integer

	Scale number									No Reg	R/W
	1	2	3	4	5	6	7	8	SUM		
LOW	42250	42256	42262	42268	42274	42280	42286	42292	43630	3	R/W
HIGH	42253	42259	42265	42271	42277	42283	42289	42295	43633	3	R/W

Data type: Float

	Scale number									No Reg	R/W
	1	2	3	4	5	6	7	8	SUM		
LOW	46200	46204	46208	46212	46216	46220	46224	46228	47120	2	R/W
HIGH	46202	46206	46210	46214	46218	46222	46226	46230	47122	2	R/W

New Commands

Ten new Modbus-commands has been added to be used in the command register (Integer 42000 or Float 46000) or as a command on the fieldbus.

Cmd	Action activated in instrument	Note
5	SUM: Select gross mode (Scale 9)	
6	SUM: Select net mode (Scale 9)	
7	SUM: Set to zero (Scale 9)	
8	SUM: Tare value (Scale 9)	
9	SUM: Print value (Scale 9)	
220	Set Total Weight to zero, i.e. register for Belt Conveyor: Total Weight LOW and Belt Conveyor: Total Weight HIGH are set to zero.	
221	Start the Dynamic zeroing process.	
222	Stop the Dynamic zeroing process.	
223	Start constant belt flow calculations (requires constant belt == ON)	
224	Stop constant belt flow calculations (requires constant belt == ON)	

Summed value: Status

Status for summed value (Scale 9).

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Net weight > INT size	The net weight in ‘scaled integer’ format does not fit in one register.
1	Gross weight > INT size	The gross weight in ‘scaled integer’ format does not fit in one register.
2		
3		
4	Good zero Gross	All scales included in the ‘SUM’-scale have Good zero Gross.

5	Good zero Net	All scales included in the ‘SUM’-scale have Good zero Net.
6	Net Mode	'1' = Net mode ‘0' = Gross mode
7	Motion	Unstable weight (If any scale has unstable weight)
8		
9	Replacement scale	If any included scales has been replaced with ‘Replacement scale’ the bit is set to ‘1’
10		
11		
12	Net weight > 6 digits	The net weight value is out of precision and should normally not be used.
13	Gross weight > 6 digits	The gross weight value is out of precision and should normally not be used.
14		
15		

Status Bits for ‘Belt Conveyor: Status’

One Belt Conveyor Status register has been added to be used in Modbus registers or Fieldbus Data block.

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Belt Flow Rate > INT size	The Belt Flow Rate in ‘scaled integer’ format does not fit in one register. (See description of data representation in the standard manual.)
1	Belt Speed Rate > INT size	The Belt Speed Rate in ‘scaled integer’ format does not fit in one register. (See description of data representation in the standard manual.)
8	Min. Weight Flow Calc	Gross weight at Scale 1 is less than ‘Min Weight Flow Calc’.
9	Low Pulse Frequency	Indicates if the pulse frequency is lower than 1/’Max Time Between Pulses’.
10	Dynamic Zeroing Running	Indicates if the Dynamic Zeroing is Running.
11		
12	Belt Flow Rate > 6 digits	The Belt Flow Rate value is out of precision and should normally not be used.
13	Belt Speed Rate > 6 digits	The Belt Speed Rate value is out of precision and should normally not be used.

Scale X: Status

Status for Scale 1-8.

Bits set to 1 in this register have the following meaning:

Bit no	Function	Comment
0	Net weight > INT size	The net weight in ‘scaled integer’ format does not fit in one register.
1	Gross weight > INT size	The gross weight in ‘scaled integer’ format does not fit in one register.
2	Flow rate > INT size	The flow rate in ‘scaled integer’ format does not fit in one register.
3	Good zero (disp. weight)	
4	Good zero Gross	
5	Good zero Net	
6	Net Mode	'1' = Net mode ‘0' = Gross mode
7	Motion	Unstable weight
8		
9	Replacement scale	If Scale X is included in the SUM and Scale X is replaced with ‘Replacement scale’ the bit is set to ‘1’.
10		
11	Flow rate display	Flow rate is shown in the display.
12	Net weight > 6 digits	The net weight value is out of precision and should normally not be used.
13	Gross weight > 6 digits	The gross weight value is out of precision and should normally not be used.
14	Max/Min values > 7 digits	One or more of the Max/Min values are out of precision and should normally not be used.
15	Max/Min values > INT size	One or more of the Max/Min values in ‘scaled integer’ format does not fit in one register.

Note: If this register (bits) is read as float value,
see description of Data representation in the standard manual.

New Error Codes

Five new Error Codes have been added to be used in the Belt Conveyor Error Modbus registers or Fieldbus Data block.

One new 'Weight Error' with error code '015' has been added as shown below and is the only error code that the ‘SUM’ scale can assume. Error code '015' is used when there is a fault in any of the scales included in the ‘SUM’ scale.

Error code	Explanation
015	**One or more scales reports an error** This error is used by the SUM scale error register to inform the user that one or more of the scales that are used in the SUM scale have an error. There may also be something wrong with the configuration of the SUM scale. Check these scale registers to find the root cause. Examples of causes may be: • That any scale included in the SUM scale has a ‘Weight error’ (e.g. ‘Weight error 011 Sense voltage error’). • That any scale included in the SUM scale is configured as ‘Not Used’.
201	**Weight Error in Flow Calc.** Indicates if Sum scale has weight error (se error codes for individual scales in standard manual) during the flow calculation. If this code occurs the Total Weight will not be accumulated and the belt flow rate is not valid.
202	**High Pulse Frequency**. Indicates if the pulse frequency is higher than 80 Hz (50% duty cycle). If this error occurs the Total Weight will not be accumulated and the belt flow rate and belt speed rate are not valid. When pulse frequency is below 50 Hz this error will disappear.
203	**Low Pulse Frequency.** Indicates if the pulse frequency is to low or absent.
204	**Dynamic Zero Not Allowed**. This error is returned if a remote user tries to start dynamic zero and constant belt mode is set to ON.
205	**Wrong Constant Mode for Toggle.** The constant mode parameter is not set to ‘ON’

Data to the fieldbus (Inputs in the master)

Three new data block types have been added:

- Belt flow rate data, floating point or integer format
- Belt speed rate data, floating point or integer format
- Total weight data, floating point or integer format

Belt Flow Rate data block

Byte	Floating-point format	Integer format
Offset + 0	Belt Conveyor: Error code MSB	Belt Conveyor: Error code MSB
Offset + 1	Belt Conveyor: Error code	Belt Conveyor: Error code
Offset + 2	Belt Conveyor: Error code	Belt Conveyor: Status MSB
Offset + 3	Belt Conveyor: Error code	Belt Conveyor: Status
Offset + 4	Belt Conveyor: Status MSB	Belt Flow Rate Data, int MSB
Offset + 5	Belt Conveyor: Status	Belt Flow Rate Data, int
Offset + 6	Belt Conveyor Status	Belt Flow Rate Data, int
Offset + 7	Belt Conveyor: Status	Belt Flow Rate Data, int
Offset + 8	Belt Flow Rate Data MSB	Belt Flow Rate Data, dec MSB
Offset + 9	Belt Flow Rate Data	Belt Flow Rate Data, dec
Offset + 10	Belt Flow Rate Data	Not used
Offset + 11	Belt Flow Rate Data	Not used
Offset + 12	Not used	Not used
Offset + 13	Not used	Not used
Offset + 14	Not used	Not used
Offset + 15	Not used	Not used

The table above describes the data block format if the parameter ‘Data Block N Format’ is set to ‘Floating point’ or ‘Integer’ where ‘N‘ stands for the index of the Data Block (1 – 12).

Belt Speed Rate data block

Byte	Floating-point format	Integer format
Offset + 0	Belt Conveyor: Error code MSB	Belt Conveyor: Error code MSB
Offset + 1	Belt Conveyor: Error code	Belt Conveyor: Error code
Offset + 2	Belt Conveyor: Error code	Belt Conveyor: Status MSB
Offset + 3	Belt Conveyor: Error code	Belt Conveyor: Status
Offset + 4	Belt Conveyor: Status MSB	Belt Speed Rate Data, int MSB
Offset + 5	Belt Conveyor: Status	Belt Speed Rate Data, int
Offset + 6	Belt Conveyor Status	Belt Speed Rate Data, int
Offset + 7	Belt Conveyor: Status	Belt Speed Rate Data, int
Offset + 8	Belt Speed Rate Data MSB	Belt Speed Rate Data, dec MSB
Offset + 9	Belt Speed Rate Data	Belt Speed Rate Data, dec
Offset + 10	Belt Speed Rate Data	Not used
Offset + 11	Belt Speed Rate Data	Not used
Offset + 12	Not used	Not used
Offset + 13	Not used	Not used
Offset + 14	Not used	Not used
Offset + 15	Not used	Not used

The table above describes the data block format if the parameter ‘Data Block N Format’ is set to ‘Floating point’ or ‘Integer’ where ‘N‘ stands for the index of the Data Block (1 – 12).

Total Weight data block

Byte	Floating-point format	Integer format
Offset + 0	Total Weight LOW MSB	Total Weight LOW, int MSB
Offset + 1	Total Weight LOW	Total Weight LOW, int
Offset + 2	Total Weight LOW	Total Weight LOW, int
Offset + 3	Total Weight LOW	Total Weight LOW, int
Offset + 4	Total Weight HIGH MSB	Total Weight LOW, dec MSB
Offset + 5	Total Weight HIGH	Total Weight LOW, dec
Offset + 6	Total Weight HIGH	Total Weight HIGH, int MSB
Offset + 7	Total Weight HIGH	Total Weight HIGH, int
Offset + 8	Not used MSB	Total Weight HIGH, int
Offset + 9	Not used	Total Weight HIGH, int
Offset + 10	Not used	Total Weight HIGH, dec MSB
Offset + 11	Not used	Total Weight HIGH, dec
Offset + 12	Not used	Not used
Offset + 13	Not used	Not used
Offset + 14	Not used	Not used
Offset + 15	Not used	Not used

The table above describes the data block format if the parameter ‘Data Block N Format’ is set to ‘Floating point’ or ‘Integer’ where ‘N‘ stands for the index of the Data Block (1 – 12).

Total Weight is represented by two values (HIGH, LOW). To get the resulting value multiply value HIGH by 10000 and add value LOW. LOW is a value between ±9999.999 with 3 decimals. HIGH is a value without decimals between ±999999. To zero Total Weight, send 0 to both HIGH and LOW.

Publication no. 602 030 R0
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