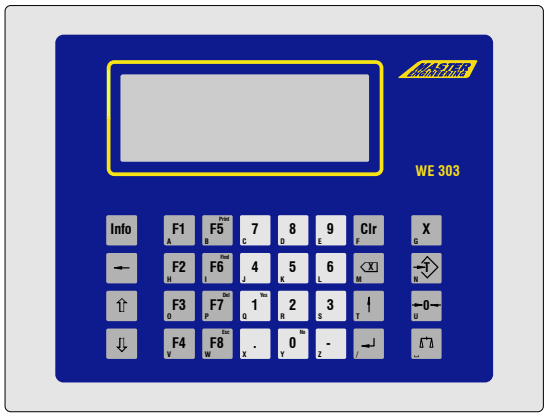
OPERATOR MANUAL

WE303D



INDUSTRIAL WEIGHING TERMINAL FOR BELT WEIGHERS AND SCREW WEIGHERS

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February 2009

ME.OE303D

Rev. 2.15

Document History

Operator Manual WE303D Belt

Date: 06 February 2009

File: WE303D-BELT-OE0215.doc

Program Version: from 2.15

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NL-6666 MH Heteren
The Netherlands

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The publisher is grateful for any information and/or advice that may contribute to correct errors or omissions in following editions.

Contents

1 Introduction

1.1 Applications

WE303D is a totalizing beltweigher for the loading or discharging of bulk material. It is based on the series WE303 industrial weighing terminal.

The weight of the material travelling over the belt is captured and the speed of the belt measured by evaluating the pulses from a sensor attached to the belt. As a result, the accumulated weight is calculated. As an option a target quantity can be entered. If the accumulated weight reaches the target weight, the process is stopped.

Also, the flow rate can be monitored. Optionally, the feeding device (screw feeder, sliding gate, etc.) can be controlled, e.g. via an external frequency inverter which is connected through an analogue or serial interface.

1.2 Documentation

In addition to this documentation, further information is provided in the following manuals:

- Technical manual **WE303**D

1.3 Warnings

Read this manual carefully before you operate this instrument!

Keep this manual for future reference!

Only permit qualified personnel to operate this instrument!

Disconnect all power to this instrument before cleaning and servicing!

This module and its associated equipment must be installed, adjusted and maintained by qualified personnel only!

It must be installed, serviced, and operated in strict compliance with all locally applicable safety regulations and the rules for the prevention of accidents!

If the line cord with connector is used as the means to separate the instrument from the mains, the wall outlet must be installed close to the instrument and must be easily accessible! If a permanently connected mains cable is used, an easily accessible separator must be included in the supply circuit!

For further information on installation, adjustment, and service refer to the corresponding installation and calibration manuals (qualified personnel only)!

If this unit is included as a component part of a system, the resulting system design must be reviewed by qualified personnel who are familiar with the construction and operation of all individual components in the system and the potential hazard involved. Failure to observe this precaution could result in bodily injury!

All switch gear connected to the unit and/or installed close to it, such as relays and contactors, must be fitted with appropriate components (RC-modules, diodes) to suppress interference.

In order to avoid static discharge, all metallic parts of a system must be thoroughly grounded. Movable parts, such as portable scales on plastic wheels, must be grounded with earth clamps or earth leads of appropriate diameter.

1.4 Technical Characteristics

1.4.1 Belt Scale

- Connection for one belt scale with one or more analogue strain gauge loadcells.
- Connection of a pulse wheel for determination of belt speed. Operation without pulse wheel is also possible.

1.4.2 Operation Modes

- Totalizing beltweighing with three counters, two resetable.
- Flow measurement for process control.
- Control of flow or beltload, by means of a standard PID regulation.
- Batching with adjustable preact.

1.4.3 Display

- Main display (19mm) showing quantity total or flow rate (kg/h or t/h), selectable.
- Secondary display showing quantity, main totals, belt speed and belt load (selectable).
- In batch mode residue quantity is also available.

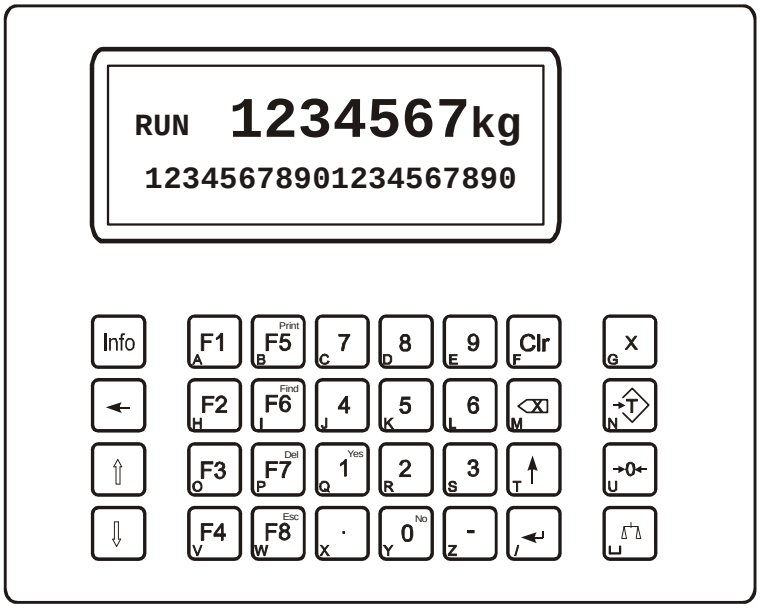
1.4.4 Options

- Pulse output, quantity per pulse adjustable.
- Analogue output for flow rate, belt load or control.
- Adjustable PID close loop controller for constant material flow rate or belt load.
- Analogue input for setpoint, moisture measurement or angle measurement.
- Serial input for setpoint, moisture measurement or angle measurement.
- Serial output, with continuous mode output of flow rate and/or total(s).
- Serial communication, with printing function and data transfer after serial, digital or manual command, for the quantity total, the main total, the actual flow or a combination.
  Point to point or Multi-drop.
- Field bus connection to PLC or control system via Profibus DP, Modbus RTU, DIN 66019, 3964 protocol or RK512, DeviceNet.
- Ethernet connection with serial communication functionality.

1.4.5 Construction

- Stainless steel housing for wall mounting or desk-top placing, protection IP65;
- Stainless steel housing for panel mounting, protection IP65;

1.5 Display and Keyboard

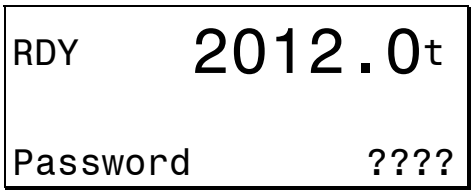


Upper display line:		Material flow rate or totalized quantity or headline of special functions
Lower display line:		Additional information e.g. totals, belt speed or Prompts, left justified, and parameter entry, right justified
Special keys:	**Info**	Forward scrolling
	←	Backwards scrolling
Function keys:	**F1**	Start/restart batching (batch mode only)
	F2	Enter batch target (batch mode only) or setpoint (PID regulation only)
	F3	Access to setup of PID close loop controller (not in batch mode)
	⇑ **F3**	Quick adjust of PID parameters (not in batch mode)
	F4	Access to supervisor mode
	F5	Print
	F6	Quick calibration mode and correction factor
	F7	Compensation value
	F8	Abort
	⇑ **Info**	Access to Fieldbus input/output data words
Clear keys:	**Clr**	Clear entry
	⌫	Delete last character
Cursor key:	↑	Return to previous program step
Enter key:	↵	Confirm entry, continue with next program step
Scale keys:	→0←	Set material flow rate to zero
	⚖	Toggle main display between flow rate and totalized quantity

1.6 Operator Prompting

The following sections describe the operating sequence of the WE303D controller with operator prompts and the requested entries.

The contents of the terminal display is shown in a frame on the left hand side. Next to the display the possible operator entries are listed, on the right hand side comments and explanations are shown.



Enter supervisor password

Enter Key ↵ and ↑-Key

In all program steps, unless otherwise specified, the Enter-key ↵ leads to the next step. Pressing the ↑-key leads to the previous step.

Confirmation with Y (1) or N (0):

A prompt such as 'Save parameters? Y' is confirmed by pressing the key #1 and subsequently the ↵ -key. By pressing key #0 and ↵ -key the proposed action is rejected and in this example the parameters are not saved.

Numeric Entries (Numerals Only):

A requested numeric entry is depicted by '**99999**'. The length of the string corresponds to the maximum length of the entry, (e.g.: 99 = 2 digits, numeric).

Numeric entries are made from right to the left. As defined in the program, entry of decimal point and minus sign may be accepted. Fixed point data entries already show the right number of decimals.

Alphanumeric Entry (Letters and Numerals):

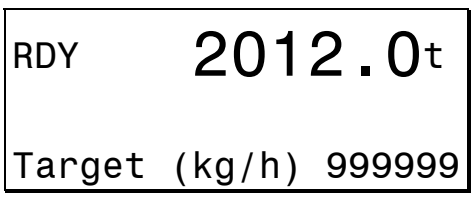
A requested alphanumeric entry is depicted by '**XXXXXXX**'. The number of x characters corresponds to the length of the entry. Alphanumeric data entry is made from left to right. If the number of characters to be entered is greater than the number of characters that can be shown on the display, the content of the display is shifted to the left by one position for every newly entered character. By pressing the ← key the entry can be scrolled to the left - simultaneously pressing the ⇑ and ← keys scrolls the entry to the right.

Adjusting the contrast of the display:

The contrast of the display can be adjusted via the keyboard. Press the key ⇑ or ⇓ three times to activate the adjustment. Then press the ⇑ or ⇓ key again to increase or reduce the contrast in steps. Press any other key to exit adjustment.

Conditional Display or Entry. Example:

Only with close loop controller:



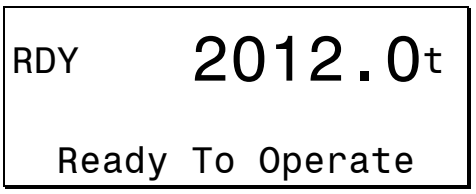
Enter target flow rate

The entry above only appears, if close loop controller is active.

2 Operation

2.1 General

After the power up messages with display of program version, the scale is started and the program is operational.



↵	Program start
⚖	Toggle material flow rate and quantity in the main display (upper line)
→0←	Set zero (after confirmation)
Info	Show total quantity for approx. 5 seconds
↑	Display program version
F3	PID controller setup (not in batch mode)
F4	Supervisor mode
F7	Compensation value

During initial step and also during operation the upper display shows the current material flow rate or the actual quantity, according to current selection.

On the left side a three character status information is shown as follows:

RDY	Indicator is ready to operate
NUL	Indicator is executing manual zero setting (is toggled with application status e.g. RDY)
AZT	Indicator is executing automatic zero setting (is toggled with application status e.g. RDY)
ERR	Error (flashing)

In totalizing mode the following application status is shown

RUN	Application is running
LCK	Application is running with close loop controller interlocked
STP	Totalizing is stopped (i.e. via external input)

In batching mode the following application status is shown

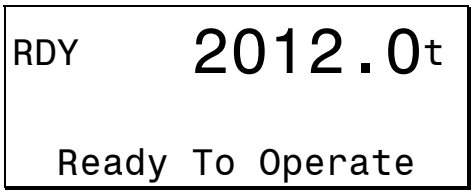
RUN	Batch is running
PRE	Batched quantity has reached preset value
DLY	After-batch delay
FIN	Batch finished
JOG	Jog feeding
STP	Batching is stopped (i.e. via external input)
ABO	Batching aborted

If a calibration verification is running, the following status is shown

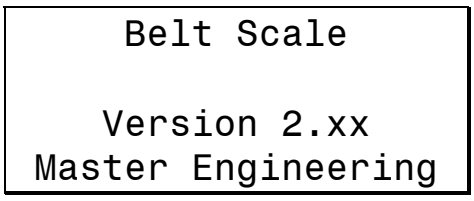
CHK	Calibration check running

2.1.1 Display Program Version

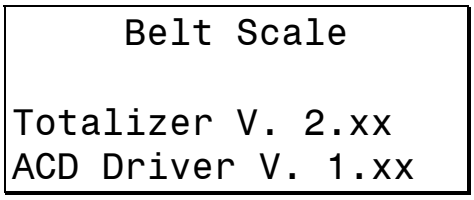
By pressing the up-arrow key in the initial program step, program name and version can be displayed for approx. 3 seconds.



↑ Display program version



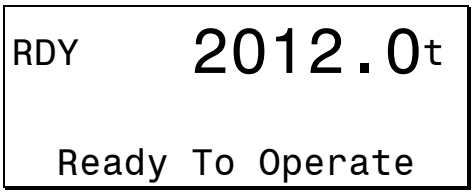
Info Display program version of sub-modules



2.2 Totalizing Mode

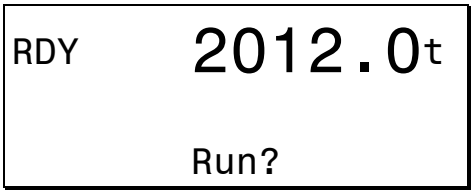
In totalizing mode the indicator serves as an instrument for totalling the quantity of material that is fed on the belt. Beside the current material flow rate and the totalled quantity additional information such as current belt speed, belt load and totals can be shown in the lower display line.

An optional PID close loop controller is available to maintain a constant material flow rate or a constant belt load, depending to configuration.



Initial step.

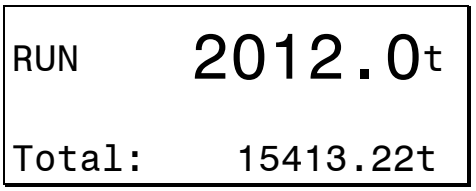
↵ Program start



Confirmation

↵ Program start

↑ Return to initial step (or automatic return after approx. 5 sec).



⚖ Toggle material flow rate and quantity in the main display (upper line)

→0← Set zero if in zero setting range (after confirmation)

Info Scroll lower display line (see below)

Clr Reset quantity of main display (after confirmation). Can also be reset via external input "Reset counter"

F3 Setup of PID close loop controller (if enabled)

⇑ **F3** Quick adjust of PID parameters (if enabled)

F4 Access to supervisor mode

F5 Print

F6 Quick calibration mode and correction factor

F7 Compensation value (if enabled)

F8 Abort

⇑ **Info** Access to Fieldbus input/output data words

By pressing the Info-key the following optional information can be called up in the lower display line:

Total: 15413.22t	Batch total in kg or in t
Belt load: 32.7kg/m	Current belt load in kg/m
Belt speed: 2.14m/s	Current belt speed in m/s

If PID close loop controller is enabled and control target via analogue input or via Fieldbus:

Target: 28.4kg/h	Controller target in kg/h or t/h
PID C.Output: 60.0%	Value of control output

If inline scale is enabled:

Inline Wgt. 2804kg	Weight value from inline scale

2.2.1 Zero setting

Via zero setting key or via external input "Set Zero" the belt totalizer can be set to zero (material flow rate = 0kg/h or 0t/h, resp.), providing that the actual material flow rate is with zero setting range.

Further more the belt totalizer can be setup to automatically set zero within a zero tracking range.

RUN 0.17 t/h Total: 15413.22t	
	→0← Set zero
RUN 0.17 t/h Set zero? N	Confirm zero setting. If no confirmation is given the display automatically returns to normal operation after approx. 5 seconds. Y(es) Zero setting is started N(o) Return to normal operation.

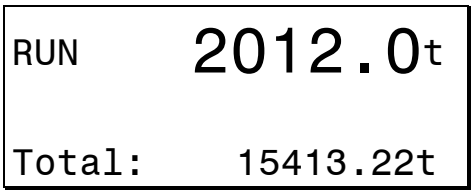
During zero setting the belt totalizer monitors the material flow rate over a certain period of time. If the flow rate is within zero range, it is subtracted from the actual flow rate. This guarantees that the indicator shows zero even if material adheres to the belt.

During zero setting the status NUL is shown alternately with the normal operation status.

If zero tracking is enabled and the current material flow rate is within zero tracking range the belt scale automatically perform zero setting cycles. For indication the status AZT (**A**uto **Z**ero **T**racking) is shown alternately with the normal operation status.

2.2.2 Reset Quantity total

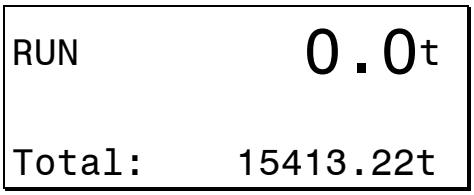
To reset the Quantity total to zero, press Clr-key or set external input “reset counter”.



Clr Reset Quantity total

Confirm resetting.

Y(es) Displayed quantity reset to zero.
N(o) Return to normal operation.

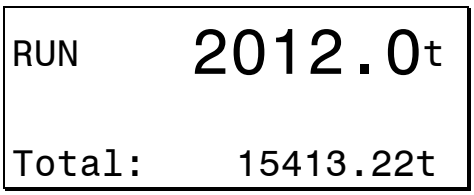


Quantity total has been reset to 0

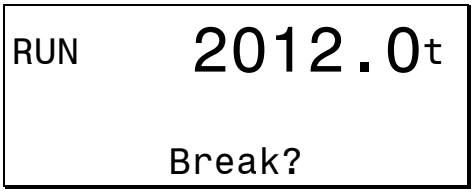
Note: The Total in the lower display line can be reset in supervisor mode.

2.2.3 Terminate Program

The totalizing mode can be terminated by pressing the F8-key.



F8 Abort



Confirmation.

↵ Abort totalizing

↑ Return to normal operation (or automatic return after approx. 5 sec).

2.3 Fast Calibration, adjust Correction Factor

There are two ways of performing a fast calibration through function key F6:
- With material
- With a test weight

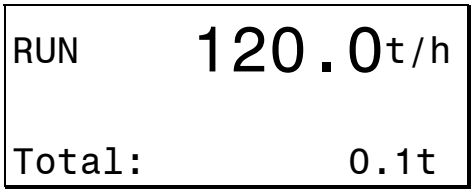
The choice is made the Service Menu, see technical manual.

Also, it is possible for fine-tuning to manually change the correction factor.

2.3.1 Fast Calibration with material

For this fast calibration a certain amount of material is discharged, collected and subsequently weighed on a static scale. The operator total is taken from the total register, but can be modified manually. The measured weight is compared with the indicated operator total (Qty.) and a deviation is calculated. From this deviation a correction factor is calculated. This correction factor can be modified or directly stored into memory or ignored and left as it was.

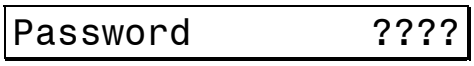
To get access to this function, the Supervisor Password is required, if installed.



Status RUN and quantity or flow on top line.

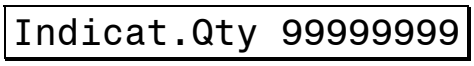
F6 Fast calibration

Password specified for Supervisor Mode:

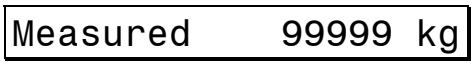


Enter 4-digit password.
Confirm with the ↵ -key (Enter).

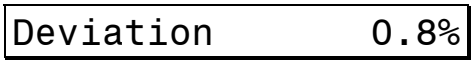
↑ Return to previous step



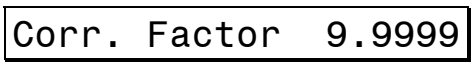
Entry of quantity measured by belt weigher.
Default value is taken from the quantity total register, but it can be change manually through the keyboard.
Confirm with the ↵ -key (Enter).



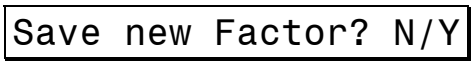
Entry of quantity measured on static scale.
Confirm with the ↵ -key (Enter).



Calculated deviation
Confirm with the ↵ -key (Enter).



Display of calculated correction factor and option to change manually.
Confirm with the ↵ -key (Enter).



Confirm correction

Y(es) Correction factor is stored (not possible when the calibration jumper is in the secured position)

N(o) Correction ignored, old factor remains

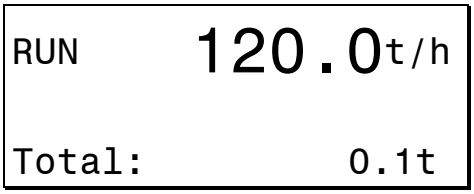
2.3.2 Fast Calibration with test weight

For fast calibration with a test weight, the operator applies a test weight on the weighframe, after which the WE303D calculates the totalized simulated amount of material during the same test period as the installed Auto Zero time.
The calculated figure is compared with its reference and a deviation is calculated. From this deviation a correction factor is calculated. This correction factor can be modified or directly stored into memory or ignored and left as it was.

The reference value can be calculated up front and entered in the Service Menu.
If this value is not entered, the WE303D will perform an initial test to calculate the value itself. If it is necessary to modify this value, than this could be done in the Service Menu. To let the WE303D calculate a new value, this parameter must be removed in the Service Menu.

Two methods can be selected in the Service Menu:
- Test weight applied manually
- Test weight applied automatically, by switching a digital output

To get access to this function, the Supervisor Password is required, if installed.



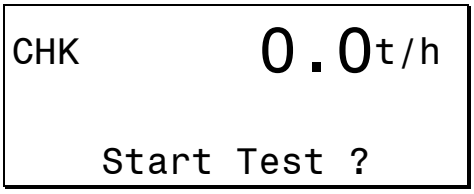
Status RUN and quantity or flow on top line.

F6 Fast calibration

Password specified for Supervisor Mode:

Enter 4-digit password.
Confirm with the ↵ -key (Enter).

↑ Return to previous step



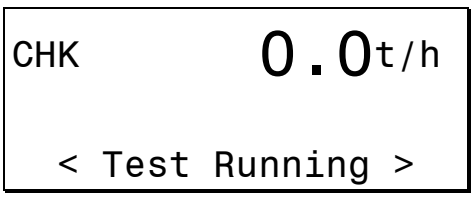
Status CHK and flow 0 t/h (or kg/h or else).

If test weight applied manually, **first** apply test weight!

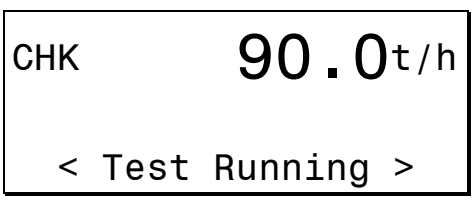
Confirm with the ↵ -key (Enter).

↑ Return to previous step

Only if test weight is applied automatically :



Status CHK and actual flow 0 during 5 seconds. In this period the test weight is applied by switching the digital output.



Status CHK and actual flow with test weight, as long as the test duration.

Measured 99999 kg	Quantity measured by the WE303D. Confirm with the ↵ -key (Enter).

Initial test to calculate the reference value, only performed if no reference value is calculated yet and no value is entered in the Service Menu :

Save Quantity? Y/N	Confirm storage of the reference value Y(es) The measured quantity is stored and used for future reference N(o) Storage ignored, 0 value remains RESTART THE PROCEDURE FOR THE FIRST COMPLETE TEST!

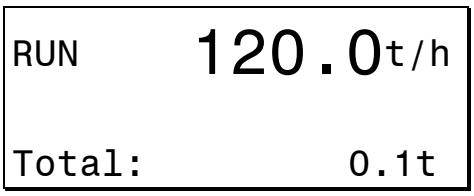
After the first initial test where the reference value is stored, the next lines will be displayed:

Deviation 0.8%	Calculated deviation Confirm with the ↵ -key (Enter).
Corr. Factor 9.9999	Display of calculated correction factor and option to change manually. Confirm with the ↵ -key (Enter).
Save new Factor? N/Y	Confirm correction Y(es) Correction factor is stored (not possible when the calibration jumper is in the secured position) N(o) Correction ignored, old factor remains

2.3.3 Fast Calibration with Inline scale

For this fast calibration a certain amount of material is discharged from a static scale like a weigh bin. The measured weight is compared internally with the operator total (Qty.) and a deviation is calculated. From this deviation a correction factor is calculated. This correction factor can be modified or directly stored into memory or ignored and left as it was.

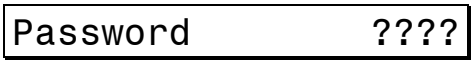
To get access to this function, the Supervisor Password is required, if installed.



Status RUN and quantity or flow on top line.

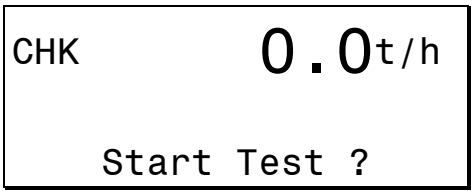
F6 Fast calibration

Password specified for Supervisor Mode:



Enter 4-digit password.
Confirm with the ↵ -key (Enter).

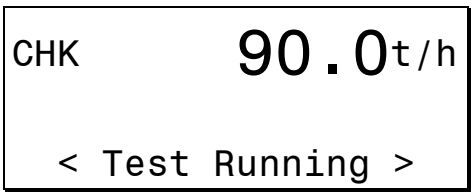
↑ Return to previous step



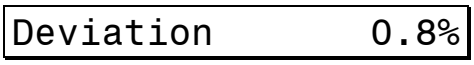
Status CHK and flow 0 t/h (or kg/h or else).

Confirm with the ↵ -key (Enter).

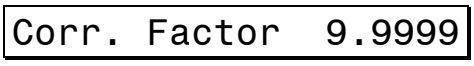
↑ Return to previous step



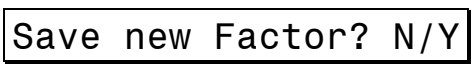
Status CHK and actual flow, as long as the test duration.



Calculated deviation
Confirm with the ↵ -key (Enter).



Display of calculated correction factor and option to change manually.
Confirm with the ↵ -key (Enter).



Confirm correction

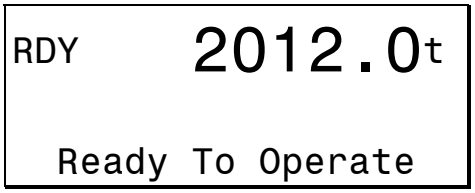
Y(es) Correction factor is stored (not possible when the calibration jumper is in the secured position)

N(o) Correction ignored, old factor remains

2.4 Batching

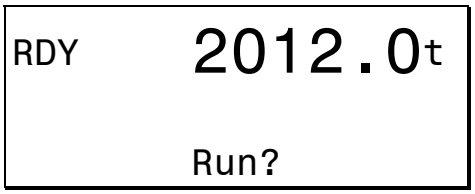
If batch mode is enabled in service mode the quantity shown in the upper (main) display is the batched quantity that is automatically reset to zero with start of batch. In addition, the residue quantity going towards zero can be shown in the lower display line.

During batching the external output "Feed" is set i.e. to control a feeding device. If the target value minus preact is reached (see parameter entry) the output is cleared. After timeout of the output "Batch ready" is set.



Initial step.

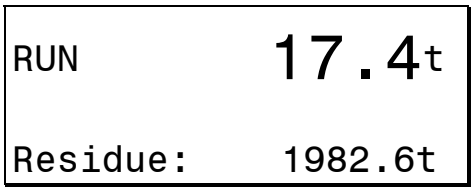
↵ Program start



Confirmation

↵ Program start

↑ Return to initial step (or automatic return after approx. 5 sec).



⚖ Toggle material flow rate and quantity in the main display (upper line)

→0← Set zero if in zero setting range (after confirmation)

Info Scroll lower display line (see below)

Clr Reset quantity of main display (after confirmation / only if batch is finished).

F1 Start / continue batching

F2 Enter target value (also during batching, see below)

F4 Access to supervisor mode

F5 Print

F6 Quick calibration mode and correction factor

F7 Compensation value

F8 Interrupt batching (see below)

⇑ **Info** Access to Fieldbus input/output data words

By pressing the Info-key the following optional information can be called up in the lower display line:

Residue: 2.6t	Remaining quantity in kg or t of running towards zero.
Total: 15.22t	Batch total in kg or in t
Belt load: 32.7kg/m	Current belt load in kg/m
Belt speed: 2.14m/s	Current belt speed in m/s

If inline scale is enabled:

Inline Wgt. 2804kg	Weight value from inline scale

Note:

Batching can also be started or continued via external input "Start/continue batch".

Batching can also be stopped or aborted via external input "Stop/abort batch".

2.4.1 Operating Sequence

FIN 200.1t Residue: -0.1t	Status FIN (finish/ready to start) and quantity of last batch in kg or t

F1 Start batching

Alternatively batching can also be started via input “Batching”

F2 Enter/change target value (see below)

F8 Abort (see below)

During batching the external output “Batching” is set to control the feeding device

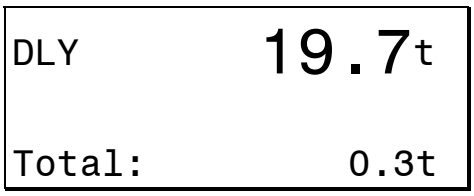
RUN 14.3t Total: 5.7t	Status RUN (batch active) and discharged quantity of current batch in kg or t

F2 Change target value (see below)

F8 Interrupt batching (see below)

Alternatively batching can be interrupted by resetting the input “Batching”

When the preset target weight minus preact is reached, the external output “Batching” is reset and the discharge delay time is started.



Status DLY (delay) and discharged quantity of current batch in kg or t

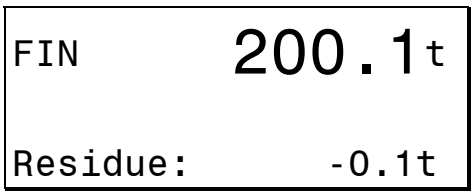
F8 Interrupt batching (see below)

Alternatively batching can be interrupted by resetting the input “Batching”

When the discharge delay time has elapsed the batched quantity is compared with the target and –if required- jog feeding is started. If jog feeding is not required or not enabled (Jog time = 0), the program returns to the initial step of the sequence.

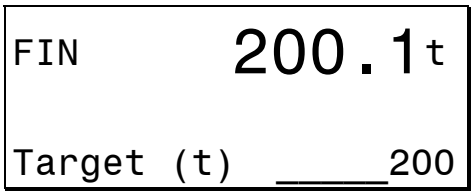
2.4.2 Entry of Batch Target

Before start of a batch or during a batching cycle the target quantity can be entered



Status FIN (finish/ready to start) and quantity of last batch in kg or t

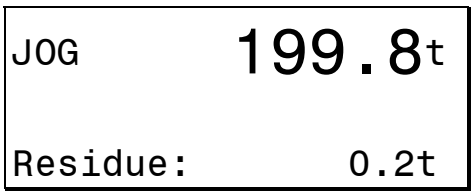
F2 Enter/change target quantity



Enter target quantity

2.4.3 Jog feeding

During a batching cycle the current material flow rate is continuously captured. After switching off the feeding device and after the discharge delay has elapsed, the actual quantity is compared with the target quantity. If the actual quantity is smaller than the target minus the quantity that can be expected for a jog feed cycle (flow rate * jog time), the external output “batching” is set for the specified jog time.

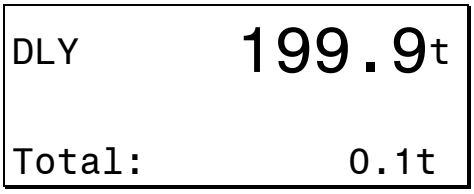


Status JOG (jog feeding) and quantity of last batch in kg or t

F8 Interrupt batching (see below)

Alternatively batching can be interrupted by resetting the input “Batching”

When the jog time has elapsed the output “batching” is reset and the discharge delay time is started.



Status DLY (delay) and discharged quantity of current batch in kg or t

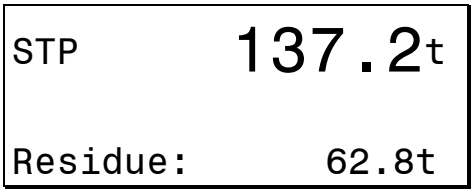
F8 Interrupt batching (see below)

Alternatively batching can be interrupted by resetting the input “Batching”

When the discharge delay time has elapsed the batched quantity is again compared with the target and –if required- a further jog feed cycle is started.

2.4.4 Interrupt / Abort

If the F8 key is pressed or if the external input “Batching” is reset during a running batch, the process is interrupted and the output “batching” is reset.

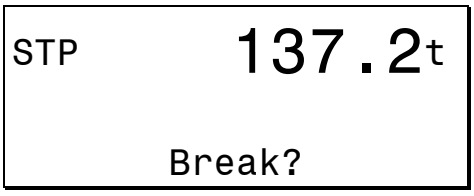


Status STP (stop / interrupt) and quantity of current batch in kg or t

F1 Continue batching

Alternatively batching can also be continued by setting the input “Batching” (rising edge)

F8 Abort the interrupted batch



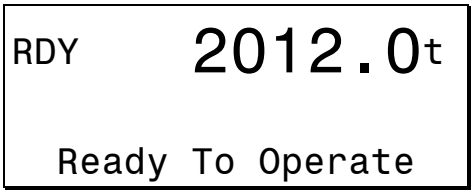
Confirmation

↵ Abort batching

↑ Return to previous step (or automatic return after approx. 5 sec).

3 Supervisor Mode

After power-up message with program version and actual date and time the scale is started. After that the application is running:



Initial step.

F4 Call up supervisor mode

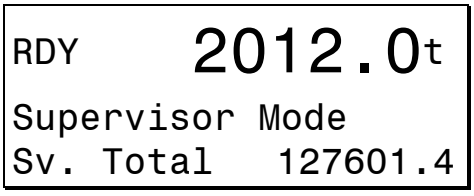
Entry of 4-digit password

Note: If no password is defined for supervisor mode (see below), password entry is skipped.

If optional demand mode output is enabled:

Entry of date

Entry of time



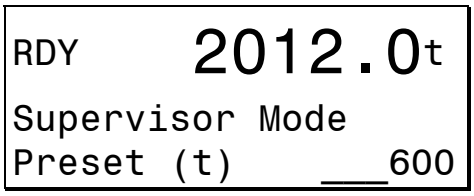
Display of supervisor (second) total

If PID regulation for Flow and setpoint by Serial input:

With this value a ratio between the master flow and the additive dosing is established.

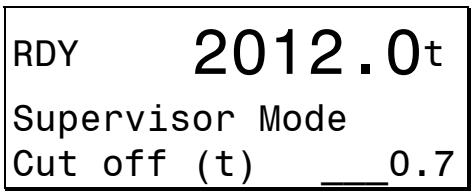
Enter value and confirm with Enter.

If batch mode:



Enter preset value

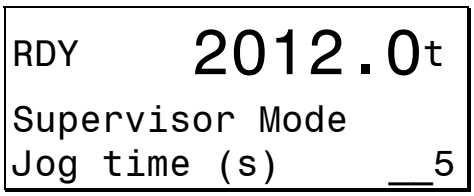
Note: The entry of a preset value is skipped, if output 1 is not used for batching



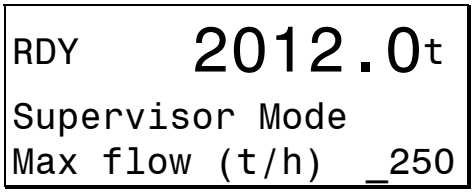
Entry of preact value in t or kg.

The preact value specifies the cut-off point for the 'Feeder' output.

Entry of delay time in seconds to empty belt after cut-off point.



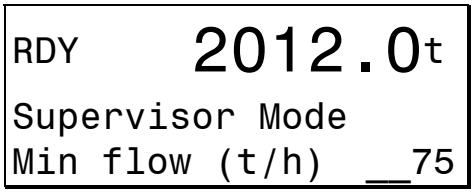
Entry of jog time in seconds for jog feeding. Enter 0 to disable jog feeding.



Enter setpoint for max. alarm output.

According to configuration the setpoint is entered as:

"Max flow (t/h)"	maximum flow rate
"Max load kg/m"	maximum belt load
"Max dev. (%)"	maximum positive deviation of close loop controller

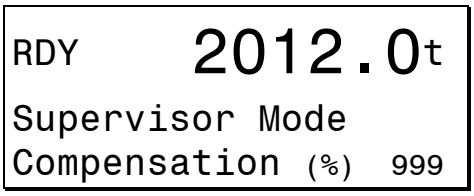


Enter setpoint for min. alarm output.

According to configuration the setpoint is entered as:

"Min flow (t/h)"	minimum flow rate
"Min load kg/m"	minimum belt load
"Max dev. (%)"	maximum negative deviation of close loop controller

If manual compensation of percentage or inclination angle is configured in service mode:



Entry of compensation value or inclination angle, according to service mode settings:

In percent: -20% to +20%

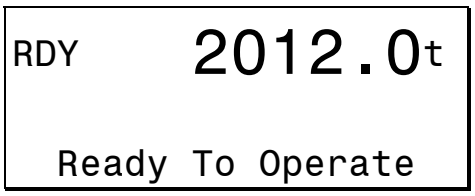
In degree: -30° to +30°

Entry of password for access of supervisor mode. If no password is specified supervisor mode can be called up without password entry.

Return to main display

4 PID Controller Setup

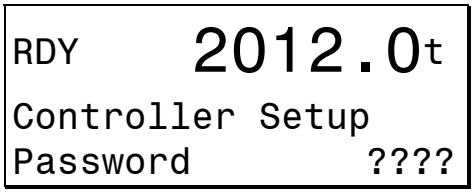
If the instrument is not configured for batch mode, a PID close loop controller is available:



Initial step.

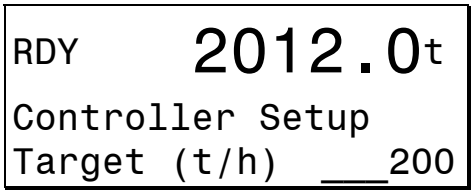
F3 Call up PID controller setup

If password is specified in supervisor mode:

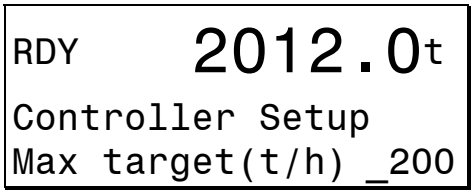


Entry of 4-digit supervisor password

If close loop controller is configured for manual (static) target:



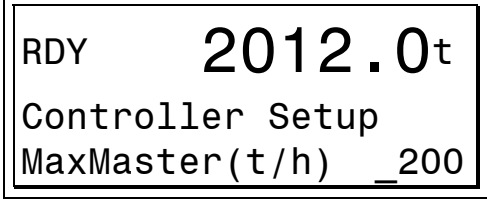
Entry required controller target in kg/h, t/h or kg/m (according to setup)



Entry of reference target value in kg/h, t/h or kg/m (according to setup) for maximum output signal

If close loop controller is configured for serial target input (slave mode):

Entry of maximum flow target of the slave in kg/h or t/h (according to setup)



Entry of maximum master flow (Master system) in kg/h or t/h (according to setup)

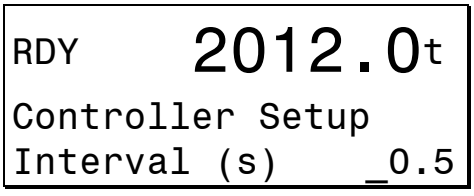
Entry proportional factor of PID controller (see. section 'adjustment of PID controller'). [1]

Enter integral factor of PID controller (see section 'adjustment of PID controller'). [1]

Enter derivative factor of PID controller (see section 'adjustment of PID controller'). [1]

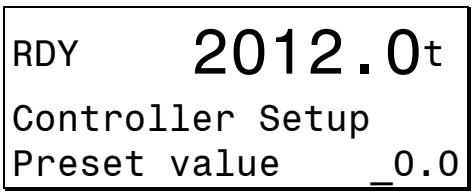
[1] The P-, I- and D-factor can also be adjusted while system is running (see par. 4.1).

Enter start-up delay in seconds. After start-up the PID controller is only started after this time has elapsed.



Entry of control interval in seconds. Adjustments of the output signal via PID controller are made at intervals specified here, see also section 'adjustment of PID controller'.

If close loop controller is configured with PID Lock to preset value:

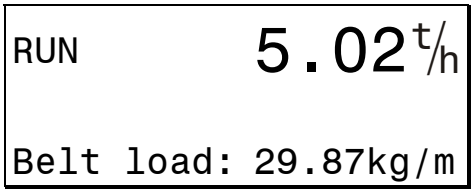


Entry required value in % to which the PID control output should be frozen at PID interlock.

Return to main display

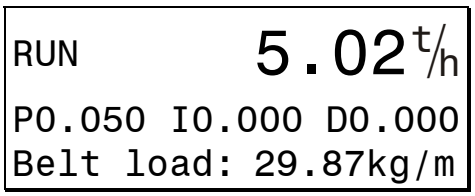
4.1 Quick adjustment of the PID Parameters

As a convenient way to setup the parameters of the PID close loop controller –if enabled in service mode- the P-, I- and D-parameters can be adjusted during operation. This makes it possible to immediately watch the effects of changes.



According to service mode settings the close loop controller operates on material flow rate or on belt load.

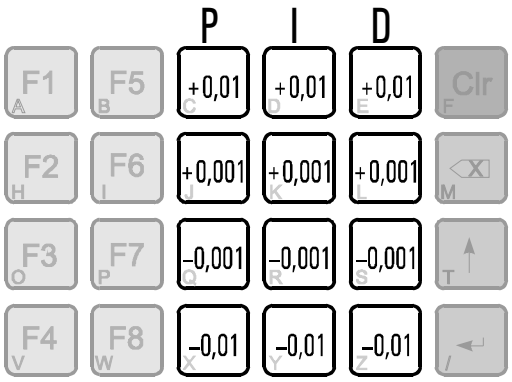
⇑ **F3** Quick adjust of PID parameters (if enabled)



An additional display line shows the current settings of the P-, I- and D-parameters.

To adjust parameters use the numeric keyboard as shown below:

The controller parameters can be modified via the numeric keypad of the weighing terminal. Key assignment is as follows:



The P-component, for instance, can be increased in steps of 1/100 with the key '7' or decreased in steps of 1/1000 with the key '1'.

Press any F key to exit quick adjustment.

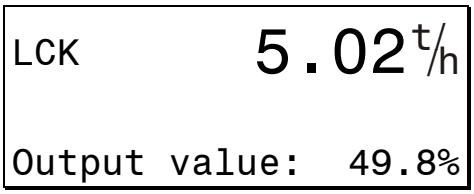
.

Note: Quick-adjustment of PID parameters is not possible if the controller is interlocked.

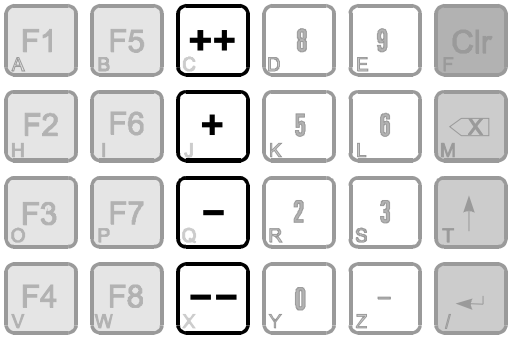
4.2 Manual adjustment of the Controller Output Value

Via external input the close loop controller can be locked, i.e. the controller output is “frozen” and not adjusted by the controller anymore. For indication the status “LCK” is shown. If the controller is locked, the output value can manually be adjusted by the keyboard.

Keyboard adjustment is active only if the controller is locked and the output value is displayed in the lower display line.



The output value can be changed with the numeric keys on the keyboard. The key assignment is as follows:



Press keys '4' (+) and '1' (—) to increase or decrease the output value in small steps of 0.1%. Press keys '7' (+ +) and '.' (— —) to change output value in 1% steps.

5 How the PID Controller works

5.1 Principal Function

The basic function of a PID close loop controller is to compare a continuously measured actual value with a nominal value and to adjust a command variable if a deviation is detected. The nominal value is the flow rate (weight / time) or the belt load (load / length), according to setup. The command variable, adjusted by the PID controller, is the output signal that serves, for instance, to control the frequency inverter of the AC drive, and thus the speed of the belt or the feeding device.

The PID controller compares the measured material flow rate or belt load with the nominal (target) value. If the measured value is lower than the nominal value, the controller increases the output signal (e.g. to the frequency inverter). If the measured value is too high, the output signal is reduced accordingly.

5.2 Components Of The PID Controller And Their Effects

5.2.1 Proportional Component P

The proportional component -as the name suggests- adjusts the output signal proportionally to the deviation.

Deviation:

$$Dev = Actual - Nominal$$

The P-component of the controller adjusts the command variable f as follows:

$$f_{new} = f_{old} - P\text{-}Comp * f_{max}$$

with

$$P\text{-}Comp = Dev/Nominal * P\text{-}Factor$$

For a P-factor of 1 and a deviation of x% from target, the command variable is also changed by x% of maximum value. For a P-factor smaller than 1, the command variable is changed 'more carefully', while P-factors greater than 1 lead to a 'stronger' reaction.

5.2.2 Integral Component I

The integral component takes previous deviations into consideration for the adjustment of the control variable. If, for instance, during the run-up phase not enough material was fed for a certain period of time, in the following period deliberately more material is fed to compensate for the earlier negative deviation. An integral component in the closed loop is recommended if it is more important to optimize the total quantity than to minimize the deviation at any time in the process.

The I-component adjusts the command variable f as follows:

$$f_{new} = f_{old} - I\text{-}Comp * f_{max}$$

with

$$I\text{-}Comp = Total_{Dev}/Nominal * I\text{-}Factor$$

If the actual value oscillates evenly around the target value, the total of the deviation is zero, i.e. under steady-state condition the integral component of the PID controller has no effect.

5.2.3 Derivative Component D

The derivative component provides reaction to the change of the deviation. It enhances the effect of the proportional component when greater deviations are experienced. For small deviations the effect of the P-component is reduced. The derivative component can be used to dampen and stabilize the controller.

The D-component adjusts the command variable f as follows:

$$f_{new} = f_{old} - \text{D-Comp} * f_{max}$$

with

$$\text{D-Comp} = (\text{Dev} - \text{Dev}_{Previous})/\text{Nominal} * \text{D-Factor}$$

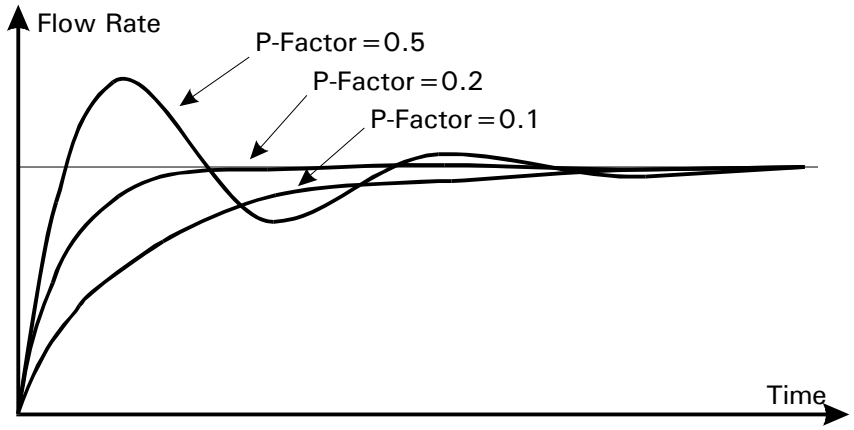
5.2.4 The PID Controller

The overall effect of the controller is the total of the individual components:

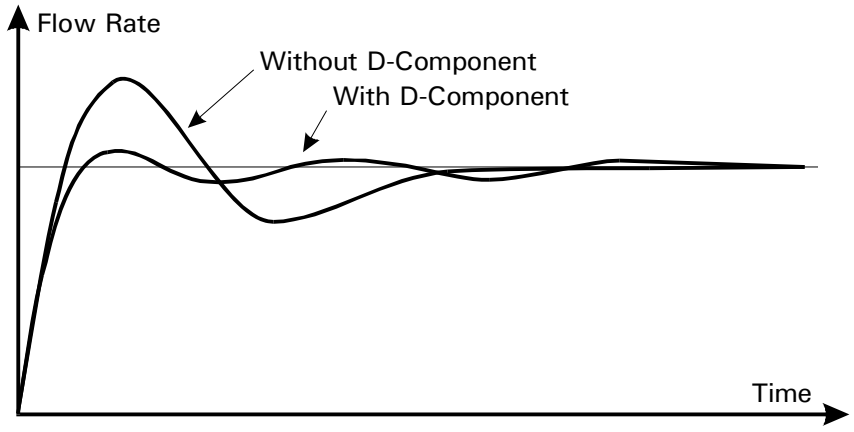
$$f_{new} = f_{old} - (\text{P-Comp} + \text{I-Comp} + \text{D-Comp}) * f_{max}$$

If any of the factors is set to zero, its component does not contribute to the control process.

Reaction of P-controller with different P-factors:



Damping of P-controller by adding a D-component:



5.2.5 Measuring Interval

The measuring interval has a strong influence on the performance of the PID controller. It specifies the time that elapses between two adjustments of the command variable. In other words, after the command variable has been adjusted the controller pauses for a certain period of time to wait for the reaction to the adjustment before a further adjustment is made.

In principal, it can be said that shortening the measuring interval has a similar effect as increasing the P-component.

6 Transport, Maintenance And Cleaning

6.1 Transport

Transport and storage of the WE303D terminal shall only be made in the original packing with foam cushion. The module must not be exposed to shock or vibration.

Transport and storage of electronic components such as boards, EPROMS, etc. must only be made in suitable anti-static ESD bags or cases.

WE303D should not be switched off for longer than 20 days, or the contents of the battery backed memory (e.g. tare file) may be lost. In this case correct function can no longer be guaranteed.

Storage temperature –25 to +70°C at 95% relative humidity without condensation.

6.2 Maintenance

This unit and its associated equipment must be maintained by qualified personnel only, who are familiar with the construction and operation of all equipment in the system and the potential hazards involved. Failure to observe these precautions could result in bodily injury!

Disconnect all power to this unit before servicing!

The WE303D terminal is designed to require a minimum of maintenance and service, however, depending on the environmental conditions a visual inspection at regular intervals is recommended. The frequency at which normal maintenance (cleaning and inspection) should be performed, when installed in a clean office environment, should be twice a year. However, if the unit is subject to a dusty or dirty environment the frequency should be increased as required. At these inspections it should be made sure that all connected cables are undamaged and that all connectors are tightly fastened.

Maintenance of scale platforms is required at regular intervals depending on use and environment. The accuracy of scales can be affected by dirt, splinters, etc. and appropriate maintenance is strongly recommended. Also recommended is the calibration with certified test weights at regular intervals.

6.3 Cleaning

Disconnect all power to this unit before cleaning!

Clean the keyboard and covers with a soft clean cloth that has been dampened with a mild window type cleaner. Do **NOT** use any type of industrial solvent or the finish of the unit may be damaged. Do not spray cleaner directly on the unit.

7 Service

> **CAUTION**
> **Only permit qualified personnel to service this equipment. Exercise care when making checks, tests, and adjustments!**

If any problem arises that has not been explained above, please follow this check list:

- Power supply on and line cord undamaged (visual inspection)?
- All cables connecting to scales and peripheral devices undamaged (visual inspection)?
- Connectors fitted correctly and tightly secured at peripheral devices (visual inspection)?

If operational difficulties are encountered that cannot be rectified by means of this manual, obtain as much information as possible regarding the particular trouble, as this may eliminate a lengthy, detailed checkout procedure.

If possible, try first to determine the conditions under which the problem occurs. Try to find out whether the appearance of the difficulties can be reproduced under the same conditions.

For the systematic analysis of an unknown problem the information as listed below is required:

- Serial-No. and delivery date of the unit and its peripheral components
- Program version as displayed on power-up
- Exact wording of any error message displayed
- Type and model of peripheral devices related to the problem (e.g. scale, remote display, etc.)

To obtain professional assistance contact our service department stating the information listed above:

Tel. +31 (0) 26 472 1319

Fax +31 (0) 26 472 2204

service@masterengineering.nl

7.1 Error Messages

If an error occurs during calibration or normal operation, error messages are displayed as follows:

Error Message	
Possible Cause	Corrective Measure

7.1.1.1 ADC Error	
• No data from A/D converter	• Replace A/D-converter
• Short circuit in loadcell cable	• Check cabling

7.1.1.2 ADC Over	
A/D converter overrange, because:	
• Wiring error loadcell	• Check wiring
• Loadcell defective	• Check loadcell
• Scale heavily overloaded	• Unload scale

8 Technical Data

Housing:

- for wall mounting or desk-top placement, stainless steel, protection IP65
  weight approx. 2,5 kg
- for panel mounting, stainless steel, protection front IP65
  weight approx. 2,5 kg

Temperature Range: Storage: -25°C to +70°C at 95% relative humidity max. without condensation
Operation: -10°C to +40°C at 95% relative humidity max. without condensation

Power Supply: Wide range AC input 110 V (-15%) to 240 V (+10%), 50/60Hz
Option: wide range DC input 12 VDC (-15%) to 30 VDC (+10%)
Power consumption max. 15 VA

Electrical Safety: Separation between primary and secondary circuits SELV, in accordance with EN 60950, over-voltage category II

Display: Back-lit LCD display

Keyboard: Membrane keyboard with tactile feedback, 32 keys incl. alphanumeric keypad, scale keys and function keys

Clock: Battery-backed real-time clock with 240 Byte battery-backed data memory

Options: Up to 4 serial interfaces (RS232, RS485 2-wire, RS485 4-wire or 20mA CL passive)

Fieldbus (Profibus-DP, Modbus, DeviceNet)

1 or 2 modules with 2 opto-isolated digital inputs, 2 opto-isolated digital outputs

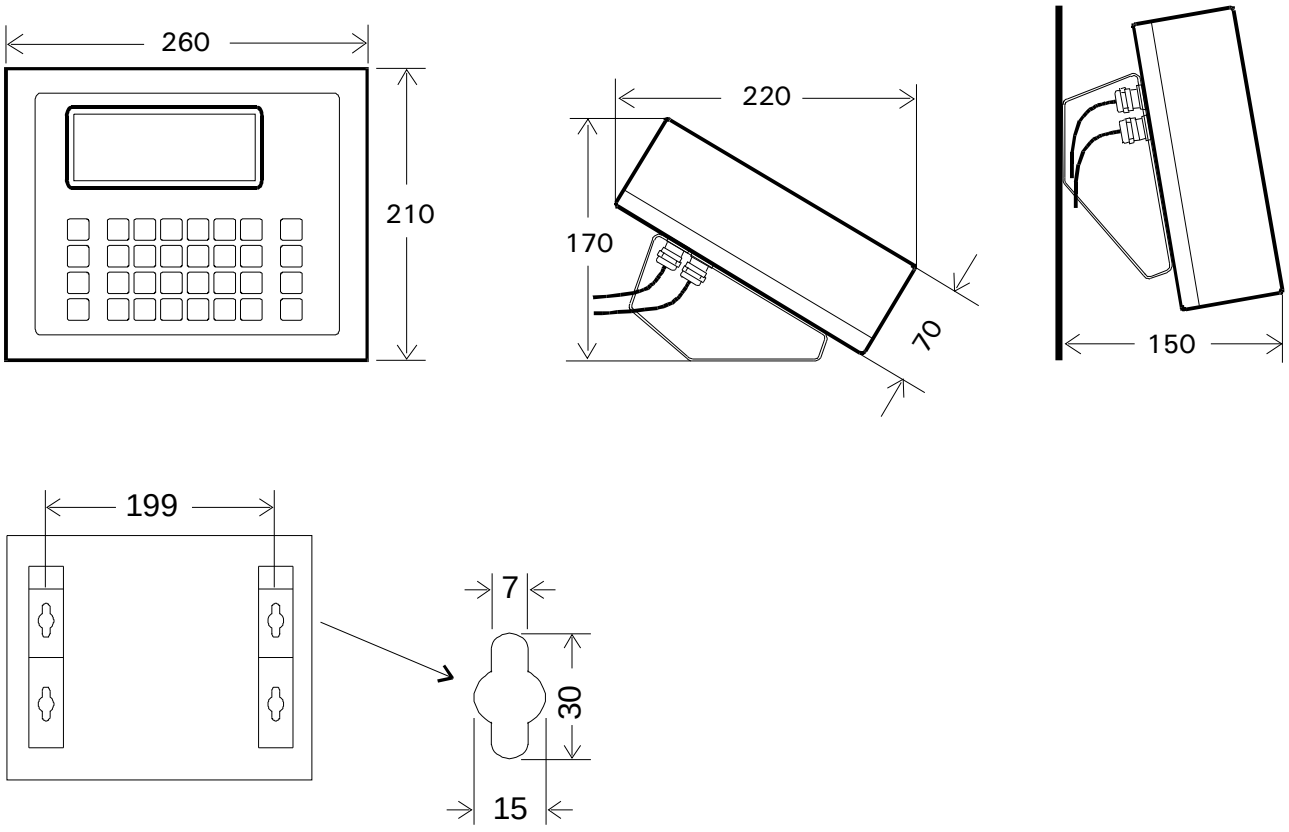
and / or

1 or 2 modules with 1 analogue output, 15 bit,
0 - 20 mA, 4 - 20 mA, 0 - 10 V, 2 - 10 V selectable

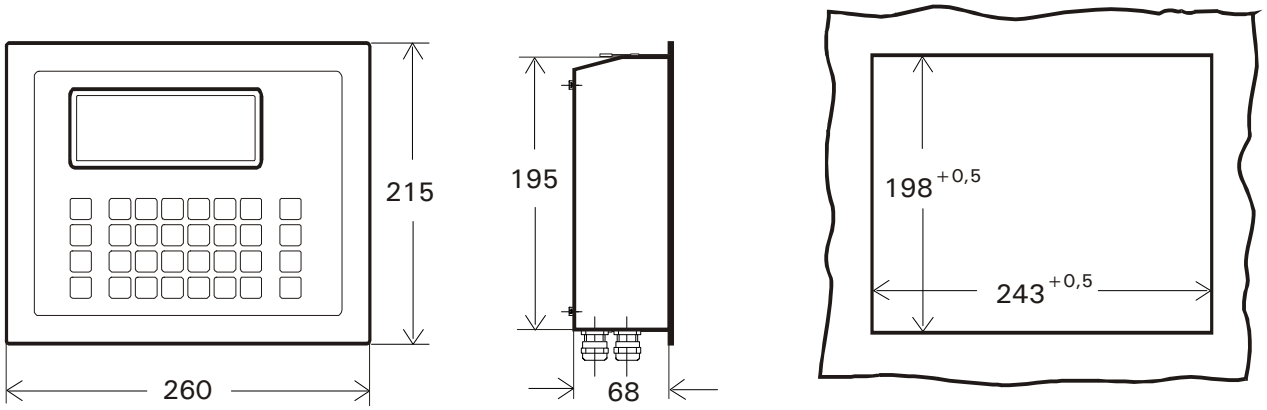
Expandable with extra external digital and analogue inputs and outputs.

9 Dimensions

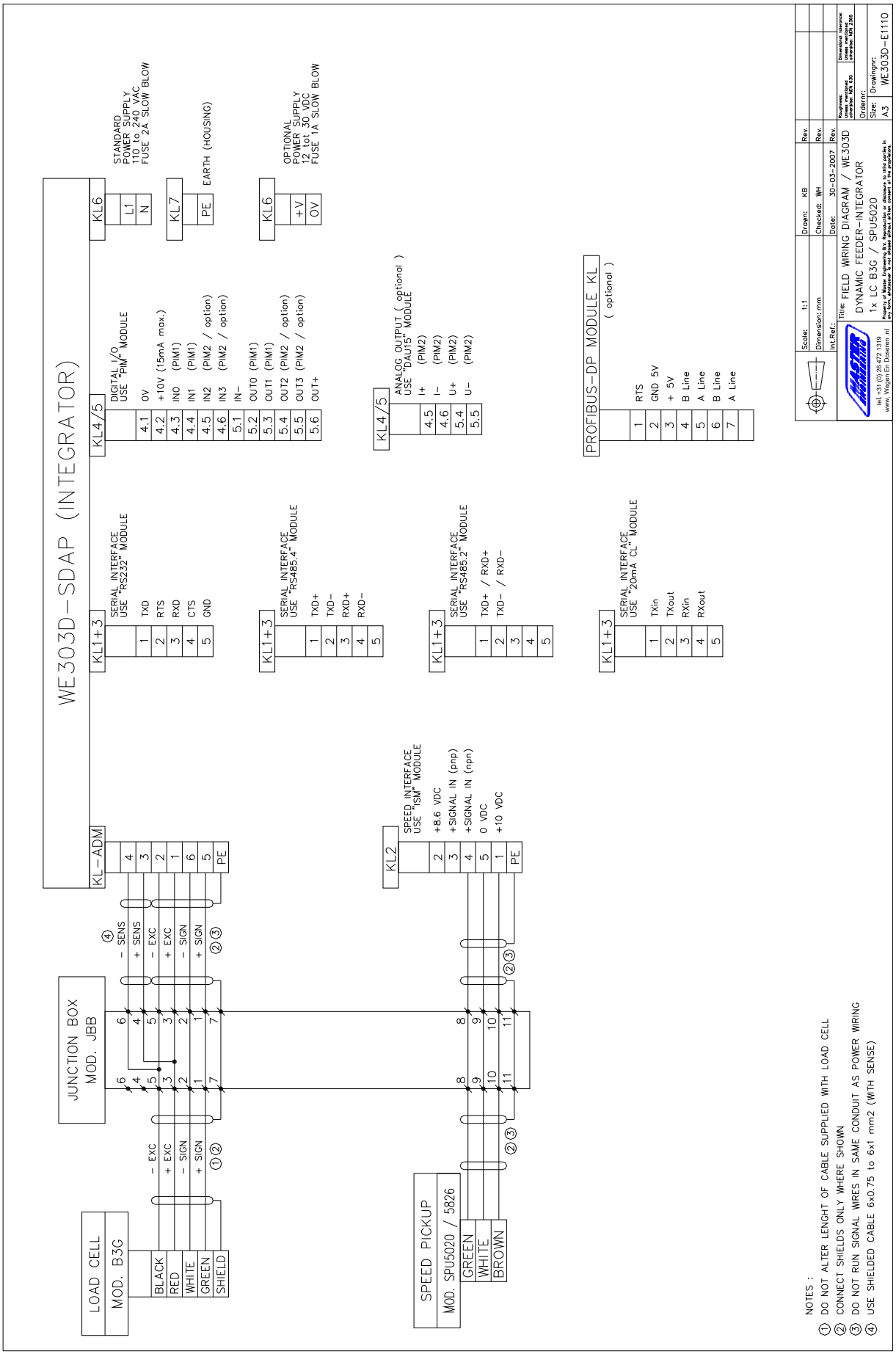
WE303 Field mount housing



WE303 Panel mount housing



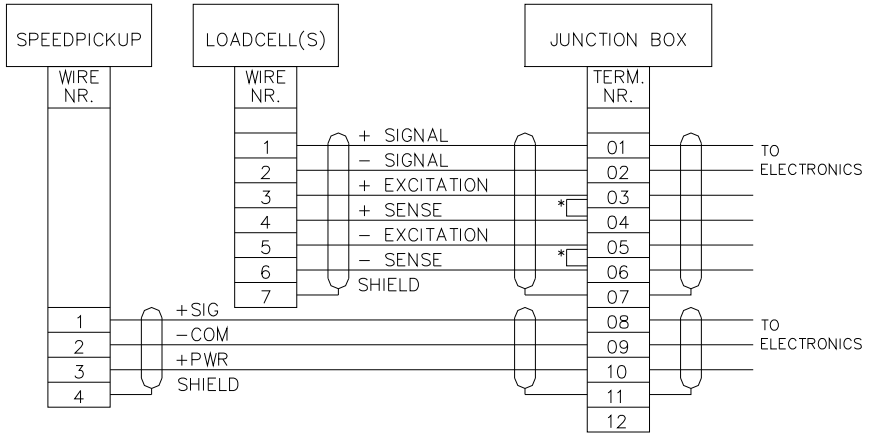
10 Wiring Diagrams



WIRE NR. / LOADCELL MODEL / FUNCTION	B3G CHP H8C H9C L6D 9123	BM11 BM8H SHB ACB	SSB BSP ALC CSP-M	L6T L6N L6G 652 642C	BM6A HPS HCB	H2F	RLC	KSR	PCB 10-31H	BSM SSM	1040 1140 1250 1510	T95 T61 VC3500 T93	M650	M460	TA-0	EXTENSION CABLE STANDARD
1 + SIGNAL	GREEN	WHITE	WHITE	GREEN	WHITE	BLUE	BROWN	BLACK	WHITE	GREEN	RED	GREEN	RED	RED	GREEN	PINK
2 - SIGNAL	WHITE	RED	RED	WHITE	RED	WHITE	WHITE	BLUE	RED	YELLOW	WHITE	YELLOW	WHITE	WHITE	WHITE	WHITE
3 + EXCITATION	RED	GREEN	GREEN	RED	GREEN	RED	PINK	RED	GREEN	RED	GREEN	RED	GREEN	GREEN	RED	GREEN
4 + SENSE	x	YELLOW*	x	BLUE	YELLOW	BROWN	x	x	x	x	BLUE	x	.	BLUE	YELLOW	YELLOW
5 - EXCITATION	BLACK	BLACK	BLACK	BLACK	BLACK	YELLOW	GRAY	WHITE	BLACK	BLUE	BLACK	BLUE	BLACK	BLACK	BLACK	GRAY
6 - SENSE	x	BLUE*	x	BROWN	BLUE	BLACK	x	x	x	x	BROWN	x	.	YELLOW	BLUE	BROWN
7 SHIELD	ORANGE	ORANGE CLEAR	ORANGE CLEAR	CLEAR	ORANGE	CLEAR	CLEAR	YELLOW CLEAR	YELLOW	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	CLEAR	MANTLE

* = OPTIONAL TYPE

WIRE NR. / SPEEDPICKUP MODEL / FUNCTION	5020 5826 .	2160N	7030H 7030HSR	2100G 6012C 6012EN	E57(pnp) 701	260	EXTENSION CABLE STANDARD
1 + SIGNAL	GREEN	1	PINK	15	BLACK(4)	BROWN	GREEN
2 - COM	WHITE	2	BLUE	16	BLUE (3)	BLACK	WHITE
3 + POWER	BROWN	-	RED	17	BROWN(1)	WHITE	BROWN
4 SHIELD	MANTLE	-	MANTLE	-	-	MANTLE	MANTLE



* : MAKE JUMPERS ONLY IF THE LOADCELL HAS NO SENSE-WIRE

Scale: 1:1	Drawn:	Rev.	
Dimension: mm	Checked: WH	Rev.	
Int.Ref.:	Date: 25-01-2008	Rev.	

Title: COLOR CODING LOADCELLS AND SPEEDPICKUPS

Roughness: Unless mentioned otherwise: NEN 650 | Dimensional tolerance: Unless mentioned otherwise: NEN 2365

Ordernr:

Size: A4 | Drawingnr: LC-SPU-E0505

tel. +31 (0) 26 472 1319
www. Wegen En Doseren .nl