

Weighing technology

FAQs
SIWAREX WP341

How do I calibrate SIWAREX WP341 with the web server?

V3 05/2025

Siemens.de/weighing

Introduction

SIWAREX WP341 is a versatile and very compact belt scale integrator. It can be used seamlessly in the distributed I/O system SIEMENS ET200SP automation environment.

Purpose of this document

This quick guide illustrates how to perform a fast commissioning of a WP341 belt scale integrator with the service and commissioning tool webserver for WP341 For further detailed information about the integrator please refer to the device manual. The latest version can be found online:
http://support.automation.siemens.com/WW/view/de/90229063/0/en
All steps in the following document describe the commissioning by using metric weight units (kg, m, t). The module itself provides imperial weight units (lbs, ft, T, TL) as well.

Warranty notes

The contents of this programming manual shall not become part of or modify any prior or existing agreement, commitment or legal relationship. All obligations on the part of Siemens AG are contained in the respective sales contract, which also contains the complete and solely applicable warranty conditions. Any statements on the device versions described in the programming manual do not create new warranties or modify the existing warranty.

The content reflects the technical status at the time of printing. We reserve the right to make technical changes in the course of further development.

Validation of this document

This documentation is valid in conjunction with the SIWAREX WP341 manual only. The manual can be found online on:
https://support.industry.siemens.com/cs/products?dtp=Manual&mfn=ps&pnid=29334&lc=en-WW

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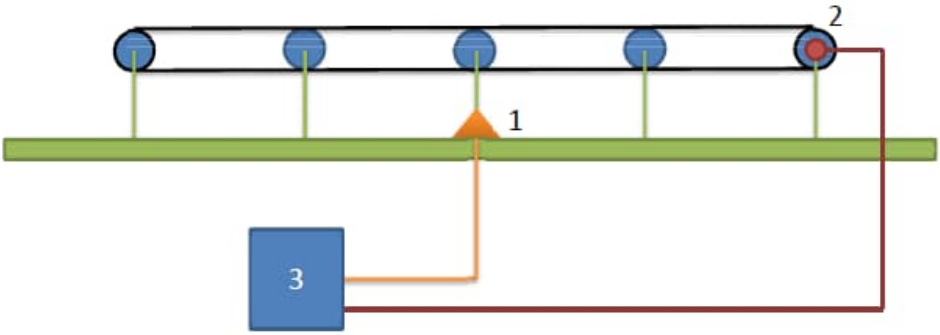
1. Required components of a conveyor belt scale

A conveyor scale typically consists of three components: a weighbridge with load cells mounted under an idler station [1], a speed sensor running on the bottom belt or mounted on an axle of an idler pulley [2], and a belt scale integrator [3].



The transmitter collects both the signal from the load cells and the electrical pulses from the speed sensor. With this information, the current belt loading and belt speed can be recorded. If these variables are multiplied with each other, the result represents the current conveying rate. By integrating the conveying rate, the material conveyed over the belt is added up.

$$FLOW\ RATE\ \left[\frac{kg}{s}\right] = BELT\ LOAD\ \left[\frac{kg}{m}\right] x\ BELT\ SPEED\ \left[\frac{m}{s}\right]$$

The load cells are fed with a DC voltage from the measuring transducer. The signal voltage from the load cells is a mV signal.
In most cases, the speed sensor supplies a defined number of square-wave signal pulses per revolution.

SIEMENS offers a large number of different belt scales and speed sensors for any type of conveyor scale. Further information can be found in Catalog WT10: www.siemens.de/weighing

In most cases, replacing an old measuring transducer while continuing to use the existing belt scale / speed sensor with SIWAREX WP341 is also possible without any problems.
Please contact us (see “Contact”) to check the respective compatibilities.

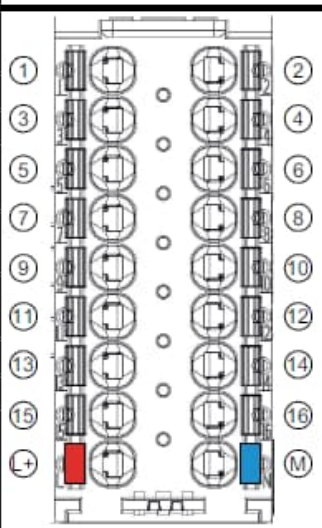
Required components for using this commissioning guide

- SIWAREX WP341 belt scale integrator →MLFB: 7MH4138-6CA00-0CU0
- Belt scale connected properly to the WP341
- Speed sensor connected properly to the WP341 (optional)

  For the right connection of the belt scale and the speed sensor please refer to the WP341 device manual. Please check the mechanical setup of your system intensively. A correct mechanical setup of the belt scale is a basic requirement for a high accuracy system. In the SIEMENS MSI belt scale manual a lot of information regarding mechanics of a belt scale can be found.

  https://support.industry.siemens.com/cs/ww/de/ps/29334/man

2. Connect

Designation	Signal name		View	Signal name		Designation
Load cell supply voltage monitoring +	SEN+	1		2	DI.0	Digital input DI.0
Load cell signal +	SIG+	3		4	DI.1	Digital input DI.1
Load cell signal -	SIG-	5		6	DI.2	Digital input DI.2
Load cell supply voltage monitoring -	SEN-	7		8	DQ.0	Digital output DQ.0
Load cell supply voltage +	EXC+	9		10	DQ.1	Digital output DQ.1
Load cell supply voltage -	EXC-	11		12	DQ.2	Digital output DQ.2
RS485 interface +	485+	13		14	CI+	Counter input CI +
RS485 interface -	485-	15		16	CI-	Counter input CI -
24 V DC supply voltage	L+				M	Ground for supply voltage

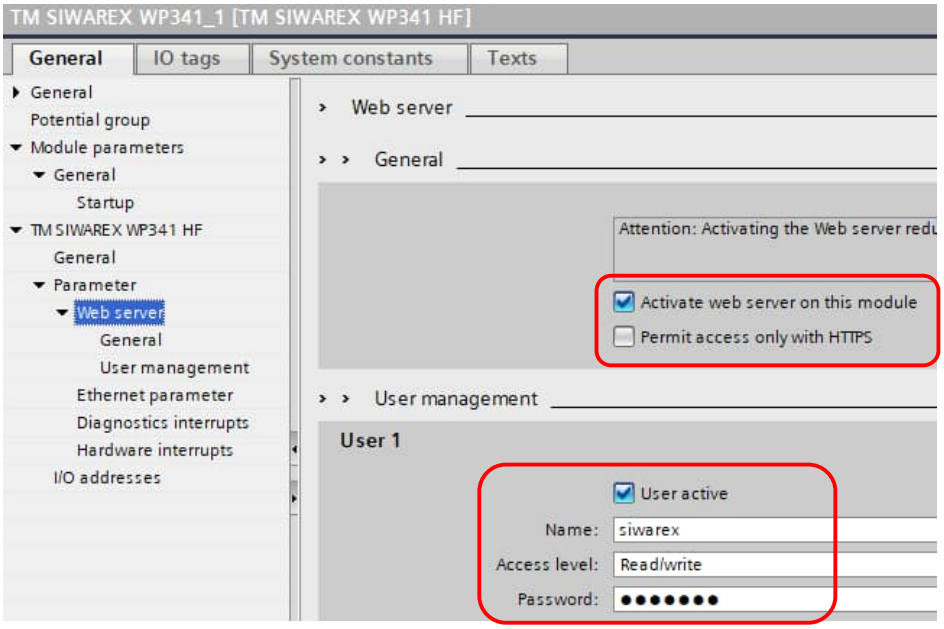
For detailed connection instructions please use chapter 4 of the device manual.

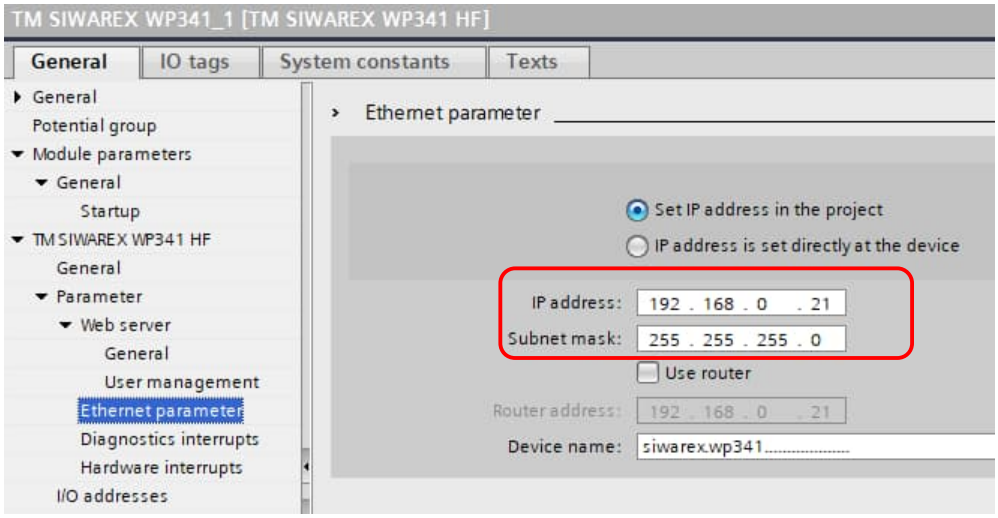
3. Webserver

The web server communicates using a standard Ethernet connection. A PC with an Ethernet interface is required for this. The correct configuration of the IP addresses of the PC and WP341 is essential for establishing a connection.

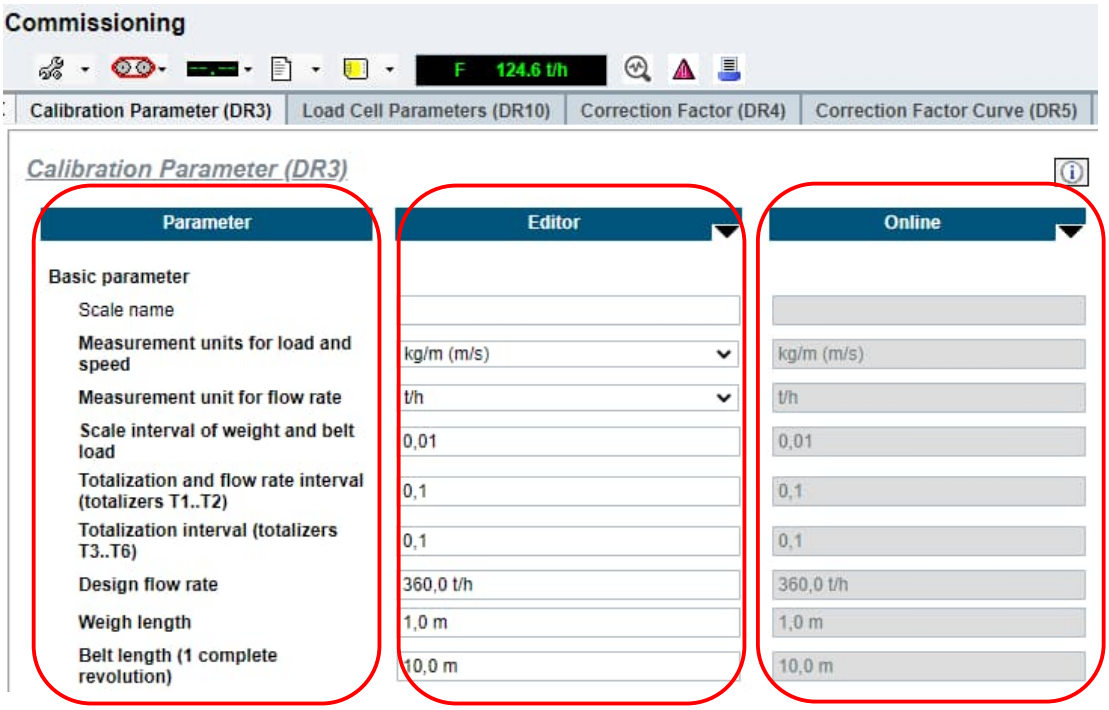
A notice:
The IP address of the PC must be in the same IP range and subnet mask as the WP341 module. (e.g. WP341=192.168.0.21 (factory default setting) => PC IP address must be 192.168.0.XXX, except 192.168.0.21.)

In the device configuration of the TIA Portal project, the web server is activated , a user is created and an IP address of the SIWAREX WP341 module is defined. By default, the IP address of the SIWAREX WP341 module is set to 192.168.0.21:





Web server overview



Parameter of SIWAREX WP341

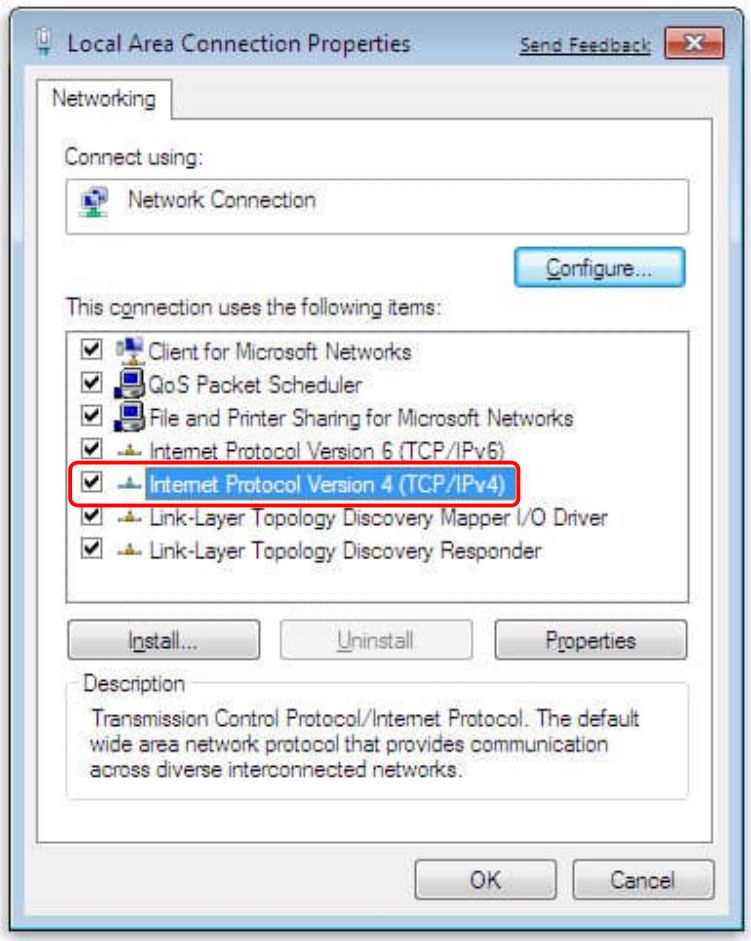
Parameter of Editor = PC

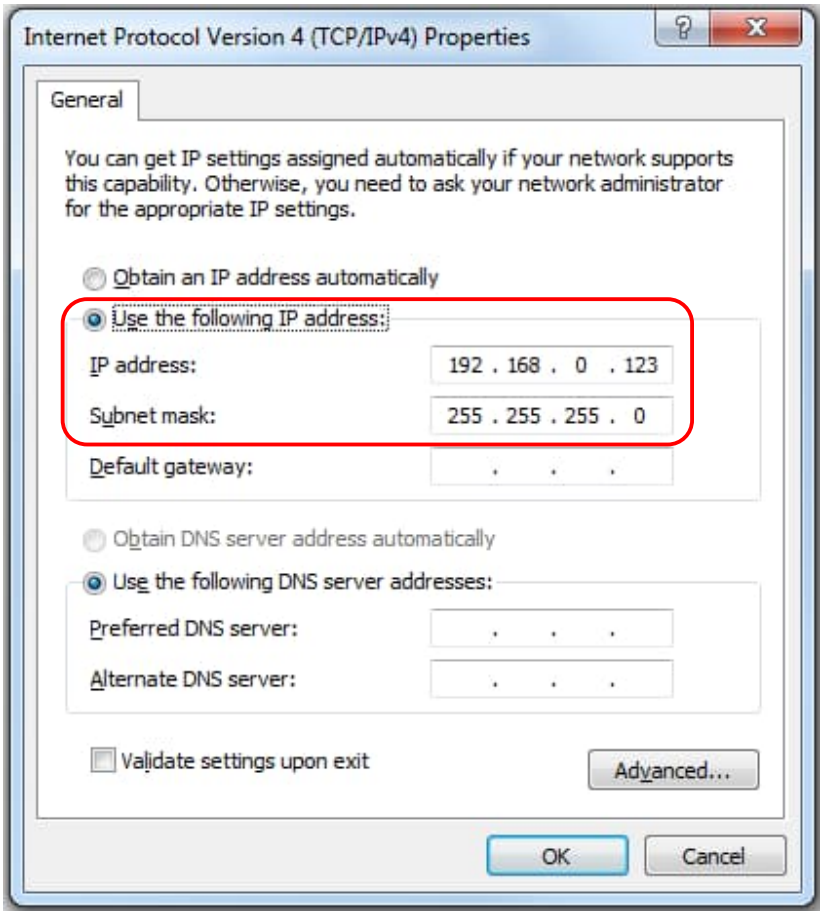
Parameter inside memory of WP341

All parameters of a SIWAREX weighing module are divided into packages – data records – (DR = Data Record).
Data sets can only ever be read and written as complete packets.
It is therefore not possible to read or write an individual parameter within a data set.
The entire data set containing the parameter must always be written to or read from, the SIWAREX module.

Factory default IP address of a SIWAREX WP341 is 192.168.0.21.
The IP address of the PC Ethernet port needs to be in the same IP range as the WP341
As the WP module supports auto negotiation, a basic Ethernet patch cable can be used for a direct connect from PC to the WP module.

The IP address of the PC can be defined in the Windows control panel in the network settings of the used Ethernet connection





To go online with the web server, enter the IP address of the SIWAREX WP341 in a browser window (recommended: Google Chrome or Firefox):

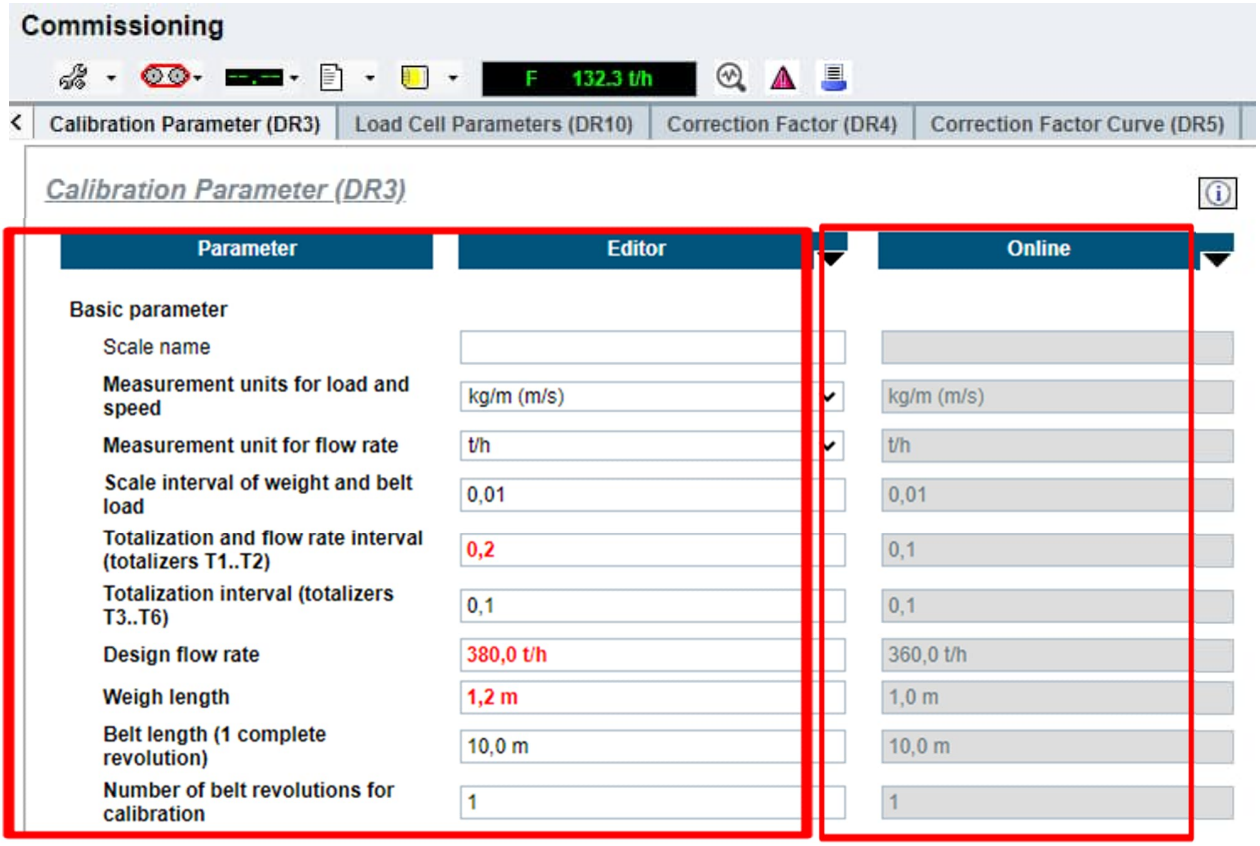


Then enter the user name and password defined in the TIA Portal:



Webserver Online and Offline Data‘s

In the main view, the web server has three columns with the titles "Parameter" / "Editor" / "Online". The "Parameters" column contains all parameters, grouped into data sets. The "Editor" column contains the current parameter values that are available offline in the PC and the "Online" column contains the current, active parameter values that are online in the SIWAREX WP341:



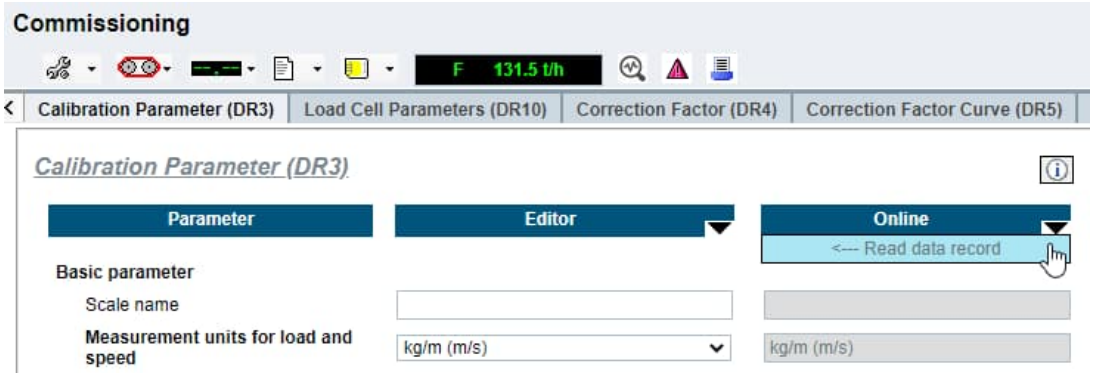
Parameter and Offline-Data’s

Online-Data’s

Differences between the offline data (PC) and the active online data (SIWAREX) are marked in red

Data record received from SIWAREX WP341 to the web server

In order to receive a data record from the SIWAREX WP341 module in the web server, a mouse click on “Online” is required. A submenu for reading the corresponding data set then opens:



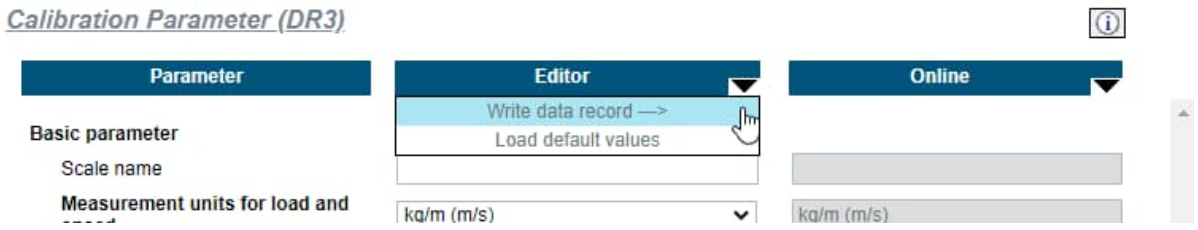
Then all parameters of the corresponding data set are written in the "Editor" column and this means that all parameters are written in black because there are no longer any differences between the online and editor data in the corresponding data set.

Send web server record from web server in SIWAREX WP341

To write a data record from the web server to the SIWAREX WP341 module, a Mouse click on “Editor” is necessary. A submenu for writing the corresponding data set then opens.

Data record send from web server in SIWAREX WP341

In order to write a data record from the web server to the SIWAREX WP341 module, a Mouse click on “Editor” necessary. A submenu for writing the corresponding data set then opens:



All parameters of the corresponding data record are then written from the "Editor" column to the SIWAREX WP341 (= in the "Online" column) and therefore all parameters are written in black, since there are no longer any differences between the online and offline data in the corresponding data record

4. Commissioning

The commissioning of a belt scale system must be carried out step by step and requires up to seven different steps:

1. Load standard parameters
2. Definition of the essential system parameters in DR3
3. Adjust belt speed
4. Zero point adjustment with empty belt
5. Span adjustment with test weight / test chain / load cell data and with an empty belt
6. Conduct a material test to calculate a correction factor
7. Determination of limit values and I/O interfaces, such as analog input, digital input, output etc.

4.1 Step 1: Load standard parameters

The document is based on a SIWAREX WP341 module with loaded standard parameters.
For this it is necessary to load the standard parameters first before continuing with the further steps. Loading the standard parameters requires "Service mode" to be switched on.
If the module has never been parameterized before, this step is not necessary.

A notice:
The service mode can be switched on with the service commands. Editing the "Adjustment parameters (DR3)" is only possible in service mode.

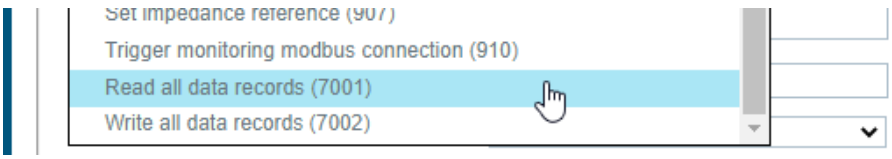


The red open-end wrench indicates "Service mode".

The factory default parameters can then be loaded with the "Load standard parameters (12)" command:

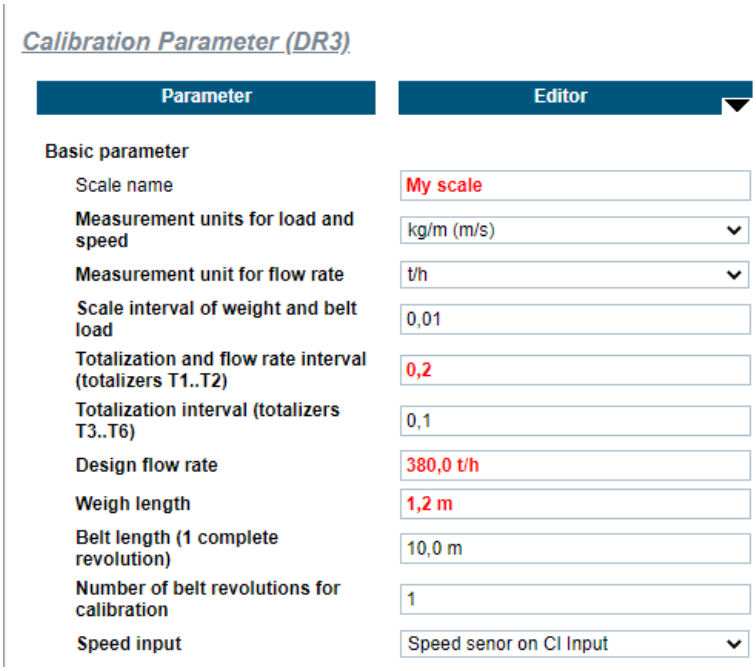


Finally, the standard parameters should be read into the editor of the web server with command "Read all data records (7001)":



4.2 Step 2: Definition of the essential system parameters in DR3

All important system parameters are summarized in data record 3. The following parameters must now be defined:



Scale name

The name of a scale (e.g. location, material, etc.) can be specified with up to 12 characters. If several WP341 are in a control cabinet, the name immediately shows which scales are used

Measurement unit for load and flow rate

The choices are "kg/m" and "(m/s)" for a metric system, and "lbs/ft" and "(ft/s)" for an imperial system.

	t/h (Metric tons per hour)	**kg/h** (Kilogramm per hour)	**T/h** (short tons per hour)	**TL/h** (large tons per hour)	**Lbs/h** (Pounds per hour)
kg/m	ok	ok			
lbs/ft			ok	ok	ok

Scale interval value weight and belt load

Examples:

0.01: the weight and belt loading are displayed in 0.01 increments.

1.0: the weight and the belt load are displayed in increments of 1.0.

These settings do not affect the accuracy of the system, as the module always works internally with very high-resolution process values. The settings are only for display to the user.

Totalization and flow rate interval T1..T2

Examples:

0.01: the totals T1...T2 and the flow rate are displayed in 0.01 increments.

1.0: the totals T1...T2 and the flow rate are displayed in increments of 1.0.

Totalization interval T3..T6

Examples:

0.01: the totals T3...T6 and the flow rate are displayed in 0.01 steps.

1.0: the totals T3...T6 and the flow rate are displayed in increments of 1.0.

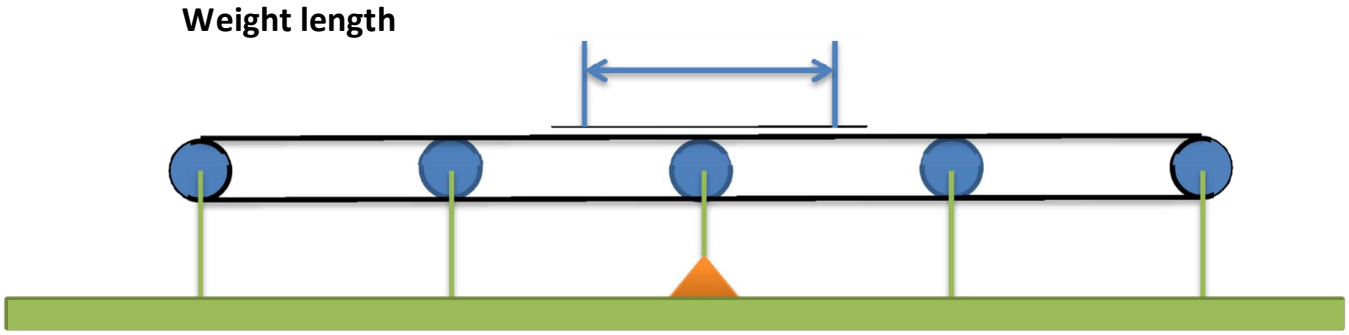
Design flow rate

The design flow rate is a firmly defined parameter that is determined by the overall system. It can be found in the belt scale data sheet. The nominal conveying rate corresponds to the maximum conveying rate (100%) for which the conveyor belt and scale are designed and depends, among other things, on the capacity of the load cells, the effective belt length and the maximum belt speed.

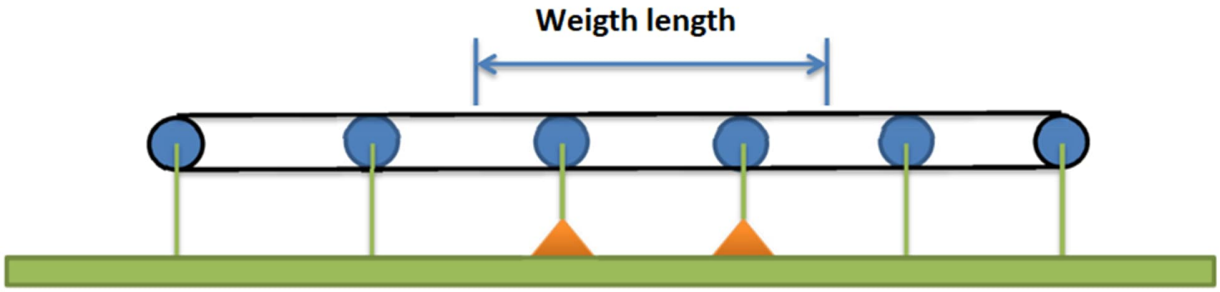
The unit for this parameter depends on the previously set parameter "Unit for flow rate “.

Weight length

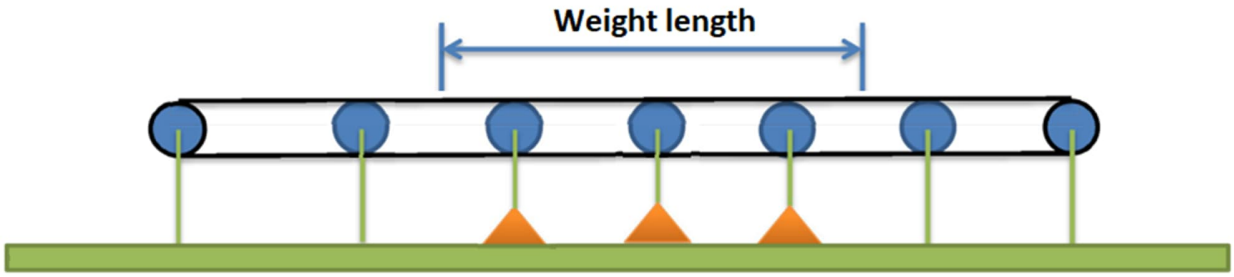
The weight belt length is made up of half the distance between the weighing bridge and the previous idler and half the distance between the weighing bridge and the following idler:



With two weighing platforms, the weight belt length is calculated as follows



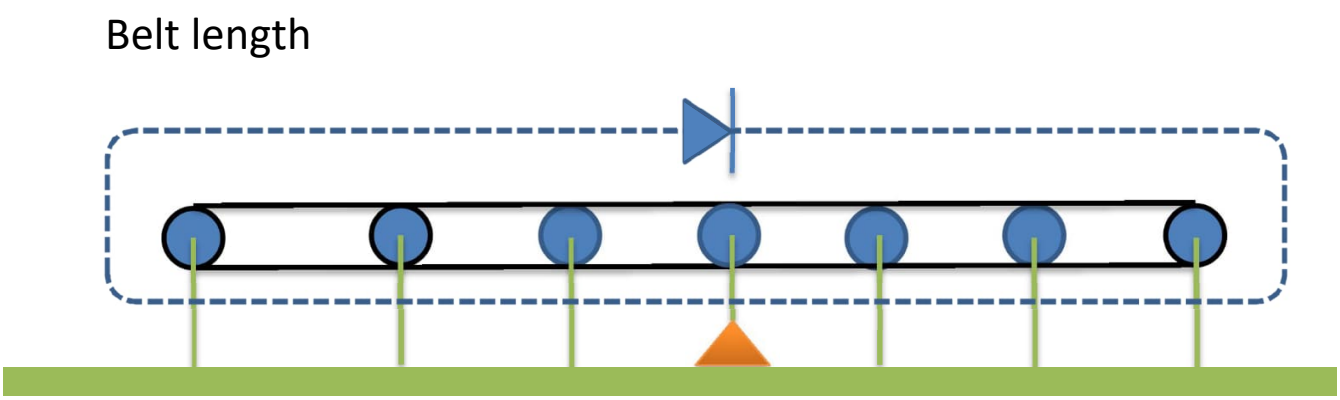
With three weighing platforms, the effective belt length is calculated as follows:



The unit for the effective belt length is based on the set "Unit for belt flow". If this is "kg/m", then the effective belt length must be specified in meters, for "lbs/ft" the entry is made in foot.

Belt length (1 complete revolution)

Total length of belt (one full revolution).



The unit for the total belt length is based on the "Unit for belt loading" setting. For "kg/m" this must be entered in meters, for "lbs/ft" the entry is in feet.
Number of belt revolutions for adjustment commands/zeroing

Number of belt revolutions for calibration commands/

Defines the number of belt revolutions that are run through for adjustment commands (zero calibration, span calibration) or the zeroing functions (automatic zeroing and zero tracking).

Speed input

There are generally three different ways to determine the current speed:

1. If a speed sensor is connected to the CI input, please select: "Pulse generator at CI input"
2. If no speed sensor is used, but a constant belt speed, please choose: "No encoder - specification/determination of constant speed"
3. If an external belt speed is specified by the CPU, please select: "External speed specification"

4.3 Step3: Adjust belt speed

Please select the next step accordingly your system environment

4.3.1 Using a speed sensor with a known pulse constant

In case of using a speed sensor, it must be connected to input CI+ and CI- of the WP341. For detailed wiring information please check the WP341 device manual.

Following parameters needs to be defined in data record 3

Calibration Parameter (DR3)

Parameter	Editor
Number of belt revolutions for calibration	1
Speed input	Speed senor on CI Input
Design speed	0,9 m/s
Speed factor under load	100,0 % * 0.9 m/s
Load at 'Speed factor under load'	100,0 % * 111.11 kg/m
Speed sensor pulses	20,0 /m

Design speed (belt empty)" defines the maximum belt speed. The minimum and maximum limits for speed are related to this parameter.
The "Speed sensor pulses (pulses per m / pulses per foot)" is a parameter based on the connected speed sensor. Most belt mounted speed sensors (like SIEMENS RBSS (150.4 pulses/m) or SIEMENS TASS (9.947 pulses/m)) provide this parameter in the datasheet.
In case of a shaft mounted speed sensor the pulses per meter resp. pulses per foot need to be calculated by following formula:

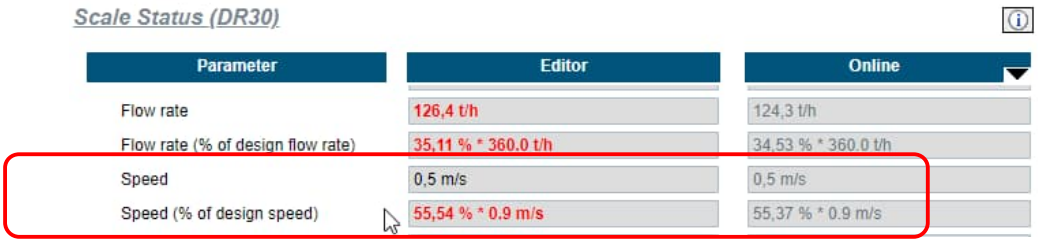
$$Pulses\ per\ meter = \frac{(Pulses\ per\ revolution)}{(\pi\ x\ d)}$$

Pulses per revolution: see data sheet of the speed sensor / encoder
π = 3,1416
d = diameter of guide pulley in meter

$$Pulses\ per\ feet = \frac{(Pulses\ per\ revolution)}{(\pi\ x\ d)}$$

Pulses per revolution: see data sheet of the speed sensor / encoder
π = 3,1416
d = diameter of guide pulley in feet

After defining all mentioned parameters, please check the belt speed in DR30:



To verify the speed, a tachometer can be used.
Alternatively the length of one complete belt revolution can be divided by the time for one complete belt revolution.

Proceed to the next step “Initial zero calibration

4.3.2 Using a speed sensor with an unknown pulse constant

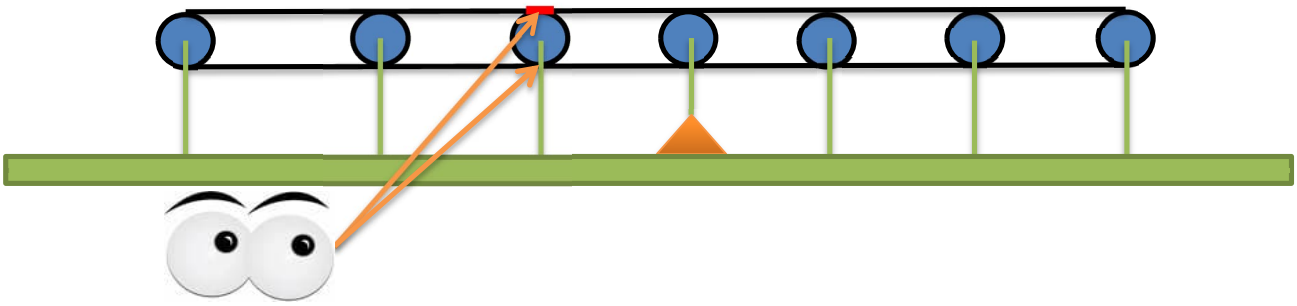
In some applications – especially retrofits – the constant of an old existing speed sensor is quite often unknown. In this case SIWAREX WP341 can calculate the “Pulses per meter” resp. “Pulses per foot” by an integrated system function.

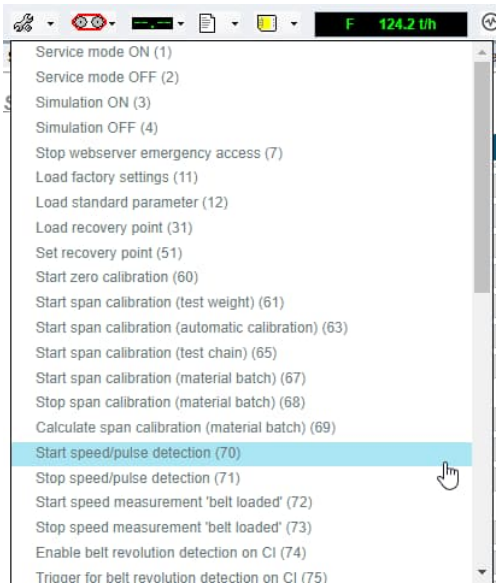
Caution:
By using this feature, be sure that the basic parameter “belt length” was entered with highest accuracy!
If the belt length is entered with an error of 10% (110m instead of 100m), the pulse constant will be calculated with an error of 10% and therefore the whole system will work with an error of 10%.
In case of using this function, the belt length needs to be measured by a length measuring device (e.g. tachometer), or measuring belt.

1st step: Stop the belt and place a check mark on the belt. This can be done by chalk or duct tape for instance. The mark should pass an easy to see fixed defined point of the belt scale (e.g. a defined part of the weigh bridge or an idler station).

2nd step: Switch on the service mode

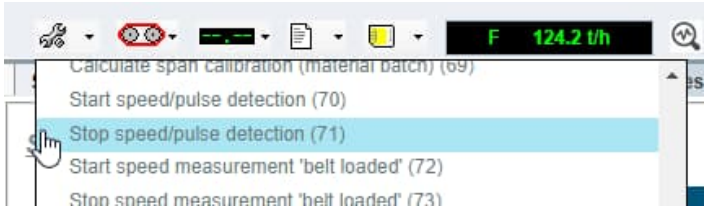
3rd step: Switch on the belt again. Monitor the mark and execute the command “Start speed-/pulse detection (79)”, when the check mark passes your selected reference point.



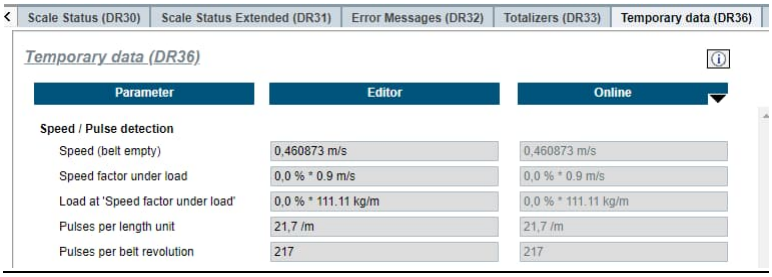


4th step.: Wait for the “number of belt revolutions”, which you defined in the basic parameters by counting the check mark passing by your reference point.

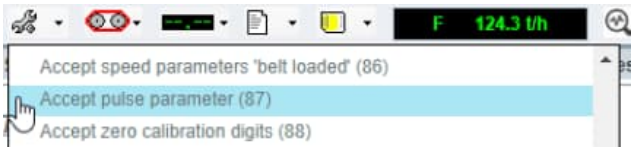
Example:
If two belt revolutions were defined in the basic parameters in DR3, the mark needs to pass by three times: first time for “Start speed-/pulse detection”(70). Second time indicates the first complete revolution.
By passing by the third time the command “Stop speed-/pulse detection” (71) need to be executed.



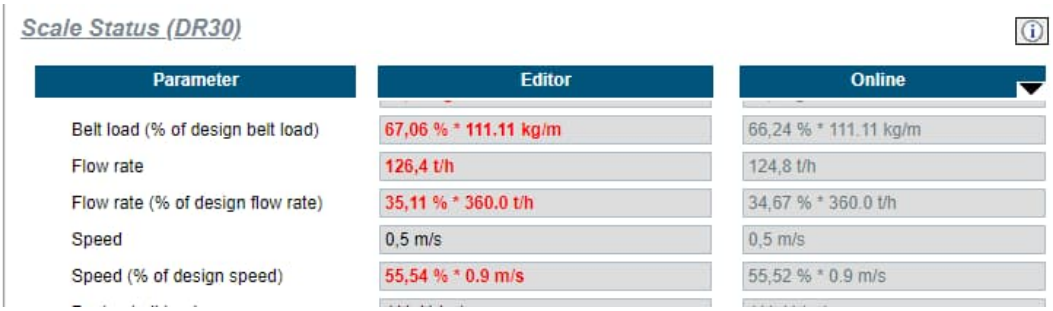
After that all calculated results are shown in DR 36 and can be verified.
The parameters are not directly active in the WP341 in this state:



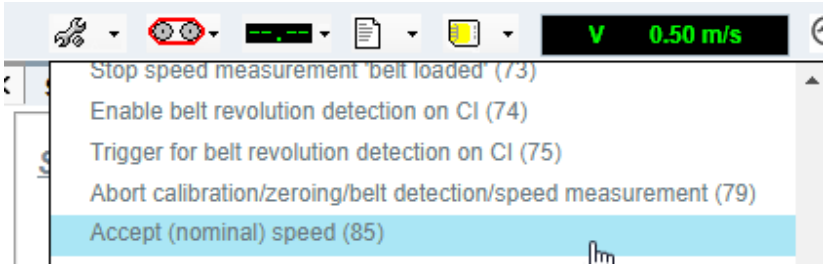
If the results of the calculation seem to be plausible, they can be accepted by following commands:



By using this command, the “Pulses per m” resp. “Pulses per foot” are copied from DR36 into the basic parameters in DR3. From that moment, the speed is calculated by the SIWAREX WP341 with the new parameters and can be verified in DR30.



At the same time, the WP341 calculates the mean belt speed based on the required cycle time. The result of this calculation is output in DR36 as the "Nominal speed (conveyor empty)" parameter. If desired, this parameter can also be copied to the "Nominal speed" parameter in DR3 using the "Apply (nominal) speed (85)" command.



Notice:

If the acquisition of the pulses is not carried out with the maximum belt speed, the "Speed (empty belt)" parameter in DR36 does not represent the nominal speed of the belt. In this case, this parameter should not be copied, but the belt with maximum speed and the actual nominal speed can be read in DR30 and entered manually in "Nominal speed".

Proceed to the next step “Zero Calibration with Empty belt”.

4.3.3 Using a known constant belt speed without speed sensor

The following parameters must be set in data record 3:

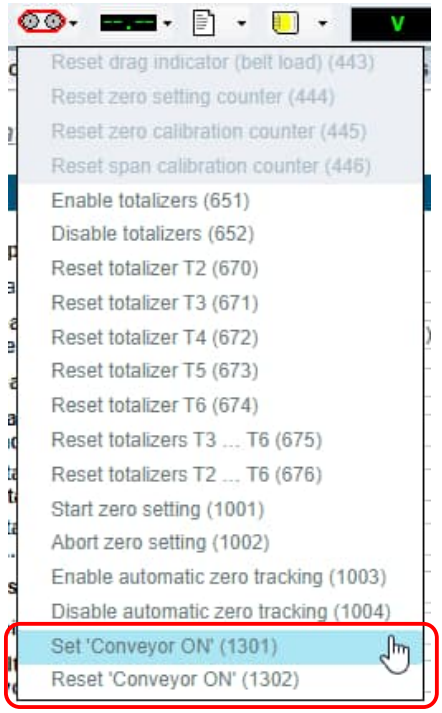
Calibration Parameter (DR3)

Parameter	Editor
Weigh length	1,0 m
Belt length (1 complete revolution)	10,0 m
Number of belt revolutions for calibration	1
Speed input	Speed senor on CI Input
Design speed	0,9 m/s
Speed factor under load	100,0 % * 0.9 m/s

The value in "Nominal Speed" is then used as the default belt speed for all calculations.
The unit depends on the selected "Units for belt loading and belt speed".
Due to the fact that WP341 cannot know whether the belt is really running, an external signal or external information is necessary. This can be realized in two different ways:

1. An external 24V signal is applied to the inputs “CI+” and “CI-” to enable the WP341 communicate that the conveyor is actually running (e.g. a relay contact of the drive).
Referring to the nominal speed of the screenshot above, this means:
At +24V, a constant speed of 1.12 m/s is used.
At +0V the belt does not run. No delivery rate is determined, and therefore no summation.

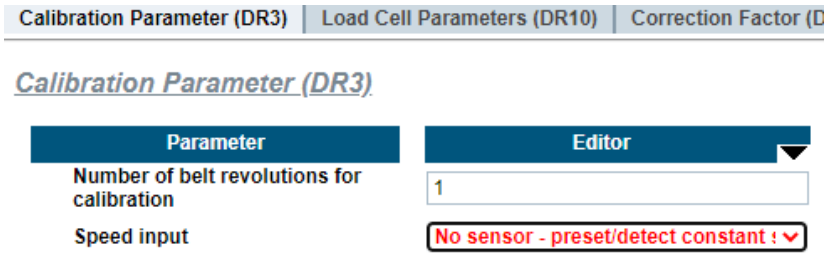
2. Alternatively, the SIMATIC CPU send a command (1301 / 1302) to the WP341 that the belt is running or not. Please use the user manual for more information on how to send a command from the SIMATIC S7 to the WP341.
For testing purposes, these commands can also be run with the WebServer:



Proceed to the next step “Zero Calibration with Empty belt”.

4.3.4 Determination of an unknown constant belt speed

If a system is used without a speed sensor and without a known constant belt speed, the speed can be determined by WP341 using a special procedure.
The following parameter in DR3 must be defined:



Due to the fact that WP341 cannot know whether the belt is really running, an external signal or external information is necessary. This can be realized in two different ways:

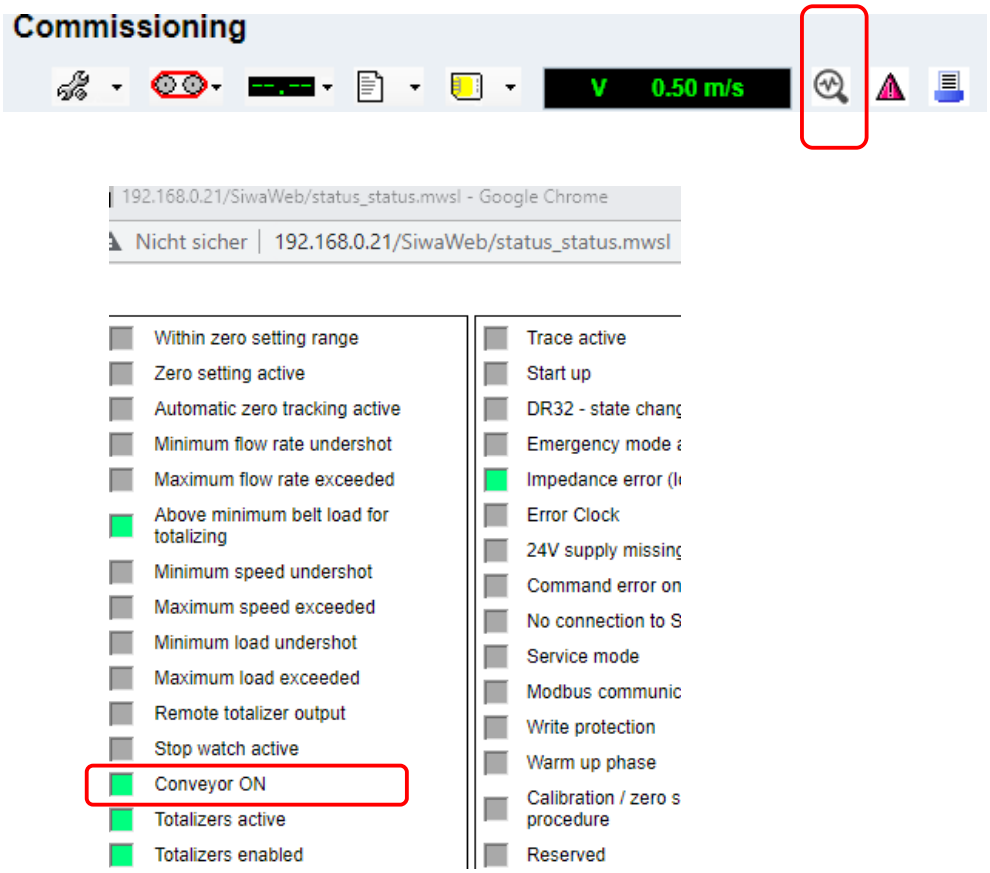
1. An external 24V signal is applied to the inputs “CI+” and “CI-” to enable the WP341 communicate that the belt is actually running (e.g. a relay contact of the drive):
   - +24V means belt on
   - 0V means belt off

2.. Alternatively, the SIMATIC CPU send a command (1301 / 1302) to the WP341 that the belt is running or not. Please use the user manual for more information on how to send a command from the SIMATIC S7 to the WP341.

For testing purposes, these commands can also be run with the WebServer:



Before proceeding, please check under “Scale Status” to see if the “Conveyor ON” status is active. This status is an important prerequisite for the following steps:

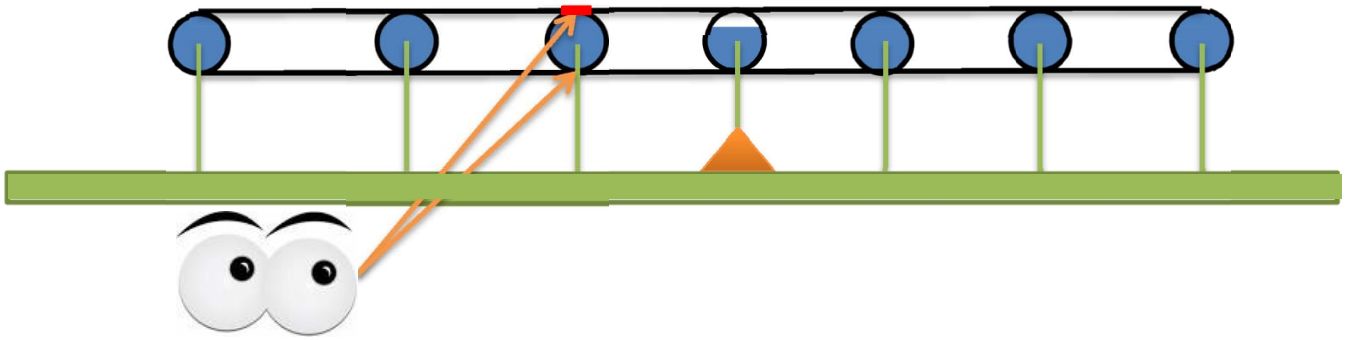


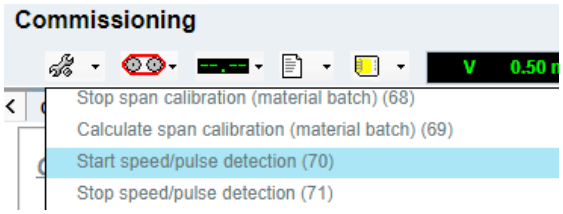
Attention:

If this functionality is used, then the basic parameter "total belt length (1 cycle)" must be specified very precisely! If the total belt length is entered with an error of 10% (e.g. 110m instead of 100m), the impulse constant is calculated with an error of 10% and thus the whole system works with an error of 10%. If this function is used, then the total belt length must be measured with a length measuring device (e.g. tachometer) or belt measure.

Step 1: Stop the belt and make a mark on the belt, e.g. with chalk or tape. This mark should pass a clearly visible, fixed point on the belt scale (e.g. defined part of the measuring idler or another idler).

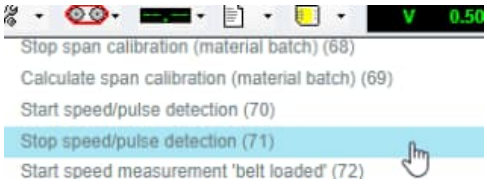
Step 2: Turn the belt back on. Observe the marking and, with service mode switched on, start the measurement with the command "Start speed/pulse detection (70)" when the marking passes the defined point.



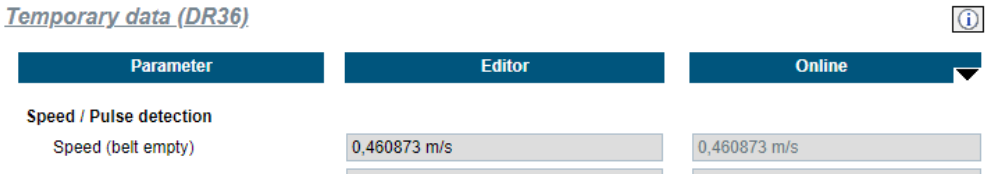


Step 3: Wait for the " Number of belt revolutions for calibration ", which you can see in the basic parameters defined in DR3 by counting how often your marking passes the defined point.

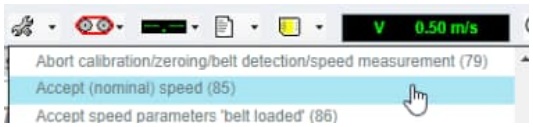
Example:
If two belt revolutions were defined in the basic parameters in DR3, then the marking must pass the defined point three times: For the first time for the "Start speed /Impulse detection (70)", the second time indicates the first belt revolution and the third time the command "Stop speed/pulse detection (71)" must be executed..



After these steps, the calculated result is displayed in DR36 and can be checked.
In this state, the parameters are not yet automatically active in the WP341.



If the result of the calculation seems plausible, then this parameter can be adjusted using the command "Accept (nominal) speed (85)" in DR3 in the "Nominal speed" parameter. The calculated speed value is then used for all further calculations in the module



Proceed to the next step “Zero Calibration with Empty belt”.

Optional step

(Only possible if zero and load point adjustment have already been carried out!)

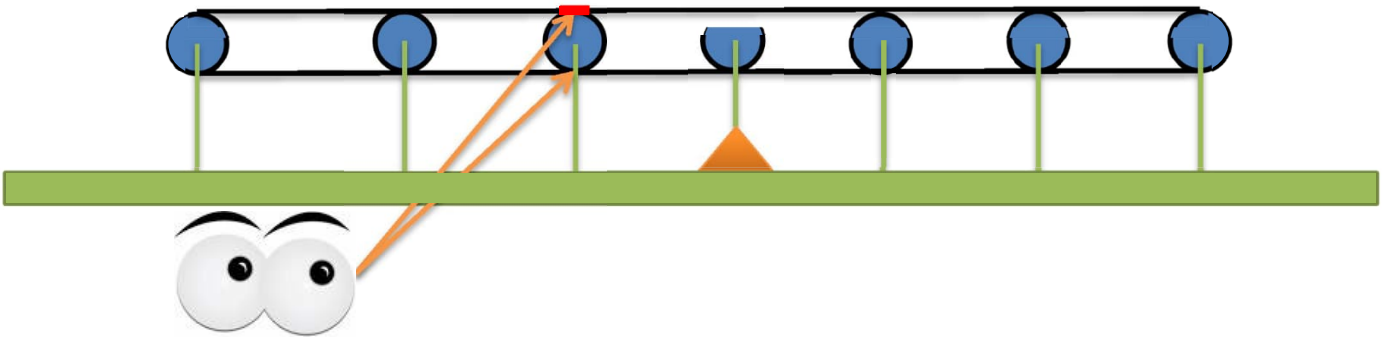
The speed just calculated refers to an empty belt. If the belt is fully loaded, the actual belt speed may deviate. Depending on the belt length this deviation has a not inconsiderable influence on the accuracy of the system.
For this reason, the SIWAREX WP341 offers the option of a second measurement of the speed when the belt is loaded. Using this second speed information, the speed of the system depends on the belt load, even if it is not speed sensor is connected.

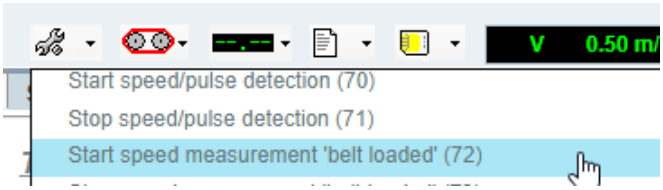
Attention:

If this functionality is used, then the basic parameter "total belt length" must be specified very precisely! If the total belt length is entered with an error of 10% (e.g. 110m instead of 100m), the impulse constant is calculated with an error of 10% and thus the whole system works with an error of 10%. If this function is used, then the total belt length must be measured with a length measuring device (e.g. tachometer) or belt measure.

Step 1: Stop the belt and make a mark on the belt, e.g. with chalk or tape. This mark should pass a clearly visible, fixed point on the belt scale (e.g. defined part of the measuring idler station or another idler station) and also when the belt is loaded being visible.

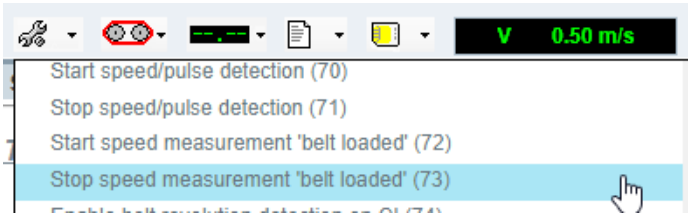
Step 2: Turn the belt back on and run it loaded with material (as close as possible at the nominal belt loading). Observe the marking and start the measurement with the command "Start speed measurement belt loaded" (72)" when the marking passes the defined point.





3rd step: Wait for the "Number of belt revolutions for calibration", which you can see in the basic parameters defined in DR3 by counting how often your marking passes the defined point.

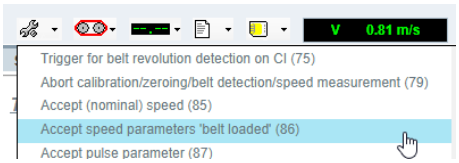
Example:
If two belt revolutions were defined in the basic parameters, then the marking must pass the defined point three times: First time for the command "Start speed determination "Conveyor loading" (72)", the second time indicates the first belt revolution and the third time the command "Stop speed measurement belt loaded" (73)" must be executed.

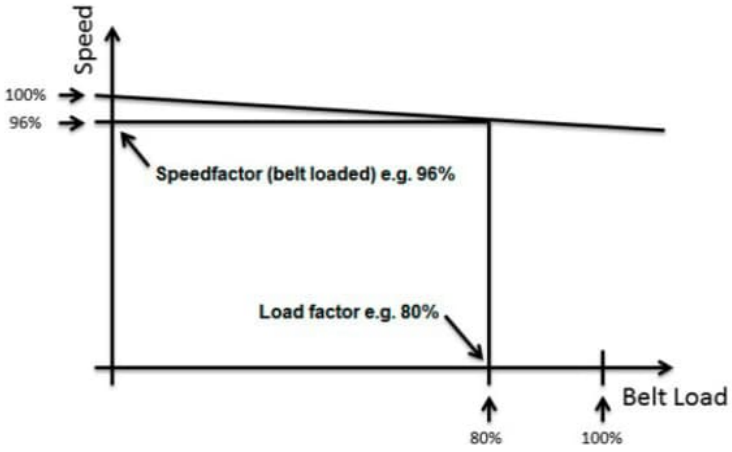


After these steps, the calculated speed of the loaded belt in % of the empty belt speed and the average belt load are displayed during the calibration process in DR36 and can be checked.
In this state, the parameters are not yet automatically active in the WP341:



If the calculated percentage results appear plausible, the values can be accepted with the command "Apply speed parameters "belt loaded" (86)". After this step, the two parameters have been copied into DR3 and the “constant” speed of the system is adjusted to the degree of current belt loading:





4.3.5 External specification of speed from a PLC

In some cases the speed is calculated or available in the PLC.
In this case, the speed value can be sent directly to the SIWAREX WP341 via the function block are transferred.

For this purpose, the following parameter must be defined in data record 3:

Calibration Parameter (DR3)

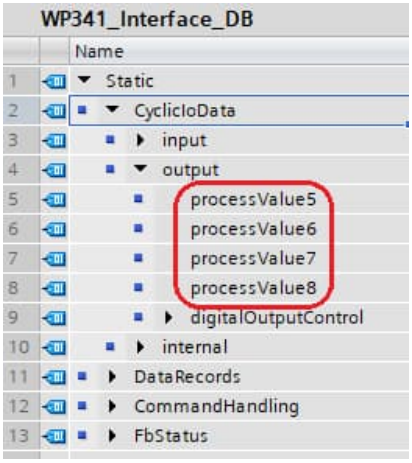
Parameter	Editor
Number of belt revolutions for calibration	1
Speed input	External speed value

In addition, one of the peripheral process values 5...8 must be defined in DR 7 as "External or simulated belt speed"

Interface Parameters (DR7)

Parameter	Editor
Device name	siwarex.wp341.....
S7-Interface	
Cyclic I/O process value 1	Flow rate
Cyclic I/O process value 2	Belt load
Cyclic I/O process value 3	Belt speed
Cyclic I/O process value 4	Main totalizer T2
Cyclic I/O process value 5	External or simulated belt speed
Cyclic I/O process value 6	No element is selected

Then, via the instance DB of the WP341, a speed can be sent to the SIWAREX WP341 via the previously defined peripheral process value (e.g. via “processValue5” in the instance DB).
If the value 0 is written, the calculation of the flow rate and the summation is stopped and the status "belt running" is reset.



Proceed to the next step “Zero Calibration with Empty belt”.

4.4 Step 4: Zero calibration with empty belt

After defining the basic parameters and successful speed adjustment, you can determine the zero point using the zero calibration.
Before the adjustment can be started, the characteristic value of the load cells must be checked/set in DR10:

Load Cell Parameters (DR10)

Parameter	Editor
Load cell input	Analogue load cells
Mains frequency	50 Hz
Mains frequency filter	enabled
4-wire / 6-wire sensor	6-wire sensor
External / internal sensor excitation	Internal supply
No. of mechanical support points	1
Averaged load cell characteristic value (mV/V)	2,13 mV/V
Capacity of one single load cell	20,0 kg

Please select the supply network frequency of your local supply network to which the signal filtering of the WP341 adjusts.

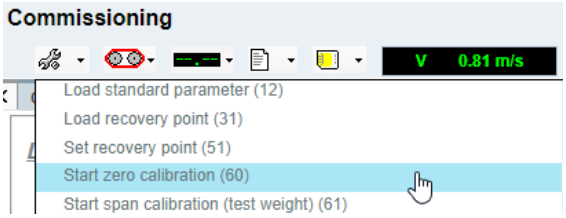
Please check the following conditions before starting the zero calibration:

- The belt is warmed up and running

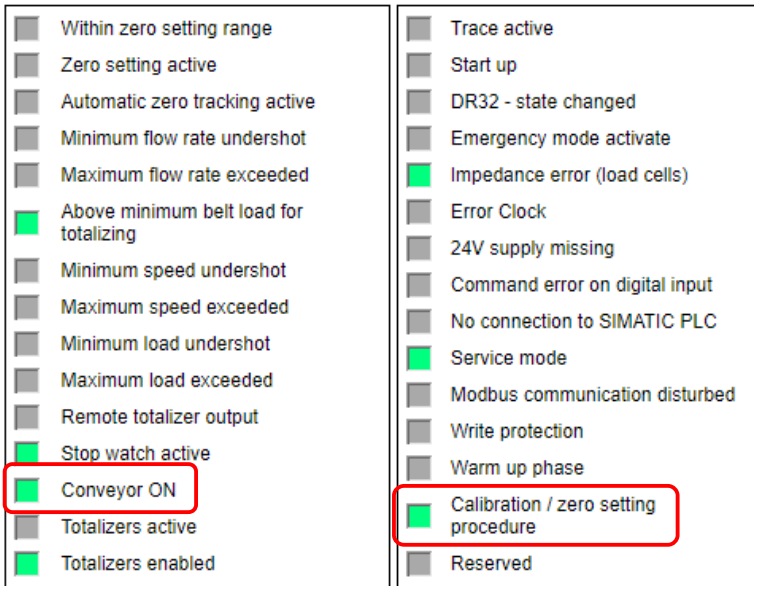
- The belt is not loaded

- Service mode is activated

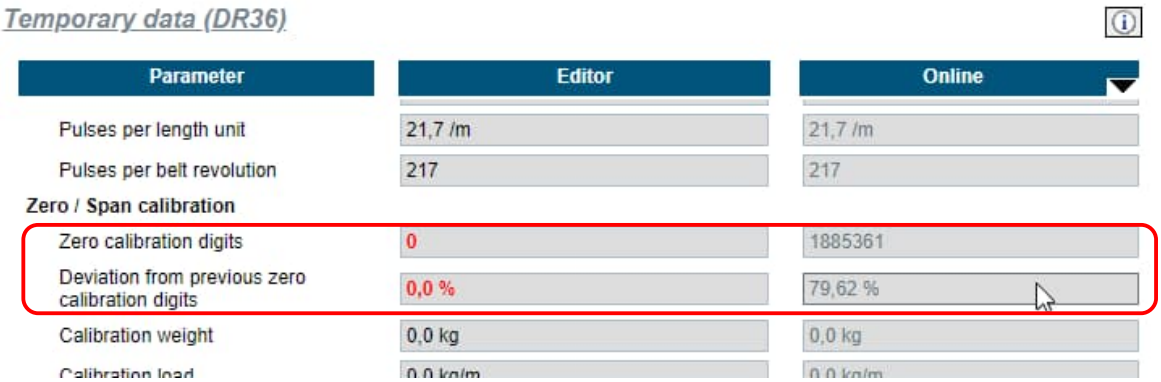
The command "Start zero calibration (60)" must now be activated:



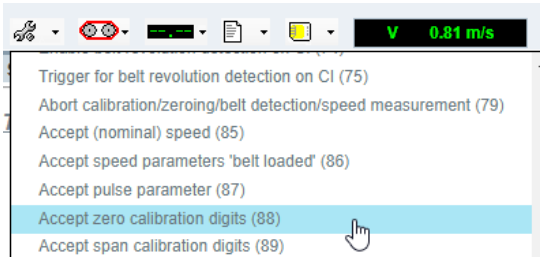
The band that is switched on and the adjustment process can be observed via the scale status:



After the defined number of belt revolutions, the result is shown in DR36.
In this state, the parameters are not yet automatically active in the WP341:



If the result appears plausible, it must be accepted and activated with the command "Accept zero calibration digits (88)":



The current belt loading should now show 0.0 kg/m or 0.0 lbs/ft.

Proceed to the next step, span calibration

4.5 Step 5. Span calibration

The SIWAREX WP341 offers different ways to perform a span calibration. This document describes the calibration by using test weights, alternatively a test chain or the load cells data. Please jump to the type of span calibration you want to perform

4.5.1 Using test weights

In case of using test weights for the span calibration, following parameter needs to be defined in DR3:

Calibration Parameter (DR3)

Parameter	Editor
Zero calibration digits	189540
Calibration weight (test weight)	18,0 kg
Calibration load (test chain)	0,0 kg/m
Calibration quantity (material	9000,0 kg

The unit of this parameter depends on the selected “Unit for belt load”. In case of “kg/m” the calibration weight must be entered in kg, in case of “lbs/ft” in lbs.

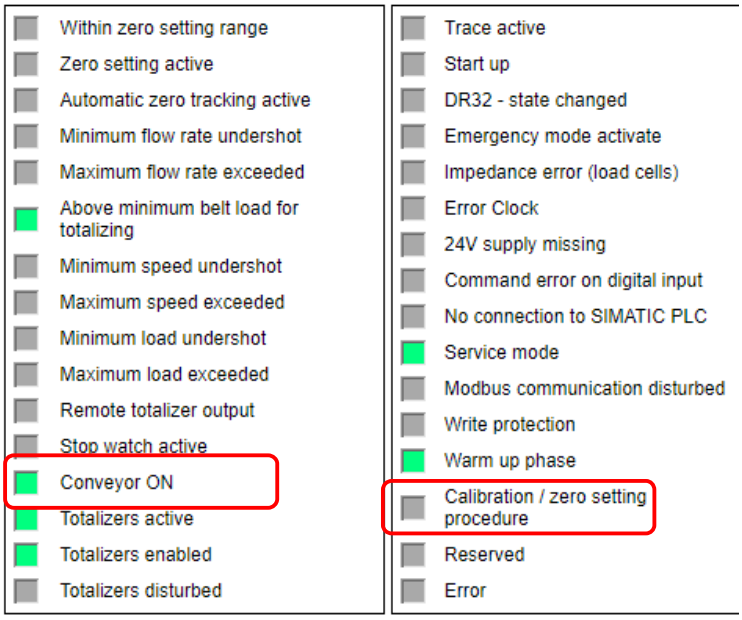
Attention:

Stop the belt before mounting the test weight(s) to the scale!

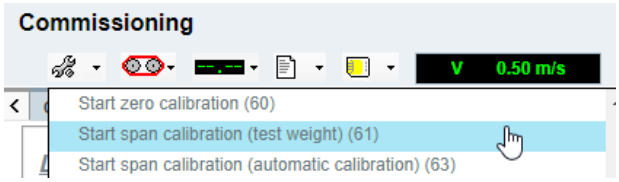
Verify the following conditions before starting the span calibration with test weights:

- Initial zero calibration was performed successfully
- Belt is warmed-up and turning
- Test weights are mounted on the scale
- The belt is empty
- Service mode is activated

The belt is switched on and the adjustment process can be monitored via the scale status:



The command “Start span calibration with test weight (61)” needs to be started now:

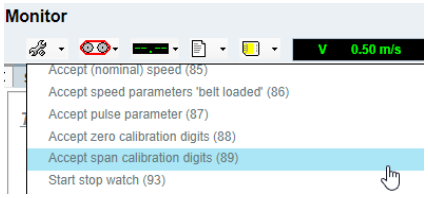


After the defined number of belt revolutions, the result of the operation is shown in DR36. The parameters are not directly active in the WP341 in this state:

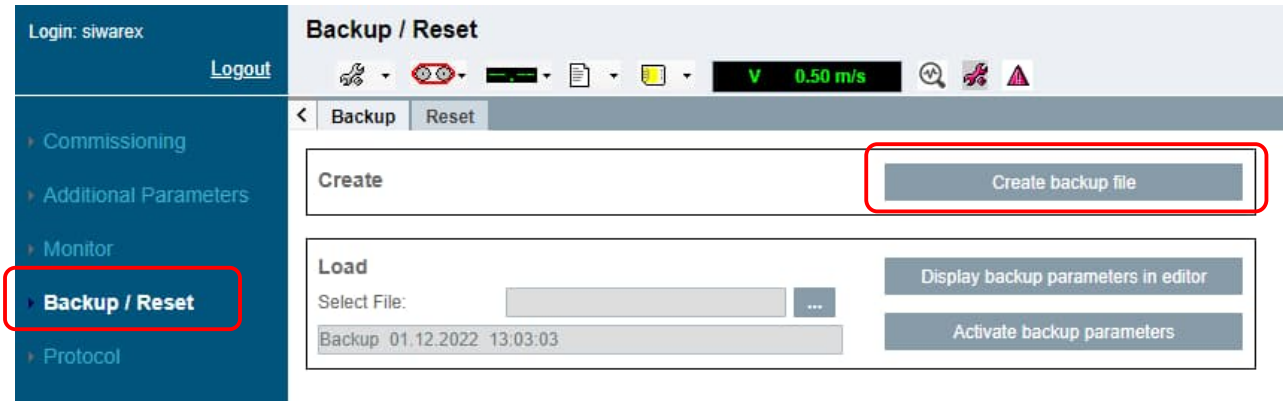
Temporary data (DR36)

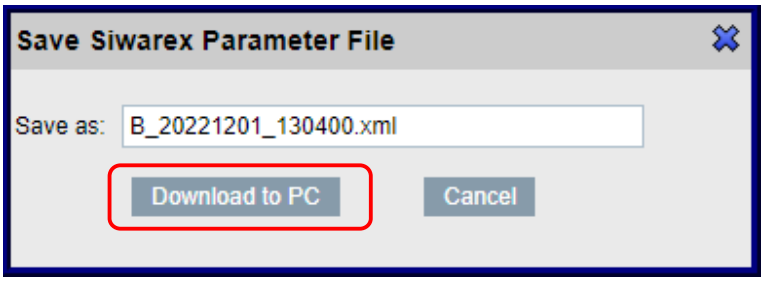
Parameter	Editor	Online
Pulses per belt revolution	217	217
Zero / Span calibration		
Zero calibration digits	1885361	1885361
Deviation from previous zero calibration digits	79,62 %	79,62 %
Calibration weight	0,0 kg	18,0 kg
Calibration load	0,0 kg/m	0,0 kg/m
Span calibration digits	0	2812573
Deviation from previous span calibration digits	0,0 %	103,75 %
Progress of calibration / zero setting	100,0 %	100,0 %

If the result seems to be plausible it needs to be accepted and activated by command “Accept span calibration digits (89)”:



- Stop the belt and dismount the test weights.
- Switch off the “Service mode”
- Create a backup file of your system





Proceed to the next step “Material test”.

4.5.2 Using a test chain

In case of using a test chain for the span calibration, following parameter needs to be defined in DR3:

Calibration Parameter (DR3)

Parameter	Editor	Online
Load at 'Speed factor under load'	100,0 % * 11.11 kg/m	100,0 % * 11.11 kg/m
Speed sensor pulses	20,0 /m	20,0 /m
Zero calibration digits	189540	189540
Calibration weight (test weight)	18,0 kg	18,0 kg
Calibration load (test chain)	20,0 kg/m	0,0 kg/m
Calibration quantity (material test)	9000,0 kg	9000,0 kg

The load of a calibration chain is a fix defined parameter of the chain. The parameter must be entered either in "kg/m" or "lbs/ft" depending on the selected "Unit for belt load".

Attention:

Stop the belt before mounting the test chain on the belt!

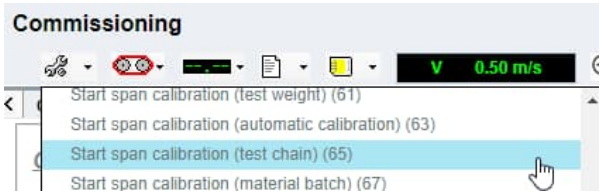
Verify the following conditions before starting the span calibration with test weights:

- Initial zero calibration was performed successfully
- Belt is warmed-up and turning
- Test chain is mounted on the belt in a centered position
- Service mode is activated

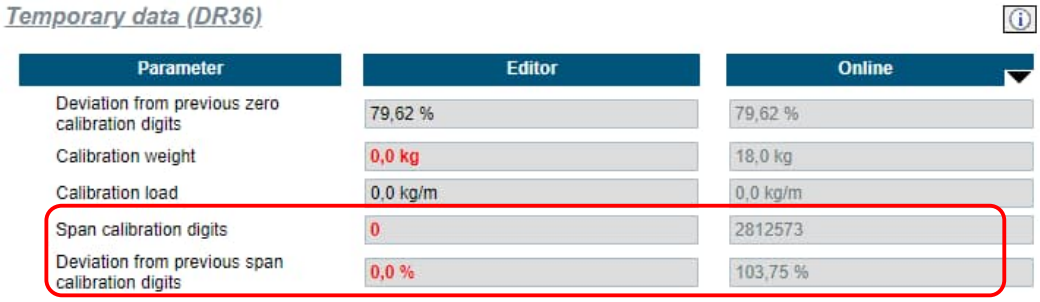
Every process value (e.g. load, speed, flow rate) of the WP341 can be monitored via the scale status.

Within zero setting range	Trace active
Zero setting active	Start up
Automatic zero tracking active	DR32 - state changed
Minimum flow rate undershot	Emergency mode activate
Maximum flow rate exceeded	Impedance error (load cells)
Above minimum belt load for totalizing	Error Clock
Minimum speed undershot	24V supply missing
Maximum speed exceeded	Command error on digital input
Minimum load undershot	No connection to SIMATIC PLC
Maximum load exceeded	Service mode
Remote totalizer output	Modbus communication disturbed
Stop watch active	Write protection
Conveyor ON	Warm up phase
Totalizers active	Calibration / zero setting procedure
Totalizers enabled	Reserved
Totalizers disturbed	Error

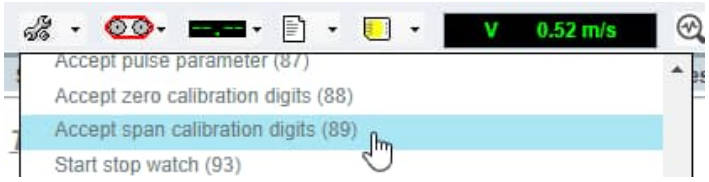
The command “Start span calibration with test chain (65)” needs to be started now:



After the defined number of belt revolutions, the result of the operation is shown in DR36.
<u>The parameters are not directly active in the WP341 in this state:</u>

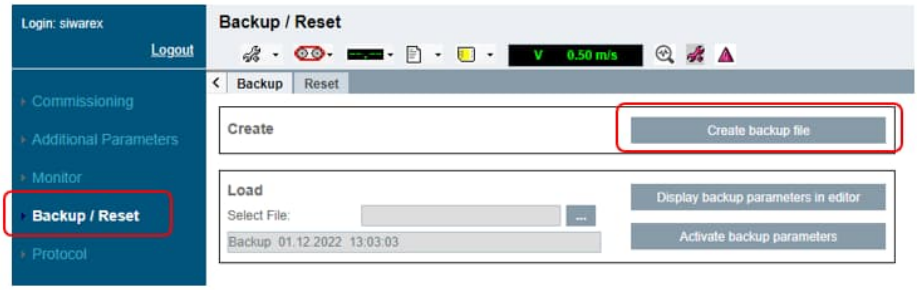


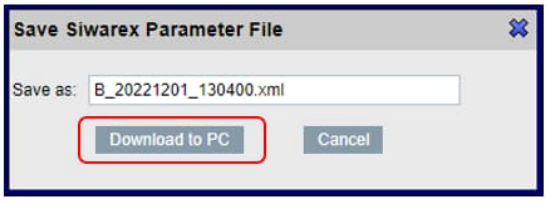
If the result is plausible it needs to be accepted and activated by command “Accept span calibration digits (89)”:



- Stop the belt and dismount the test chain.
- Switch off the “Service mode”

- Create a backup file of your system, menu Backup / Reset

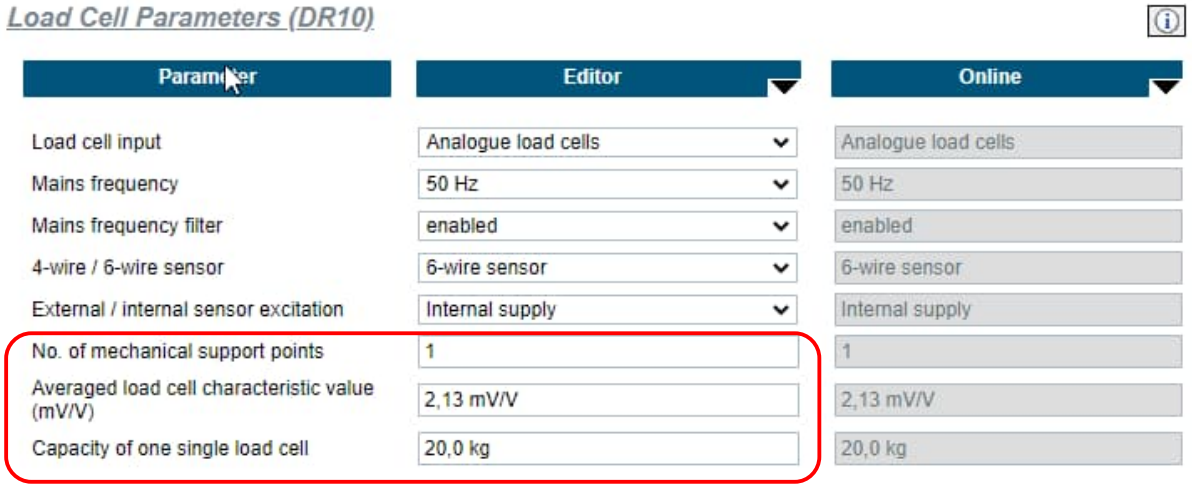




Proceed to the next step “Material test”.

4.5.3 Using load cell data (automatic calibration)

In case of performing an automatic calibration, following parameters needs to be defined in DR10:



""No. of loadcells"

Defines the number of connected load cells. In case of using a SIEMENS MSI belt scale, the number of load cells would be two, for an MMI-2 four.

"Averaged characteristic value (mV/V)"

In case of using two or more load cells, the characteristic value needs to be averaged:
LC1 : 1,998 mV/V
LC2 : 1,997 mV/V
LC3 : 1,999 mV/V
LC4 : 2,001 mV/V

7,995 mV/V / 4 = 1,99875 mV/V = averaged characteristic value

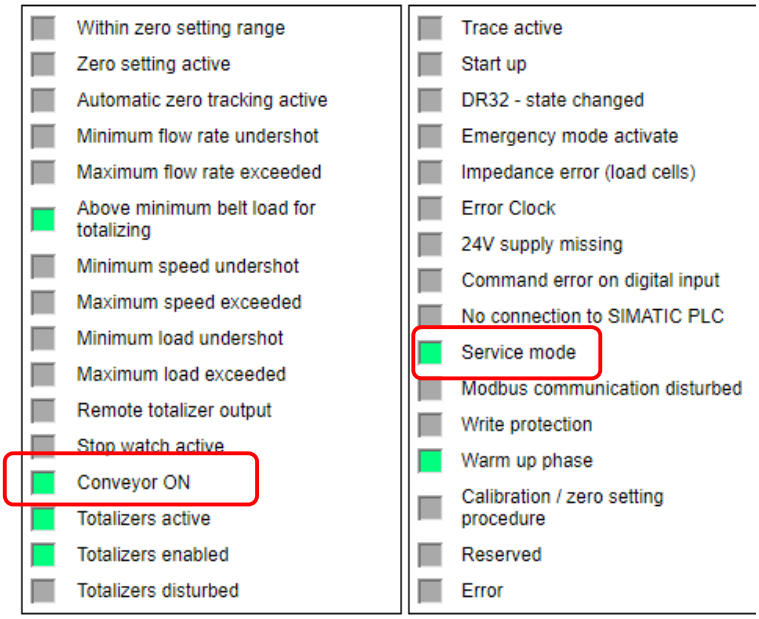
The exact characteristic values can be found directly on the load cells or in the load cells data sheet. If it's not possible to use the exact value, a value of 1.0mV/V, 2.0mV/V or 4mV/V (depending on the load cell) can be assumed and entered.

"Nominal load of one single load cell"

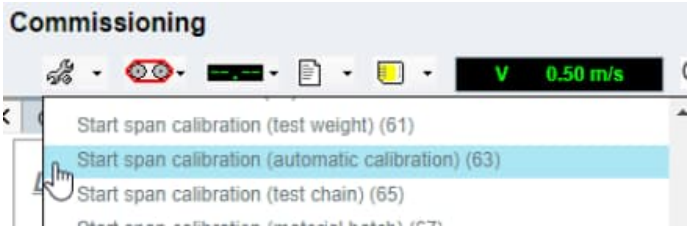
Defines the nominal load (= rated capacity) of one single load cell of the belt scale. The unit of the parameter must be either "kg" or "lbs" depending on the selected unit for belt load.

Verify the following conditions before starting the automatic span calibration:
- Initial zero calibration was performed successfully
- Belt is empty and not turning
- No test weights / test chains are on the scale
- Service mode is activated

Every process value (e.g. load, speed, flow rate) of the WP341 can be monitored via the scale status.



The command “Start span calibration (automatic calibration((63)” needs to be executed now



Directly after executing the command, the result is entered in DR3 and active!
In case of performing an automatic calibration it’s highly recommended to perform a material test afterwards in order to increase the accuracy of the system.

Proceed to the next step “Material test”.

4.6 Step 6: Material test

The material test is the last step of the belt scale calibration. During this test, a defined quantity of material is conveyed on the belt scale system. The quantity needs either to be pre- or post-weighed – typically by a truck scale.
Totalizer S6 of the SIWAREX WP341 is designed for material tests, as all other totalizers (S1…S5) can be optionally stopped during the test, so that the test does not impact the already totalized values. Totalizer S6 can't be stopped and therefore totalizes always.

A known quantity of material (truck weighed on a truck scale) is conveyed via the belt scale system. By doing this type of test, the material can be used directly in the process.

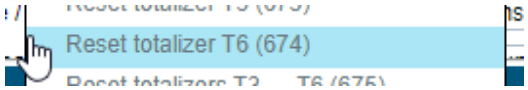
It is recommended to do at least 3 material tests to check the reproducibility of the belt scale.

The result is then used to calculate a correction factor and thus optimize the accuracy of the belt scale.
It is possible to calculate the correction factor manually or automatically.

4.6.1 Material test with manually calculated correction factor

1st step:
Belt need to run empty

2nd step:
Reset totalizer S6 by command



3rd step:
Start conveying constantly the pre-weighed material

4th step:
Wait until the complete material was conveyed and check the value of totalizer S6 in DR33

Totalizers (DR33)

Parameter	Editor	Online
General Totalizer T1	6930,2 t	6986,2 t
Totalizer T2	6930,2 t	6986,2 t
Totalizer T3	6930,2 t	6986,2 t
Totalizer T4	5611,4 t	5667,4 t
Totalizer T5	6930,2 t	6986,2 t
Totalizer T6	3881,3 t	1,5 t

Depending on the selected unit for flow rate, the WP341 totalizes either in t (tons), kg (kilograms), T (short tons), TL (long tons) or lb (pound).

5th step:
With the information of totalizer S6 (high resolution) and the weight of the conveyed material a correction factor can be calculated now by following formula:

$$Correction\ factor\ new\ = \frac{pre-weighed\ material\ quantity}{totalized\ weight\ of\ totalizer\ S6}$$

Example:
- pre-weighted material: 1.1 t
- Total T6: 1.017 t

Correction factor new = 1.1 t / 1.017 t = 1.082

6th step:
A second material test is to be carried out with the calculation of a second correction factor.
To do this, follow steps 1 – 5 above again.

7th step:
A third material test is to be carried out with the calculation of a second correction factor.
To do this, follow steps 1 – 5 above again.

8th step:
The three individual correction factors are now checked for plausibility among each other.
The three individual correction factors should be relatively identical to one another. This means that the belt scale works reproducibly, e.g.:

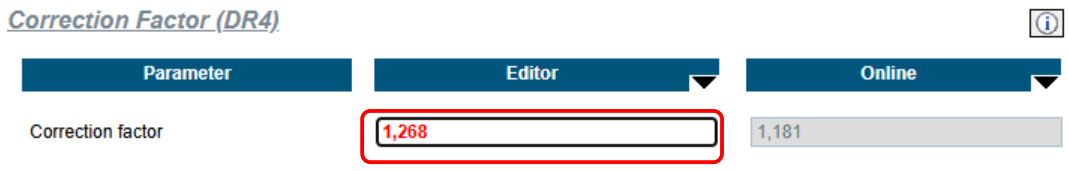
- Correction factor from 1st material test: 1.082
- Correction factor from 2nd material test: 1.156
- Correction factor from 3rd material test: 0.983

9th step:
The mean value is formed from the three individual correction factors, e.g.:
Correction Factor Mean = (1.082 + 1.156 + 0.983) / 3 = **1.074**

10th step:
The mean value calculated from the three individual correction factors is now multiplied by the existing correction factor from DR4, e.g.:
- old correction factor in DR4: 1.181
- Mean correction factor: **1.074**

New correction factor = 1.181 x 1.074 = **1,268**

The new factor must be entered in DR4 and send to the WP341:



Note:

It is recommended to do at least 3 material tests to check the reproducibility of the belt scale.

4.6.2 Material test with automatically calculated correction factor

The correction factor can also be determined automatically via the WP341.
To do this, proceed as follows:

1st step:
Switch on service mode

2nd step:
Start material test (= command 101)

3rd step:
Run a certain amount of material over the belt

4th step:
Stop material test (= command 102)

5th step:
In the DR36 you can see the material quantity (and belt loading) determined by the WP341:

Last material test		
Totalized weight	0,0 t	0,147879 t
Belt load	0,0 % * 11.11 kg/m	48,2897 % * 11.11 kg/m
Correction factor	0,0	1,014345
Stopwatch	20,1 s	20,1 s

6th step:
In DR14, enter the amount of material that has actually run over the belt under point 3:

Correction factor reference (DR14)

Parameter	Editor	Online
Refrence weight of material test	0,15 t	0,3 t

A correction factor is automatically determined in the DR36:



7th step:
Average correction factor (= command 103)
The correction factor is averaged in the DR36:



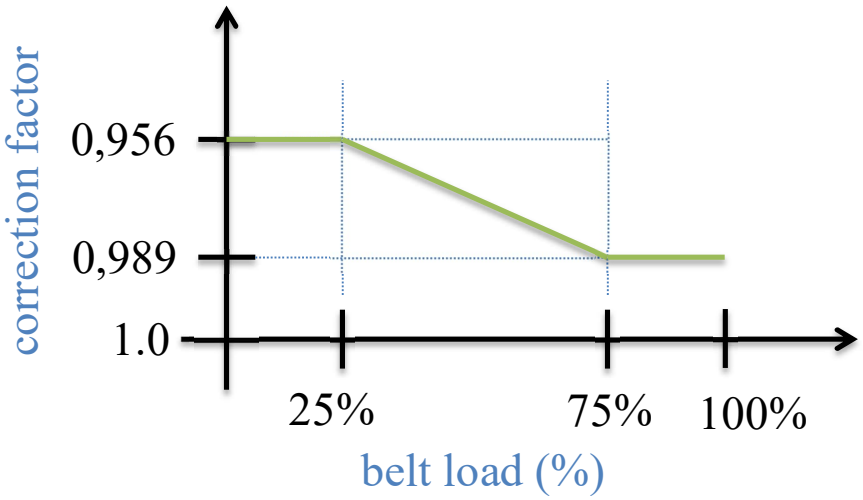
8th step:
Repeat points 1 - 7 above for two more material tests

9th step:
When the three material tests have been run, then execute the command "Accept correction factor (104)".

10th step:
Switch off service mode

Optional – Use the correction curve

To further increase system accuracy, you can determine a characteristic curve consisting of up to 3 pairs of values.
Assuming that the scale mechanics has different effects at different belt loads, a material test can be run at 25%, 50% and 75% of the load, for example. The 3 resulting correction factors can be stored in a characteristic curve with the associated percentage belt loads in DR05. Thus, the correction factor is automatically adjusted by the WP341 depending on the current belt load.



To do this, proceed as follows:

1. Start material test (= command 101)

2. Run a certain amount of material over the belt

3. Stop material test (= command 102)

4. In the DR36 you can see the material quantity (and belt loading) determined by the WP341:

5. In DR14, enter the amount of material that actually ran over the belt under point 2:



6. A correction factor is automatically determined in the DR36
7. Accept correction factor as correction curve point 1 (= command 105)
8. Redo the same procedure for a second and eventually a third correction factor

Accept correction factor as correction curve point 2 (106)
Accept correction factor as correction curve point 3 (107)

4.7 Step 7. Defining limits & I/O interfaces

In the last step of the commissioning, the limits and I/O interfaces need to be defined.

Limits

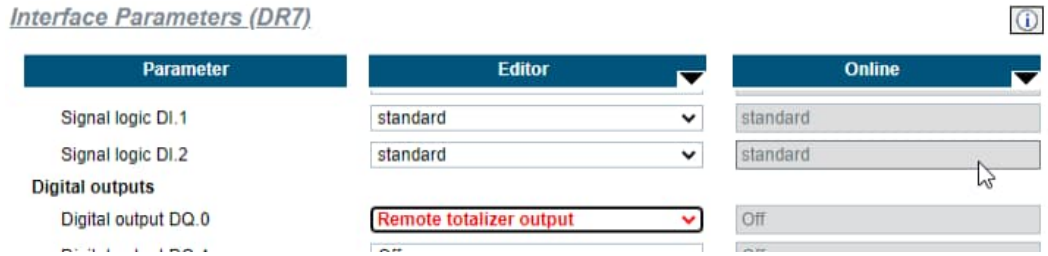
All limit settings are self-explanatory defined in DR6.

Limits (DR6)

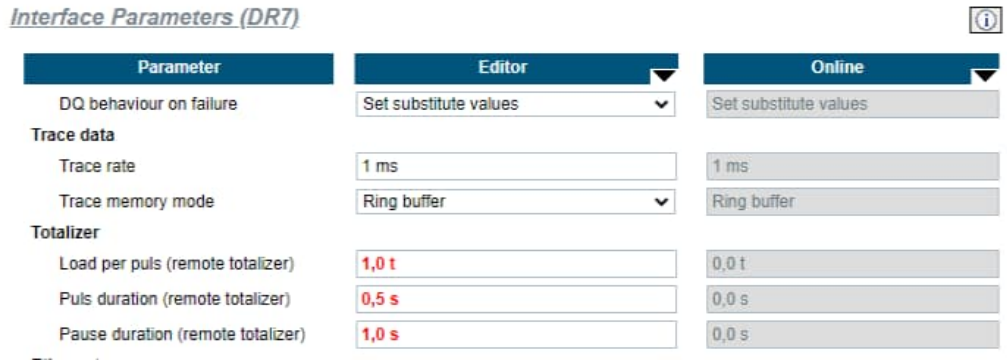
Parameter	Editor	Online
Maximum negative zero setting range	1,0 % * 11.11 kg/m	1,0 % * 11.11 kg/m
Maximum positive zero setting range	3,0 % * 11.11 kg/m	3,0 % * 11.11 kg/m
Minimum flow rate	20,0 % * 36.0 t/h	20,0 % * 36.0 t/h
Maximum flow rate	100,0 % * 36.0 t/h	100,0 % * 36.0 t/h
Delay time flow rate limits	1,0 s	1,0 s
Minimum belt speed	20,0 % * 0.9 m/s	20,0 % * 0.9 m/s
Maximum belt speed	100,0 % * 0.9 m/s	100,0 % * 0.9 m/s
Delay time belt speed limits	1,0 s	1,0 s
Minimum belt load	20,0 % * 11.11 kg/m	20,0 % * 11.11 kg/m
Maximum belt load	100,0 % * 11.11 kg/m	100,0 % * 11.11 kg/m
Delay time belt load limits	1,0 s	1,0 s
Minimum belt load for totalizing	4,0 % * 11.11 kg/m	4,0 % * 11.11 kg/m

Pulse signal for remote totalizer

A digital output of the WP341 can be used for sending pulse signals according a defined quantity of totalized material. First step is the definition of the quantity of material and the duration of the pulse signal in DR 7:



In addition, the desired material quantity and the pulse duration must be defined in DR7:



“Load per pulse” defines the quantity of material, after which a pulse signal is generated (e.g. 1t). The unit of the parameter depends on the selected unit of the flow rate (t, kg, T, TL or lbs).
“Pulse duration” defines the duration of the pulse high signal in seconds.

Contact

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