User Manual

IND360dynamic

Application software

METTLER TOLEDO

Table of Contents

1 Introduction 3
1.1 Overview 3
1.2 Enabling Dynamic application 4
1.3 Display and keypad 4
1.3.1 IND360 Panel and IND360 Harsh version 4
1.3.1.1 Display in In-motion weighing mode 4
1.3.1.2 Display in Static weighing mode 5
1.3.2 IND360 DIN Rail-mount version 6
1.3.3 Keypad, softkeys and symbols 7
1.4 Further information 8

2 Hardware installation 9
2.1 Wiring 9
2.2 Installation for in-motion weighing 10
2.2.1 Photoeye installation 10
2.2.2 Reject pusher installation 11
2.3 Static weighing installation 11
2.3.1 Weight trigger installation 11
2.3.2 Reject pusher installation 11

3 Application overview 12
3.1 Operating modes 12
3.1.1 In-motion catchweighing 12
3.1.2 In-motion checkweighing 14
3.1.3 Static weighing 16
3.2 Main menu and navigation 18
3.3 Automation system connectivity 19
3.4 Legal-for-trade configuration 20

4 Setup 21
4.1 Application -> Dynamic -> PAC 22
4.2 Application -> Dynamic -> General 22
4.3 Application -> Dynamic -> Weight Trigger 23
4.4 Application -> Dynamic -> Measurement setup 24
4.4.1 Parameter configuration 24
4.4.2 Photoeyes and trigger points 27
4.5 Application -> Dynamic -> Conveyor 29
4.6 Application -> Dynamic -> Compensation 30
4.7 Application -> Dynamic -> Re-zero 30
4.8 Application -> Dynamic -> Event and alarm 32
4.9 Application -> Dynamic -> Classification 32
4.10 Application -> Dynamic -> Statistics 33
4.11 Application -> Discrete I/O 33

5 Operation 35
5.1 Adjustment 35
5.2 Operating states and run mode 36
5.3 Automation interface 37
5.4 Alibi memory 37
5.5 EPrint 38

6 Signal Analyzer 39
6.1 Purpose of the Signal Analyzer 39
6.2 Operating/navigating the Signal Analyzer 40
6.3 Tuning a system using the Signal Analyzer 42

7 Troubleshooting 44
7.1 SMART5™ alarms ... 44
7.2 Error codes ... 44
7.3 Mechanical troubleshooting ... 45

8 Automation system connectivity 46
8.1 PLC sample code ... 46
8.2 Parameter verification ... 46
8.3 Getting started ... 46
8.4 Modbus RTU/TCP protocol ... 47
8.5 SAI protocol ... 51
8.5.1 Cyclic commands ... 51
8.5.1.1 Measuring block ... 51
8.5.1.2 Status block ... 52
8.5.2 Acyclic commands ... 56

9 Appendix 65
9.1 Configuration menu tree ... 65

1 Introduction

1.1 Overview

IND360dynamic is the optimal fit for your automated weighing needs delivering reliable weighing results including status information to your PLC/DCS. All weighing functionality including the handling of photoeyes and pushers for checkweighing can be handled by IND360dynamic, allowing you to reduce costs, complexity, and performance requirements on your PLC/DCS.

IND360dynamic supports catchweighing and checkweighing, both in-motion and statically.

Operating and weighing modes

Mode		Description
Operating mode	**Catchweighing**	Determine the weight of the object and report the weight to a higher-level system such as a PLC, DCS or PC.
	Checkweighing	Determine the weight and compare against given tolerances. IND360dynamic supports up to two minus tolerances and up to two plus tolerances.
Weighing mode	**In-motion**	Capture the weight in-motion (while the item is moving), for example while the item is moving on a conveyor belt.
	Static	Capture the weight while the object is at rest. Trigger weight capture and wait for a stable weight.

Features

IND360dynamic supports the following main features

- Static and in-motion weighing
- High speed processing of the weight signal with 480 Hz
- Multi-item processing maximizing the throughput on long conveyor belts
- Easy configuration through web interface and 4.3" color display (display not for DIN Rail Mount version)
- Built-in graphical setup and analysis tool with data export to Excel
- Checkweighing with over/under tolerances and configurable digital outputs
- Weighing trigger through light barrier (photoeye) or PLC
- Single photoeye or dual photoeyes mode
- Memory storage storing up to 8 Mio. entries for legal purposes and data export to Excel for analysis
- Legal for Trade OIML R51 approved
- Communication protocols: PROFINET, Profibus DP, EtherNet/IP, EtherCAT, CC-Link IE Field Basic, Modbus RTU/TCP
- PLC / DCS interface for parametrization and process monitoring
- Cyclical and acyclical PLC / DCS communication

1.2 Enabling Dynamic application

Before configuration and operation, please ensure that the Dynamic application is enabled. Follow the instructions below to enable the application on the IND360 indicator:

1 Long press the ePrint/Setup key.
   ➡ If the indicator is password protected, a login screen will display.
2 Enter a valid username and password. If no password is set, simply login by pressing the Enter key.
   ➡ The indicator will display the Setup screen with Scale selected and highlighted in blue.
3 Navigate to Application > PAC > PAC management.
4 Select Dynamic from the selection list and confirm selection by pressing the Enter key.
5 To exit the menu structure, press the Zero key several times until the screen displays "Save all Settings before exiting?".
6 Select YES and press the Enter key to accept all changes.
   ➡ The device will restart automatically.

➡ The application is now active and in idle mode. After configuration, switch to run mode to start weighing.

1.3 Display and keypad

1.3.1 IND360 Panel and IND360 Harsh version

The IND360 Panel and IND360 Harsh version offer a 4.3" TFT color display for visualization and configuration of device and application data.

1.3.1.1 Display in In-motion weighing mode

Display in In-motion weighing mode

1	IP address	IP address of the IND360 indicator service port (web interface)
2	Application setup	Graphical visualization of the weighing system. In this example: in-motion checkweighing, with front and rear photoeye.
3	Application status	Information about the application run status. In this example: application running and weight captured.
4	Softkeys	Refer to [Keypad, softkeys and symbols ▸ Page 7]
5	Target	Checkweighing target weight
6	Current weight	Current weight on the conveyor belt
7	Captured weight	The weight captured for the last item

8	Metrological information	Information about weighing range, resolution and approval
9	Date & Time	Current date and time

1.3.1.2 Display in Static weighing mode

Display in Static weighing mode

1	IP address	IP address of the IND360 indicator service port (web interface)
2	Application setup	Graphical visualization of the weighing system. In this example: static checkweighing, with target weight input.
3	Application status	Information about the application run status. In this example: application running and weight captured.
4	Softkeys	Refer to [Keypad, softkeys and symbols ▸ Page 7]
5	Current weight	Current weight on the conveyor belt
6	Captured weight	The weight captured for the last item
7	Metrological information	Information about weighing range, resolution and approval
8	Date & Time	Current date and time

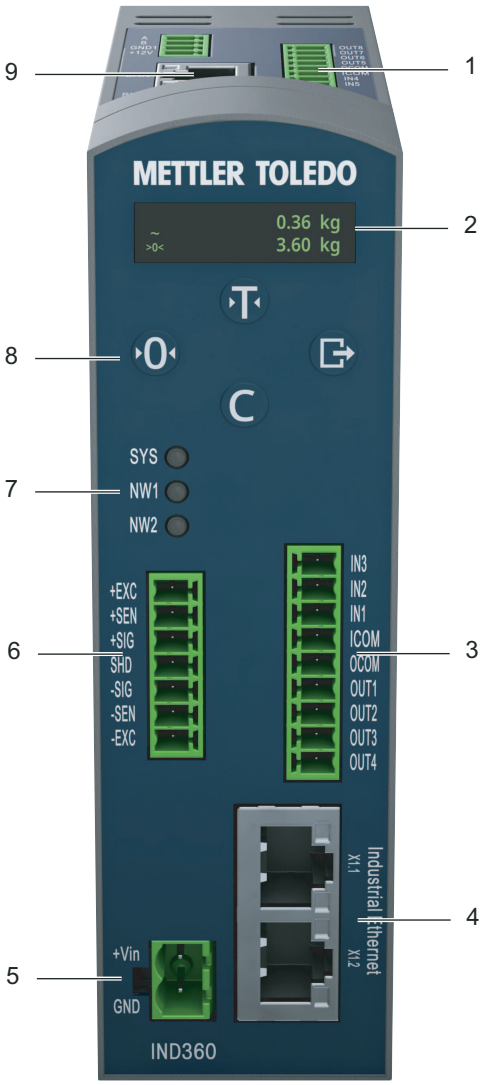
1.3.2 IND360 DIN Rail-mount version

The IND360 DIN Rail-mount version includes a keypad (4 push buttons) and a 1.04" OLED display.

The keypad is used for Zero, Tare, Clear and ePrint operations and cannot be used to edit application parameters.

The display shows the weight value only.

Application parameters have to be edited on the the web interface.



IND360 DIN Rail-mount

1	Discrete I/Os (IN4, IN5, OUT5..OUT8)	2	Weight display
3	Discrete I/Os (IN1...IN3, OUT1..OUT4)	4	Automation interface
5	DC power connection	6	Analog scale interface
7	LED status indicators	8	Keypad
9	Service port		

1.3.3 Keypad, softkeys and symbols

Keypad

Key		Name	Normal operation	Setup menu	Numerical values	List selection
DIN Rail-mount version	Panel and Harsh version					
		Tare	Tare	Up	Increase value	Previous item (up)
		Zero	Zero	Back / Exit	Select left digit	Exit parameter selection
		Clear	Clear	Down	Decrease value	Next item (down)
		ePrint/ Setup	ePrint (short press) Enter setup (long press)	–	Select right digit	–
–		Enter	Confirm selection	Enter to parameter selection / setup	Accept	Accept

Softkeys

Soft-key	Name	Function
	Information recall	Shows information of the indicator: model, serial number, software version, approval, PLC type, node address, DIO type, etc.
	Shortcut menu	Contains the most used settings.
	Run/Stop	Start and stop the application. While the application is in run mode, parameters cannot be changed.
	Expand readability	Increase weight readability on the display for 5 seconds. This functionality is typically used during verification in legal-for-trade setup.
	Normal condition	Device/application is operating normally.
	Predictive alarm	Routine test, calibration or preventative maintenance recommended.
	Out of specification	Wrong operator action or device/application is operating out of specification.
	Imminent failure	Wrong weight or equipment failure expected. Please contact the METTLER TOLEDO service.
	Failure	Significant error in the weight measurement due to a failure, such as a broken cable. This alarm indicates that the automation device must stop the weighing process and alert the maintenance department for corrective action. Please contact the METTLER TOLEDO service.

Application status icons

Icon	Name	Function
	Run	Dynamic application running.
	Stop	Dynamic application stopped.
	Complete	Weight captured.
	Scale empty	Indicates that there is no item on the scale. Detection is based on a configurable threshold.
	Pending re-zero	Re-zero operation is overdue based on time requirement (configurable).
	Light barrier	Indicates that the light barrier has been triggered. This is intended for functionality check only as there is a delay in reaction time on the display.

1.4 Further information

For more information, please refer to the following documentation available online on ▸ http://www.mt.com/ind-ind360-download:

- Dynamic application information
  - IND360dynamic data sheet
- Device information and drawings
  - IND360base data sheet
  - IND360base Indicator and Transmitter User's Guide
- PLC sample code for applications, refer to [PLC sample code ▸ Page 46]

2 Hardware installation

To install and ground the indicator refer to Appendix A, **Installation**, in the **IND360base Indicator and Transmitter User's Guide**.

Grounding performance of the equipment must be maintained in a good condition. Equipment grounding must be completed by a professional electrician. The METTLER TOLEDO Service Center offers supervision and consultation only.

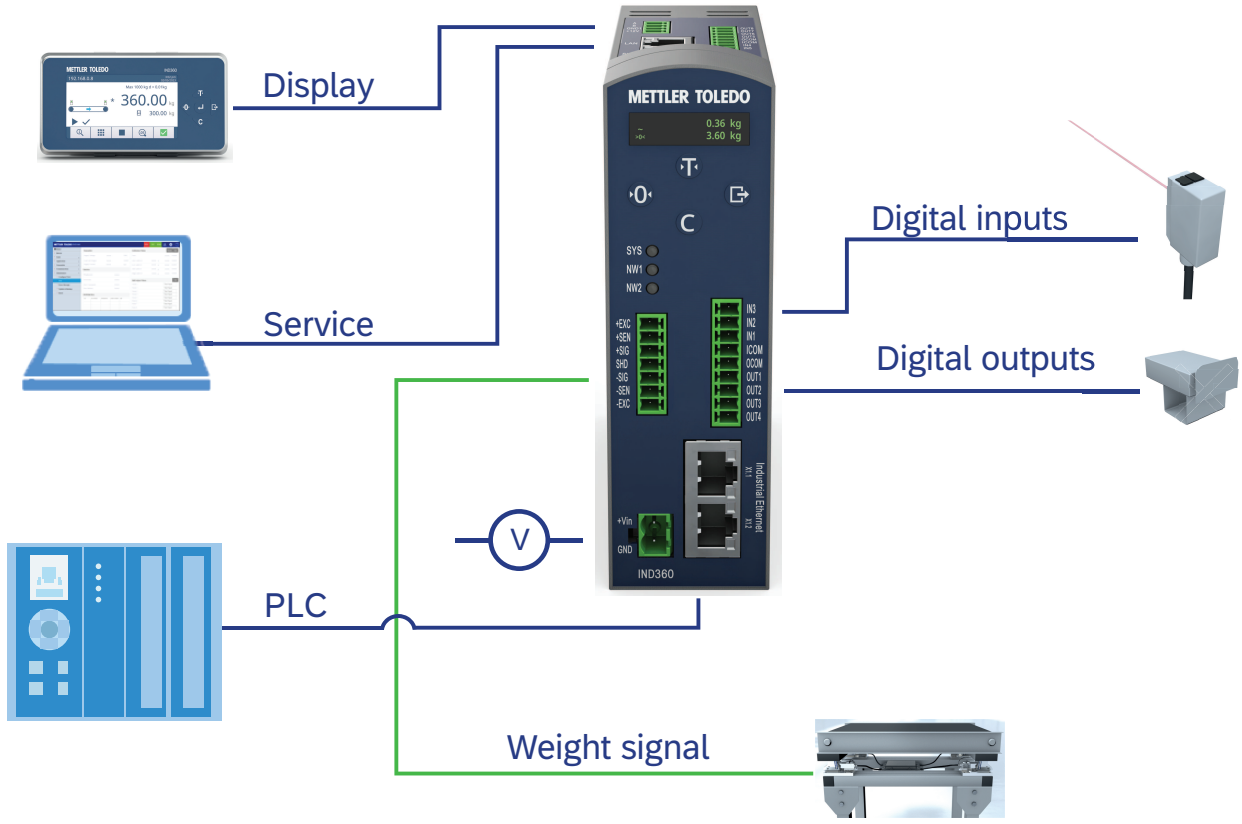
– Complete the grounding of all equipment (power supply unit, weighing display, and scale, etc.), in reference to the wiring diagrams of the equipment and based on the relevant national or local regulation requirements.

In this process, it is essential to make sure that:

- All equipment enclosures are connected at the same earth potential through grounding indicators.
- No current circulates through the cable shield of any conductors such as the load cell or scale.
- The neutral grounding point shall be as close to the weighing system as possible.

2.1 Wiring

Refer to the wiring chart below to connect the indicator with a dynamic weighing system.



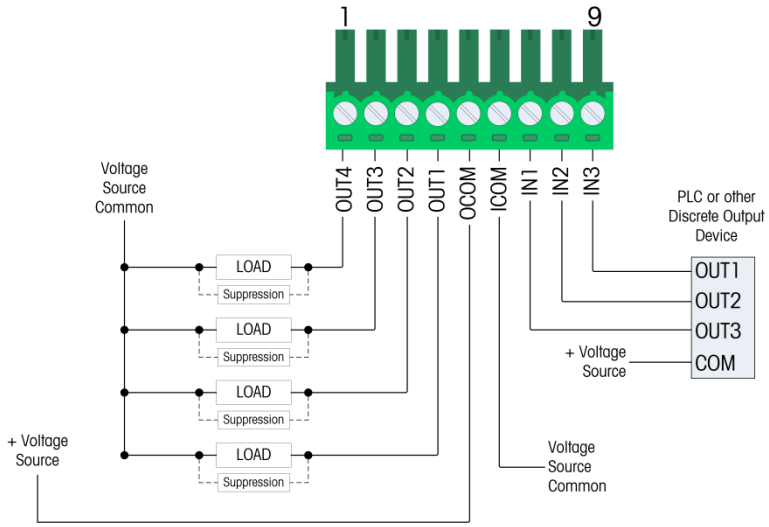
Wiring chart for a dynamic system

Performance considerations

Best performance, i.e. having a guaranteed reaction time, is achieved by connecting the IOs directly to the IND360.

Physical digital I/O connection

The digital I/O block must be attached to a common ground or voltage source+ to be operated. A typical setup is shown below, other combinations of sinking or sourcing input/output are possible as well.



Digital I/O connection

Note

For additional information about the digital I/Os refer to Appendix A, **Installation**, in the **IND360base Indicator and Transmitter User's Guide**.

2.2 Installation for in-motion weighing

2.2.1 Photoeye installation

When installing photoeye(s) note the following:

Wiring

As the timing is essential for fast and good weighing results, directly wire the photoeye(s) to the IND360. This provides the best reaction times with the least jitter.

The weighing operation can also be triggered through the automation network in case photoeyes are not desired.

Number of photoeyes

The advantage of a dual photoeye setup is that we know exactly when the item is entering and leaving the scale. This information is also visible on the signal analyzer for fine tuning and debugging. Using a rear or front photo eye only is also possible. The exact time when the object enters/leaves the scale needs to be determined based on the timing.

Position of the photoeyes

1 Position the photoeyes exactly at the entrance resp. exit of the conveyor belt.

2 Perform the fine tuning later via offsets in the software.

Dedicated re-zero photoeye

A dedicated re-zero photoeye provides direct control that the conveyor belt is empty instead of relying on thresholds. This is particularly useful for problematically shaped objects which could already enter the conveyor belt without triggering the photo eye at first.

Position the re-zero photoeye between 10 cm and 15 cm in front of the conveyor. The actual distance depends on the conveyor speed.

2.2.2 Reject pusher installation

When installing the reject pusher note the following:

1 Directly wire the reject pusher to the IND360 for a fast reaction and minimal jitter.

2 Configure the timing at the I/O control.

The results of the tolerance check are transmitted to the PLC as well. Therefore, it is possible that the PLC controls the reject pushers.

2.3 Static weighing installation

2.3.1 Weight trigger installation

In static weighing mode, the timing is less critical than in dynamic weighing mode.

The weighing operation can either be triggered by a digital input signal (e.g. photoeye) or the PLC.

2.3.2 Reject pusher installation

When installing the reject pusher note the following:

1 Directly wire the reject pusher to the IND360 for a fast reaction and minimal jitter.

2 Configure the timing at the I/O control.

The results of the tolerance check are transmitted to the PLC as well. Therefore, it is possible that the PLC controls the reject pushers.

3 Application overview

This section describes the IND360dynamic applications and the user interface.

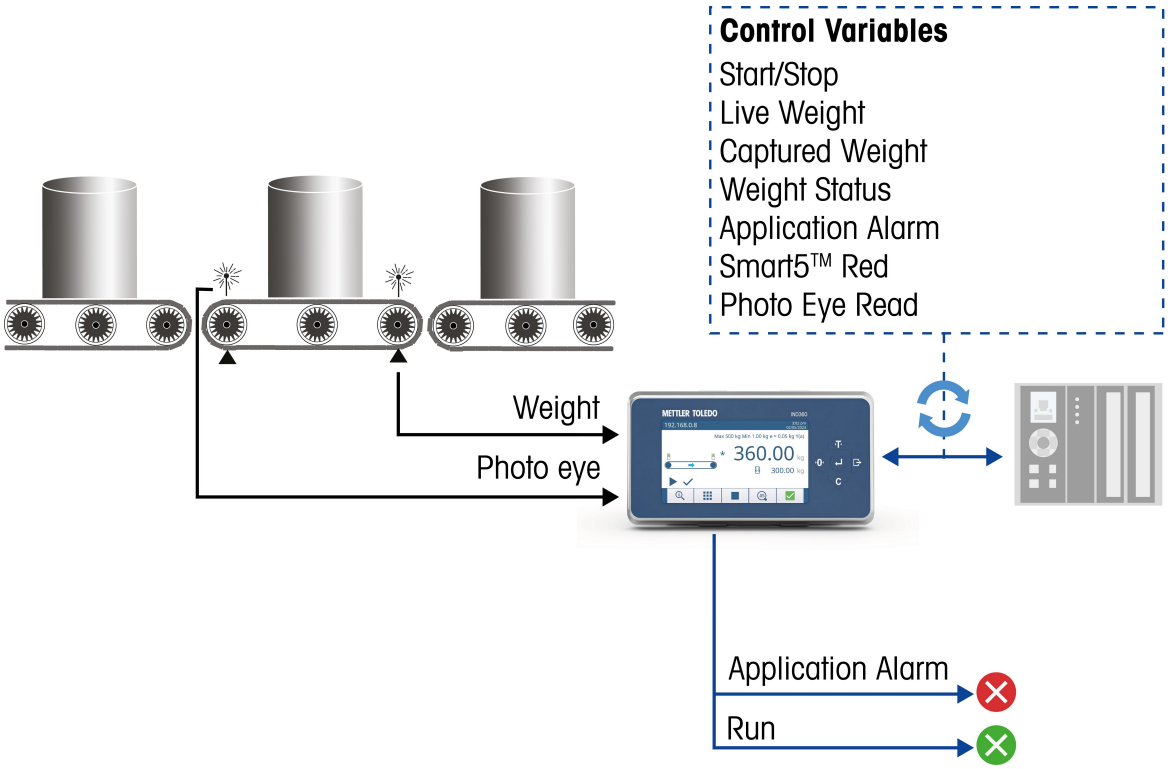
3.1 Operating modes

IND360dynamic offers four operating and weighing modes in total.

3.1.1 In-motion catchweighing

The objective is to determine the weight in-motion and transfer the result to a higher level system for further processing.

Example 1: Dual photoeyes triggering the weighing operation

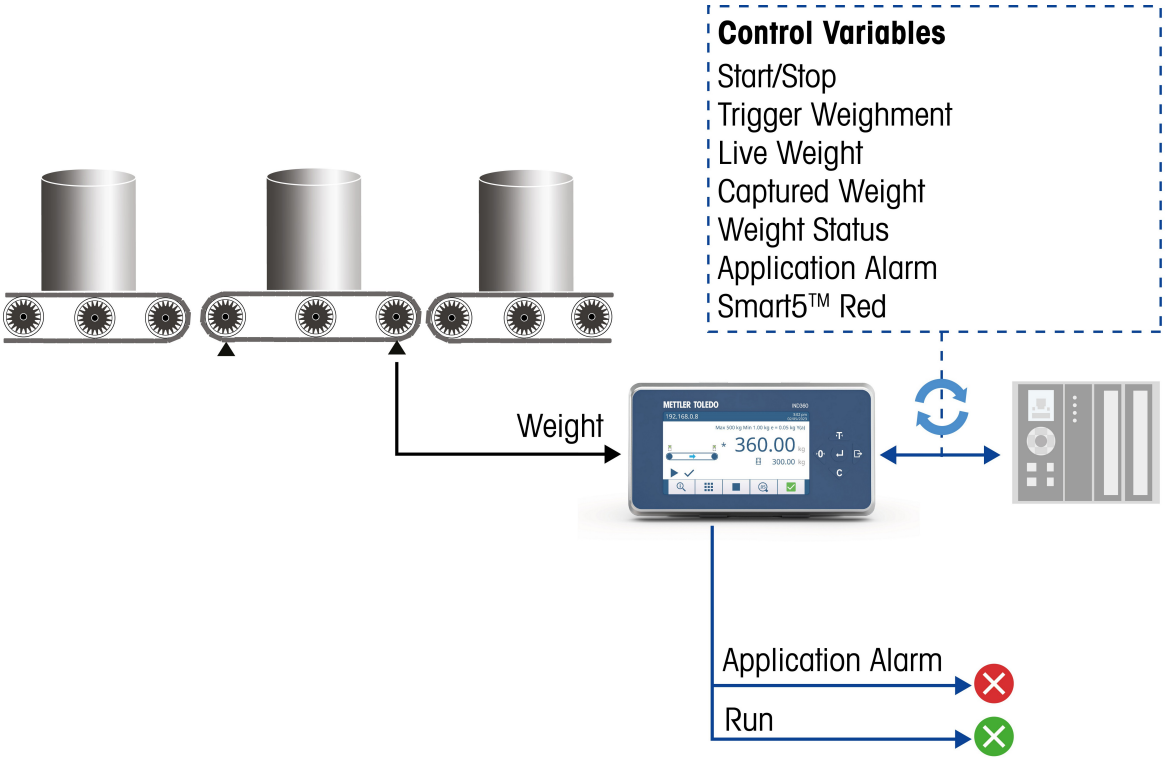


Example 1: Setup with two photoeyes: The front photoeye detects when the item is located completely on the scale while the rear photoeye detects the item leaving the conveyor belt.

The two photoeyes to trigger the weighing operation are connected directly to the input of the IND360.

This method provides the best reaction time, causes the least jitter and saves I/O space on the PLC. The live weight and photoeye status are continuously transmitted to the PLC. The resulting weight captured including status information is sent to the PLC once the weighing operation has been completed.

Example 2: PLC triggering the weighing operation



Example 2: The PLC sends the trigger signal (e.g. via the Industrial Ethernet interface).

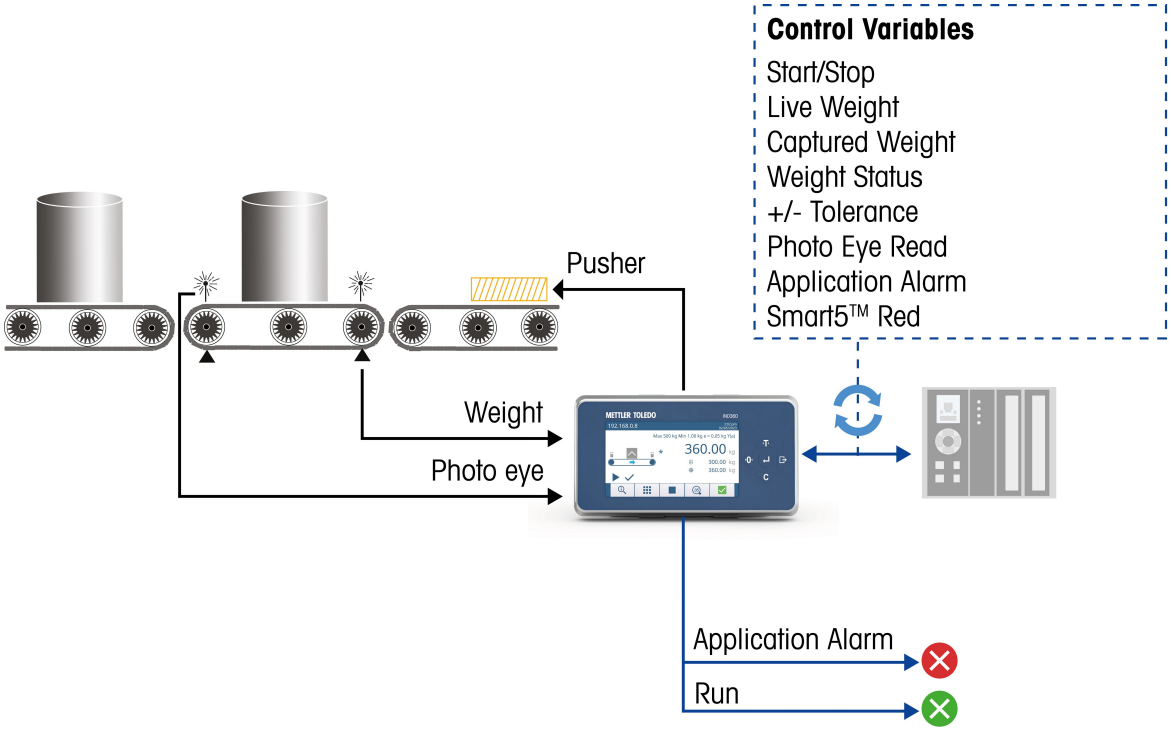
The PLC sends a command to trigger the weight capture in a similar way as the photoeyes.

This operating mode does not need photoeyes, simplifying the hygienic design, but requires that the PLC knows the position of the item. The live weight is continuously transmitted to the PLC and the resulting weight captured including status information is sent to the PLC once the weighing operation has been completed.

3.1.2 In-motion checkweighing

In contrast to catchweighing, the checkweighing mode also performs a tolerance check against up to two lower and up to two upper limits.

Example 1: Photoeyes and pusher controlled by IND360

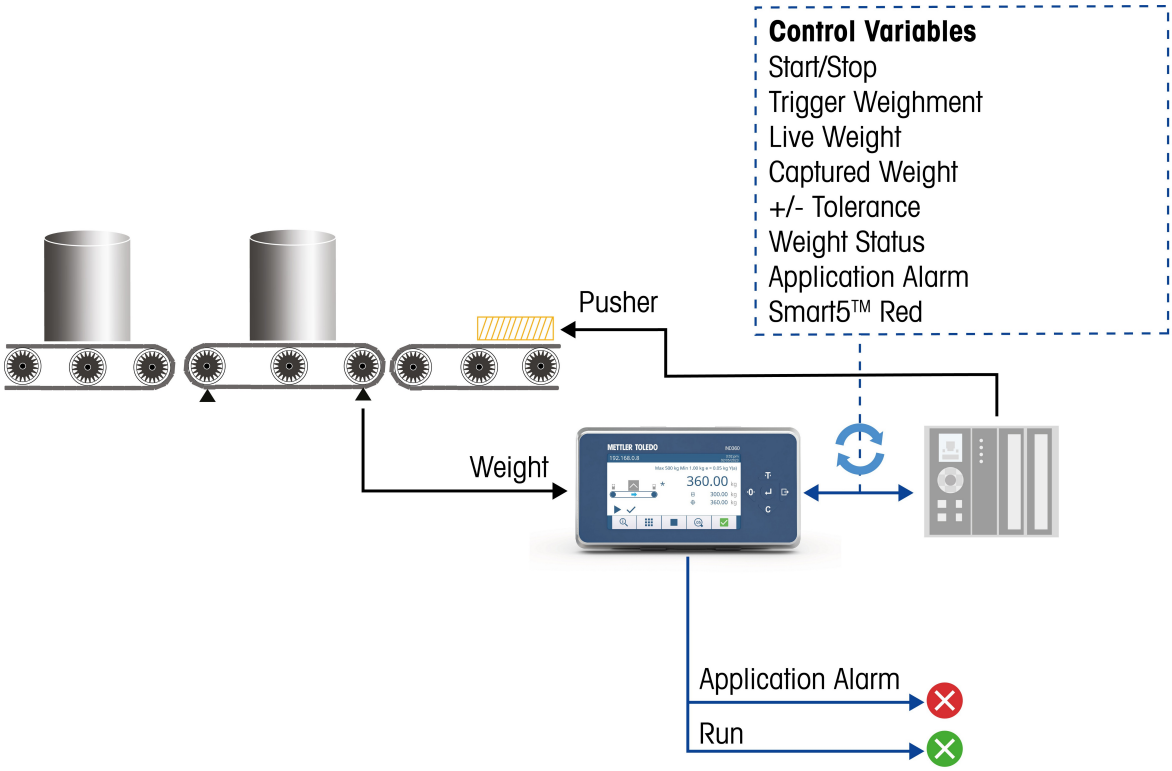


Example 1: IND360dynamic acting as a self-contained module handling weight determination, tolerance checking and activating the reject pushers, if needed. This is ideal in a distributed control environment.

The two photoeyes to trigger the weighing operation as well as the pushers are connected directly to the inputs and outputs of the IND360.

This method provides the best reaction time, causes the least jitter and saves I/O space on the PLC. The live weight and photoeye status are continuously transmitted to the PLC. The resulting weight captured, the tolerance and status information is sent to the PLC once the weighing operation is completed.

Example 2: Weight trigger and pusher controlled by PLC



Example 2: IND360dynamic performs the weighing operation in cooperation with the PLC, sending the trigger signal and activating the reject pushers.

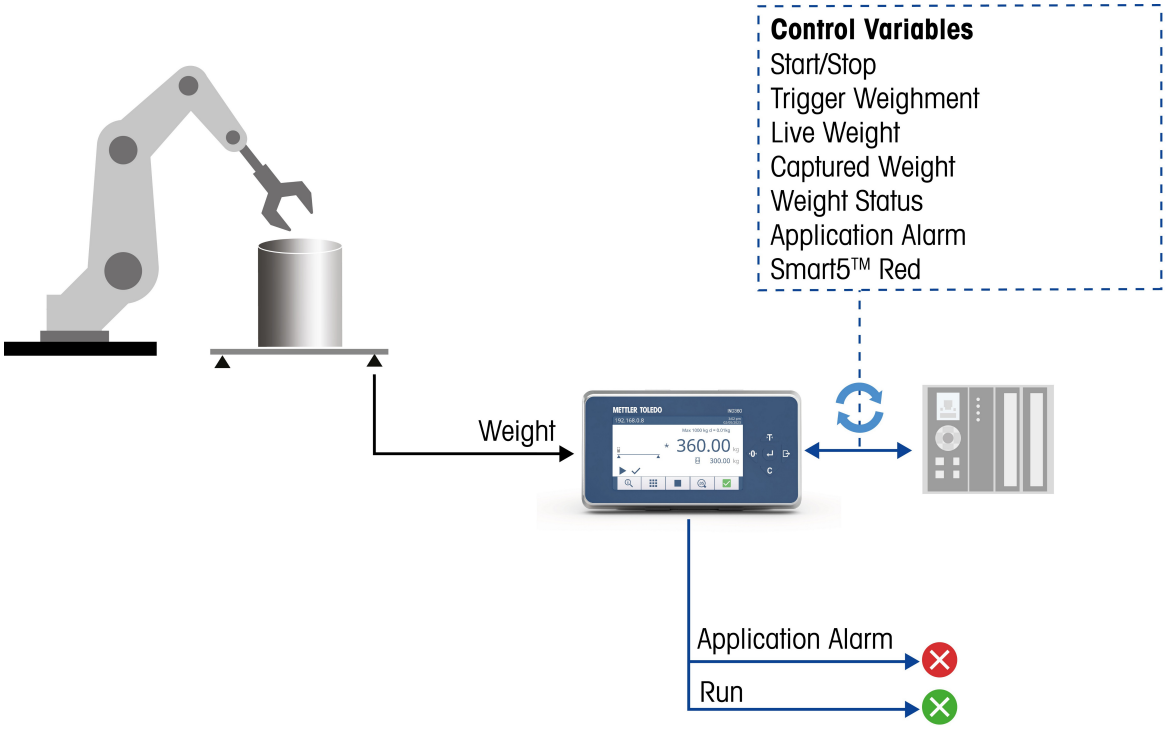
This operating mode does not need photoeyes, simplifying the hygienic design. Both the weight trigger and the pusher control require that the PLC knows the position of the item.

The PLC sends a command to trigger the weight capture in a similar way as the photoeyes. The pusher is controlled by the PLC based on the tolerance check results from IND360. The live weight is continuously transmitted to the PLC and the resulting weight captured, the tolerance and status information are sent to the PLC once the weighing operation is completed.

3.1.3 Static weighing

In static weighing, the weight is captured as soon as the weight signal stabilizes.

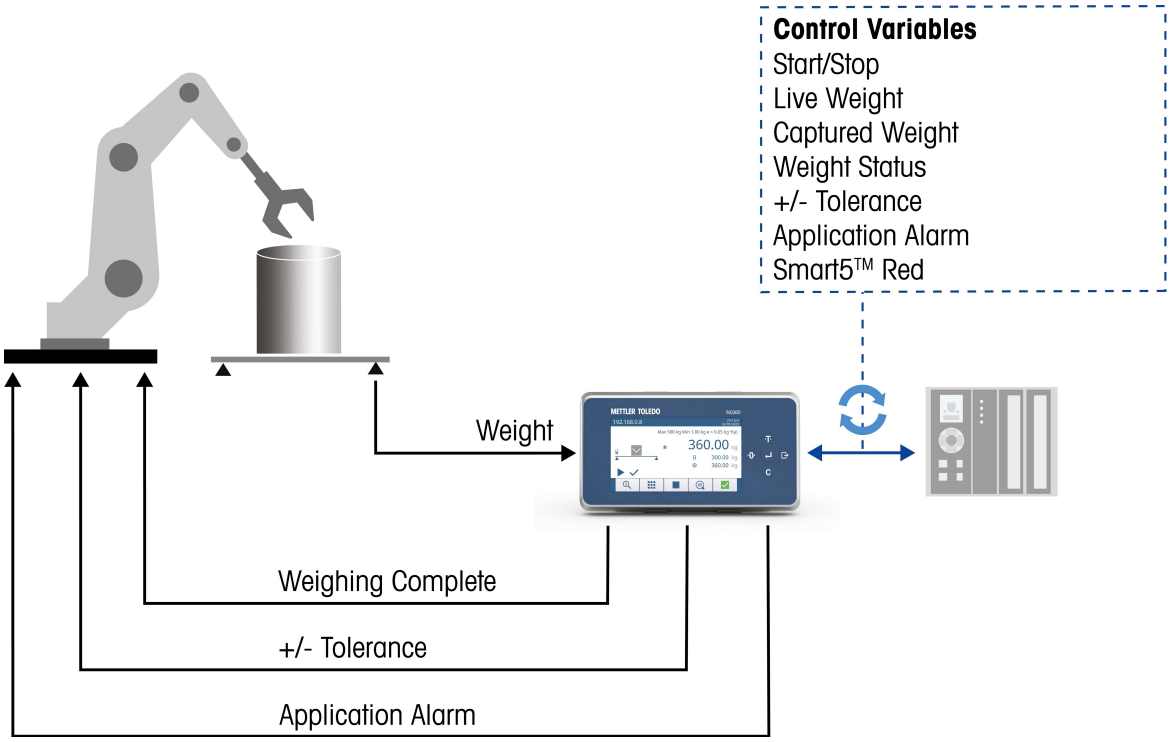
Example 1: PLC triggered catchweighing



Example 1: Static weighing setup where the PLC triggers the weighing operation.

The PLC sends a command to trigger the weight capture as soon as the item has been placed on the scale. The resulting weight captured including status information is sent to the PLC once the weighing operation has been completed.

Example 2: Self-contained checkweighing



Example 2: Autonomous checkweighing. The IND360 is operating as a self-contained module for weight determination and tolerance checking.

This setup demonstrates a self-contained, weight-based sorting machine. Higher level systems such as PLCs or PCs only read the result. A robot or another mechanical conveying system places an item on the scale triggering the weighing operation via the photoeye. Once the weighing operation has been completed, the result is transmitted to the robot using IND360's digital outputs.

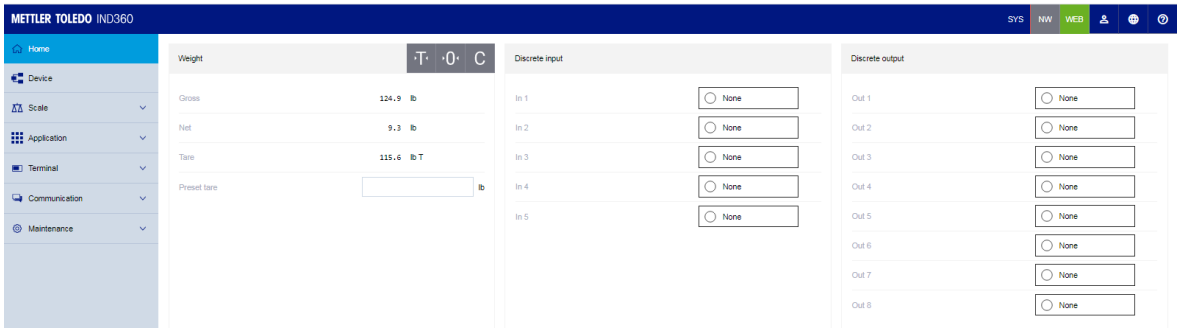
3.2 Main menu and navigation

This section gives an overview of the IND360dynamic menu.

The web interface is recommended as the main setup tool. Setup is also possible via the panel display. Many setup options are also available via the PLC, refer to [PLC sample code ▸ Page 46].

In this manual only the specific settings ofIND360dynamic are described. For general settings, e.g. Date & Time, refer to the **IND360base Indicator and Transmitter User's Guide**.

Home screen



Home screen

The home screen shows the current weight and the status of the discrete inputs/outputs.

The weight section offers options of taring, zeroing and clearing the tare weight.

Using this page, the discrete inputs/outputs can easily be checked, e.g. by holding your hand in front of a photoeye.

Setup overview

Main setup	Setup items	Description
Device	This setup page shows general device information, e.g. serial number, software version. In the Recall information window of the application the result of the last weighing series is shown.	
Scale	Under Scale setup, the weighing related parameters are configured such as scale capacity and increment, approval type, etc., refer to the **IND360base Indicator and Transmitter User's Guide**.	
Application	This is the setup for the IND360dynamic application and consists of the following setup items:	
	Alibi memory	Enable/disable the Alibi memory to record the captured weights. To export the Alibi log file go to the Maintenance menu, see below.
	Dynamic	This is the main setup for the IND360dynamic application where the parameters for dynamic and static weighing (operating mode, timing, measurement setup, ...) are set. The dynamic application setup is described in detail in section [Setup ▸ Page 21].
	Discrete I/O	Assignment of the discrete inputs and outputs.
	Signal analyzer	This is a graphical visualization to tune the system, refer to [Signal Analyzer ▸ Page 39].
	Reset	Reset the dynamic application parameters to factory defaults.
Terminal	This is the setup for device settings, e.g. Backlight, Date & Time, refer to the **IND360base Indicator and Transmitter User's Guide**.	

Main setup	Setup items	Description
Communication	This is the setup for the communication interfaces, refer to the **IND360base Indicator and Transmitter User's Guide**. Regarding the IND360dynamic application the setup item **Industrial Ethernet** is important.	
Maintenance	This setup is the same as for IND360base, refer to the **IND360base Indicator and Transmitter User's Guide**. Regarding IND360dynamic the following setup items can be relevant:	
	Configure/View	• Enable/disable logs • Export logs, e.g. Alibi log file
	Update & Backup	• Update the firmware • Backup system settings and logs

3.3 Automation system connectivity

IND360 connects to major automation systems.

- Ethernet based protocols are selectable on the web interface.
- For more details refer to the **IND360base Indicator and Transmitter User's Guide.**

Datapoints

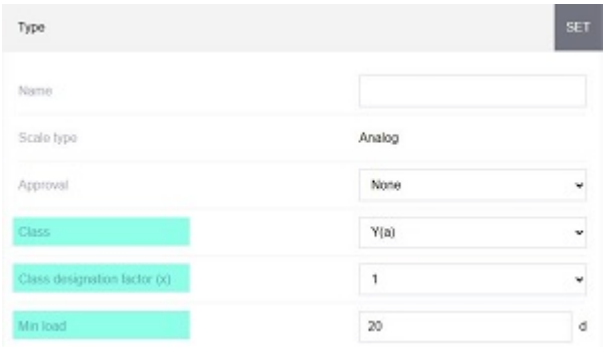
- IND360dynamic implements the METTLER TOLEDO Standard Automation Interface (SAI) for in-motion weighing.
- For selected PLC brands, a ready to use sample code and engineering notes are available on ▸ http://www.mt.com/ind360-downloads
- For the full list of instructions refer to chapter [Automation system connectivity ▸ Page 46].

3.4 Legal-for-trade configuration

IND360dynamic offers legal-for-trade configuration options specifically covering the requirements to operate as an Automated Weighing Device (AWI) following OIML R51.

These configurations are located under Scale -> Type, see also **IND360base Indicator and Transmitter User's Guide**.

Legal-for-trade configuration



Legal-for-trade setup

The configuration items relevant with respect to automated weighing are described in the table below.

Legal-for-trade setup items

Setup item	Setting	Description
Class	Y(a)	Category Y device for Catchweighing
	XIII	Category X device for Checkweighing
	III	Operation as non-automatic weighing device
Class designation factor (x)	0.01 ... 1	For class X devices only. The class designation factor is part of the equation to define the maximum permissible standard deviation.
Min. load	1... 9999 d	For class Y devices only. Defines the minimum load to be applied.

4 Setup

For the setup of the Dynamic application we recommend to use the web interface. All parameters can also be set on the panel display, the structure of the menu is similar to the web interface.

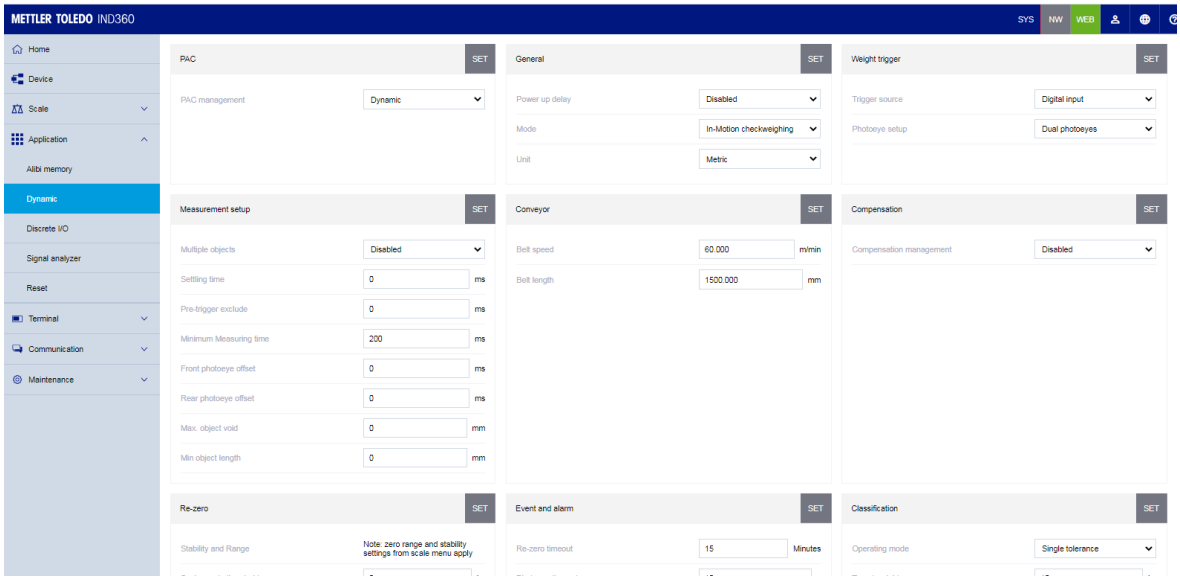
Application setup

The Application setup consists of the following main setup items:

Application setup overview

Setup item	Description	Reference
Alibi memory	Enabling the Alibi memory	**IND360base Indicator and Transmitter User's Guide**
Dynamic	Main setup of the IND360dynamic application	See below
Discrete I/O	Settings of digital inputs and outputs	[Application -> Discrete I/O ▸ Page 33]
Signal analyzer	Graphical visualization of the weight signal	[Signal Analyzer ▸ Page 39]

Overview of the Dynamic setup



The Dynamic setup consists of the following items:

Dynamic setup overview

Setup item	Description	Reference
PAC	Enabling the Dynamic application	[Application -> Dynamic -> PAC ▸ Page 22]
General	General application settings, e.g. operating and weighing mode	[Application -> Dynamic -> General ▸ Page 22]
Weight trigger	Trigger source and photoeye setup	[Application -> Dynamic -> Weight Trigger ▸ Page 23]
Measurement setup	Optimizing the measuring time	[Application -> Dynamic -> Measurement setup ▸ Page 24]
Conveyor	Conveyor belt settings	[Application -> Dynamic -> Conveyor ▸ Page 29]
Compensation	Compensate in-motion results to static results	[Application -> Dynamic -> Compensation ▸ Page 30]
Re-zero	Periodic re-zeroing due to dirt on the belt or in legal-for-trade applications	[Application -> Dynamic -> Re-zero ▸ Page 30]

Setup item	Description	Reference
Event and alarm	Conditions for events and alarms	[Application -> Dynamic -> Event and alarm ▸ Page 32]
Classification	Checkweighing settings, i.e target and tolerances	[Application -> Dynamic -> Classification ▸ Page 32]
Statistics	Clearing all statistic data	[Application -> Dynamic -> Statistics ▸ Page 33]

Note

In the following detailed setup description default settings are shown in **bold**.

Note

The available setup items depend on the selected operating and weighing mode (Dynamic -> General -> Mode).

4.1 Application -> Dynamic -> PAC

In this setup item the Dynamic application is activated.

PAC stands for "Application Package".

PAC settings

Setup item	Setting	Description
PAC management	**Dynamic**	Dynamic application enabled.
	Disabled	Dynamic application disabled, the device is working as an IND360base.

4.2 Application -> Dynamic -> General

General settings

Setup item	Description	Setting
Power up delay	**Warm up time** Power up delay is used to ensure that the scale has warmed up before starting the weighing operation, e.g. in Legal-for-trade applications.	**Disabled**
		5 minutes
		15 minutes
		30 minutes
Mode	**Operating and weighing mode** **Note** For a description of the operating and weighing modes refer to [Operating modes ▸ Page 12]. Changing the mode will clear the statistics.	**In-Motion checkweighing**
		In-Motion catchweighing
		Static checkweighing
		Static catchweiging
Unit	**Unit system for length data** Only available for in-motion weighing. **Note** The weight unit is defined under Scale -> Capacity & Increment.	**Metric**
		Imperial

4.3 Application -> Dynamic -> Weight Trigger

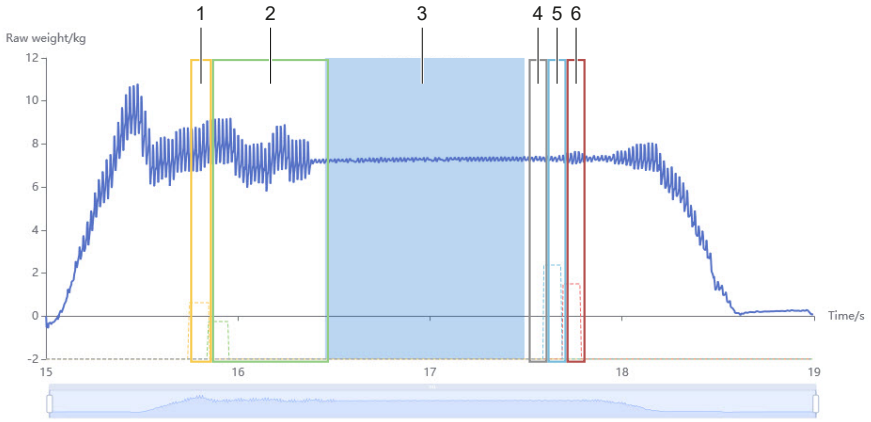
Weight Trigger settings - overview

			Weighing mode	
Setup item	**Description**	**Setting**	**Static**	**In-motion**
Trigger source	**Source of the signal initiating a weighing operation**	Automation interface	x	x
		Digital input		
Photoeye setup	**Number of photoeye(s)**	**Dual photoeyes**		x
		Single photoeye		
Photoeye position	**Position of the photoeye** Only available if Photoeye setup = Single photoeye	**Front**		x
		Rear		

Weight Trigger settings - background information

Setup item	Setting	Explanation
Trigger source	Automation interface	Trigger for the weighing operation, e.g. via ProfiNet / Ethernet IP
	Digital input	Trigger for the weighing operation, e.g. via photoeye or PLC sending a signal to the digital input of the IND360
Dual photoeyes mode		**Advantages of Dual photoeyes mode compared to Single photoeye mode** • Easier to analyze the signal and to tune the system because it is exactly known when the item is coming on the conveyor and when it is leaving the conveyor. • Both, Pre-trigger exclude time and Settling time can be determined. • Enables Multiple objects mode. • Enables to determine the exact point in time when the conveyor belt is empty during re-zeroing. • Flexible measuring time option helps to determine the optimum measuring time, e.g. for a very long and a very short item.
Single photoeye mode	Front/Rear	**Front photoeye** Using a front photoeye, the system can detect errors such as "Gap too small" or "Item too long" and flag the measurement accordingly. **Rear photoeye** Once the item hits the rear photoeye, the item is already stable and we calculate backwards from a stable weight. However, as the weighing operation has already been completed, the system cannot detect conditions such as "Gap too small". **Note** Multiple objects mode is not supported with Single photoeye mode.

4.4 Application -> Dynamic -> Measurement setup



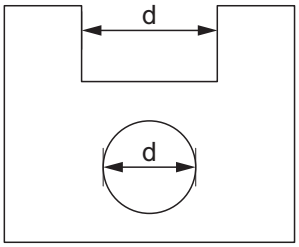
Measurement setp for Dynamic weighing modes and Dual photoeyes mode

1	Front photoeye offset	2	Settling time
3	Measuring time	4	Pre-trigger exclude
5	Rear photoeye offset	6	Rear photoeye triggered

4.4.1 Parameter configuration

In-motion weighing – dual photoeyes measurement settings

Setup item	Description	Setting
Multiple objects	Allows up to three objects on the conveyor belt at the same time and is still able to determine individual objects. This mode is intended to handle a mix of short and long items. This increases the throughput because the spacing between the objects can be optimized. This mode is not intended to handle a stream of short items with always multiple items on the conveyor. The longer the stream of short items, the higher the measurement uncertainty. We recommend Trigger source = Digital input because the timing needs to be very precise. It is essential that the photoeyes are well positioned and a fine tuning with the photoeye offsets might be necessary.	**Disabled** / Enabled
Settling time	This part is excluded from the measurement.	**0 ms** ... 3000 ms
Pre-trigger exclude	Time to be excluded before the rear photoeye is reached, e.g. because there are disturbances before the item is leaving the conveyor. Not available when Multi objects mode is enabled.	**0 ms** ... 3000 ms

Setup item	Description	Setting
Minimum Measuring time	An alert is sent when the measuring time is below the set minimum measuring time, e.g. because the object was too long. The longer the measuring time, the more precise the captured weight value. The longer the object, the less measuring time is available. This parameter is only applicable if flexible measuring time is selected.	0 ms ... **200 ms** ... 10,000 ms
Front photoeye offset	Correcting a non-perfect physical positioning of the photoeye. The photoeye can be shifted to the perfect position by applying an offset. This way the the exact point in time when the object enters the conveyor belt can be determined. For more information refer to [Photoeyes and trigger points ▸ Page 27].	-1500 ms ... **0 ms** ... 1500 ms
Rear photoeye offset		-1500 ms ... **0 ms** ... 1500 ms
Max. object void	This setting determines how long a hole or a gap (d) in the object can be so that it is still recognized as a single object and not as two objects. The photoeye needs a minimum time to work uninterruptedly in order to detect two objects vs. one object. Knowing the belt speed, the application calculates the minimum release time to distinguish one vs. two objects. 	**0 mm** ... 10,000 mm resp. **0 in** ... 10,000 in
Min. object length	This is the minimum length of an object so that the system is able to detect it as an object to be weighed and distinguish it from an unintended trigger. Using the conveyor belt speed, the device internally calculates the timing behavior.	**0 mm** ... 10,000 mm resp. **0 in** ... 10,000 in

In-motion weighing – single photoeye measurement settings

		Position		
Setup item	**Description**	**Front**	**Rear**	**Setting**
Measuring time mode	Using a flexible measuring depending on the object length or a fixed measuring time.	x		**Flexible** / Fixed
Measuring time	Setting the measuring time. Applicable to fixed measuring time only.	x	x	0 ms ... **300 ms** ... 12,000 ms
Settling time	The object entering the conveyor belt causes disturbances to the weighing signal. The settling time is the time the object needs to stabilize on the conveyor belt. This part is excluded from the measurement.	x		**0 ms** ... 3000 ms

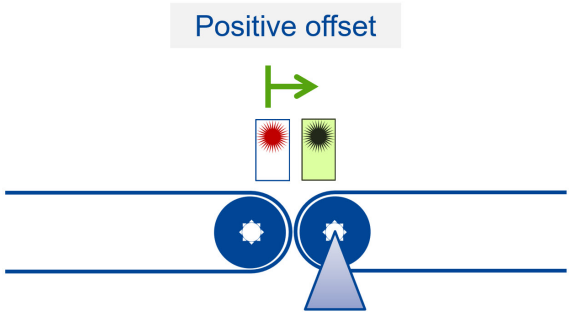
		Position		
Setup item	**Description**	**Front**	**Rear**	**Setting**
Pre-trigger exclude	Measuring time to be excluded before the rear photoeye is reached, e.g. because there are disturbances before the item is leaving the conveyor belt. With a front photoeye only and a flexible measuring time, the pre-trigger exclude is calculated from a virtual rear photoeye. The position of the virtual rear photoeye is determined using the belt speed and belt length. For more information refer to [Photoeyes and trigger points ▸ Page 27].	x	x	**0 ms** ... 3000 ms
Minimum Measuring time	The measurement is flagged as "object too long" when the measuring time is below the set minimum measuring time. The longer the measuring time, the more precise the captured weight value. The longer the object, the less measuring time is available.			0 ms ... **200 ms** ... 10,000 ms
Front photoeye offset	Correcting a non-perfect physical positioning of the photoeye. The photoeye can be shifted to the perfect position by applying an offset. This way the the exact point in time when the object enters the conveyor belt can be determined. For more information refer to [Photoeyes and trigger points ▸ Page 27].	x		-1500 ms ... **0 ms** ... 1500 ms
Rear photoeye offset			x	-1500 ms ... **0 ms** ... 1500 ms
Max. object void	This setting determines how long a hole or a gap in the object can be so that it is still recognized as a single object and not as two objects. The photoeye needs a minimum time work uninterruptedly in order to detect two objects vs. one object. Knowing the belt speed, the application calculates the minimum release time to distinguish one vs. two objects. For an example refer to the Dual photoeyes mode.	x	x	**0 mm** ... 10,000 mm resp. **0 in** ... 10,000 in
Min. object length	This is the minimum length of an object so that the system is able to detect it as an object to be weighed and distinguish it from an unintended trigger. Using the conveyor belt speed, the device internally calculates the timing behavior.	x	x	**0 mm** ... 10,000 mm resp. **0 in** ... 10,000 in

Static weighing – measurement setup

Setup item	Description	Setting
Capture weight offset	When the signal is triggered and the item is not yet on the scale an offset is required before capturing the weight.	-12,000 ms ... **0 ms** ... 12,000 ms
Min. trigger time	The trigger signal has to be active for a certain span of time before initiating the weighing operation. Recommended for Trigger source = Digital input, e.g. a light barrier, otherwise it can be 0 ms.	**0 ms** ... 12,000 ms
Trigger debouncing time	The photoeye needs a minimum time to be non-interrupted in order to detect two objects vs. one object.	**0 ms** ... 12,000 ms
Stability timeout	In a very harsh environmont it might occur that the weight signal does not stabilize. Instead of waiting forever, after the set stability timeout a weight is captured even if it is unstable. The unstable weight is marked.	**0 ms** ... 120,000 ms 0 ms = no timeout, i.e. waiting forever

4.4.2 Photoeyes and trigger points

This subsection outlines the relationship between different events, such as detecting an item entering/leaving the conveyor or triggering a pusher, and the corresponding photoeye signal. In most cases, an offset does not need to be configured (offset = 0), and the shifted photoeye will be equivalent to the physical photoeye. However, when using the photoeye offset, the resulting shifted photoeye will serve as a new reference point for certain actions and calculations.



Front photoeye

In front photoeye mode, IND360dynamic calculates the position of the virtual rear photoeye to determine when the item is leaving the conveyor.

Calculations

Shifted front photoeye = Physical front photoeye + Offset

Virtual rear photoeye = Shifted front photoeye + (Belt length) / (Belt speed)

Front photoeye event triggers

Event	Physical front photoeye	Shifted front Photoeye	Virtual rear photoeye
Detect items coming onto the conveyor		x Rising edge	
Settling time reference point (time 0)		x Rising edge	
Weight captured, calculate and transmit result (flexible measuring time only)			x Rising edge
Reference point (time 0) for digital output signal delay (e.g. reject pusher)	x Rising edge		

Rear photoeye

In rear photoeye mode, there is no concept of a virtual photoeye.

Calculation

Shifted rear photoeye = Physical rear photoeye + Offset

Rear photoeye event triggers

Event	Physical rear photoeye	Shifted rear Photoeye
Detect items leaving the conveyor		x Rising edge
Weighing completed and transmitting result		x Rising edge
Reference point (time 0) for digital output signal delay (e.g. reject pusher)	x Rising edge	
Pre-trigger exclude reference point (time 0)		x Rising edge

Dual photoeyes

The dual photoeyes mode is a combination of front photoeye and rear photoeye mode.

Calculations

Shifted front photoeye = Physical front photoeye + Offset

Shifted rear photoeye = Physical rear photoeye + Offset

Virtual rear photoeye = Shifted front photoeye + (Belt length) / (Belt speed)

Dual photoeyes event triggers

Event	Physical front photoeye	Shifted front Photoeye	Physical rear photoeye	Shifted rear photoeye
Detect items coming onto the conveyor		x Rising edge		
Settling time reference point (time 0)		x Rising edge		
Detect items leaving the conveyor				x Rising edge
Weight captured, calculate and transmit result (flexible measuring time only)				x Rising edge
Reference point (time 0) for digital output signal delay (e.g. reject pusher)			x Rising edge	
Pre-trigger exclude reference point (time 0)				x Rising edge

4.5 Application -> Dynamic -> Conveyor

Conveyor settings

Setup item	Description	Range
Belt speed	Speed of the conveyor belt	0 m/min ... **60 m/min** ... 10,000 m/min resp. 0 feet/min ... **60 feet/min** ... 10,000 feet/min
Length	Length of the conveyor belt	0 mm ... **1500 mm** ... 10,000 mm resp. 0 in ... **1500 in** ... 10,000 in

Note

These parameters are necessary to calculate Min. object void and Min. object length as well as timing parameters, refer to [Application -> Dynamic -> Measurement setup ▸ Page 24].

4.6 Application -> Dynamic -> Compensation

When weighing relatively big and light objects there might be a difference in static and dynamic weighing results, e.g. because of the air flow around the moving object.

The Compensation management serves to compensate for this effect.

Procedure

1 Ensure that Compensation management is disabled.
2 Select up to 5 samples covering your typical weighing range.
3 Weigh the samples statically and note the results.
4 Weigh the samples dynamically and note the results.
5 Enable Compensation management.
6 Enter the static results in the fields Static weight 1 to Static weight 5.
7 Enter the dynamic results in the fields Dynamic weight 1 to Dynamic weight 5.

➡ IND360dynamic will compensate the difference in static and dynamic results so that the dynamic result will be compensated to the static result.

Example

Compensation settings

Compensation	Static weight	Dynamic weight
Disabled	2.00 kg	1.90 kg
Enabled	2.00 kg	2.00 kg

4.7 Application -> Dynamic -> Re-zero

Conveyor belts need to be re-zeroed periodically, e.g. because dirt accumulates on the belt and it is a requirement in legal-for-trade applications. For re-zeroing it has to be ensured that no items are on the conveyor.

Re-zero settings

Setup item	Setting	Range	Explanation
Stability and Range			**Note** For zeroing it is essential that the weight is marked as stable, i.e. within the defined stability tunnel. What is detected as stable for re-zeroing is set in the Scale menu (Scale -> Filter & Stability, sub items Motion range, No-motion interval, Timeout), see **IND360base Indicator and Transmitter User's Guide**.
Scale empty threshold		**0** to max. capacity	This is the threshold to determine when the scale is empty to trigger the re-zero operation. This ensures that no items are on the conveyor belt when waiting for a stable re-zeroing signal.

Setup item	Setting	Range	Explanation
Re-zero trigger	**External only**		Triggering re-zeroing via a PLC or digital input. The re-zero will be triggered on the positive flank of the input signal. The zero calculation is done backwards in time, i.e. the measurement data from previous weighing operations is taken into account to check the empty threshold and calculate the zero point. This means that the scale has to be empty and in a stable state for at least 1 second before sending the re-zero signal. **Note** This is particularly relevant for the initial re-zero after starting a weighing conveyor. The motor and belt have a ramp-up time during which the weight signal is not stable enough to conduct a zero operation. The re-zeroing shall be conducted once the system is fully running and in a steady state.
	Periodic		Triggering re-zeroing periodically, e.g. every 300 seconds.
	Period	0 s … **300 s** … 7200 s	Period after which the next re-zeroing operation will be triggered. After the timer expires, the IND360 will check the Scale empty threshold.
	After trigger delay	1 ms … **3000 ms** … 20,000 ms	When an empty scale is detected, there will be a delay to ensure that the scale stays empty before executing the re-zero command.
	Re-zero photoeye		Triggering re-zeroing via a photoeye mounted 10 to 15 cm in front of the conveyor belt. When the conveyor is started, a dead time of 15 seconds is set to allow the system to start up and stabilize. After this, a re-zeroing operation is triggered. During operation, the re-zero photoeye starts an internal timer of 15 seconds. Each item passing the re-zero photoeye resets this timer to 15 seconds. If there is a continuous flow of objects to be weighed, the timer will never expire, and the re-zero setting instruction will not be sent. Only a gap between objects longer than 15 seconds will allow the timer to expire, triggering a re-zero operation. Once the timer expires, a re-zeroing operation is triggered and the timer is restarted.

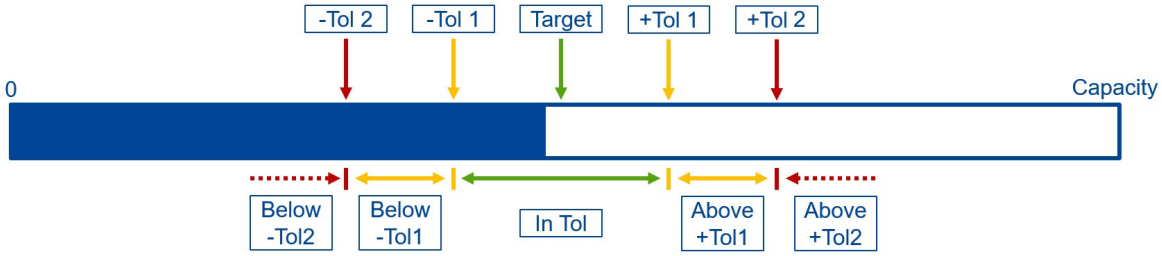
4.8 Application -> Dynamic -> Event and alarm

Event and alarm settings

Setup item	Description	Range
Re-zero timeout	If no re-zeroing was possible during this time frame, the display indicates the expired re-zero using the star symbol and weight values recorded in the memory are flagged.	0 min ... **15 min** ... 120 min
Photoeye timeout	If a photoeye is blocked longer than the set timeout, a SMART5™ yellow alarm becomes active.	0 s ... **10 s** ... 3600 s
Upper limit	Max. weight of the items. If the upper limit is exceeded, this status information is sent to the automation system and also available as digital output signal. This feature is often used to detect items which are too heavy potentially causing damage to equipment mounted further downstream.	**0** ... max. capacity

4.9 Application -> Dynamic -> Classification

Classification is only available with In-Motion checkweighing mode or Static checkweighing mode.



Classification settings

Setup item	Description	Setting
Operating mode	Classification working relative to a target weight with one plus and one minus tolerance.	**Single tolerance**
	Classification working relative to a target target weight with two plus and two minus tolerances.	Dual tolerance
Target weight	Target weight against which the weighing samples will be checked.	0 ... max. capacity
-Tolerance2	Only available in Operating mode = Dual tolerance. Second lower tolerance value as deviation from the target. Note that -Tolerance2 > -Tolerance1	**0** ... max. capacity 0: -Tolerance2 not active
-Tolerance1	Lower tolerance value as deviation from the target	0 ... max. capacity
+Tolerance1	Upper tolerance value as deviation from the target	0 ... max. capacity
+Tolerance2	Only available in Operating mode = Dual tolerance Second upper tolerance value as deviation from the target Note that +Tolerance2 > +Tolerance1	**0** ... max. capacity 0: +Tolerance2 not active

4.10 Application -> Dynamic -> Statistics

This setup item allows to clear all statistic data.

1 Click RESET.
   ➡ A safety prompt is displayed.
2 Confirm clearing all statistic data with OK.

4.11 Application -> Discrete I/O

Setup of the discrete inputs and outputs

1 Select Application -> Discrete I/O.
   ➡ The current assignments of the discrete inputs 1 … 5 and the discrete outputs 1 … 8 are displayed.
2 Select an input or output and open the Assignment drop-down list.
   ➡ The full lists of possible inputs and outputs are displayed, independent of the settings under Application -> Dynamic.
3 Assign a signal to the selected input or output. If required, make additional settings to the input or output.

Note

When assigning a signal to an input or output make sure that this signal is not already used for another input/ output.

Assignment of Discrete inputs 1 ... 5

Assignment	Setting		Description
None			Input not assigned
Run/Stop			Start or stop the Dynamic application. Pulse signal triggered on high level. Run: Application active and capturing the weight. The weighing results will be recorded in the Alibi memory, if activated. Stop: Application in idle state. The current weight is shown but the captured weight will not be updated.
Front photoeye	Trigger mode	**High level**	Trigger the front photoeye at the high level of the signal.
		Low level	Trigger the front photoeye at the low level of the signal.
Rear photoeye	Trigger mode	**High level**	Trigger the rear photoeye at the high level of the signal.
		Low level	Trigger the rear photoeye at the low level of the signal.
Re-zero	Trigger mode	**High level**	Trigger the re-zero photoeye at the high level of the signal.
		Low level	Trigger the re-zero photoeye at the low level of the signal.
Reverse			As long as the signal is on, the conveyor belt is running backwards and no weight will be captured. **Note** Before switching from "on" to "off", make sure that no item is on the conveyor belt. Otherwise the first item my be reportet as "Ghost item".

Assignment of Discrete outputs 1 ... 8

Assignment	Description	Output settings
None	Input not assigned.	
Run	Output is on when the system is running.	
Ready	Output is on when the system is ready to run.	
Smart5 red	Output is on when there is a SMART5™ red alarm.	

Assignment	Description	Output settings
Smart5 orange	Output is on when there is a SMART5™ orange alarm.	
Application alarm	Output is on when there is an Application alarm, e.g. application configuration not consistent.	
Scale loaded	Output is on when the scale is loaded.	
Re-zero timeout	Output is on when the re-zero timeout is elapsed.	
Weighing completed	When an item has been completely processed, the output will be on.	Impulse length
In Tolerance	In checkweighing mode: When the item is in tolerance, the output will be on.	Signal delay
		Impulse length
-Tolerance2	In checkweighing mode: When the item is below "-Tolerance2", the output will be on. This signal can be used to trigger the reject pushers.	Signal delay
		Impulse length
-Tolerance1	In checkweighing mode: When the item is below "-Tolerance1", the output will be on. This signal can be used to trigger the reject pushers.	Signal delay
		Impulse length
+Tolerance1	In checkweighing mode: When the item is above "+Tolerance1", the output will be on. This signal can be used to trigger the reject pushers.	Signal delay
		Impulse length
+Tolerance2	In checkweighing mode: When the item is above "+Tolerance2", the output will be on. This signal can be used to trigger the reject pushers.	Signal delay
		Impulse length
Weighing failed	When a weight could not be captured, the output will be on, e.g. because the object is too long or the measuring time is too short.	Signal delay
		Impulse length
Upper limit	When "Upper limit" is exceeded, the output will be on, refer to Events and alarms.	Signal delay
		Impulse length
Remote	Output controlled by a PLC.	

Output settings

Setting	Description	Range
Signal delay	Time to wait before the digital output signal will be active. The delay starts • In-motion weighing: rising edge of the rear photoeye In case if a front photoeye only: on the rising edge of the front photoeye. For more information refer to [Photoeyes and trigger points ▸ Page 27]. • Static weighing: delay starts from the rising edge of the capture weight signal. In case the time the system is waiting for a stable weight exceeds the configured signal delay, the digital output will be triggered immediately after the weight has been captured.	**0 ms** ... 20,000 ms
Impulse length	Duration of the signal	0 ... **500 ms** ... 20,000 ms

5 Operation

5.1 Adjustment

This chapter describes the initial adjustment of a weighing conveyor system from scratch.

Preconditions

- Load cells are properly wired and connected to the IND360 via a junction box. For more information refer to the **IND360base Indicator and Transmitter User's Guide**.
- The weighing conveyor system is ready to run.

Note

We recommend to use the web interface for the adjustment.

Perform a general scale test

– On the home screen confirm that the scale is operational.
  ➡ The weight display must change when a load is applied to the conveyor belt.

Perform a zero adjustment

1 Unload the conveyor belt.
2 Go to Scale -> Calibration -> Zero adjust and press START.
3 When the zero adjustment is done, go back to the home screen and check if the weight is zero.
4 Perform a general scale test again.

Perform a span adjustment

■ Have a test load at hand, ideally close to the configured scale capacity.
1 Go to Scale -> Calibration -> Span adjust.
2 Enter the weight of the test load.
3 Place the test load in the middle of the conveyor belt and press START to execute the span adjustment.
4 When the test load is captured, press DONE to accept.
5 Return to the home screen and check if the weight corresponds to the test load.

Check the corner load

– Place the test load in each corner of the conveyor belt and read the result.
  ➡ The results of all corners must be close to the test load.

If the corner results considerably differ from the test load, check the following:

- All load cells wired properly.
- All transport locks removed.
- All load cells free and not blocked in any way.
- Conveyor frame even and stable.
- No life-to-dead connections, i.e. the weighing conveyor is free and not connected to any other non-weighing parts.

Check real items

■ Have sample(s) similar to the samples you want to weigh at hand.
1 Place a sample in the middle of the conveyor belt and read the result.
2 Place a sample on the left side of the conveyor belt and read the result.
3 Place a sample on the right side of the conveyor belt read the result.
  ➡ The results of all positions must be close to the result in the middle.
4 If the results for the items differ considerably, repeat steps 1 to 3 with other samples, e.g. largest/smallest or lightest/heaviest samples.

Perform a runtime check

- Conveyor system is running.

1 Process items of different sizes and weights.

2 Go to Application -> Signal analyzer and check the weight signal, refer to [Signal Analyzer ▸ Page 39].

3 Ensure the reproducibility of the captured weight values.

Check if compensation is needed

When weighing relatively big and light objects there might be a difference in the static and dynamic weighing results, e.g. because of the air flow around the moving object.

The Compensation management serves to adjust this effect resulting in a offset of the mean weight. For more details refer to [Application -> Dynamic -> Compensation ▸ Page 30].

Legal-for-trade setup

When used in legal-for-trade applications, contact your local sales representative for the effective regulations. Specific settings and a type label are required to fulfill the legal-for-trade regulatory requirements.

Adjustment service

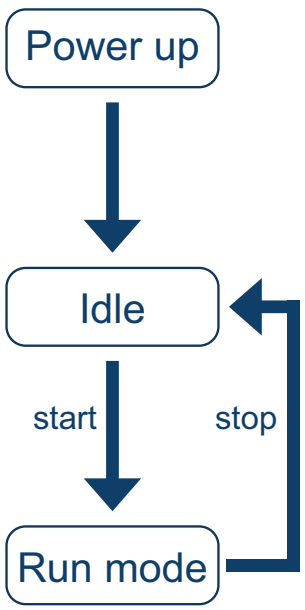
If support is needed when adjusting the system, please contact the METTLER TOLEDO service.

5.2 Operating states and run mode

Operating states

The IND360dynamic has the following operating states:

Power up	When the system is powered, it goes through its power up sequence.
Idle	After the power up sequence, the system is in the idle state, i.e. it is ready to run. The current weight is displayed, but no values are written to the internal storage. Dynamic weight determination is also disabled. While the device is in the idle state, the configuration parameters can be changed.
Run	After a start signal the system is in run mode. Dynamic weight values are captured and saved in the internal storage, if activated. A stop signal ends the run mode and the system returns to idle state. While the system is in run mode, the configuration parameters cannot be changed.



Triggering start and stop signal

There are the following possibilities to trigger a start signal and a stop signal:

- Via softkey ▶ in the display of the IND360dynamic
- Via digital inputs
- Via automation interface

5.3 Automation interface

Data transmission to the automation interface in Dynamic weighing modes

Precondition: The system is in run mode

In the IND360dynamic appliation, multiple datapoints form one reading, e.g. weight value + status information. This reading is a consistent piece of information.

The captured weight and status information like "Weighment valid" or "inTol" is coupled with two sequence bits, refer to [Status block ▸ Page 52]. Status information related to the sequence bits are marked with *.

Every time an item is processed (i.e. a weight is captured), the weight value is updated along with the status bits and the sequence bits are incremented by 1 (00, 01, 10, 11, 00, ...). These sequence bits inform the PLC that there is new information to read. Therefore, after the change of the sequence bits, the PLC shall read the weight captured including the status information.

IND360dynamic provides both the current weight reading as well as the captured weight to the PLC. Using the SAI 8-block format, this information can be read concurrently.

Interaction of IND360 (sending) and PLC (reading)

Information	IND360 (sending)	PLC (reading)
Current weight	How much weight is on the scale right now? IND360 provides the live weight including status information.	Continuously read live weight and status.
Captured weight	What was the weight of the last processed item? IND360 provides the weight captured including the related status information as a consistent piece of information.	On a change of the sequence bits, read the captured weight value (SAI measuring block) as well as the related status information (SAI status block).

Sample code

The free sample code provided by METTLER TOLEDO demonstrates how to read the weight value and status information, refer to [PLC sample code ▸ Page 46].

5.4 Alibi memory

The Alibi memory table stores basic transaction information that is not user-definable. The Alibi memory table can be accessed:

- via Maintenance section of the web interface
- via IND360 display
- via PLC Alibi read command

The Alibi memory is configured as a "ring" buffer that overwrites the oldest record when it reaches its memory limit. The Alibi memory can hold approximately 100,000 transactions before it reaches its limit and starts to overwrite old transactions. With the extended memory option, the Alibi memory can hold approximately 8,000,000 records.

For more information refer to the **IND360base Indicator and Transmitter User's Guide**.

Alibi log file structure of IND360dynamic

The Alibi log file structure of IND360dynamic is different from the log file structure of IND360base.

Record ID	Running record number in the Alibi memory	0000001 to 9999999
Date and time	Date and time of the weighing operation	Format dd.mm.yyyy hh:min
Device ID	The last two characters of the Device ID entered when activating the Alibi memory	2 characters
Net	Net weight	8 characters, incl. decimal point
Tare	Tare weight	8 characters, incl. decimal point
Unit	Weight unit	2 characters
Status	Weight status / error code	0 = Good 1 = Overload 2 = Underload 3 = Negative weight (weight < 0) 4 = Invalid (any other issue causing an invalid weight capture, such as "item too long" or "gap too small") 100 = Re-zeroing required 101 = Under minload (0 < weight < minload) 255 = Broken

5.5 EPrint

The EPrint functionality of IND360dynamic sends the weight captured along with status information and a time stamp to a PC via TCP/IP communication. For more information refer to the **IND360base Indicator and Transmitter User's Guide**.

The EPrint reports the following data:

- Date and time
- Weight
- Record ID
- Status

The status recorded with IND360dynamic are different from the status recorded with IND360base.

The EPrint reports the following status information:

- Good
- Item too light
- Item too heavy
- Gross item
- Gap too small
- Item too long
- Stability timeout (static weighing)

6 Signal Analyzer

6.1 Purpose of the Signal Analyzer

The Signal Analyzer visualizes the weight value and trigger points. It is mainly used for:

- Fine tuning the timing
- Test runs
- Troubleshooting
- Remote support

Fine tuning the timing

The fine tuning of the timing to capture the measurement is essential to achieve accurate and reliable results. Machine setups differ (system mechanics, scale setup, photoeye position, etc.) and the type of item to be weighed influence the weight determination as well (e.g. stabilization time). The Signal Analyzer assists in determining the correct measurement window.

Points to be checked:

- Do the photoeyes correctly detect the weighing sample?
- Which part of the weight signal is the best for measuring?

Test runs

The previous 50 measurements are displayed in detail and can be analyzed.

Troubleshooting

Points to be checked:

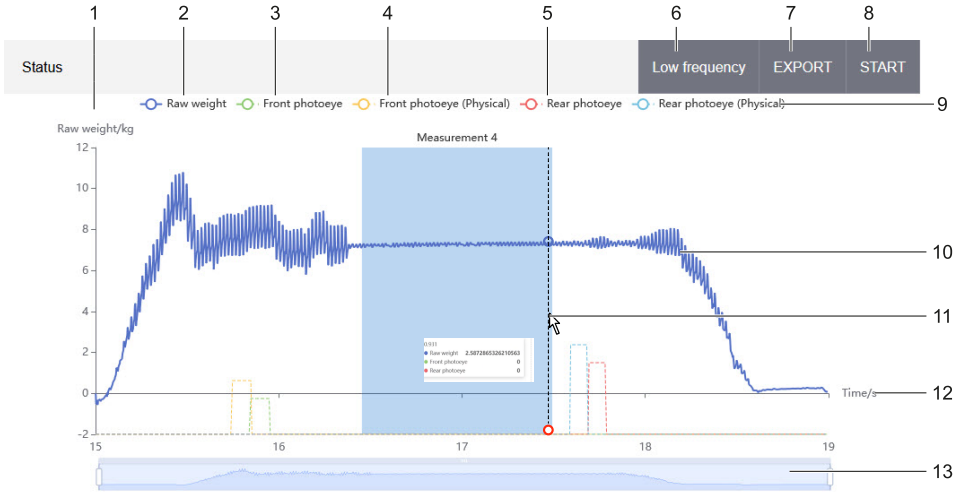
- Is/are the photoeye(s) detecting the item entering/leaving the scale?
- For how long are the photoeyes triggered?
- Are there strong vibrations while the conveyor belt is running in an empty state?
- Is the measurement captured at the correct point of time?

Remote support

The IND360 web interface offers remote access via the network (service port) or can be easily shared during a video call.

6.2 Operating/navigating the Signal Analyzer

Signal Analyzer screen



Signal Analyzer screen

1	y-axis: Raw weight	2	Enable/disable the display of the raw weight
3	Enable/disable a front photoeye signal (physical signal incl. offset)	4	Enable/disable a physical front photoeye signal
5	Enable/disable a rear photoeye signal (physical signal incl. offset)	6	Toggle between the Low frequency mode and the High frequency (default) mode
7	Export the weight signal to .csv for further evaluation	8	Start/Stop the Signal analyzer
9	Enable/disable a physical rear photoeye signal	10	Raw weight signal
11	Hovering over the weight signal will show details about the selected sample including a timestamp. The timestamp is helpful to calculate the settling time or pre-trigger exclude.	12	x-axis: Time
13	Timeline		

Exporting the weight signal (8)

Example of the exported weight signal

# Datetime:2023-08-18-13-57-43						
# Terminal S/N:C048600873						
# Workmode: 3. Dual photoeye with single object						
timestamp/s	weight/kg	Front photoeye	Front photoeye(Physical)	Rear photoeye	Rear photoeye(Physical)	Raw counts
0.001	2.54442	0	0	0	0	33829312
0.0021	2.55235	0	0	0	0	33829964
0.0031	2.55658	0	0	0	0	33830312
0.0042	2.5595	0	0	0	0	33830552
0.0052	2.57575	0	0	0	0	33831888
0.0062	2.61702	0	0	0	0	33835280
0.0073	2.63006	0	0	0	0	33836352

Exported weight signal

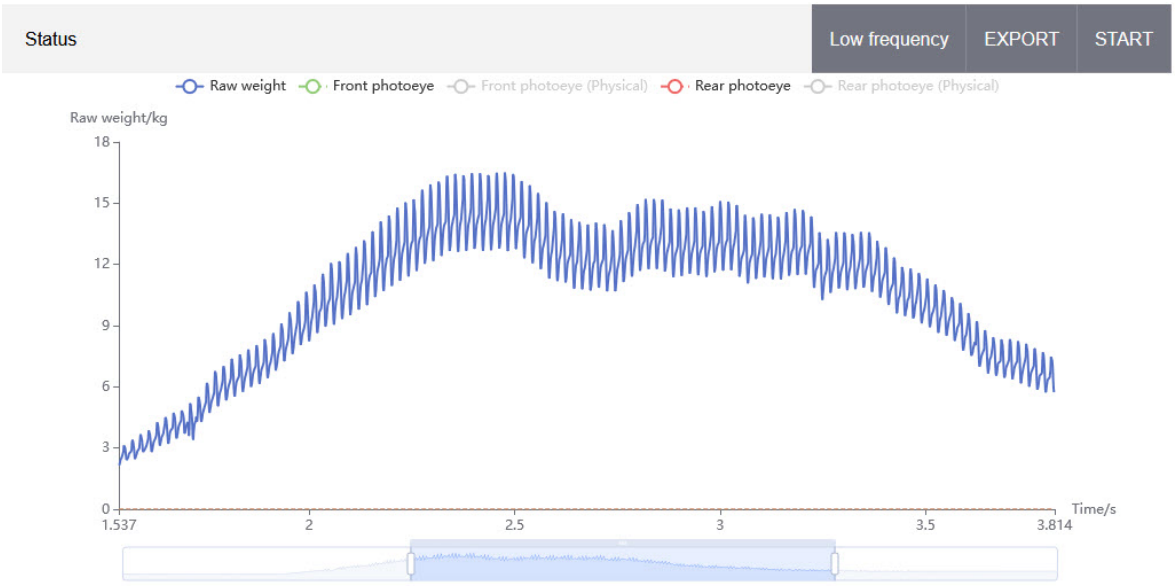
The weight signal is logged every milisecond.

Details (11)

The detailed view shows the following:

- Time in ms
- Raw weight in kg
- Front photoeye status: either 0 or 1
- Rear photoeye status: either 0 or 1

Zooming



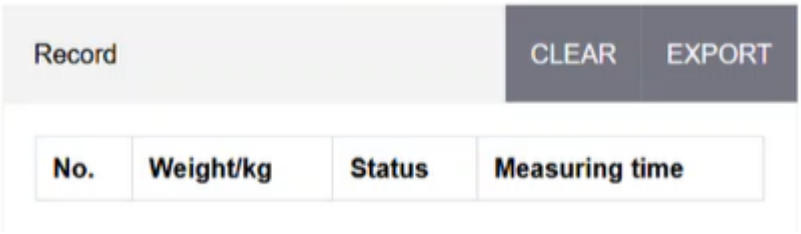
Zooming the weight signal

To get more details, e.g. of the behavior of the photoeye, the time axis can be zoomed.

– Push the ends of the timeline so that the desired time range is displayed in higher resolution.

Captured records

The previous 50 records captured are displayed at the right hand side of the Signal Analyzer screen.



Captured records

Each captured record is displayed with:

- Running number
- Captured weight
- Status
  Measurement successful: good
  Measurement failed: status information such as "Item too long" or "Gap too small"
- Measuring time in ms used to capture the weight

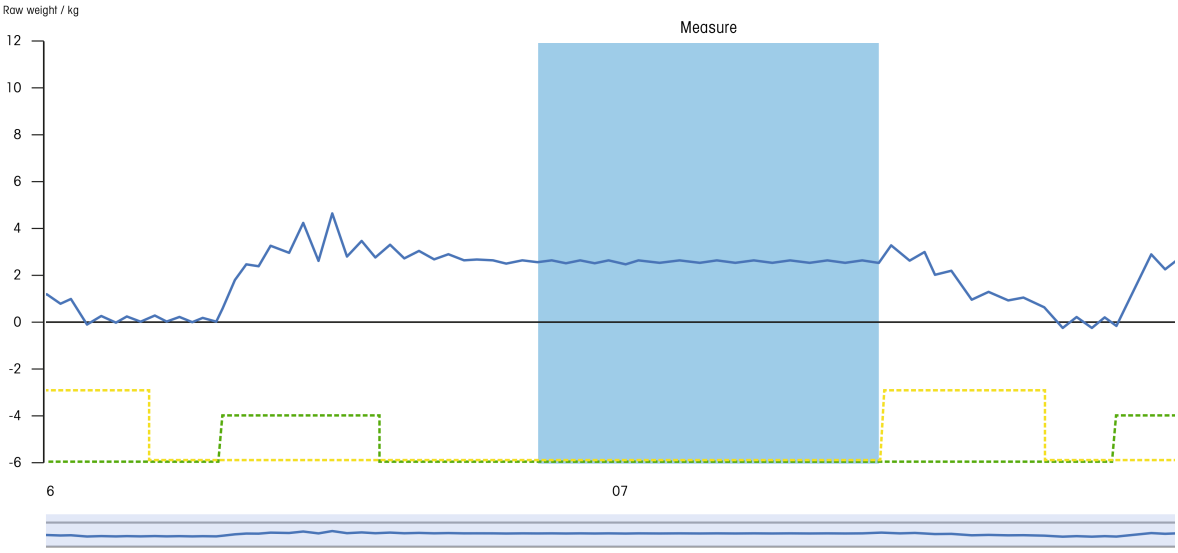
These captured records can be exported to .csv for further external evaluation.

A	B	C	D
# Datetime:2023-08-18-14-14-02			
# Terminal S/N:C048600873			
No.	Weight/kg	Status	Measuring time/ms

Example of exported captured records

6.3 Tuning a system using the Signal Analyzer

Target state



Example of a well tuned system

The screen is showing a well tuned system with a front photoeye (green) and a rear photoeye (yellow).

- The front photoeye (green) is triggered when the item starts entering the conveyor belt and remains triggered until the item is completely located on the conveyor belt.

  At this time, the weight signal increases, but there are significant disturbances keeping the item from entering the conveyor belt.
- When the item is located on the conveyor belt, the weight signal stabilizes. This so-called settling time can be excluded from the measurement via a setup parameter.
- A nearly stable weight signal follows until the item leaves the conveyor belt. This time span will be used for the measurement. The aim is to have a measuring time that is as long as possible, but also as stable as possible.
- When the item leaves the conveyor belt, the rear photoeye (yellow) is triggered and remains triggered until the item has been completely moved off the conveyor belt.

  When the photoeye is triggered, the measuring time is over and the weight is captured.

  In the setup it is also possible to exclude the time span before the rear photoeye is triggered from the measuring time (pre-trigger exclude), e.g. when there are disturbances even before leaving the conveyor belt.

Fine tuning procedure

Fine tuning targets

Tuning target	Signal analyzer status	Rectification
Reduce background vibrations	When the conveyor belt is running empty, there will be a certain degree of noise caused by the belt and motor. However, ensure that the noise is not too high compared to your weighing accuracy target.	• Check the conveyor motor. • Ensure that the rollers are balanced and the belt is tight. • Exclude vibrations from nearby machines or traffic.
Optimum photoeye position	The front photoeye has to be triggered when the item starts entering the conveyor belt and has to remain triggered until the item is located completely on the conveyor belt. The rear photoeye has to be triggered when the item starts leaving the conveyor belt and has to remain triggered until the item has been completely moved off the conveyor belt.	• Check the physical photoeye position. • Configure a photoeye offset in the setup. • Check the item properties, e.g. if there were reflexions or transparencies.
Optimum measuring time	The most stable part of the weight signal has to be used as measuring time. Set the measuring time to be as long as possible, but also with a weight signal that is as stable as possible.	• Configure the settling time or the pre-trigger exclude in the setup.

7 Troubleshooting

7.1 SMART5™ alarms

IND360dynamic follows the SMART5™ alarm management. For more information on alarm management, please refer to the **IND360 Indicator and Transmitter User's Guide**.

SMART5™ alarm list

ID	Alarm	Mode	Description	Action
6400	PE timeout	In-motion	Photoeye not responding (photoeye timeout reached)	Ensure that the photoeye is mounted properly and no object is blocking the photoeye.
6408	Parameter invalid	In-motion, Static	Applicaton parameter value invalid (value out of bounds)	Check application parameter settings. Refer to the ID to pinpoint the issue.
6409	Parameter logic invalid	In-motion, Static	Incorrect combination of application parameters	Check application parameter settings. Refer to the ID to pinpoint the issue.

7.2 Error codes

If the weighing process is started with an invalid configuration, IND360dynamic reports a SMART5™ yellow alarm. To pinpoint the incorrect setting, the alarm message is accompanied by a parameter ID. The following table provides an interpretation of the ID.

Parameter invalid

ID	Parameter	Example
1	Scale empty threshold	Scale empty threshold larger than the scale capacity
2	Upper limit	Upper limit larger than the scale capacity

Logic errors

ID	Parameter	Example
101	Classification error	+Tol2 ≤ +Tol1 or -Tol2 ≥ -Tol1
102	Compensation management	Difference of static weight and dynamic weight too large
103	Conveyor settings	Min. object length > Belt length
104	Conveyor belt speed too slow	Increase conveyor belt speed or reduce the conveyor belt length

7.3 Mechanical troubleshooting

If you experience any issues related to accuracy or repeatability, we recommend checking the following points on your mechanical design. If you have any questions or concerns, please don't hesitate to reach out to your local METTLER TOLEDO sales representative for assistance.

Issue	Description
Weighing conveyor connected to static element	To ensure accurate weighing results, make sure that the weighing conveyor is not touching any other static elements. Additionally, be sure to check that all cables have enough freedom to move and are not affecting the movement of the weighing conveyor.
Wind affecting the scale or object	Wind can be a potential source of error in weighing processes, caused either by environmental factors such as open doors, windows, or air conditioners, or by the movement of the item being weighed. To minimize the impact of wind on your weighing results, add shielding if necessary. To adjust for wind effects caused by object movement, use the compensation factors.
Heat source influencing the weighing sensor	Keep heat sources away from load cells. In particular heat gradients lead to reduced accuracy.
Insufficient number of load cells or weigh modules installed (rocker pin design)	When using load cells or weigh modules with a rocker pin, it's important to install at least 3, or preferably 4, load cells/weigh modules. A single load cell with a rocker pin is unable to withstand bending moments, which can cause it to become unstable and tip to the side.
Platform size too big for a single point load cell	Single point load cells are designed to operate alone and can handle bending moments. However, it's important to ensure that the scale does not exceed the maximum platform size specified for the load cell.

8 Automation system connectivity

8.1 PLC sample code

The free PLC sample code demonstrating the IND360dynamic application is available for download on ▶ http://www.mt.com/ind360-downloads.

Packages are available for Siemens TIA Portal and Rockwell Studio 5000, and each includes an Engineering Note.

8.2 Parameter verification

The IND360dynamic application checks the parameters once the application is started and reports configuration issues as SMART5™ yellow alarm. SMART5™ alarms are also accessible by the PLC.

The IND360 performs the same checks when entering the configuration through the web interface or display.

8.3 Getting started

IND360 offers a comprehensive set of data points to configure, control and monitor the dynamic/static weighing process. Given that (part of) the configuration is done directly on the device, the following data points are among the most relevant ones:

Relevant data points

Operation	Data Point
Read weight of item	• Read item's captured weight (cyclic) • Status block command 12
Setting target and tolerances for checkweighing	Classification
Start/Stop weighing process and monitor device operation	• Start/Stop command • Status block command 12

8.4 Modbus RTU/TCP protocol

Note

For the individual function arguments (e.g. trigger source in weight trigger), refer to [Configuration menu tree ▸ Page 65].

Modbus RTU/TCP protocol

Function	Subelement/Description	MODBUS Address	Read/Write	Data Type
Set device ID (Alibi)		45000	R/W	Long
Classification	Operating mode	47016	R/W	Short
	Target weight	47017	R/W	Float 32
	- Tolerance 1	47019	R/W	Float 32
	- Tolerance 2	47021	R/W	Float 32
	+ Tolerance 1	47023	R/W	Float 32
	+ Tolerance 2	47025	R/W	Float 32
General settings	Power up delay	47031	R/W	Short
	Mode	47032	R/W	Short
	Unit	47033	R/W	Short
Weight trigger	Trigger Source	47060	R/W	Short
	Photoeye setup	47061	R/W	Short
	Photoeye position	47062	R/W	Short
Measurement setup (dynamic)	Multiple objects	47090	R/W	Short
	Measuring time mode	47091	R/W	Short
	Measuring time	47092	R/W	Short
	Settling time	47093	R/W	Short
	Pre-trigger exclude	47094	R/W	Short
	Minimum measuring time	47095	R/W	Short
	Front photoeye offset	47096	R/W	Int32
	Rear photoeye offset	47098	R/W	Int32
	Min. object distance	47100	R/W	Float32
	Min. object length	47102	R/W	Float32
Clear statistics	0 = Disable 1 = Enable	42006	W	Short
Measurement setup (static)	Capture weight offset	47120	R/W	Long
	Min. trigger time	47122	R/W	Short
	Trigger debounce time	47123	R/W	Short
	Stability timeout	47124	R/W	Long
Conveyor	Belt speed	47150	R/W	Float32
	Belt length	47152	R/W	Float32

Function	Subelement/Description	MODBUS Address	Read/Write	Data Type
Compensation	Static weight 1	47181	R/W	Float32
	Dynamic weight 1	47183	R/W	Float32
	Static weight 2	47185	R/W	Float32
	Dynamic weight 2	47187	R/W	Float32
	Static weight 3	47189	R/W	Float32
	Dynamic weight 3	47191	R/W	Float32
	Static weight 4	47193	R/W	Float32
	Dynamic weight 4	47195	R/W	Float32
	Static weight 5	47197	R/W	Float32
	Dynamic weight 5	47199	R/W	Float32
Re-zero settings	Scale empty threshold	47210	R/W	Float32
	Re-zero trigger	47212	R/W	Short
	Period	47213	R/W	Short
	After trigger delay	47214	R/W	Short
Event and alarm	Re-zero timeout	47240	R/W	Short
	Photoeye timeout	47241	R/W	Short
	Upper limit	47242	R/W	Float32
Input trigger mode	Input 1 trigger mode	47270	R/W	Short
	Input 2 trigger mode	47271	R/W	Short
	Input 3 trigger mode	47272	R/W	Short
	Input 4 trigger mode	47273	R/W	Short
	Input 5 trigger mode	47274	R/W	Short
Output signal delay	Output 1 signal delay	47300	R/W	Short
	Output 2 signal delay	47301	R/W	Short
	Output 3 signal delay	47302	R/W	Short
	Output 4 signal delay	47303	R/W	Short
	Output 5 signal delay	47304	R/W	Short
	Output 6 signal delay	47305	R/W	Short
	Output 7 signal delay	47306	R/W	Short
	Output 8 signal delay	47307	R/W	Short
Output impulse length	Output 1 impulse length	47330	R/W	Short
	Output 2 impulse length	47331	R/W	Short
	Output 3 impulse length	47332	R/W	Short
	Output 4 impulse length	47333	R/W	Short
	Output 5 impulse length	47334	R/W	Short
	Output 6 impulse length	47335	R/W	Short
	Output 7 impulse length	47336	R/W	Short
	Output 8 impulse length	47337	R/W	Short
Start/stop	1 = Start 0 = Stop	42060	R/W	Short

Function	Subelement/Description	MODBUS Address	Read/Write	Data Type
Re-zero (signal)	**Write**: Trigger to do re-zero (any value) **Read**: 0 = zero successful 1 = zero in process 2 = zero failed, scale in motion 4 = zero failed, out of negative zero range 5 = zero failed, out of positive zero range	42061	R/W	Float32
Reverse	Communicate to the indicator that the conveyor belts are running in reverse. When using this command, do not assign a digital input signal with the same function.	42063	W	Short
Photoeye router (front photoeye, rear photoeye, re-zero (sensor))	Photoeyemode ->Trigger Source -> choose 'Automation interface' before using this function. This command allows the PLC to send the trigger signal. During this thime, the discrete input "photoeye" cannot be used. For a typical dual photoeyes system use the following: • when front photoeye high -> write 1 • when rear photoeye high -> write 2 • when both photoeyes high -> write 3 • when both photoeyes low -> write 0	42064	W	Short
Read captured weight	Read the captured weight including status information.	45100	R	Reg0: Sequence (Short) Reg1: Status code (Short) Reg2-3: TransactionCount (Long) Reg4-5: CapturedWeight (Float32)
Input assignment 1	0 = None 21 = Run/Stop 22 = Front photoeye 23 = Rear photoeye 25 = Re-Zero 26 = Reverse 27 = Capture weight	40702	R/W	Short
Input assignment 2		40704	R/W	Short
Input assignment 3		40706	R/W	Short
Input assignment 4		40708	R/W	Short
Input assignment 5		40710	R/W	Short

Function	Subelement/Description	MODBUS Address	Read/Write	Data Type
Output assignment 1	0 = None	40711	R/W	Short
Output assignment 2	21 = Run	40712	R/W	Short
Output assignment 3	22 = Ready	40713	R/W	Short
Output assignment 4	14 = SMART5™ red	40714	R/W	Short
Output assignment 5	15 = SMART5™ orange	40715	R/W	Short
Output assignment 6	32 = Application alarm	40716	R/W	Short
Output assignment 7	34 = Scale loaded	40717	R/W	Short
Output assignment 8	26 = Re-zero timeout 23 = Weighing completed 33 = Weighing failed 29 = In tolerance 27 = -Tolerance limit 2 28 = -Tolerance limit 1 30 = +Tolerance limit 1 31 = +Tolerance limit 2 35 = Upper limit 16 = Remote	40718	R/W	Short
Set transaction number		40900	R/W	Long
Read one Alibi record		40902	R	For dynamic weight values: Reg0-1: Transaction number (Long) Reg2-3: Date & Time, UTC timestamp (Long) Reg4: Device ID (Byte) Reg5-6: Rounded net weight (Float32) Reg7-8: Rounded tare weight (Float32) Reg9: Unit type (Byte) Reg10: Status (Byte)

8.5 SAI protocol

8.5.1 Cyclic commands

8.5.1.1 Measuring block

Note

The measuring block contains values of type Float32.

Measuring block

		SAI	
Function	**Option/range**	**Read Command**	**Write Command**
Clear statistics	1 = Execute clear statistics operation	NA	306
Start/stop	1 = Start 0 = Stop	NA	346
Re-zero (signal)	**Write**: Trigger to do re-zero (any value) **Read**: 0 = zero successfully 1 = zero in process 2 = zero fail, scale in motion 4 = zero fail, out of negative zero range 5= zero fail, out of positive zero range	147	347
Reverse	Communicate to the indicator that the conveyor belts are running in reverse. When using this command, do not assign a digital input signal with the same function. 0 = not reverse (default) 1 = reverse	NA	348
Photoeye router (front photoeye, rear photoeye, re-zero (sensor))	Photoeyemode ->Trigger Source -> choose 'Automation interface' before using this function. This command allows the PLC to send the trigger signal. During this thime, the discrete input "photoeye" cannot be used. For a typical dual photoeyes system use the following: • when front photoeye high -> write 1 • when rear photoeye high -> write 2 • when both photoeyes high -> write 3 • when both photoeyes low -> write 0	NA	349
Read captured weight (cyclic)	Read the current parcel's weight. Monitor the sequence bit in Custom group1. If there are changes, this means that the weight is updated.	150	NA

8.5.1.2 Status block

Status block command values

Status command	Description		Reference
0	Word 0	RedAlert Alarm	SAI Reference Guide for Transmitters for additional details
	Word 1	Scale Group 2	
	Word 2	I/O Group 1	
	Word 3	Command response	
1	Word 0	RedAlert Alarm	SAI Reference Guide for Transmitters for additional details
	Word 1	Scale Group 2	
	Word 2	I/O Group 1	
	Word 3	Command response	
12	Word 0	Custom Group 1	[Custom Group 1 (for dynamic) – Run status ▸ Page 53]
	Word 1	Custom Group 2	[Custom Group 2 (for dynamic) – Alarm status ▸ Page 54]
	Word 2	I/O Group	[I/O Group 1 ▸ Page 55]
	Word 3	Command response	

Custom Group 1 (for dynamic) – Run status

Custom Group 1 – Run status bits

Bit	Function	Description
0	Sequence Bit 0	Sequence bits are incremented once a weighing operation is completed. This informs the PLC that a new weight value is now available.
1	Sequence Bit 1	
2	Weighment Valid *	The registered weight is good to use. If this bit is false, the weight has not been captured properly and the weighment has a higher degree of uncertainty.
3	<reserved>	
4	Ready to start	The system was started up and is ready to run the application. Send start command to run the application. Bit 4 goes high when: • Alibi memory check completed • Power up zero state --> power up has been completed **Note** This bit will not check whether the application parameters are invalid or not. The parameter check will be conducted when switching to run mode.
5	<reserved>	
6	App state	0 = stopped 1 = running
7	Scale loaded	An item is located on the conveyor belt. Configured by the threshold setting in the re-zero section.
8	Front PE triggered	The front photoeye has been triggered (item coming onto the conveyor belt). This signal is directly coupled with the photoeye, it stays high as long as the photoeye is interrupted.
9	Rear PE triggered	The rear photoeye has been triggered (item leaving the conveyor belt). This signal is directly coupled with the photoeye, it stays high as long as the photoeye is interrupted.
10	<reserved>	
11	-Tol2*	Checkweighing function: item below -Tol2 value
12	-Tol1*	Checkweighing function: item below -Tol1 value but above -Tol2 value
13	inTol*	Checkweighing function: item in tolerance
14	+Tol1*	Checkweighing function: item above +Tol1 value but below +Tol2 value
15	+Tol2*	Checkweighing function: item above +Tol2 value

* Coupled with sequence bits

Custom Group 2 (for dynamic) – Alarm status

Custom Group 2 – Alarm status bits

Bit	Function	Description
0	Front PE timeout (in-motion weighing)	The front photoeye is blocked for too long. The signal will reset once the photoeye is not blocked anymore.
	Capture weight photoeye timeout (static weighing)	The capture weight photoeye is blocked for too long. The signal will reset once the photoeye is not blocked anymore.
1	Rear PE timeout	The rear photoeye is blocked for too long. The signal will reset once the photoeye is not blocked anymore.
2	Re-Zero PE timeout	The re-zero photoeye is blocked for too long. The signal will reset once the photoeye is not blocked anymore.
3	<reserved>	
4	<reserved>	
5	<reserved>	
6	<reserved>	
7	Re-zero pending	Re-zero is overdue and needs to be executed. On the display, this is indicated with a star.
8	Application alarm	Alarm present preventing the application to execute. Bit 8 goes high when: • Try to start before 'Ready to start' bit is high(bit4 in group1) • Parameter logic error when try to start • Parameter invalid when try to start
9	<reserved>	
10	Gap too small* (in-motion mode)	The gap between the consecutive packets is too small. Higher measurement uncertainty due to insufficient measuring time. Only available in single front photoeye mode & dual photoeyes mode without multiple objects.
	Gap too small* (static mode)	A new "capture weight" signal arrives before the current process of weighing capture is finished.
11	Item too long* (in-motion mode)	The package is too long. Higher measurement uncertainty due to insufficient measuring time. Only available in single front photoeye mode and dual photoeyes mode without multiple objects.
	Stability timeout* (static mode)	Cannot get a stable value before stability timeout.
12	Item too light*	The package is too light leading to higher uncertainty in measurements.
13	Item too heavy*	The package is too heavy leading to higher uncertainty in measurements.
14	<reserved>	
15	Ghost item*	The package triggered the rear photoeye but did not trigger the front photoeye. Only available with dual photoeyes mode.

* Coupled with sequence bits

I/O Group 1

I/O Group 1

Bit	I/O Group 1		Bit	I/O Group 1
0	Input 1		8	Output 1
1	Input 2		9	Output 2
2	Input 3		10	Output 3
3	Input 4		11	Output 4
4	Input 5		12	Output 5
5	Reserved		13	Output 6
6	Reserved		14	Output 7
7	Reserved		15	Output 8

8.5.2 Acyclic commands

Note

For the individual function arguments (e.g. trigger source in weight trigger), refer to [Configuration menu tree ▸ Page 65].

Acyclic commands

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Set device ID (Alibi)		3	0xA0	0x41B	0x01	0x01	0, 1	0x4701	0x10000	Long	R/W
Classification	Operating mode	3	0xA1	0x41B	0x01	0x02	0, 1	0x4702	0x010420	struct • uint8 operationMode • float targetWeight • float minusTol1 • float plusTol1 • float minusTol2 • float plusTol2 • uint32 reserved • uint32 reserved2	R/W
	Target weight										
	- Tolerance 1										
	- Tolerance 2										
	+ Tolerance 1										
	+ Tolerance 2										
	Reserved										
General settings	Power up delay	3	0xA2	0x41B	0x01	0x03	0, 1	0x4703	0x010440	struct • uint8 powerUpDelay • uint8 mode • uint8 unit • uint8 reserved • uint32 reserved2	R/W
	Mode										
	Unit										
	Reserved (8 bit)										
	Reserved (32 bit)										
Weight trigger	Trigger Source	3	0xA3	0x41B	0x01	0x04	0, 1	0x4704	0x010460	struct • uint8 triggerSource • uint8 photoeyeSetup • uint8 photoeyePosition uint8 reserved • uint32 reserved2	R/W
	Photoeye setup										
	Photoeye position										
	Reserved (8 bit)										
	Reserved (32 bit)										

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Measurement setup (dynamic)	Multiple objects Measuring time mode Measuring time Settling time Pre-trigger exclude Minimum measuring time Front photoeye offset Rear photoeye offset Min. object distance Min. object length Reserved (32 bit)	3	0xA4	0x41B	0x01	0x05	0, 1	0x4705	0x010480	struct • uint8 multiple_objects • uint8 measuring_time_mode • uint16 measuring_time • uint16 settling_time • uint16 pre_trigger_exclude • uint16 min_measuring_time • int32 frontEyeOffset • int32 rearEyeOffset • float min_object_distance float min_object_length • uint32 reserved	R/W
Clear statistics	1 = Execute clear statistics operation	3	0xA5	0x41B	0x01	0x06	0, 1	0x4706	0x1000A	Float 32	W
Measurement Setup (static)	Capture weight offset Min. trigger time Trigger debounce time Stability timeout Reserved (32 bit)	3	0xA6	0x41B	0x01	0x07	0, 1	0x4707	0x0104A0	struct • int32 captureWeightOffset • uint16 minTriggerTime • uint16 triggerDe-bounceTime • uint32 stabilityTimeout • uint32 reserved	R/W
Conveyor	Belt speed Belt length Reserved (32 bit) Reserved (32 bit)	3	0xA7	0x41B	0x01	0x08	0, 1	0x4708	0x0104C0	struct • float32 beltSpeed • float32 beltLength • uint32 reserved • uint32 reserved2	R/W

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Compensation	Static weight 1	3	0xA8	0x41B	0x01	0x09	0, 1	0x4709	0x0104E0	struct • uint8 compensationMan-agement • float32 staticWeight1 • float32 dynamicWeight1 • … • float32 staticWeight5 • float32 dynamicWeight5 • uint32 reserved	R/W
	Dynamic weight 1										
	Static weight 2										
	Dynamic weight 2										
	Static weight 3										
	Dynamic weight 3										
	Static weight 4										
	Dynamic weight 4										
	Static weight 5										
	Dynamic weight 5										
	Reserved (32 bit)										
Re-zero settings	Scale empty threshold	3	0xA9	0x41B	0x01	0x0A	0, 1	0x470A	0x010500	struct • float scale_empty_threshold • uint8 rezero_trigger • uint16 period • uint16 after_trigger_delay • uint32 reserved	R/W
	Re-zero trigger										
	Period										
	After trigger delay										
	Reserved (32 bit)										
Event and alarm	Re-zero timeout	3	0xAE	0x41B	0x01	0x0F	0, 1	0x470F	0x010520	struct • uint16 rezeroTimeout • uint16 photoeyeTimeout • float32 upperLimit • uint32 reserved • uint32 reserved2	R/W
	Photoeye timeout										
	Upper limit										
	Reserved (32 bit)										
	Reserved (32 bit)										

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Input trigger mode	Input 1 trigger mode	3	0xAF	0x41B	0x01	0x10	0, 1	0x4710	0x010540	struct • uint8 input1Triggermode • … • uint8 input5Triggermode • uint8 reserved • uint16 reserved2	R/W
	Input 2 trigger mode										
	Input 3 trigger mode										
	Input 4 trigger mode										
	Input 5 trigger mode										
	Reserved (8 bit)										
	Reserved (16 bit)										
Output signal delay	Output 1 signal delay	3	0xB0	0x41B	0x01	0x11	0, 1	0x4711	0x010560	struct • uint16 output1SignalDelay • … • uint16 output8SignalDelay	R/W
	Output 2 signal delay										
	Output 3 signal delay										
	Output 4 signal delay										
	Output 5 signal delay										
	Output 6 signal delay										
	Output 7 signal delay										
	Output 8 signal delay										
Output impulse length	Output 1 impulse length	3	0xB1	0x41B	0x01	0x12	0, 1	0x4712	0x010580	struct • uint16 output1Impulse-Length • … • uint16 output8Impulse-Length	R/W
	Output 2 impulse length										
	Output 3 impulse length										
	Output 4 impulse length										
	Output 5 impulse length										
	Output 6 impulse length										
	Output 7 impulse length										
	Output 8 impulse length										
Start/stop	1 = Start 0 = Stop	3	0xCD	0x41B	0x01	0x2E	0, 2	0x472E	0x1005A	Float 32	W

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Re-zero (signal)	**Write**: Trigger to do re-zero (any value) **Read**: 0 = Zero successfully 1 = Zero in process 2 = Zero fail, scale in motion 4 = Zero fail, out of negative zero range 5= Zero fail, out of positive zero range	3	0xCE	0x41B	0x02	0x2F	0, 3	0x472F	0x1005C	Float 32	R/W
Reverse	Communicate to indicator that the conveyor belts are running in reverse. When using this command, do not assign a digital input signal with the same function.	3	0xCF	0x41B	0x03	0x30	0, 4	0x4730	0x1005E	Float 32	W

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Photoeye router (front photoeye, rear photoeye, re-zero (sensor))	Weight trigger ->Trigger source -> choose 'Automation interface' before using this function. This command allows the PLC to send the trigger signal. During this thime, the discrete input "photoeye" cannot be used. For a typical dual photoeye system use the following: • when front photoeye high -> write 1 • when rear photoeye high -> write 2 • when both photoeyes high -> write 3 • when both photoeyes low -> write 0	3	0xD0	0x41B	0x04	0x31	0, 5	0x4731	0x10060	Float 32	W
Read captured weight with status code	Read the captured weight along with its status infor-mation.	3	0xD1	0x41B	0x05	0x32	0, 5	0x4732	0x10062	struct (12 Bytes) • Byte: Sequence bit • Byte: Status code • Short: Reserved • Long: Transaction number • Float: Captured weight	R

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Input assignment 1	The following settings are possible to configure the digital input functionality: 0 = None 21 = Run/stop 22 = Front photoey 23 = Rear photoeye 25 = Re-zero 26 = Reverse 27 = Capture weight	2	0x11	0x418	0x01	0x02	0, 1	0x4402	0x009002	Byte	R/W
Input assignment 2		2	0x14	0x418	0x01	0x05	0, 1	0x4405	0x009004	Byte	R/W
Input assignment 3		2	0x17	0x418	0x01	0x08	0, 1	0x4408	0x009006	Byte	R/W
Input assignment 4		3	0x21	0x418	0x01	0x42	0, 1	0x4602	0x009008	Byte	R/W
Input assignment 5		3	0x24	0x418	0x01	0x45	0, 1	0x4605	0x00900A	Byte	R/W

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Output assignment 1	The following settings are possible to configure the digital output functionality: 0 = None 21 = Run 22 = Ready 14 = SMART5™ red 15 = SMART5™ orange 32 = Application alarm 34 = Scale loaded 26 = Re-zero timeout 23 = Weighing completed 33 = Weighing failed 29 = In tolerance 27 = -Tolerance limit 2 28 = -Tolerance limit 1 30 = +Tolerance limit 1 31 = +Tolerance limit 2 35 = Upper limit 16 = Remote	2	0x1D	0x418	0x01	0x0E	0, 1	0x440E	0x009020	Byte	R/W
Output assignment 2		2	0x24	0x418	0x01	0x15	0, 1	0x4415	0x009021	Byte	R/W
Output assignment 3		2	0x2B	0x418	0x01	0x1C	0, 1	0x441C	0x009022	Byte	R/W
Output assignment 4		2	0x32	0x418	0x01	0x23	0, 1	0x4423	0x009023	Byte	R/W
Output assignment 5		2	0x39	0x418	0x01	0x2A	0, 1	0x442A	0x009024	Byte	R/W
Output assignment 6		3	0x27	0x418	0x01	0x48	0, 1	0x4608	0x009025	Byte	R/W
Output assignment 7		3	0x2E	0x418	0x01	0x4F	0, 1	0x460F	0x009026	Byte	R/W
Output assignment 8		3	0x35	0x418	0x01	0x56	0, 1	0x4616	0x009027	Byte	R/W
Set transaction number											R/W

Function	Subelement/ Description	PROFIBUS Slot	PROFIBUS Index	EIP Class Code	EIP Instance Values	EIP Attribute #	PROFINET Slot + Subslot	PROFINET/ EtherCAT Index	CC Lind IE Field Basic Address	Data Type	Read/Write
Read one Alibi record										For dynamic weight values: struct (24 Bytes) • Long: Transaction number • Long: Date & Time (UTC Timestamp) • Byte: Device ID • Float: Rounded net weight • Float: Rounded tare weight • Byte: Unit type • Byte: Status	R

9 Appendix

9.1 Configuration menu tree

Configuration menu tree

	Static		In-Motion				
First class	**Catch-weighing**	**Check-weighing**	**Check-weighing**	**Catch-weighing**	**Default value**	**Range**	**LFT-Relevant**
General	Power up delay				Disabled	0 = Disabled 1-5 minutes 2-15 minutes 3-30 minutes	Yes
	Mode				In-Motion check-weighing	0 = In-Motion check-weighing 1 = In-Motion catch-weighing 2 = Static check-weighing 3 = Static catch-weighing	Yes
			Unit		Metric	0 = Metric 1 = Imperial	Yes
Weight trigger	Trigger Source				Digital Input	0 = Automation interface 1 = Digital input	Yes
			Photoeye setup		Dual photoeyes	0 = Dual photoeyes 1 = Single photoeye	Yes
			Photoeye position		Front	0 = Front 1 = Rear	Yes
Measurement setup			Multiple objects		Disabled	0 = Disabled 1 = Enabled	Yes
			Measuring time mode		Flexible	0 = Flexible 1 = Fixed	Yes
			Measuring time		200 ms	[1, 12,000] ms	Yes
			Settling time		0 ms	[0,3000] ms	Yes
			Pre-trigger exclude		0 ms	[0, 3000] ms	Yes
			Minimum measuring time		200 ms	[1,10,000] ms	Yes
			Front photoeye offset		0 ms	[-1500, 1500]ms	Yes
			Rear photoeye offset		0 ms	[-1500, 1500] ms	Yes
			*Max. object void		0	[0, 10,000]	Yes
			*Min. object length		0	[0, 10,000]	Yes
	Capture weight offset				0 ms	[-12,000, 12,000] ms	Yes
	*Min. trigger time				0 ms	[0, 12,000] ms	Yes
	*Trigger debounce time				0 ms	[0, 1,2000] ms	Yes
	*Stability timeout				0 ms	[0, 120,000] ms	No

	Static		In-Motion				
First class	**Catch-weighing**	**Check-weighing**	**Check-weighing**	**Catch-weighing**	**Default value**	**Range**	**LFT-Relevant**
Conveyor			Belt speed		60	[0, 10,000]	Yes
			Belt length		1500	[0, 10,000]	Yes
Compensation			Compensation management		Disabled	0 = Disabled 1 = Enabled	Yes
			Static weight 1 - 5		0	[0, Capacity] <unit>	Yes
			Dynamic weight 1 - 5		0	[0, Capacity] <unit>	Yes
Re-zero	Stability and range					**Note** Apply zero range and stability settings from Scale menu	Yes
	Scale empty threshold				0	[0, Capacity] <unit>	Yes
	Re-zero trigger				External only	0 = External only 1 = Periodic 2 = Re-zero photoeye	Yes
	Period				300 s	[1, 7200] s	Yes
	After trigger delay				3000 ms	[1, 20,000] ms	Yes
Event and alarm	Re-zero timeout				15 min	[0,120] min	Yes
	Photoeye timeout				10 s	[3600] s	No
	Upper limit				0	[0, Capacity] <unit>	No
Classification		Operating mode *			Single Tolerance	0 = Single tolerance 1 = Dual tolerance	No
		Target weight *			10	[0, Capacity] <unit>	No
		- Tolerance 1 *			1	[0, Capacity] <unit>	No
		- Tolerance 2 *			0	[0, Capacity] <unit>	No
		+ Tolerance 1 *			1	[0, Capacity] <unit>	No
		+ Tolerance 2 *			0	[0, Capacity] <unit>	No
Statistics	Clear statistics						No
Input	Assignment (Input1-5)				None	0 = None 21 = Run/Stop 22 = Front photoeye 23 = Rear photoeye 25 = Re-Zero 26 = Reverse 27 = Capture weight	No
	Trigger mode (appears when assignment equals Front/Rear photoeye/Re-zero)				High level	0 = High level 1 = Low level	No

	Static		In-Motion				
First class	**Catch-weighing**	**Check-weighing**	**Check-weighing**	**Catch-weighing**	**Default value**	**Range**	**LFT-Relevant**
Output	Assignment (Output1-8)				None	0 = None 21 = Run 22 = Ready 14 = SMART5™ red 15 = SMART5™ orange 32 = Application alarm 34 = Scale loaded 26 = Re-zero timeout 23 = Weighing completed 33 = Weighing failed 29 = In tolerance 27 = -Tolerance limit 2 28 = -Tolerance limit 1 30 = +Tolerance limit 1 31 = +Tolerance limit 2 35 = Upper limit 16 = Remote	No
	Signal delay (if applicable)				0 ms	[0, 20000] ms	No
	Impulse length (if applicable)				500 ms	[0, 20000] ms	No
Alibi	Alibi Memory				Disabled	0 = Disabled 1 = Enabled	Yes
	Device ID				1	[1, 999,999,999]	Yes

* Available in shortcut menu as well.

To protect your product's future:
METTLER TOLEDO Service assures the quality, measuring accuracy and preservation of value of this product for years to come.

Please request full details about our attractive terms of service.

www.mt.com/service

www.mt.com/ind360
For more information

Mettler-Toledo GmbH
Im Langacher 44
8606 Greifensee, Switzerland
www.mt.com/contact

30927526A en

30927526