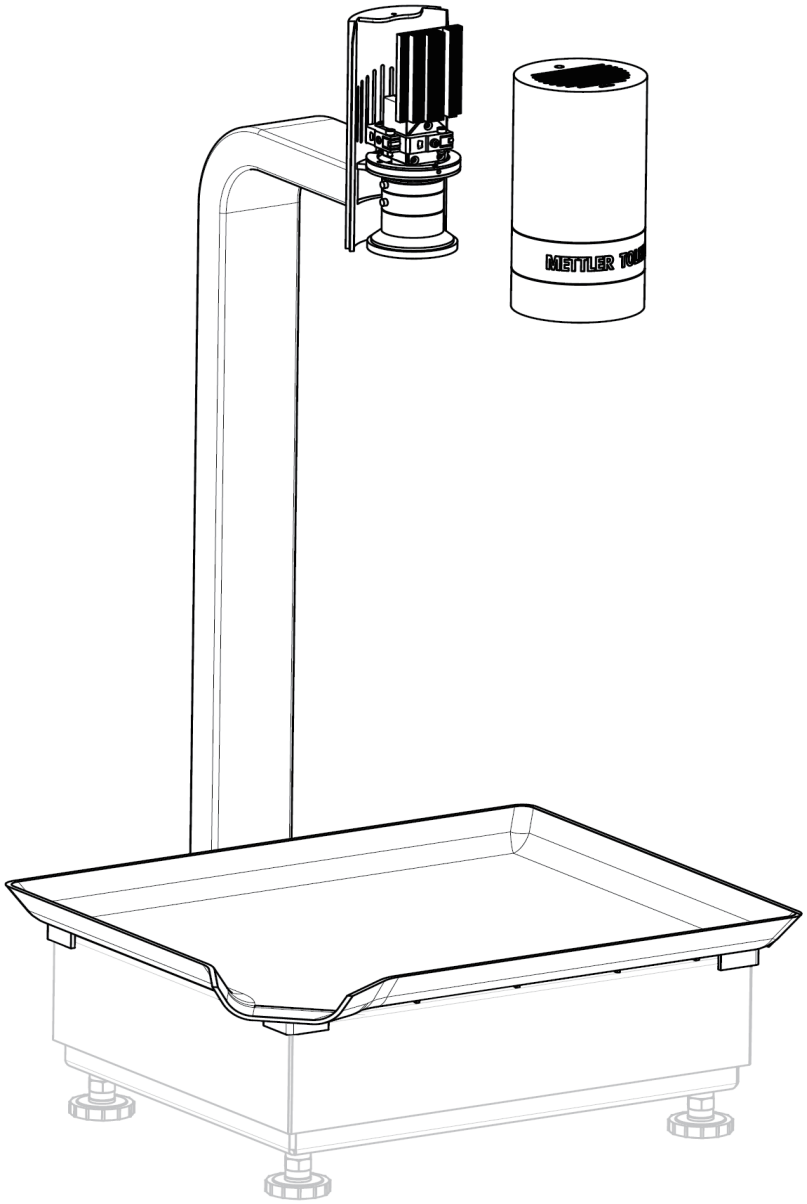
User Manual

InVision
Pick & Pack System



METTLER TOLEDO

METTLER TOLEDO Service

Congratulations on choosing the quality and precision of METTLER TOLEDO. Proper use of your new equipment according to this User manual and regular calibration and maintenance by our factory-trained service team ensures dependable and accurate operation, protecting your investment. Contact us about a service agreement tailored to your needs and budget. Further information is available at www.mt.com/service.

There are several important ways to ensure you maximize the performance of your investment:

1. **Register your product:** We invite you to register your product at www.mt.com/productregistration so we can contact you about enhancements, updates and important notifications concerning your product.

2. **Contact METTLER TOLEDO for service:** The value of a measurement is proportional to its accuracy – an out of specification scale can diminish quality, reduce profits and increase liability. Timely service from METTLER TOLEDO will ensure accuracy and optimize uptime and equipment life.

    a. Installation, Configuration, Integration and Training: Our service representatives are factory-trained, weighing equipment experts. We make certain that your weighing equipment is ready for production in a cost effective and timely fashion and that personnel are trained for success.

    b. Initial Calibration Documentation: The installation environment and application requirements are unique for every industrial scale so performance must be tested and certified. Our calibration services and certificates document accuracy to ensure production quality and provide a quality system record of performance.

    c. Periodic Calibration Maintenance: A Calibration Service Agreement provides on-going confidence in your weighing process and documentation of compliance with requirements. We offer a variety of service plans that are scheduled to meet your needs and designed to fit your budget.

    d. GWP® Verification: A risk-based approach for managing weighing equipment allows for control and improvement of the entire measuring process, which ensures reproducible product quality and minimizes process costs. GWP (Good Weighing Practice), the science-based standard for efficient life-cycle management of weighing equipment, gives clear answers about how to specify, calibrate and ensure accuracy of weighing equipment, independent of make or brand.

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This device complies with Part 15 of the FCC Rules and the Radio Interference Requirements of the Canadian Department of Communications. Operation is subject to the following conditions: (1) this device may not cause harmful interference, and (2) this device must accept any interference received, including interference that may cause undesired operation.

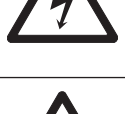
This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to Part 15 of FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his or her expense.

Safety Instructions

- ❑ **READ this manual BEFORE operating or servicing this equipment and FOLLOW these instructions carefully.**
- ❑ **SAVE this manual for future reference.**

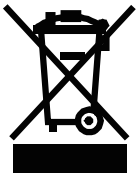
	⚠ WARNING
	ONLY PERMIT QUALIFIED PERSONNEL TO MAKE CHECKS, TESTS AND ADJUSTMENTS TO BE CARRIED OUT WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM.
	⚠ WARNING
	ALWAYS DISCONNECT THE DEVICE FROM POWER BEFORE INSTALLING, SERVICING, CLEANING OR PERFORMING MAINTENANCE.
	⚠ WARNING
	CHECK THE CABLES REGULARLY. THE DEVICE MUST NOT BE USED WHEN ANY CABLE IS DAMAGED.
NOTE	
TREAT THE DEVICE CAREFULLY. KNOCKS TO THE WEIGHING PLATTER OR OVERLOADING IT EXCESSIVELY WILL DAMAGE THE DEVICE.	
NOTE	
ONLY USE RECOMMENDED ACCESSORIES AND PERIPHERALS.	
NOTE	
DO NOT OPEN THE DEVICE. THE WARRANTY IS VOID IF THIS STIPULATION IS IGNORED. THE DEVICE MAY ONLY BE OPENED BY AUTHORIZED PERSONNEL.	

Cautionary Notes Regarding Installation

	⚠ WARNING
	DO NOT OPERATE THE DEVICE IF ITS HOUSING, PROTECTION COVER, OR AC ADAPTER INCLUDING ALL CONNECTIONS, IS DAMAGED. DISCONNECT THE DAMAGED DEVICE FROM POWER.
	⚠ CAUTION
	THE DEVICE MUST ONLY BE USED INDOORS. AVOID GENERATING STATIC ELECTRICITY ON GLASS AND PLASTIC PARTS. ONLY CLEAN THE DEVICE AS STIPULATED IN THE CLEANING INSTRUCTIONS, AND DISCONNECT THE DEVICE FROM POWER BEFORE CLEANING.
	⚠ CAUTION
	DO NOT TOUCH THE SURFACE OF THE TOUCHSCREEN WITH SHARP, POINTED, ROUGH OR HARD OBJECTS. TAKE CARE OF THE GLASS PANEL. IF IT IS DAMAGED, DISCONNECT THE DEVICE FROM POWER IMMEDIATELY.
	**⚠ CAUTION**
	RUN THE CABLES WHERE THEY WILL NOT BE DAMAGED BY ANY SHARP EDGES OR POSE ANY RISK OF A TRIP HAZARD.

	⚠ CAUTION
	THE DEVICE MEETS IP20 PROTECTION RATING REQUIREMENTS. PLEASE HANDLE THIS DEVICE ACCORDING TO ITS IP PROTECTION RATE AND PROPERLY SECURE THE ENVIRONMENT WHERE THE DEVICE OPERATES.
	⚠ CAUTION
	ONLY USE ACCESSORIES SUPPLIED BY METTLER TOLEDO. MAKE SURE THAT THE VOLTAGE RATING PRINTED ON THE AC ADAPTER IS IDENTICAL TO YOUR LOCAL MAINS VOLTAGE. IT IS ESSENTIAL TO COMPLY WITH NATIONAL REGULATIONS REGARDING GROUNDING CONNECTIONS.
	⚠ CAUTION
	DO NOT EXPOSE THE DEVICE TO EXTREME TEMPERATURES, AGGRESSIVE CHEMICAL VAPORS, SHOCKS, MOISTURE, VIBRATIONS, OR STRONG ELECTROMAGNETIC FIELDS. CHEMICALS MUST BE KEPT AWAY FROM CABLES, PLASTIC COVERS, AND OTHER CORROSION PRONE COMPONENTS.
	NOTE
	OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.

Disposal of Electrical and Electronic Equipment



In conformance with the European Directive 2012/19/EU on Waste Electrical and Electronic Equipment (WEEE) this device may not be disposed of in domestic waste. This also applies to countries outside the EU, per their specific requirements.

Please dispose of this product in accordance with local regulations at the collecting point specified for electrical and electronic equipment.

If you have any questions, please contact the responsible authority or the distributor from which you purchased this device.

Should this device be passed on to other parties (for private or professional use), the content of this regulation must also be related.

Thank you for your contribution to environmental protection.

Material Limits

Recognizable Materials

The InVision system is capable of recognizing materials meeting the following requirements.

- ≥0.6g in weight.
- ≤80mm in height.
- ≤80mm in length.
- ≤80mm in width.
- Not transparent nor semi-transparent.
- Not easily changeable in physical features.

The InVision system cannot visually recognize a material that does not meet the requirements listed above, even its model pictures have been captured successfully.

Low Recognition Rate Cases

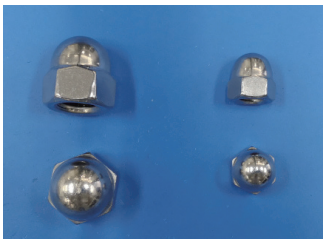
The recognition rate of the InVision system may decrease if two materials in the same recipe present only subtle differences when they are placed in the same pose. Under such circumstances, the operator's intervention is necessary – these materials will have to be recognized by human eyes. Below is a list of typical situations that may present a challenge to the InVision system.

Case A: Same Pose, Similar Appearance

Two materials have a subtle difference in sizes – for instance, diameter (Exampe 1 and Example 3) or length (Example 2).

Example 1

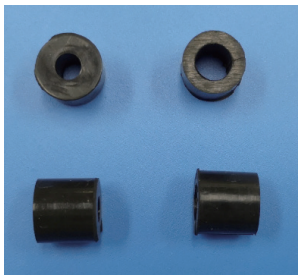
Example 2



Example 3

Case B: Same Pose, Different Appearance Details

Two materials have subtle differences in appearance – for instance, inner diameter (Example 4), texture (Example 5) or spacing (Example 6).



Example 4

Example 5

Example 6

Case C: Same Appearance in One Pose but Different in Another

Two materials have the same or similar appearance in a certain pose.

Example 7

Example 8

Case D: Similar Color As the Weighing Platter

The material (example 9) has the same or similar color as the InVision weighing platter.

Example 9 - Bolts with blue coating

InVisionWeighing Platter

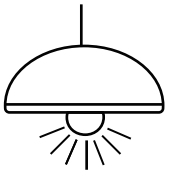
Important Notes for Pick&Pack

Beware of the following notes when you use the InVision system for Pick&Pack application. For detailed instructions on Pick&Pack operation, please refer to the user manual.

Ambient Lighting Requirements

▲ Ensure that the ambient lighting meets the requirements:

- **Iluminance: 350 - 650 lux;**
- **Coefficient of variation: < 20%;**
- **Color temperature: 4000 - 6500 k.**

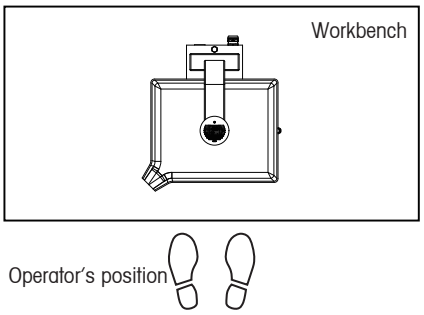


Before Operation

1. Check the ambient lighting and the camera's white balance. Ensure the lighting conditions do not change since last white balance adjustment, otherwise, you may have to readjust the white balance using the W/B softkey on the screen.

📖 See "2.5.1 Adjusting White Balance" in the user manual for more information about the white balance adjustment.

2. It is highly recommended that the operator stand in front of the weighing platform during operation.



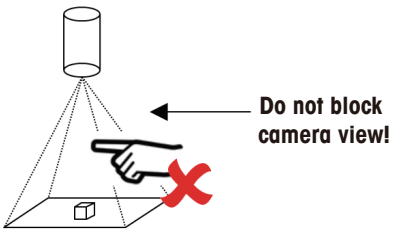
3. There is no object or human body around which can easily produce shadow or darkness over the platter, causing recognition errors.

During Operation:

1. Check the ambient lighting constantly during operation. If the lighting conditions change, please readjust the white balance using the W/B softkey on the screen.

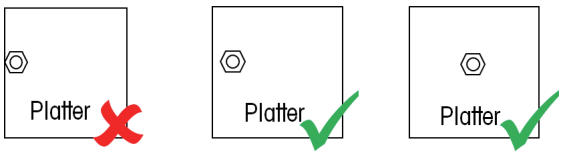
📖 See "2.5.1 Adjusting White Balance" in the user manual for more information about the white balance adjustment.

2. Do not block the camera's view when a material is being weighed and recognized. Do draw back your hand immediately after you place pieces of material on the platter for recognition.

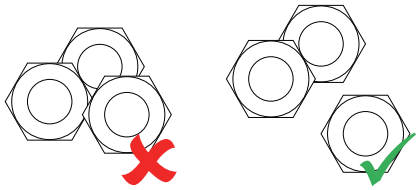


3. Start weighing and recognizing with any recognizable material in the order. There is no necessary sequence among recognizable materials. Unrecognizable materials will be weighed after all recognizable materials are completed.

4. Make sure that all materials are away from the edges of the platter, otherwise, recognition errors may occur.

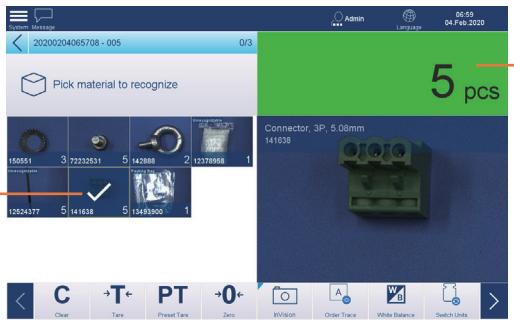


5. For any material that is newly placed on the platter, ensure that at least one piece of the material is not in contact with any other material, otherwise, recognition errors occur.



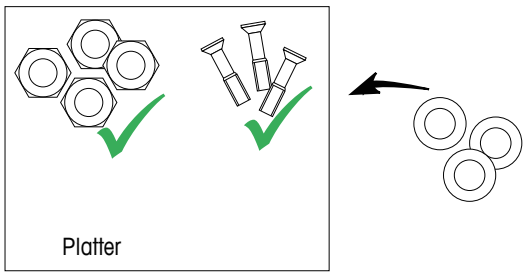
6. Do not remove any piece of the material, when weighing and recognition of the material is completed (judging by the "√" mark and the **green** weighing /counting indicator in the screen as shown below).

A "√" mark appears when the material is completed.



Weighing/Counting indicator shows **green** when the material is completed.

7. Ensure that the current material is recognized and meets its target amount (judging by the "√" mark and the **green** weighing /counting indicator in the screen as shown above) before you move to the next material. Otherwise, reconition errors occur.



8. If a material can roll easily, ensure that you place it on the platter steadily.

9. Avoid heavy shocks when you place any material on the platter.

InVision Pick & Pack System User Manual Change Notices

Date (MM/DD/YYYY)	Changes	Revision
02/28/2020	Official Launch	A

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1 Introduction

1.1 Documentation

This document describes the installation, operation, configuration and maintenance of the InVision Pick & Pack system.

Basic information for working with the IND970 weighing terminal and PBD769-AB-15 weighing platform can be found in their respective **User's Guides**.

1.2 Introduction

The InVision Pick & Pack system is an innovative, unique and well-differentiated in-plant weighing solution for bench scales. InVision uses a smart camera recognition technology to identity and/or classify parts, components and materials presented on a bench scale platter.

1.2.1 Features

- Supports one scale channel
- Material visual modeling
- Material visual recognition
- Pick-in & Pack
- Track & Trace
- Data storage
- Support orders import from ERP/SAP or local
- Intuitive human-machine interface
- Zero mis-recognition rate
- Stores up to 2000 material entries
- Stores up to 100,000 track & trace records
- Four languages available: English (factory default), German, French, Spanish

1.2.2 Benefits

- Optimized productivity: Identify parts through visual recognition and improve workflow efficiency by up to 30%.
- Eliminated quality risks: Guide operators to follow right steps and recognize parts through machine instead of manually, the result is less human errors.
- Quick integration: Easy installation without complex system connectivity debug.
- Speed to work: Intuitive and concise guidance reduces time for training.
- Documentation and traceability: Visual proof for compliance and improved traceability.

1.2.3 System Components

To make the InVision system work, you need:

- InVision Camera Boom (provided)
- InVision Platter (provided)
- IND970 PC Application Terminal (including a human-machine-interface and an Elo box) (purchased separately)
- PBD769-AB-15 Weighing Scale (purchased separately)

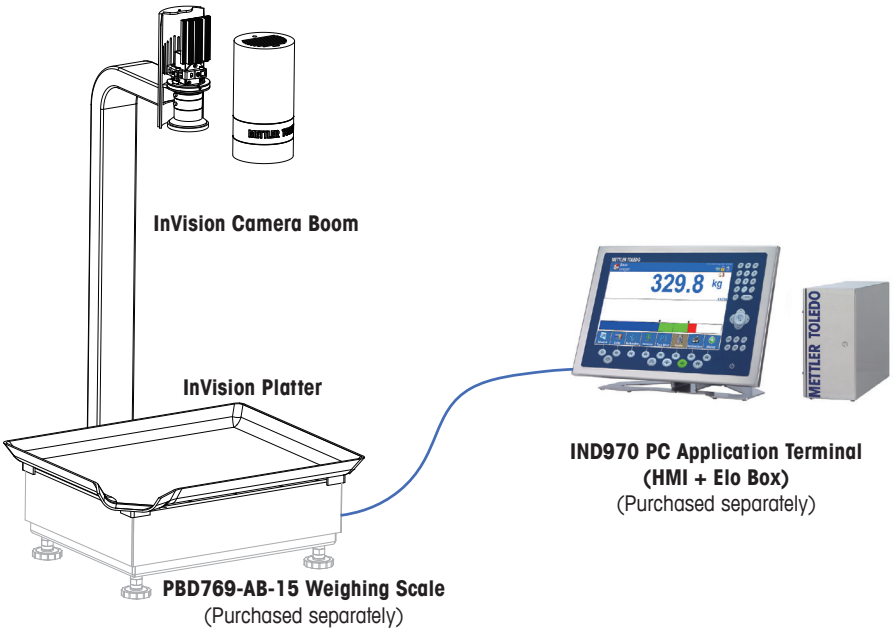


Figure 1-1: InVision Pick & Pack System

1.3 Environmental Requirements

⚠ WARNING

THIS EQUIPMENT IS NOT INTRINSICALLY SAFE! IT MAY NOT BE USED IN AREAS THAT ARE CLASSIFIED AS POTENTIALLY EXPLOSIVE DUE TO COMBUSTIBLE OR EXPLOSIVE ENVIRONMENTS.

- For use in non-hazardous areas only
- Elevation below 2000 meters
- Operating temperature: 0 °C- +35 °C (at 10%- 70% relative humidity, non-condensing)
- Storage temperature: -20 °C - +60 °C (at 10%- 70% relative humidity, non-condensing)
- Recommended ambient lighting condition (white LEDs are preferred):

  Illuminance: 350 – 650 lux

  Coefficient of variation: < 20%

  Color temperature: 4000 - 6500 k

1.4 Application Restrictions

- The single material/part to be weighed and recognized through the InVision system should be:
  - ≥0.6g in weight.
  - ≤80mm in height, ≤80mm in length, ≤80mm in width.
  - Not transparent nor semi-transparent.
  - Not easily changeable in physical features.
- We highly recommend you shut down the InVision system if the system is going to stay idle for more than 6 hours.

1.5 Inspection and Contents Checklist

Item	Quantity	Item	Quantity
InVision camera boom	1	M10 screw pin	1
Lens	1	M5x16 screw with spring and washer	7
USB extension cable	2	Flat spring	1
M5 Allen wrench	1	Pressing plate	1
M3 Allen wrench	1	InVision platter	1
M3 screwdriver	1	Calibration board	1

1.6 Dimensions

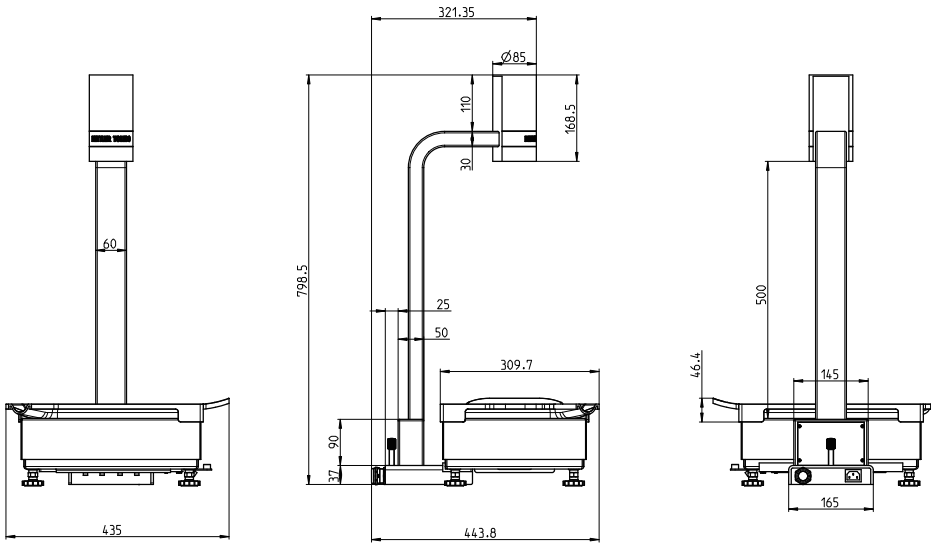


Figure 1-2: InVision System Dimensions (in mm)

For dimensions of the PBD769-AB-15 scale and IND970 terminal, please refer to their user's manuals.

1.7 Technical Data

Table 1-1: Technical Data

InVision Pick & Pack System Technical Data	
Housing type	• Camera boom: AISI 304 • Platter: ABS757
Dimensions (L x W x H)	• Camera boom: 280 x 321.5 x 798.5 mm • Platter: 435 x 310 x 46.5 mm • With PBD769-AB-15: 435 x 444 x 802 mm
Net weight	• Camera boom: 5.9 kg • Platter: 0.59 kg
Power supply	100 - 240 VAC, 50/60 Hz, 0.15 A
Camera parameters	• Model: acA4024-8gc Basler ace GigE camera • Resolution (H x V pixels): 4024 x 3036 • Sensor type: Sony IMX226CJL-C, progressive scan CMOS, rolling shutter • Optical size: 1/1.7" • Mono / Color: Color • Image data interface: Gigabit Ethernet (1000 Mbit/s) • Synchronization: Via software trigger • Exposure time control: < 100,000 • Camera power requirements: – 12 VDC, 1.0A supplied via I/O connector – ≈12 W (rated) @ 12 VDC supplied via I/O connector
Lens working conditions	<55% relative humidity
Image parameters	3020 x 2430 (H x V pixels, factory default)
Type of protection	The InVision system satifies the requirement for protection class IP20.
Operating temperature	0 °C - +35 °C (at 10%- 70% relative humidity, non-condensing)
Storage temperature	-20 °C - +60 °C (at 10%- 70% relative humidity, non-condensing)
Ambient conditions according to EN61010	• Indoor use only • Pollution degree 2 • Overvoltage category II • Max. installation height 2,000 m AMSL
Recommended ambient lighting condition	• Illuminance: 350 - 650 lux • Coefficient of variation: < 20% • Color temperature: 4000 - 6500 k
Hazardous areas	The InVision system cannot be used in hazardous areas.

InVision Pick & Pack System Technical Data	
Communication (camera connectors)	• Ethernet connector – 1000 Mbit/s Ethernet connection to the camera – 8-pin RJ-45 jack – Matching connector: Standard 8-pin RJ-45 plug (supplied) – When using locking screws, note the horizontal orientation of the screws • I/O connector – For 12 VDC power supply – Hirose micro receptacle – Matching connector: Hirose micro plug

1.8 User Interface

1.8.1 Order Selection Screen

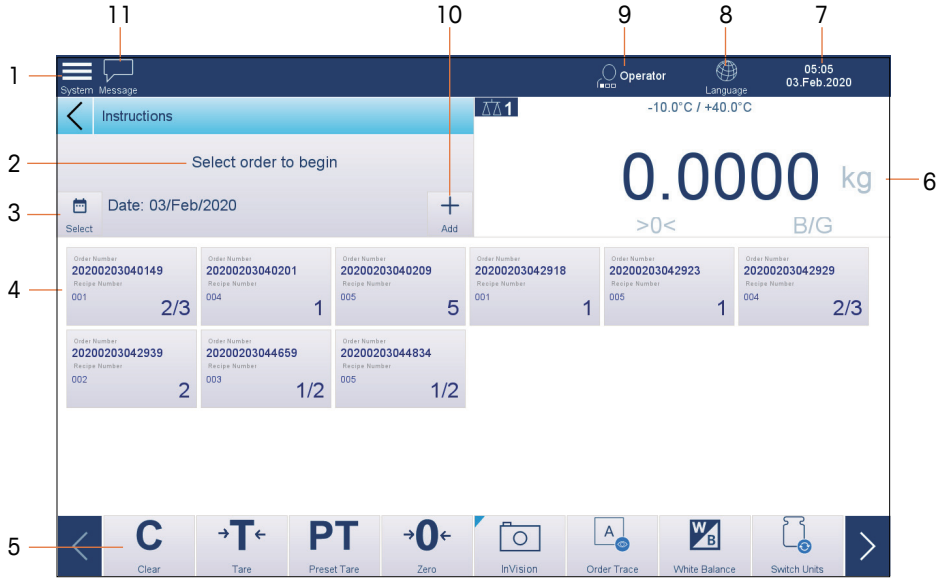


Figure 1-3: Order Selection Screen

1 System button
2 Instructions
3 Order production date
4 Order list
5 Softkeys (see **1.8.3 Softkeys**)
6 Weight information
7 Time and date
8 Language
9 Logged user
10 To add orders
11 System messages

1.8.2 Pick & Pack Screen

Figure 1-4: Pick & Pack Screen

1 System button

2 Order information (including order number and recipe number)

3 Instructions

4 Material list

5 Softkeys (see **1.8.3 Softkeys**)

6 Material being weighed and recognized

7 Quantity indication

8 Time and date

9 Language

10 Logged user

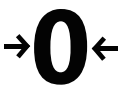
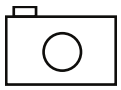
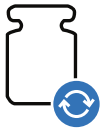
11 Pick & Pack progress

12 System messages

1.8.3 Softkeys

Table 1-2: Softkeys

Symbol	Designation	Explanation
C	Clear	When in the net weight mode, press the CLEAR key to clear the current tare value; the InVision sytem will revert to the gross weight value.
→T←	Tare	Tare is the weight of an empty container. Tare is normally used to determine the net weight of the contents of a container. Press the TARE key when an empty container is on the scale or the platter. The InVision system then displays a zero net weight. As the container is loaded, the InVision system then displays the net weight of the contents.
PT	Preset Tare	Tares the current scale with a predefined value.

Symbol	Designation	Explanation
	Zero	When the scale platter is empty, the InVision application screen should indicate zero. Press the ZERO key to set or reset the initial zero reference point of the InVision system.
	InVision Camera	Press the Camera key to check the camera status. The blue triangle( ) indicates the camera is ready to work.
	Order Trace	Library of all the recipe pictures (taken before being packaged) for trace of completeness check.
	White Balance	Press the White Balance key to adjust the white balance settings of the camera. White balance should be done when ambient lighting changes.
	Switch Units	Press the Switch Units key to switch the units of measure.

1.8.4 Main Setup Screen

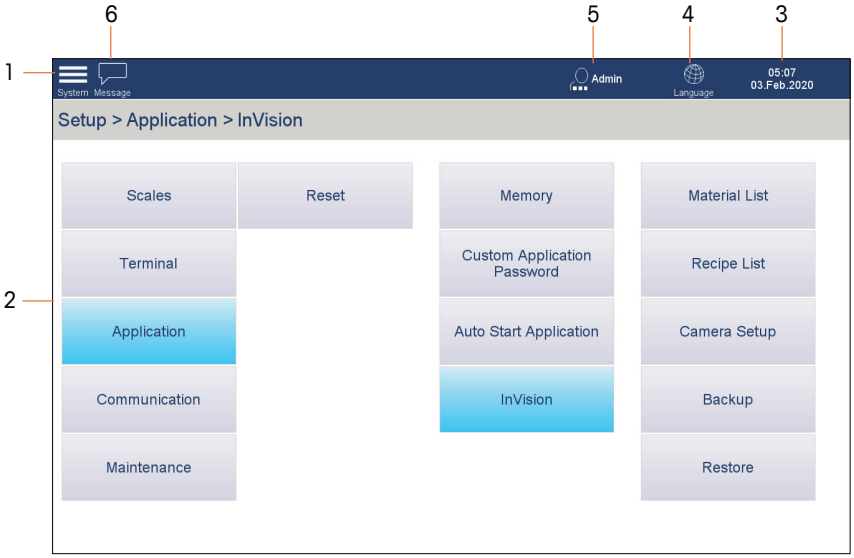


Figure 1-5: Main Setup Screen

1 System button
2 Sub-menus
3 Time and date
4 Language
5 Logged User
6 System messages

Table 1-3: Setup Menu Structure

Level 1	Level 2	Level 3	Level 4	Level 5
Setup	Scale 1	Identification		
		Metrology		
		Capacity & Increment		
		Calibration	Zero	
			Zero + Span	
			Capture Span	
		Units & Resolution		
		Tare	Types	
			Auto Tare	
			Auto Clear	
		Min Weigh		
		Scale Reset		
	Application	InVision App	Material List	
			Recipe List	
			Camera Setup	White Balance
				Posture Calibration
				Focus Adjustment
				Factory Reset
			Backup	
			Restore	
	Maintenance	Run	Software Update	

1.9 Security

The InVision system is protected by security features provided by the IND970 terminal. **Table 1-4** shows accessibility of different InVision features at different security levels. An Operator-level user has no privilege to add orders on the Order Selection screen (**Figure 1-3: Order Selection Screen**) or enter the InVision setup screens, including Material List, Recipe List, Camera Setup, and Backup and Restore (**Figure 1-5: Main Setup Screen**).

Table 1-4: Accessibility of InVision Features

	Administrator	Supervisor	Operator
Pick & Pack	Yes	Yes	Yes
Order Trace	Yes	Yes	Yes
Add Orders	Yes	Yes	No
Setup	Yes	Yes	No

For more information about how to configure security levels, please refer to the **IND970 User's Guide**.

2 Installation

Installation of the InVision system includes the installation of system hardware (PBD769-AB15, InVision camera boom, IND970 terminal and IND970 Elo box), scale configuration, and camera calibration.

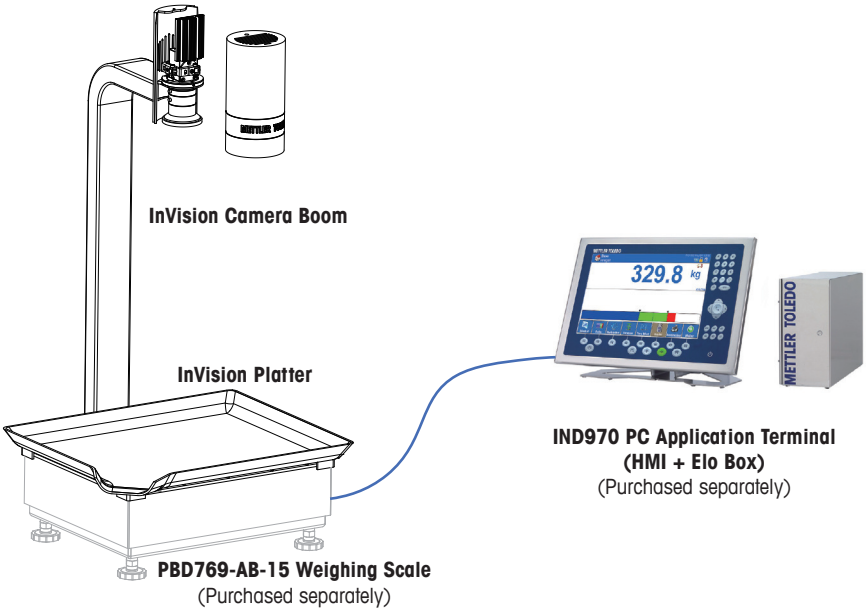
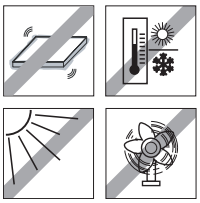


Figure 2-1: InVision Pick & Pack System

2.1 Preparatory Work

2.1.1 Selecting Installation Site



- The foundation at the installation site must be capable of safely supporting the total weight of the InVision system hardware at its support points, when a maximum load is on the weighing scale.
- Ensure that the installation site is even and stable, and that no vibrations occur during operation of the system.
- Ensure that there are no vibrations from machines near the installation site.
- Ensure that there are no drafts at the installation site.
- Ensure that there are no excessive temperature fluctuations.

2.1.2 Ambient Conditions

Refer to section **1.3 Environmental Requirements**, where the required conditions are listed.

2.2 Installing Hardware

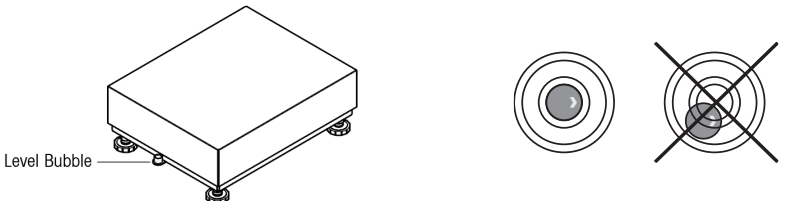
To install the hardware of the InVision system, you need:

- M5 Allen wrench (provided).

- M3 screwdriver (provided).

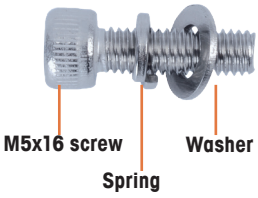
Install the InVision system as follows:

1. Unpack the PBD769-AB15 weighing scale and place it at the installation site. If necessary, level it by adjusting its levelling feet, until the level bubble is within the ring marking.

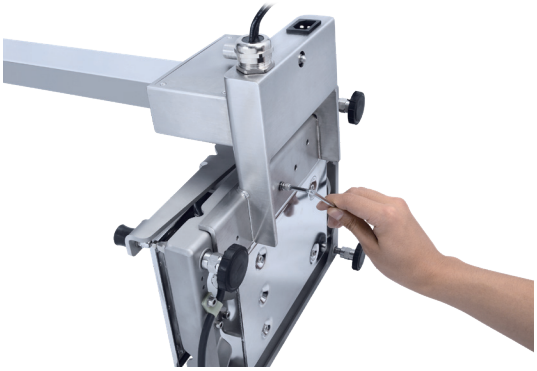


2. Remove the PBD769-AB15 load plate.

3. Flip the weighing platform by 90° to reveal the four screw holes on the supporting frame.



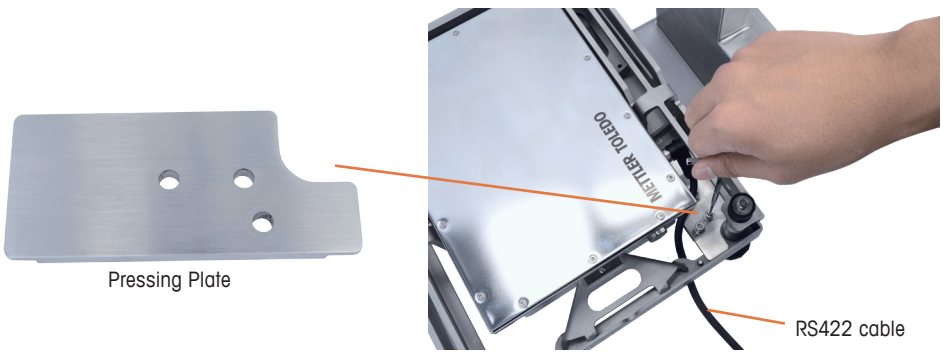
4. Attach the camera boom to the PBD769-AB15 supporting frame using four M5x16 screws provided.



5. Flip the weighing platform back. Re-level the scale if necessary.

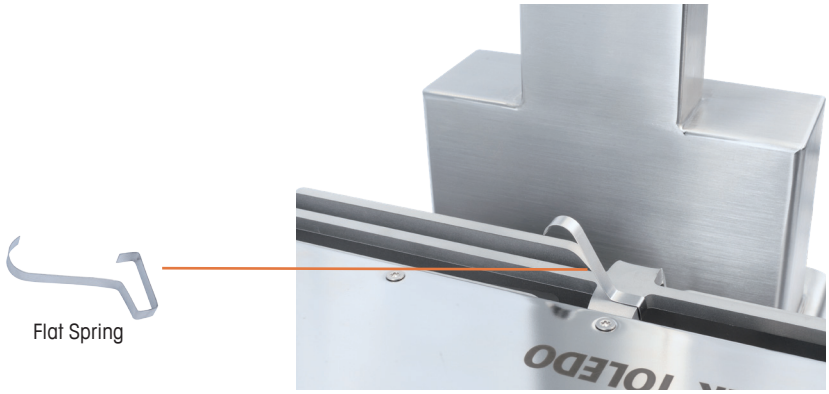
6. Disconnect the RS422 scale cable from the weighing load cell to get ready for installation of the pressing plate.

7. Install the pressing plate to the platform (the upper right corner area) using three M5x16 screws.

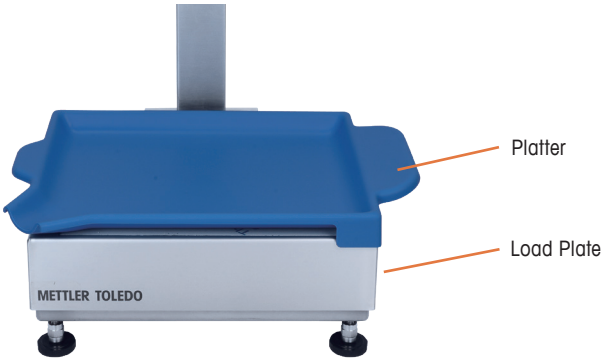


8. Reconnect the RS422 scale cable to the weighing load cell.

9. Clip the flat spring to the platform.



10. Replace the load plate, then put the weighing platter onto the load plate.



11. At the back of the scale, install the M10 screw pin until it immediately touches the supporting surface of the installation site.

12. Remove the M3 screws on top of the camera housing, and slide the camera housing up to reveal the camera.

IMPORTANT: Avoid using slippery gloves and exercise extra care while uninstalling the camera housing

13. Remove the camera protection cover.

14. Unpack the camera lens, and check if the f-stop reaches f/2.8. If it does not, loosen the upper screw and adjust the aperture ring until the f-stop reaches f/2.8 (2.8 above the two white dots), then refasten the upper screw.

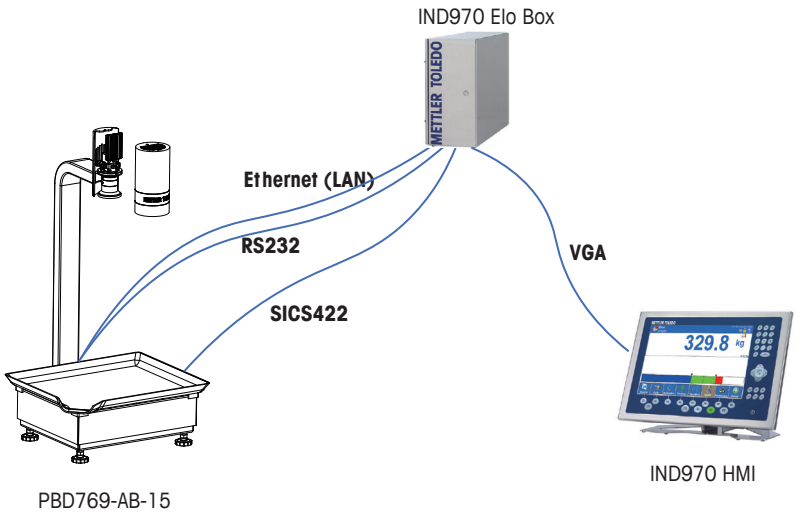
Figure 2-2: f-stop should reach f/2.8

15. Install the lens on the camera, and remove the lens cap.

IMPORTANT: Do not reinstall the camera housing before completing camera calibration (refer to **2.5 Calibrating the Camera**).

16. Connect the InVision system as shown in the diagram below.

IMPORTANT: Elo box offers two Ethernet connectors. Please choose the one that fits the Ethernet cable provided with the InVision camera boom.



For information about wiring and pin assignment, refer to the **IND970 User's Guide**.

17. Connect the Elo box, terminal and camera boom to correct power source.
18. Power on the IND970 terminal. The InVision system program will start up automatically.
19. Before performing any operation on the system, wait for 15 minutes until the camera fully warms up.

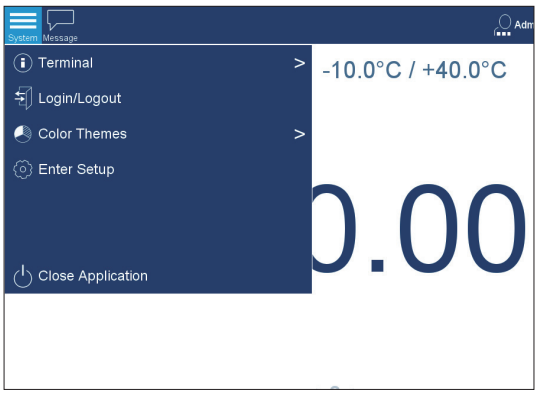
2.3 Configuring the Scale

NOTE:

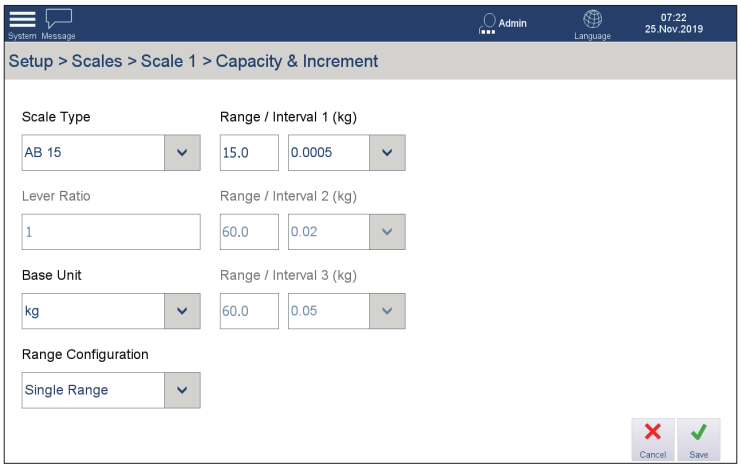
Ensure you have **Admin** access level before entering Setup.

Configure the scale settings as follows:

1. From the system button at the left upper corner of the screen, access **System > Enter Setup**.



2. Select **Scale > Scale 1 > Capacity & Increment**, and then configure parameters as follows:
    - Scale Type: AB 15
    - Range / Interval 1(kg): 15 / 0.0005
    - Range Configuration: Single Range



3. Press **Save**.

IMPORTANT: The "Save" button may not show if no parameter in the screen is changed. In this case, simply press "Setup" to return to the setup screen.

2.4 Setting Ambient Lighting

Lighting is crucial to Pick & Pack performance and recognition rate of the InVision system. Ideal lighting should fit the ambient lighting conditions as described in section **1.3 Environmental Requirements** and, at the same time, project as little material shadow on the platter as possible.

2.4.1 Recommended Luminaires

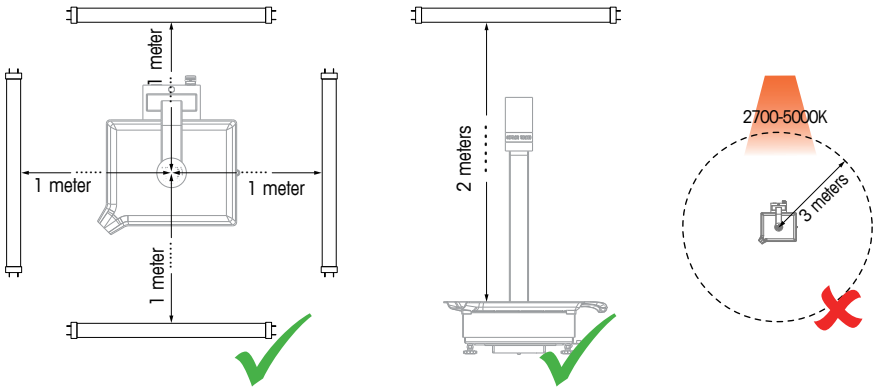
To meet the lighting requirements of the InVision system (refer to **1.3 Environmental Requirements**). We recommend the use of the following lights:

- Recommended light source: T8 LED tubes
- Power class: 35W - 60W
- Color temperature: 4000k - 6500k (white light)
- Recommended brands: PHILLIPS, OSRAM, NVC, OPPLE

2.4.2 Recommended Installation of Lighting Fixtures

- Quantity: 4 x T8 LED tubes, one for each side of the platter.
- Distance: Each T8 LED tube should be 1 meter away from the center of the platter.
- Height: Each T8 LED tube should be 2 meters above the platter surface.

- Free from movement and vibration.
- Recommended lifecycle: 2 years (on an average of 8 working hours per day).
- Ensure that there is no warm light (2700 - 5000K) within a 3-meter radius of the InVision system.



2.4.3 Measuring Illuminance on the Platter

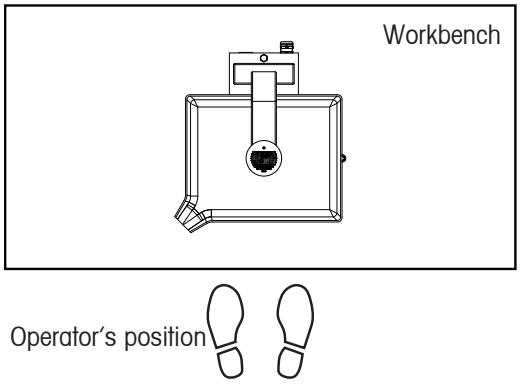
Chroma Meter
(not provided)

Check the illuminance on the platter each time the InVision system is moved to a new location and ensure the ambient lighting meets the requirements described in **1.3 Environmental Requirements**.

A chroma meter is needed to measure the illuminance values. You may purchase one from your local photography equipment store. Refer to the user manual of the chroma meter you have purchased for the detailed operation instructions on how to measure illuminance values.

NOTE:

- While measuring illuminance, it is highly recommended that the operator stand in front of the weighing platform.

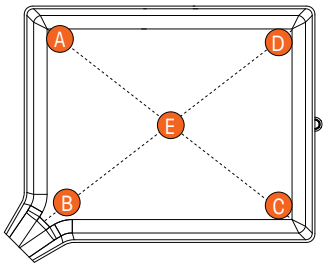


- Ensure that there's no object or human body around that can easily produce shadow or darkness over the platter. Otherwise, the measurement may be inaccurate.

Measure illuminance on the platter as follows:

1. Measure illuminance at four corners and the center of the platter, and record all

values. Each point should have its illuminance value fall in the ranges of 350 - 650 lux and 4000 - 6500 K.



2. Use the lux values of the five points to calculate the coefficient of variation (refer to **A.1 Coefficient of Variation Calculation Example** for calculation instructions). The coefficient of variation (or CV) should be ≤ 20%.

$$\mathrm{CV} = \frac{\sqrt{\sum_{i-1}^{n}(x_i - \bar{x})^2}}{\bar{x}}$$

3. If any illuminance value is out of the range, or the CV is higher than 20%, adjust the ambient lighting – for instance, move the scale to another place or adjust the lighting design.

4. Re-measure the five points, and repeat steps above, if necessary, until all illuminance values are within the ranges of 350 - 650 lux and 4000 - 6500 K, and the CV within 20%.

2.5 Calibrating the Camera

Remove the camera housing before calibrating the camera

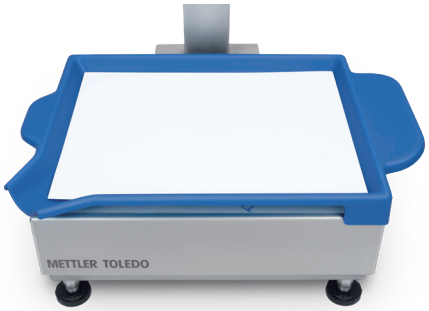
The camera and lens must be calibrated to their optimum settings before the system is used for production. We suggest the camera and lens be calibrated each time the InVision system changes location.

The calibration includes both user interface operations and hardware tuning. To calibrate the camera and lens, the provided M3 allen wrench and calibration board are required.

Before calibrating the camera and lens, ensure the camera housing is removed (by removing the M3 screw on top of it, then sliding the housing up).

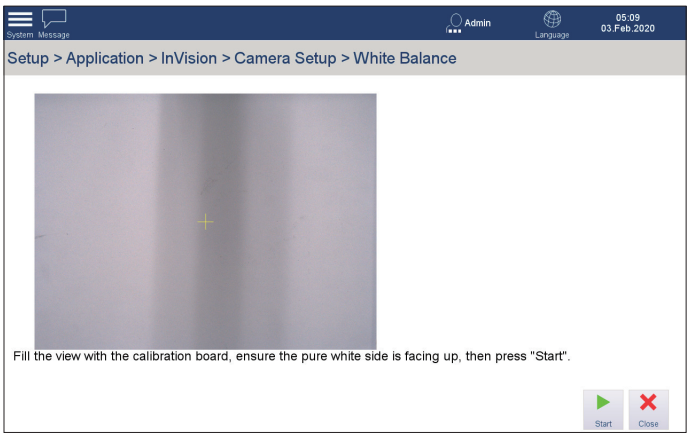
2.5.1 Adjusting White Balance

1. Place the camera calibration board on the platter, with its non-graphic side facing up.

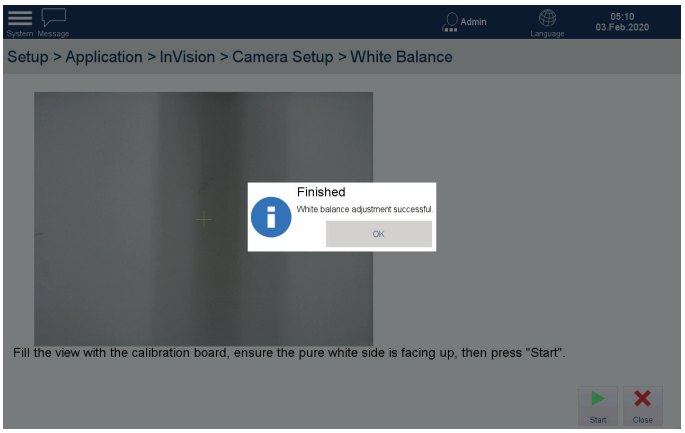


2. Access **Setup > Application > InVision > Camera Setup > White Balance**.

3. In the screen which appears (below), press **Start** to begin the procedure.



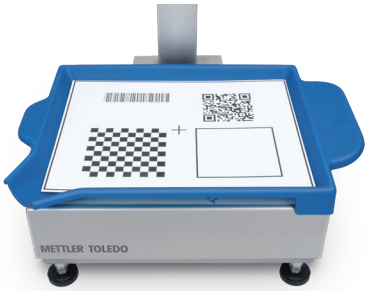
4. When white balance is captured, a confirmation message appears. Press OK.



5. The White Balance screen will reappear. Press **Close**.

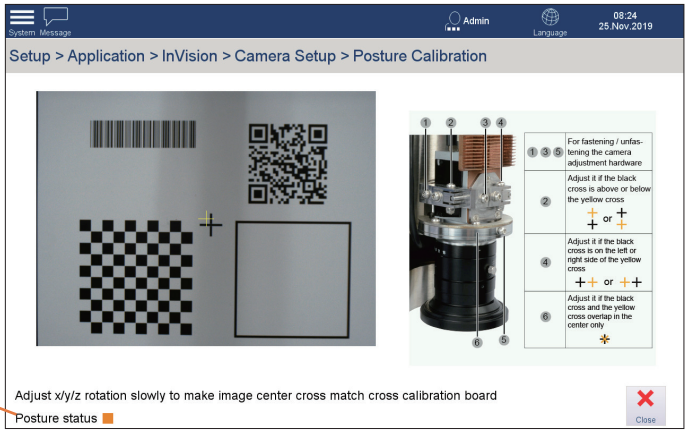
2.5.2 Adjusting the Camera Position

1. Place the calibration board on the platter with the graphic side facing up.



2. Access **Setup > Application > InVision > Camera Setup > Posture Calibration**.

3. Adjust the calibration board to ensure that its black borders are not visible on the Posture Calibration screen.



Posture Status Indicator

4. If the Posture Status indicator shows in amber, refer to section **2.5.2.1 Camera Position Adjustments**, to make the necessary correction.

5. When correction is done and the Posture Status indicator shows in green, press **Close**.

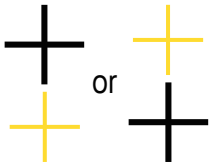
2.5.2.1 Camera Position Adjustments

The goal of these adjustments is to align the yellow cross displayed in the Posture Calibration screen with the black cross on the calibration target. An M3 Allen wrench

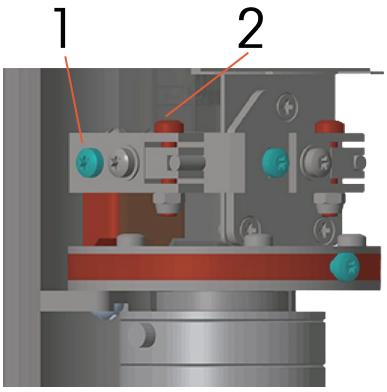
(provided) is used to adjust the camera's position and orientation.

Configure the camera settings as follows:

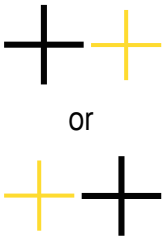
If the yellow cross is above or below the black cross:



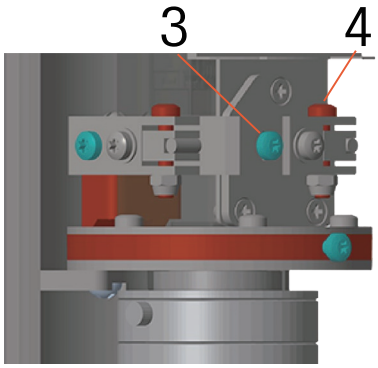
1. Slightly loosen the M3 screw (1).
2. Adjust the M3 screw (2).
3. When the black and yellow crosses overlap, tighten the M3 screw (1).



If the yellow cross is to the right of left of the black cross:

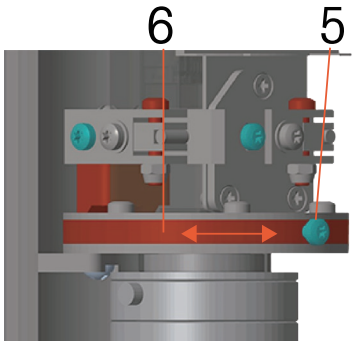


1. Slightly loosen the M3 screw (3).
2. Adjust the M3 screw (4).
3. When the black and yellow crosses overlap, tighten the M3 screw (3).



If the yellow cross and black cross overlap in the center only:

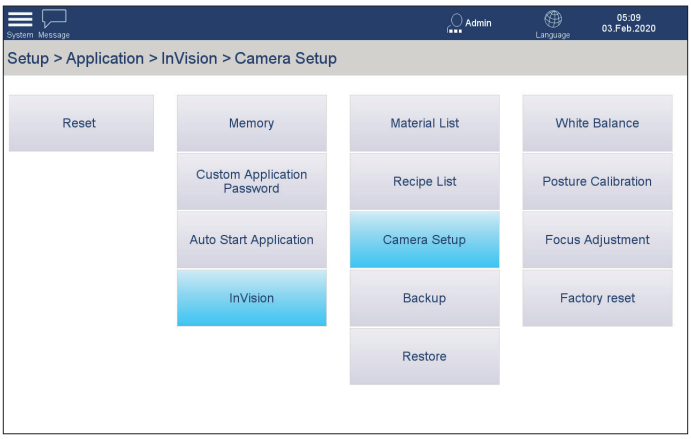
1. Slightly loosen the M3 screw (5).
2. Rotate the annulus (6).
3. When the black and yellow crosses are in the same orientation, tighten the M3 screw (5).



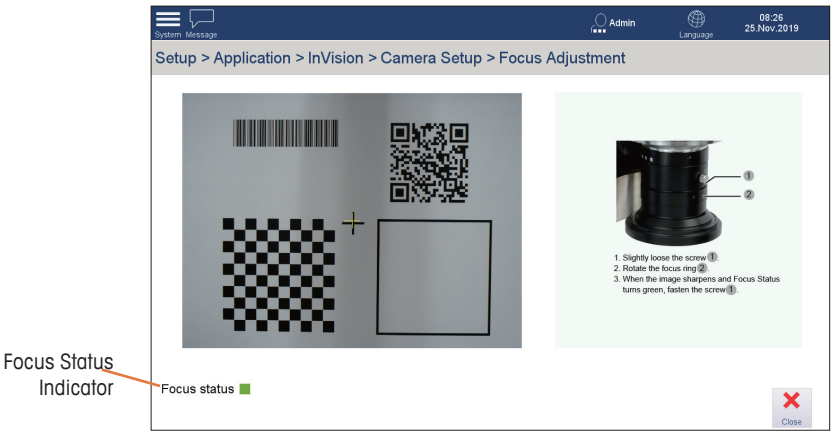
2.5.3 Adjusting Focus

1. Ensure that the calibration board is on the platter, with its graphic side facing up.

2. Access **Setup > Application > InVision > Camera Setup > Focus Adjustment**.



3. The screen shown below will display. Note the **Focus status** indicator at lower left.



4. Loosen the locking screw and rotate the focus ring until the Focus Status indicator turns green.

5. Finally, reinstall the camera housing by sliding it down the camera and fastening it in place with its M3 screw.

IMPORTANT: Avoid using slippery gloves and exercise extra care while installing the camera housing

NOTE:

For safety reasons, ensure that the camera housing is fastened with its M3 screw after camera calibration is done.

3 Configuration

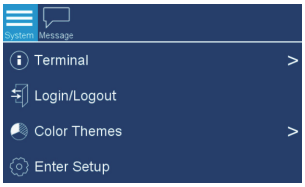
3.1 Entering and Exiting Setup

3.1.1 Entering Setup

NOTE:

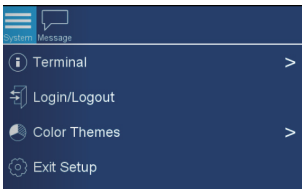
Ensure you have **Admin** access level before entering Setup.

To enter setup, press **System > Enter Setup**.



3.1.2 Exiting Setup

To exit setup, press **System > Exit Setup**.



3.2 Managing Materials

The **Material List** screen allows users to manage all materials, including recognizable materials, unrecognizable materials and packing materials, and supports up to 2000 entries.

To access the Material List screen, select **Setup > Application > InVision > Material List**.

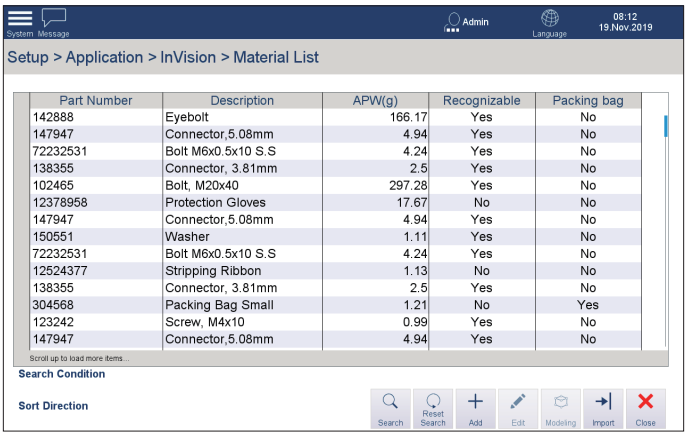
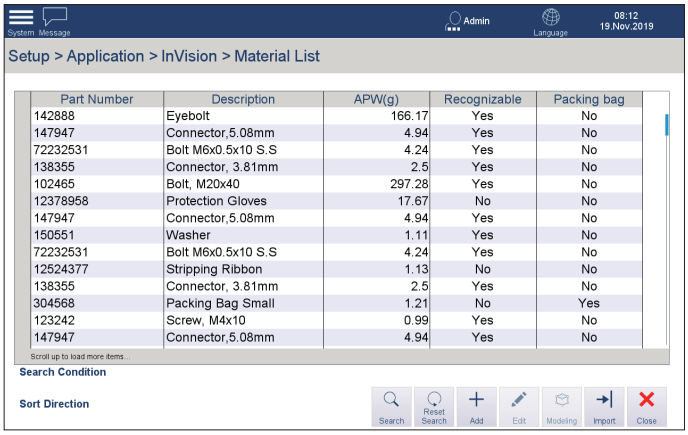


Figure 3-1: Material List Screen

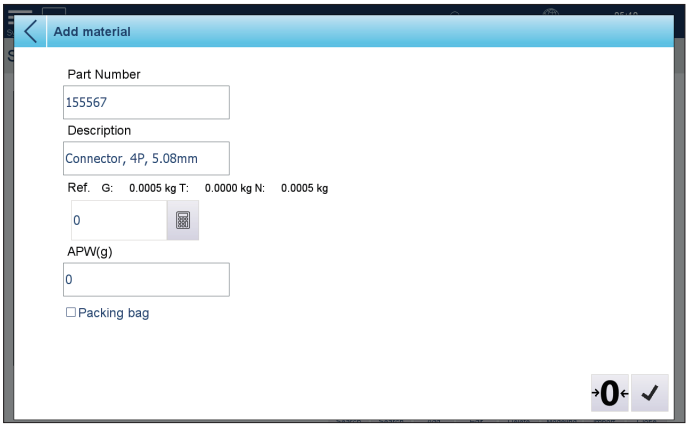
3.2.1 Adding a New Material

1. Press **Add** in the Material List Screen.



2. In the Add Material dialog, edit the material's Part Number and Description.

IMPORTANT: (1) The part number should contain no more than 20 characters. (2) Description should contain no more than 50 characters.



3. Zero the scale by pressing →0←. The G and T should show 0 kg.

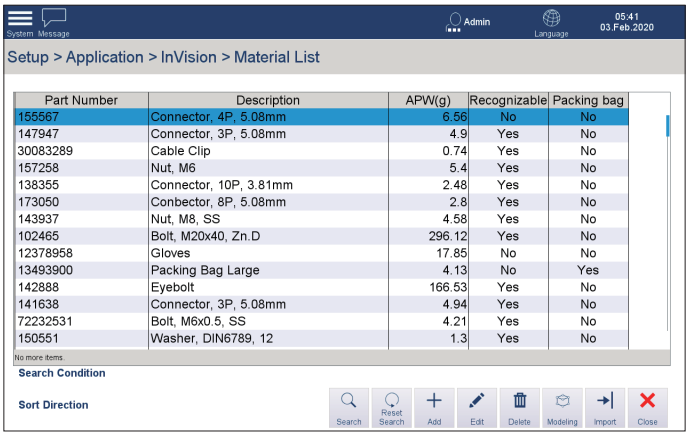
4. Place several pieces of the material on the platter. Suggested quantities are 5, 10 or 20.

5. Enter the material quantity in the Ref. text field, then press . The result of the calculation will display in the APW (g) text field.

6. Check "Is packing bag?" if the material is a packing bag; otherwise, skip this step.

7. Press ✓ to confirm.

8. The newly-added material will display in the first row of the Material List.



3.2.2 Modelling a Material

Modelling is a process of capturing the visual features of a material, including its color, shape, texture, and pose, etc., and building templates for later smart camera recognition. It consists of both on-the-user-interface and on-the-platter operations, and requires more human effort. However, you will only have to do it once.

We highly suggest you follow these principles when you model a material because these principles will help guarantee the camera recognition rate:

- **Every pose that allows the material to stand on the platter stably should be modelled.**

- **The same pose placed in different regions of the platter should be modelled, because the camera gets a different view of the same pose when it's placed in different regions.**

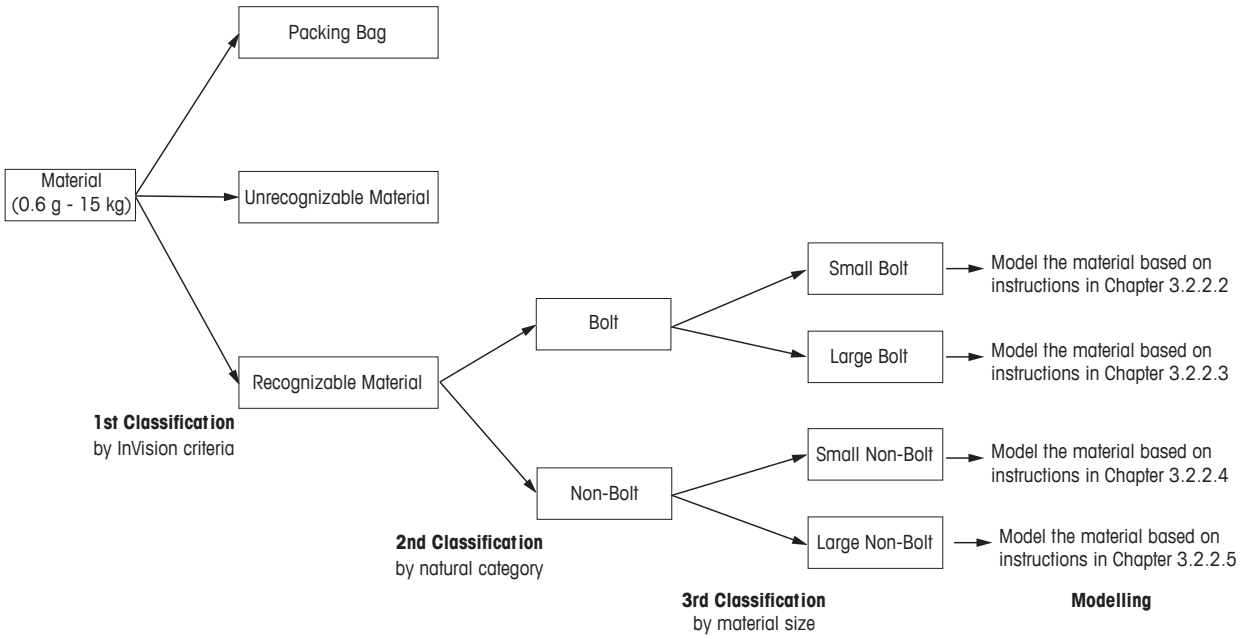
- **Metal bolts/screws are using a different set of modelling rules (refer to 3.2.2.2 Building Models for a Small Bolt Using 3x4 Modelling Grid and 3.2.2.3 Building Models for a Large Bolt Using 1x2 Modelling Grid) than other materials, because metal bolts/screws are more sensitive to lighting conditions due to their light-reflectivity and round bodies, instead of a shape with clear edges.**

- **Surplus models are suggested if there are similar materials in one recipe or the material is difficult to recognize:**

  - **For similar materials in the same recipe, build equal number of models for each of these similar materials.**

  - **For a material that is simply difficult to recognize by the camera, build as many models as possible.**

3.2.2.1 Material Classification



Prior to modelling, the operator/user will have to help the InVision system classify the material:

1. **First Classification: Classify the material as a packing bag, recognizable or unrecognizable material.**

Use the InVision criteria to decide whether the material is a packing bag, recognizable or unrecognizable material.

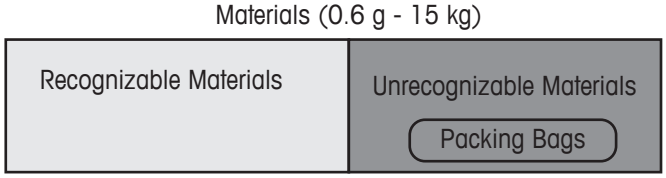


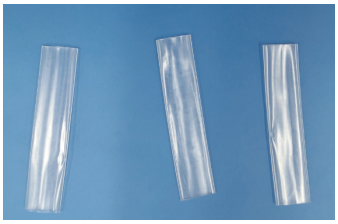
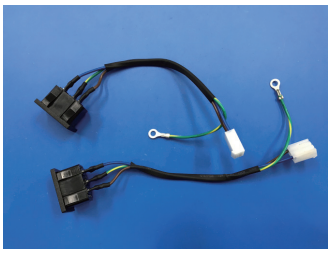
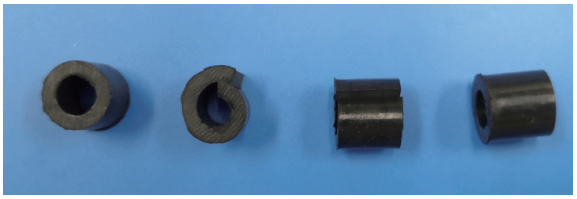
Figure 3-2: InVision Material Classification Criteria

A material is recognizable if it meets ALL the following requirements, otherwise, it is unrecognizable. Note that packing bags or other packing materials are classified as unrecognizable materials.

- ≥0.6g in weight.
- ≤80mm in height.
- ≤80mm in length.
- ≤80mm in width.
- Not transparent nor semi-transparent.
- Not easily changeable in physical features. For instance, cables or wires are not recommended for modelling because their shape bends easily.

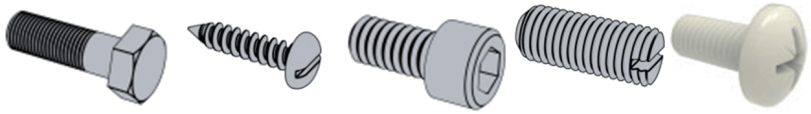
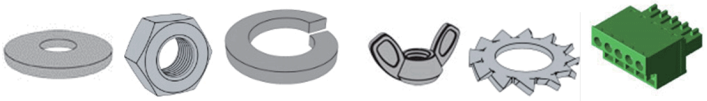
The table below shows some examples of **unrecognizable** materials.

Table 3-1: Examples of Unrecognizable Materials

	Transparent
 	Easily changeable shape

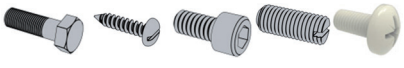
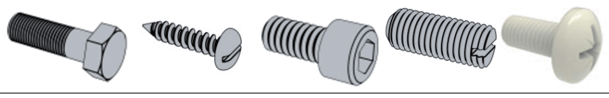
2. Second Classification: Classify the material as bolt or non-bolt.

Decide if the material is a bolt or non-bolt material based on its natural category.

Bolt	
Non-Bolt	

3. Third Classification: Classify the material as small bolt, large bolt, small non-bolt or large non-bolt.

Further classify the material based on its size. If the material has all sides short than 70 mm, then it goes to the group of small bolt or small non-bolt. If the material has any of its side longer than 70 mm, then it belongs to the group of large bolt or large non-bolt.

Bolt	Small Bolt (all sides <70mm)	
	Large Bolt (any sides ≥70mm)	

Non-Bolt	Small Non-Bolt (all sides <70mm)	
	Large Non-Bolt (any sides ≥70mm)	

When classification is done, continue modelling based on instructions in the following chapters:

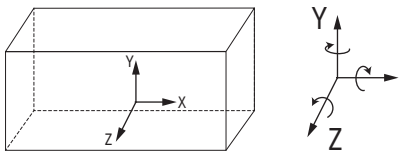
- **3.2.2.2 Building Models for a Small Bolt Using 3x4 Modelling Grid**
- **3.2.2.3 Building Models for a Large Bolt Using 1x2 Modelling Grid**
- **3.2.2.4 Building Models for a Small Non-Bolt Material Using 3x4 Modelling Grid**
- **3.2.2.5 Building Models for a Large Non-Bolt Using 1x2 Modelling Grid**

3.2.2.2 Building Models for a Small Bolt Using 3x4 Modelling Grid

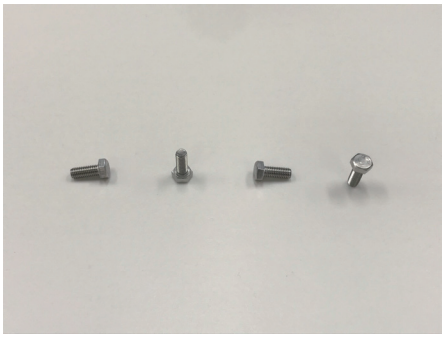
If the material is classified as a recognizable small bolt (see **3.2.2.1 Material Classification**), follow instructions in this chapter to build models. An example will guide the user to operate both on the HMI and on the platter.

Step 1: Decide possible poses of the small bolt.

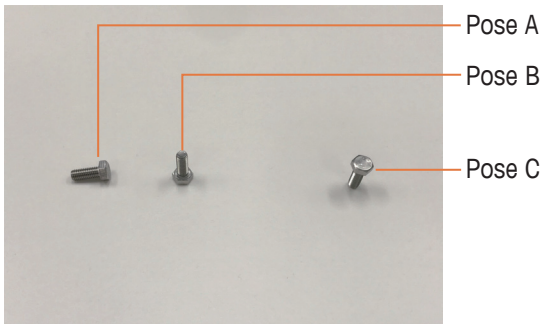
1. Rotate the material along its X, Y, Z axes.



2. Record each pose that occurs in each rotation. Note that each copied pose should allow the material to stand on the weighing platter fully and steadily. [Tip: Copy each decided pose with another piece of the material.]

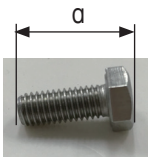


3. Omit poses that duplicate an existing pose.



Step 2: Decide to model Pose B or not.

For Pose A and Pose B, if their lengths under the camera are like this: **a < 1.5 b, Pose B should be modelled**. Otherwise, omit Pose B. In this case, Pose B should be modelled.



Pose A

Pose B

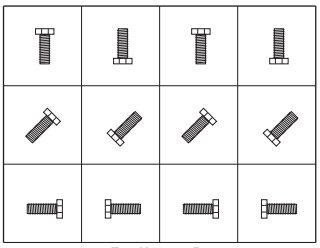
Step 3: Decide to model Pose C or not.

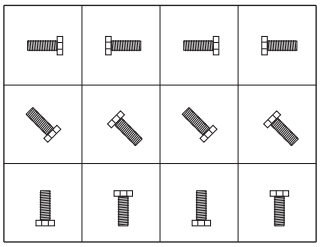
Pose C

If Pose C may easily occur when you randomly place the bolt on the platter, from different angle or with different force, Pose C should be modelled. Otherwise, omit Pose C. In this case, Pose C can rarely appear and should not be modelled.

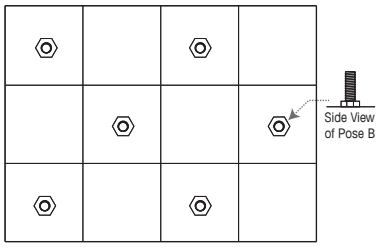
Step 4: Place the poses on the platter according to the patterns below. Use one pattern each time.

Pose A


Pattern 1

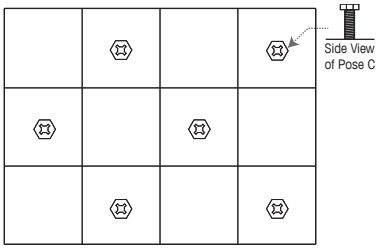

Pattern 2

Pose B



Pattern 3

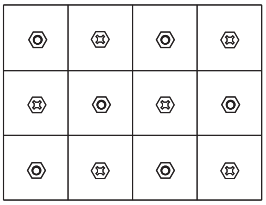
Pose C



Pattern 4

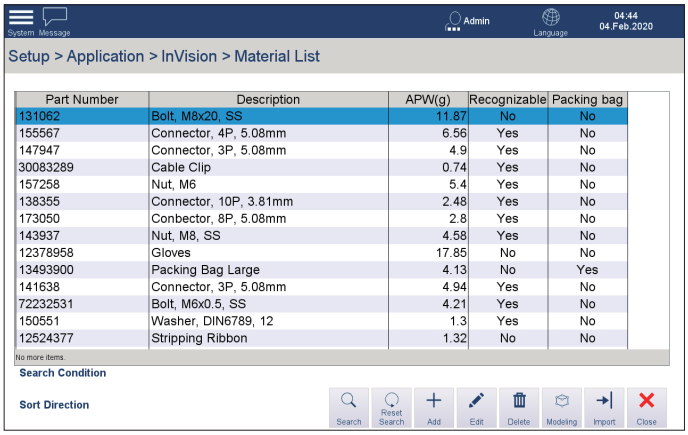
In this case, Pose C will not be modelled, hence, Pattern 4 is not necessary.

Tip: If a bolt will have both Pose B and Pose C modelled, Pattern 3 and Pattern 4 can be combined as shown below.

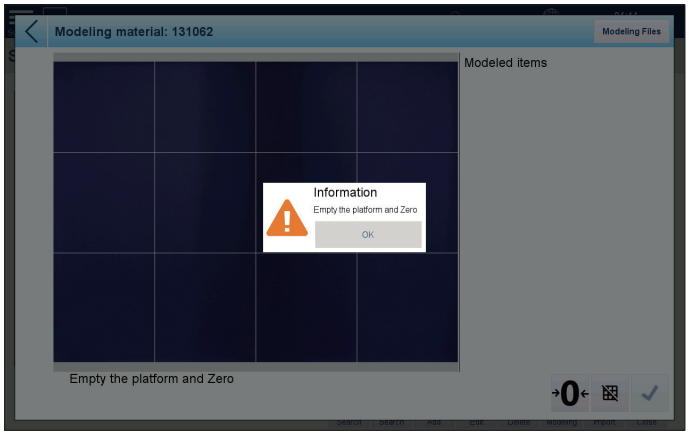


Step 5: Build models for the small bolt material.

1. Press to select the material from the Material List, then press **Modeling**.



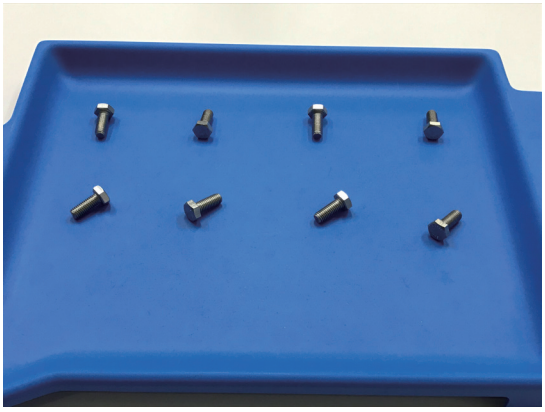
2. Ensure the platter is empty and the scale is zeroed (by pressing →0←) then press OK in the pop-up dialog. The pop-up dialog appears only if the platter is not empty and the scale not zeroed.



3. The system uses the 3x4 modelling grid in default.

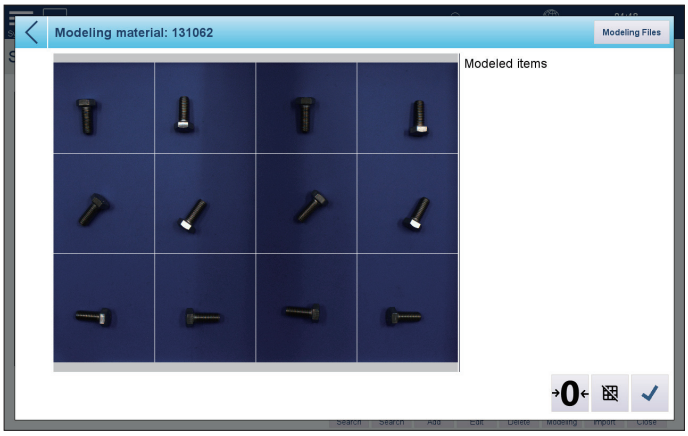
4. Place four bolts in the first row as shown below.

5. Take each piece in the first row as master, then rotate each piece in the second row 45˚ clockwise.

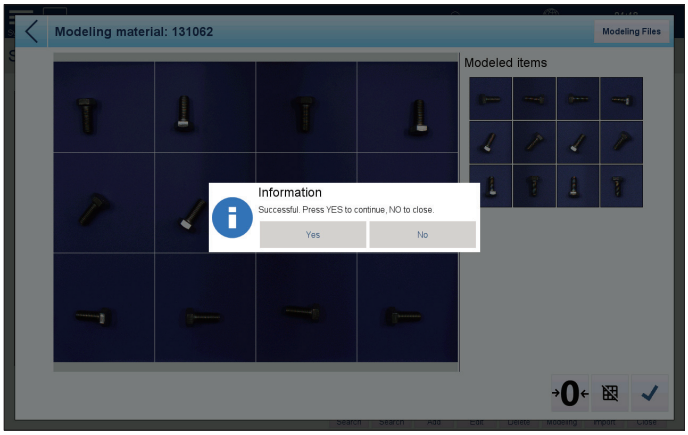


6. Take each piece in the first row as master, then rotate each piece in the third row 90˚ clockwise.

7. Ensure each piece is placed within a cell of the modelling grid, then press ✓ on the screen.



8. The captured images will appear in the right side of the screen. Press **Yes** in the information dialog (shown below) to continue image capturing.



9. Place the four bolts in the first row as shown below (or rotate 90° clockwise from step 4).

10. Take each piece in the first row as master, then rotate each piece in the second row 45° clockwise.

11. Take each piece in the first row as master, then rotate each piece in the third row 90° clockwise.

12. Repeat step 7 & 8.

13. Remove six bolts and stand the remaining bolts on their head as shown.

14. Ensure each piece is placed within a cell of the modelling grid on the screen, then press ✓.

15. Press **No** in the information dialog to end modelling.

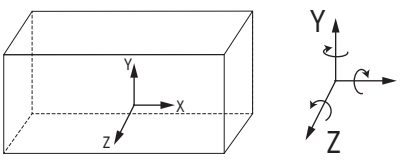
16. The Material List will display, showing '**Yes**' in the '**Recognizable**' column for the material.

3.2.2.3 Building Models for a Large Bolt Using 1x2 Modelling Grid

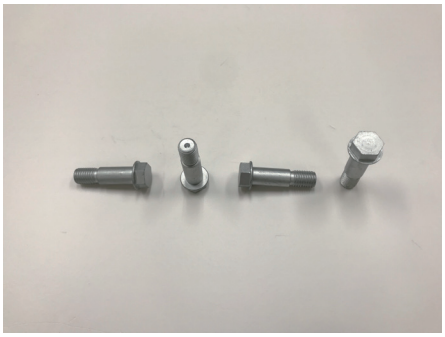
If the material is classified as a recognizable large bolt (see **3.2.2.1 Material Classification**), follow instructions in this chapter to build models. An example will guide the user to operate both on the HMI and on the platter.

Step 1: Decide possible poses of the large bolt.

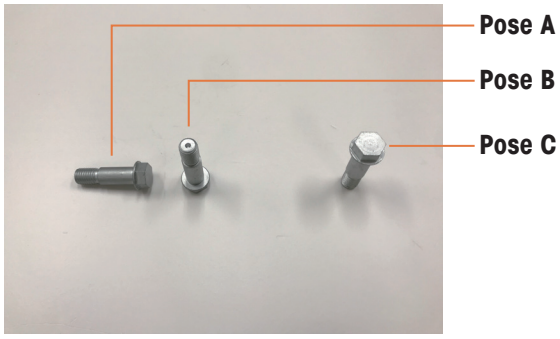
1. Rotate the material along its X, Y, Z axes.



2. Record each pose that occurs in each rotation. Note that each copied pose should allow the material to stand on the weighing platter fully and steadily. [Tip: Copy each decided pose with another piece of the material.]

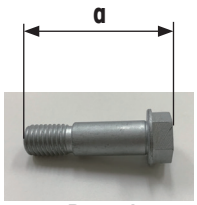


3. Omit poses that duplicate an existing pose.



Step 2: Decide to model Pose B or not.

For Pose A and Pose B, if their lengths under the camera are like this: **a < 1.5 b, Pose B should be modelled**. Otherwise, omit Pose B. In this case, Pose B should not be modelled.



Pose A

Pose B

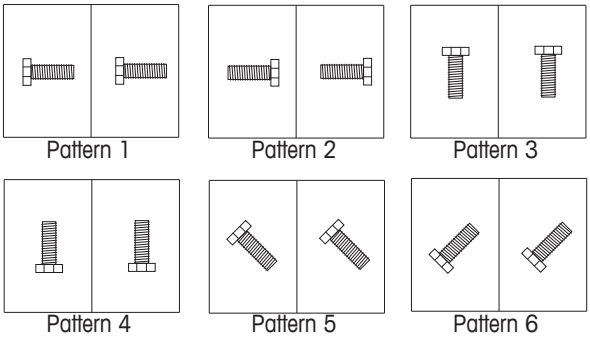
Step 3: Decide to model Pose C or not.

Pose C

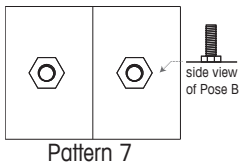
If Pose C may easily occur when you randomly place the bolt on the platter, from different angle or with different force, Pose C should be modelled. Otherwise, omit Pose C. In this case, Pose C can rarely appear and should not be modelled.

Step 4: Place the poses on the platter according to the patterns below. Use one pattern each time.

Pose A

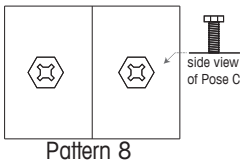


Pose B



Pattern 7

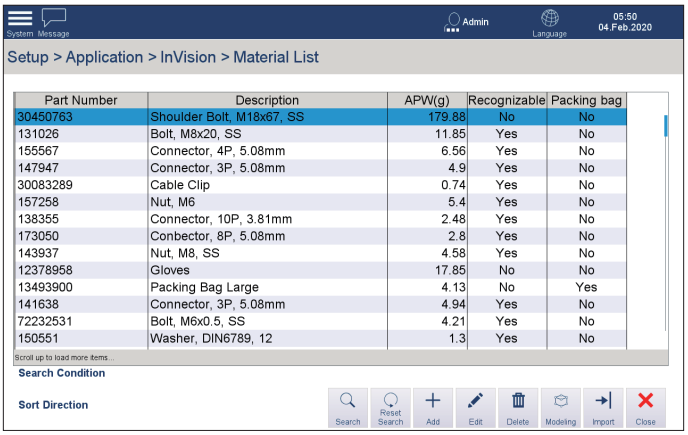
Pose C



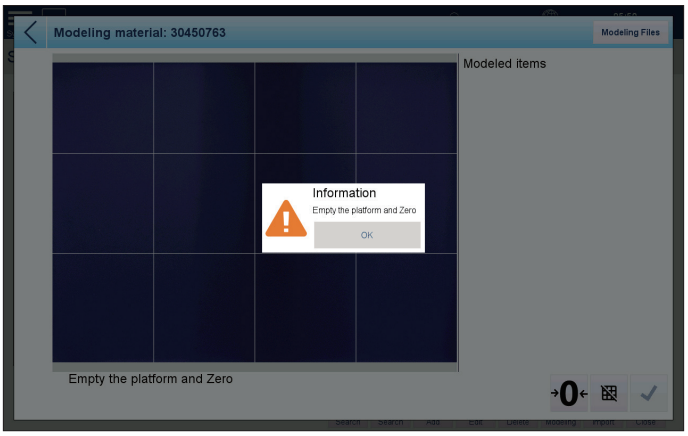
Pattern 8

Step 5: Build models for the large bolt material.

1. Press to select the material from the Material List, then press **Modeling**.



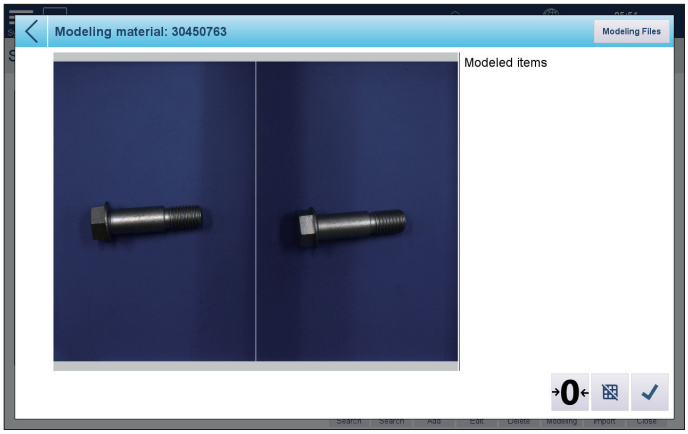
2. Ensure the platter is empty and the scale is zeroed (by pressing →0←) then press OK in the pop-up dialog. The pop-up dialog appears only if the platter is not empty and the scale not zeroed.



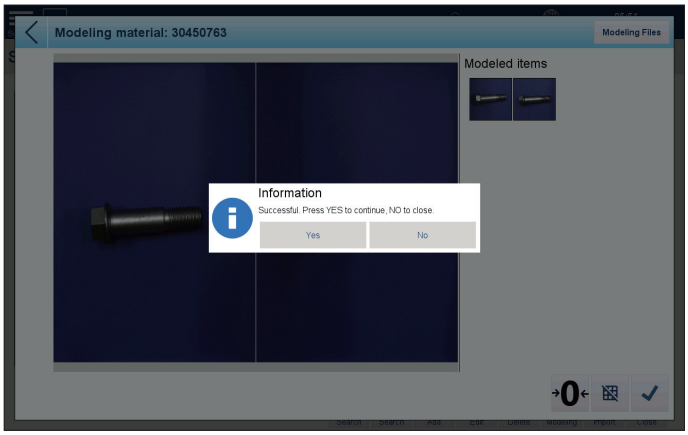
3. Ensure the modelling grid on the screen is switched to 1x2 grid mode (by pressing the button).

4. Place two pieces of bolts in the same pose on the weighing platter.

5. Ensure each piece of material is placed in a cell of the modelling grid, then press on the screen.



6. The captured images will appear in the right side of the screen. Press **Yes** in the information dialog (shown below) to continue image capturing.



7. Repeat step 4 and 5 to build models for the remaining patterns.

8. When modelling is done, press **No** in the information dialog to end modelling.

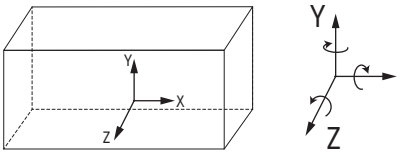
9. The Material List will display, showing '**Yes**' in the '**Recognizable**' column for the material.

3.2.2.4 Building Models for a Small Non-Bolt Material Using 3x4 Modelling Grid

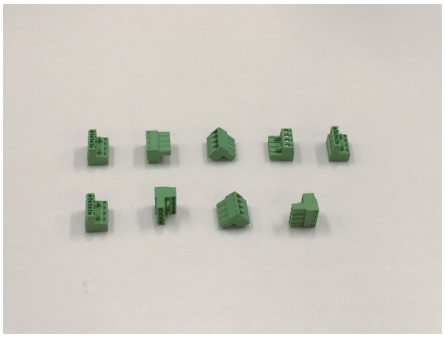
If the material is classified as a recognizable small non-bolt (see **3.2.2.1 Material Classification**), follow instructions in this chapter to build models. An example will guide the user to operate both on the HMI and on the platter.

Step 1: Decide possible poses of the small non-bolt material.

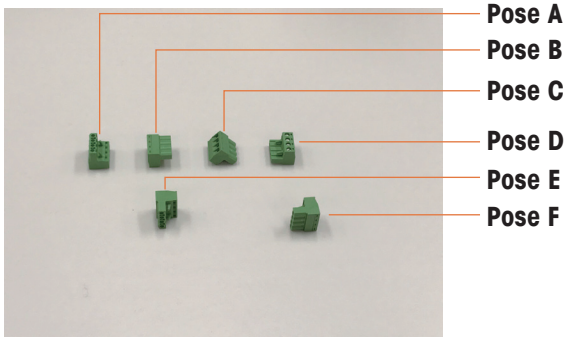
1. Rotate the material along its X, Y, Z axes.



2. Record each pose that occurs in each rotation. Note that each copied pose should allow the material to stand on the weighing platter fully and steadily. [Tip: Copy each decided pose with another piece of the material.]



3. Omit poses that duplicate an existing pose.



Step 2: Place the poses on the platter according to the patterns below. Use one pattern each time. Each pattern includes two different poses placed next to each other. If there is only one pose, use the single-pose placement pattern.

Two-Pose Placement

Pose A	Pose B	Pose A	Pose B
Pose B	Pose A	Pose B	Pose A
Pose A	Pose B	Pose A	Pose B

Pattern 1

Pose C	Pose D	Pose C	Pose D
Pose D	Pose C	Pose D	Pose C
Pose C	Pose D	Pose C	Pose D

Pattern 2

Pose E	Pose F	Pose E	Pose F
Pose F	Pose E	Pose F	Pose E
Pose E	Pose F	Pose E	Pose F

Pattern 3

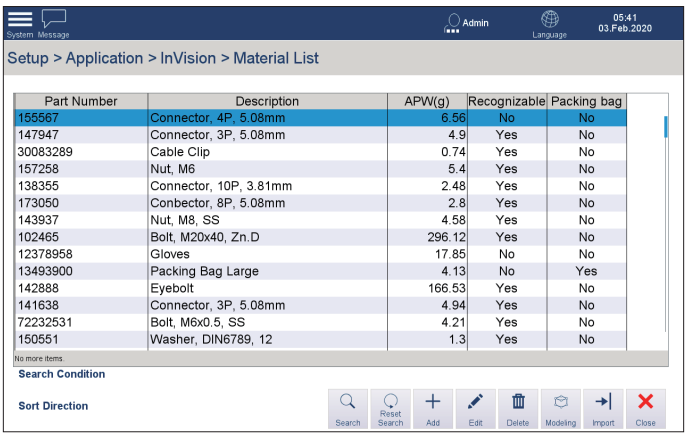
° ° ° ° ° °

Single-Pose Placement

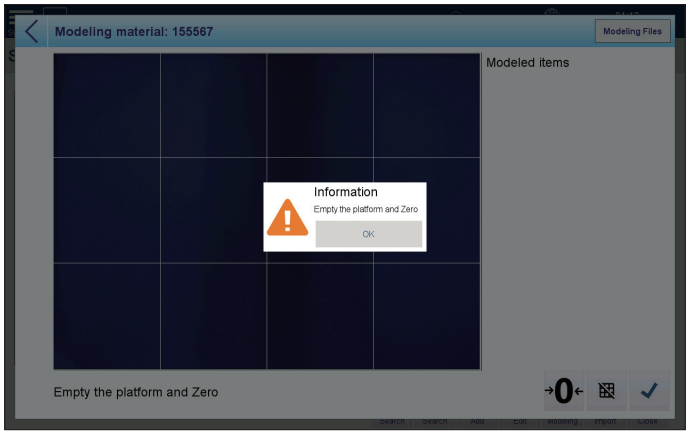
Pose X		Pose X	
	Pose X		Pose X
Pose X		Pose X	

Step3: Build models for the small non-bolt material.

1. Press to select the material from the Material List, then press **Modeling**.

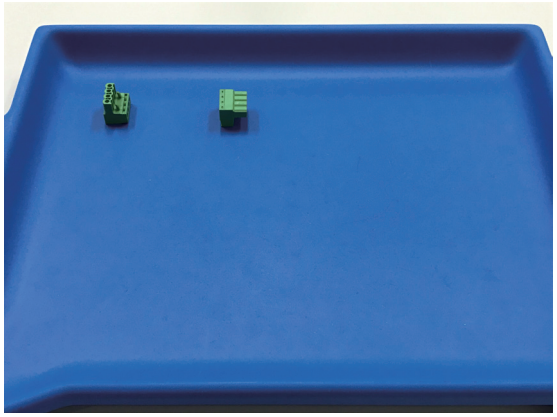


2. Ensure the platter is empty and the scale is zeroed (by pressing →0←), then press **OK** in the pop-up dialog. The pop-up dialog appears only if the platter is not empty and the scale not zeroed.

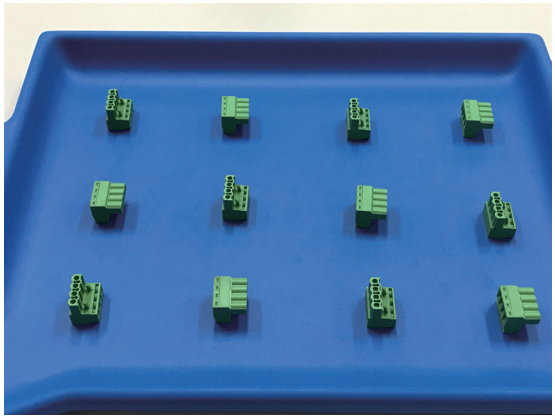


3. The system uses the 3x4 modelling grid in default.

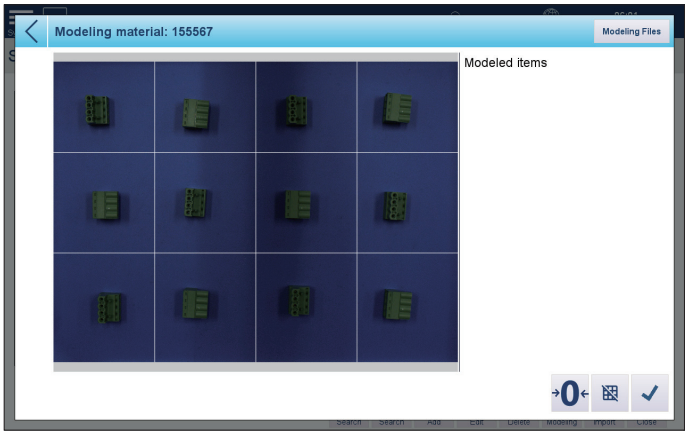
4. Place two poses on the platter.



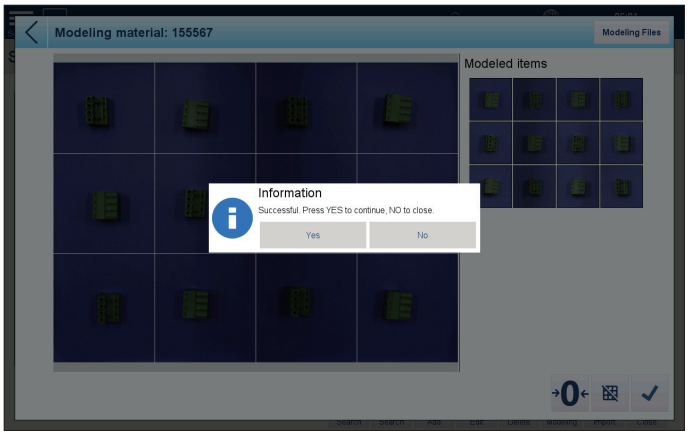
5. Copy the two poses in intervals with ten more pieces of the material.



6. Ensure that each piece is placed in a cell of the modelling grid, then press ✓ on the screen.



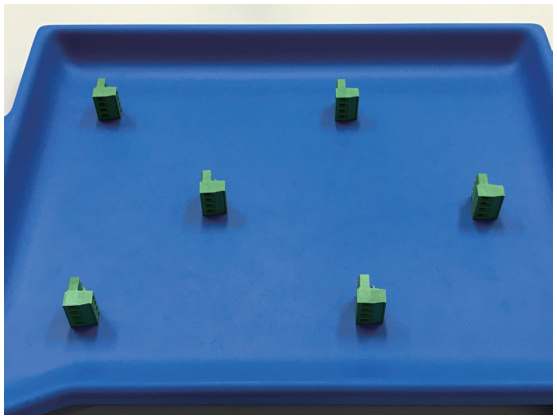
7. The captured images will appear in the right side of the screen. Press **Yes** in the information dialog (shown below) to continue image capturing.



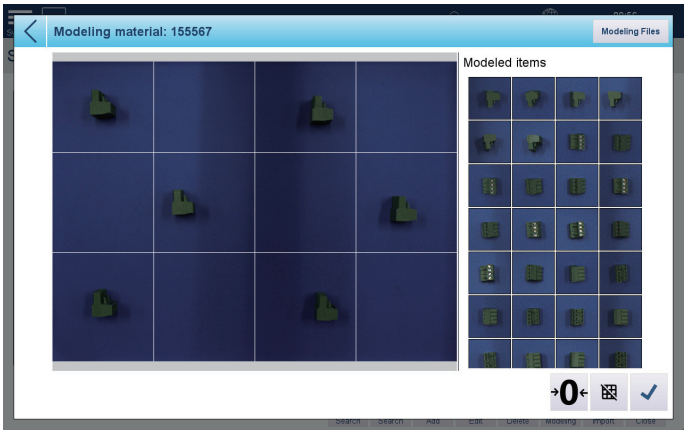
8. Repeat step 4 to 7 to build models for the remaining poses.

9. If one pose remains, place this pose on the platter, then copy the pose in intervals

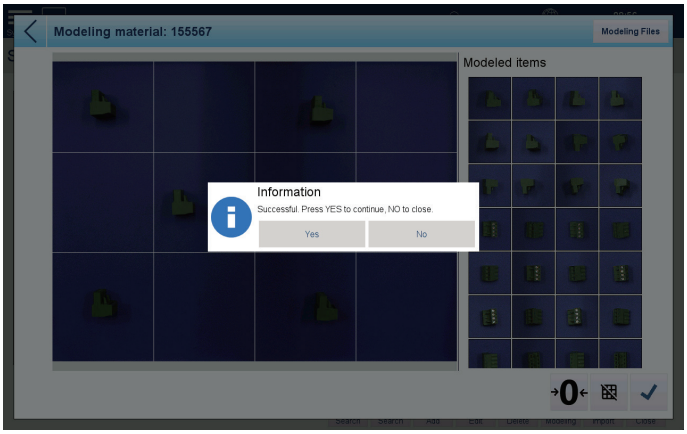
with five more pieces of the material.



10. Ensure each piece of material is placed in a cell of the modelling grid, then press ✓ on the screen.



11. When modelling is done, press **No** in the information dialog to end modelling.



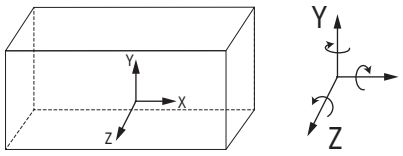
12. The Material List will display, showing '**Yes**' in the '**Recognizable**' column for the material.

3.2.2.5 Building Models for a Large Non-Bolt Using 1x2 Modelling Grid

If the material is classified as a recognizable large bolt (see **3.2.2.1 Material Classification**), follow instructions in this chapter to build models. An example will guide the user to operate both on the HMI and on the platter.

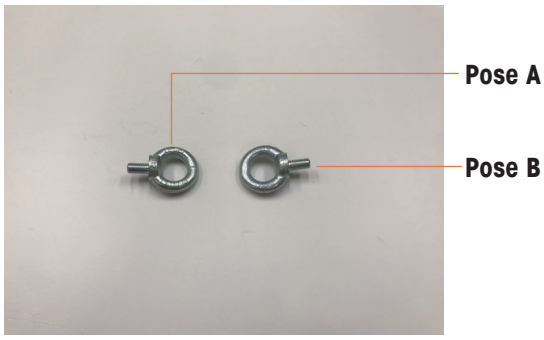
Step 1: Decide possible poses of the large non-bolt material.

1. Rotate the material along its X, Y, Z axes.



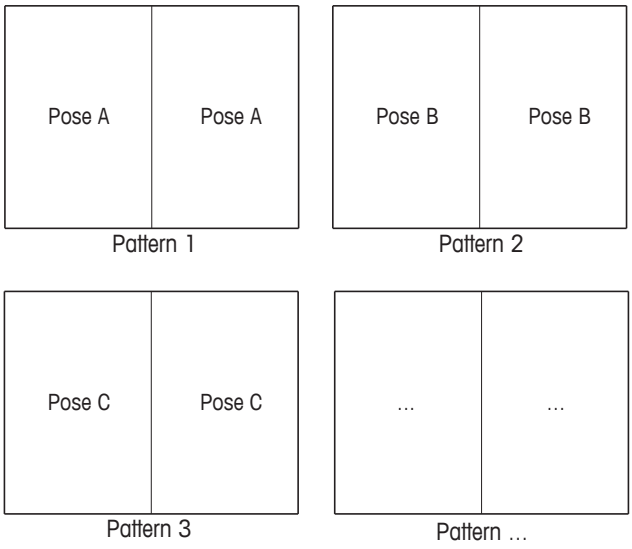
2. Record each pose that occurs in each rotation. Note that each copied pose should allow the material to stand on the weighing platter fully and steadily. [Tip: Copy each decided pose with another piece of the material.]

3. Omit poses that duplicate an existing pose. In this case, no duplicate poses because of different markings on two sides of the material.



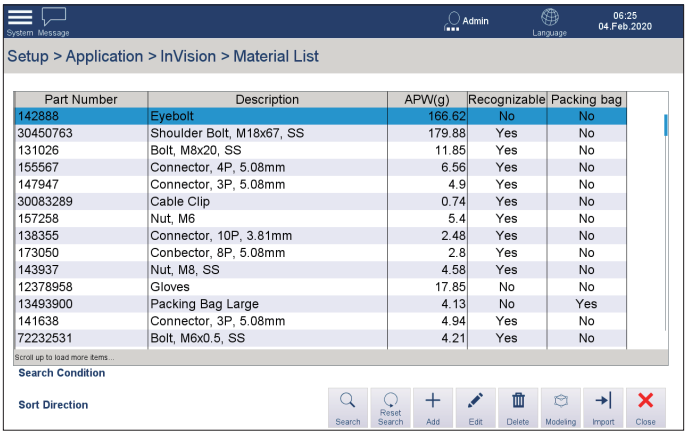
Step 2: Place the poses on the platter according to the pattern below.

Placement of a Non-Bolt Material Pose

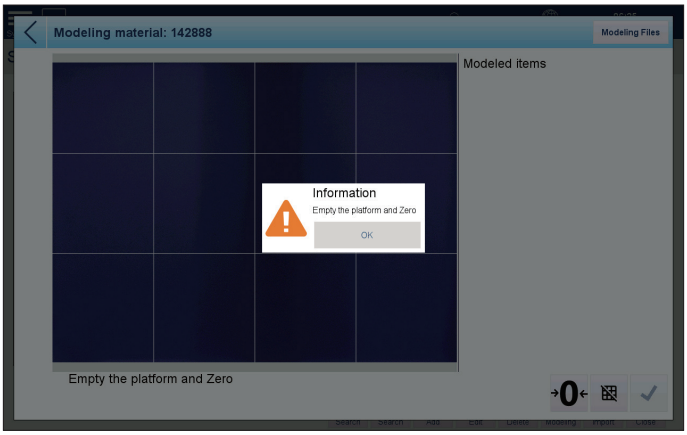


Step 3: Build models for the small non-bolt material

1. Press to select the material from the Material List, then press **Modeling**.



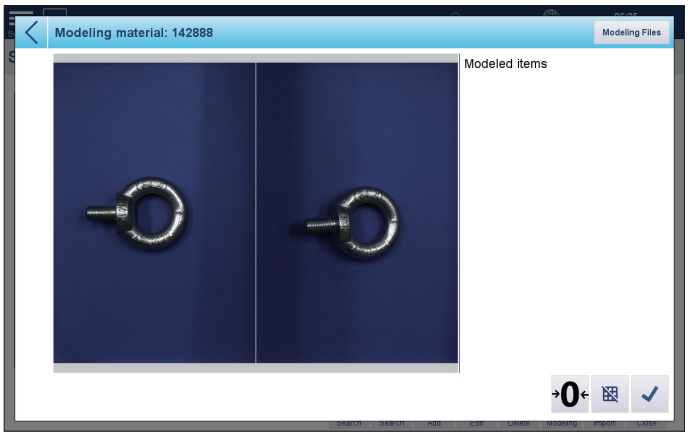
2. Ensure the platter is empty and the scale is zeroed (by pressing →0←) then press OK in the pop-up dialog. The pop-up dialog appears only if the platter is not empty and the scale not zeroed.



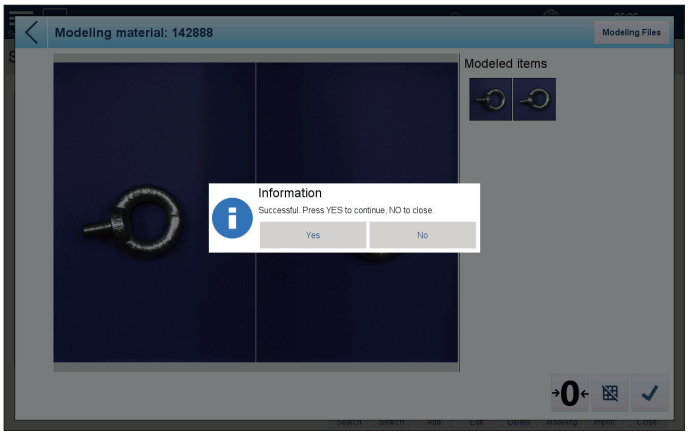
3. Ensure the modelling grid on the screen is switched to 1x2 grid mode (by pressing the ▦ button).

4. Place two pieces of the non-bolt material (in the same pose) on the weighing platter.

5. Ensure each piece of material is placed in a cell of the modelling grid, then press ✓ on the screen.



6. The captured images will appear in the right side of the screen. Press **Yes** in the information dialog (shown below) to continue image capturing.



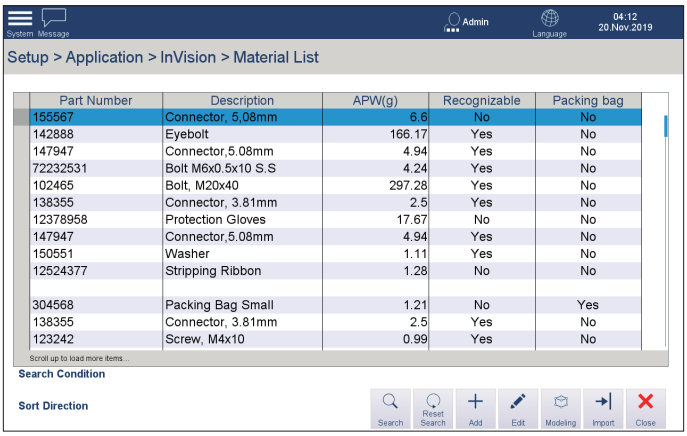
7. Repeat step 4 and 5 to build models for the remaining pose. In this case, one pose remains.

8. When modelling is done, press **No** in the information dialog to end modelling.

9. The Material List will display, showing '**Yes**' in the '**Recognizable**' column for the material.

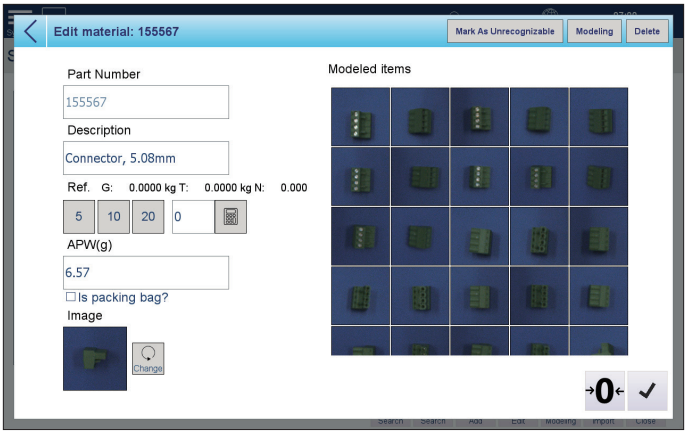
3.2.3 Editing a Material

1. Press to select the target material from the Materials List, then press **Edit**.



2. In the 'Edit Material' dialog, edit the material's information as required, then press ✓.

IMPORTANT: The part number cannot be edited.



For information about editing the APW value, changing the material image, or marking the material as unrecognizable, please refer to the sections **3.2.3.1 Editing APW** and **3.2.3.2 Changing a Material Image** and **3.2.3.3 Marking a Material as Unrecognizable.**

3.2.3.1 Editing APW

1. Stay in the Edit Material screen.
2. Ensure that the platter is empty and the scale zeroed (by pressing →0←). The G and T should show 0 kg.
3. Place several pieces of the material on the platter. Suggested quantities are 5, 10 or 20.
4. Enter the material quantity in the Ref. text field, then press . The recalculated result will display in the APW (g) text field.

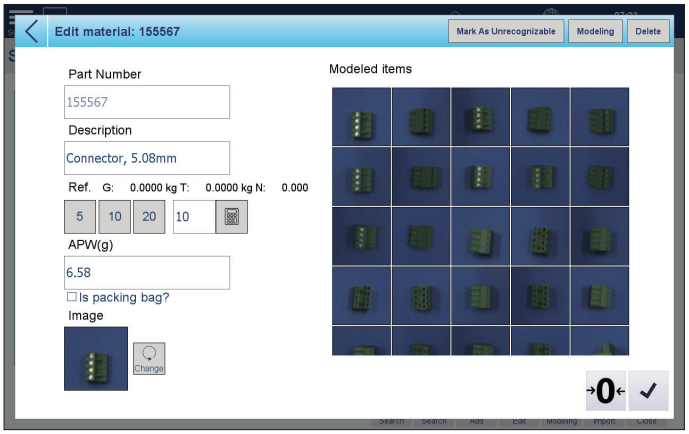
3.2.3.2 Changing a Material Image

This function determines which material image (captured during modelling) will be shown during Pick & Pack operation. Choose one that can help the operator to easily and rapidly identify the correct material and prepare it for recognition and weighing.

To change the material image, do as follows:

1. Stay in the Edit Material screen.
2. Press Change.
3. Press to select the target image. The selected image is highlighted in a blue frame, in this case at top left.

4. Press Submit at upper right of the screen.
5. The selected image appears at lower left, and will be used during operation.



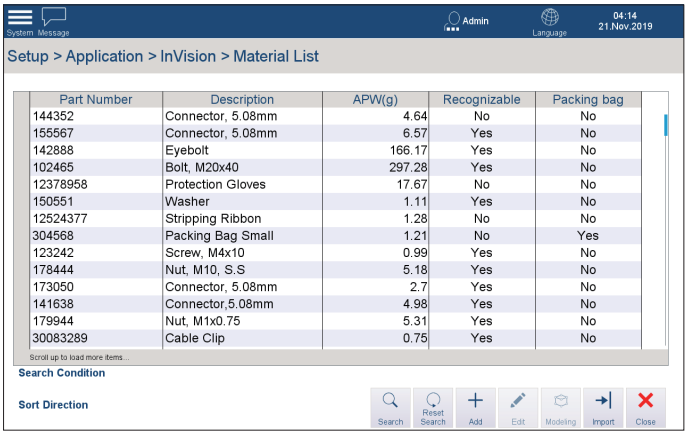
3.2.3.3 Marking a Material as Unrecognizable

If the material is unrecognizable, follow these steps:

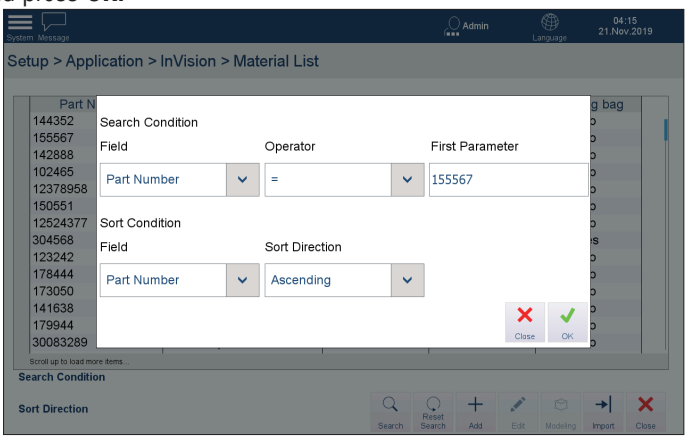
1. Stay in the Edit Material screen, press **Mark As Unrecognizable**.
2. The system will display the Material List screen.
3. The material will now display '**No**' in the '**Recognizable**' column.

3.2.4 Searching for a Material

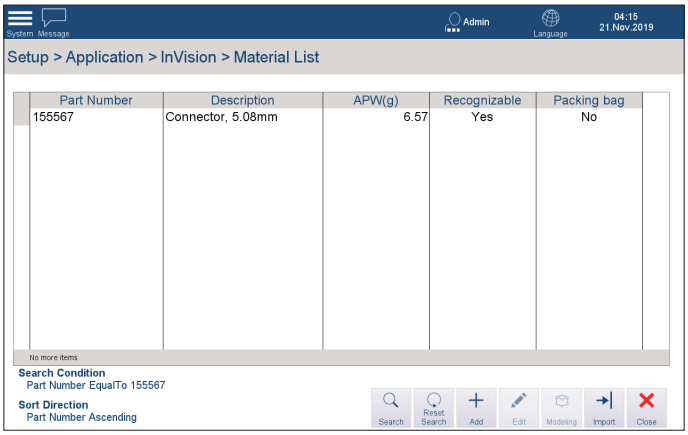
1. Press **Search** in the Material List.



2. In the dialog which displays, define the **Search Condition** (enter the full part number) and press **OK.**



3. The Material List will display the result of the search.



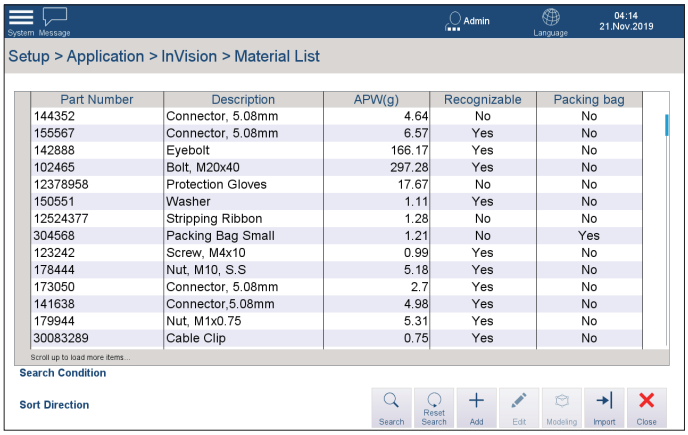
4. Press **Reset Search** to refresh this view, or **Close** to end the search.

3.2.5 Importing Material Data

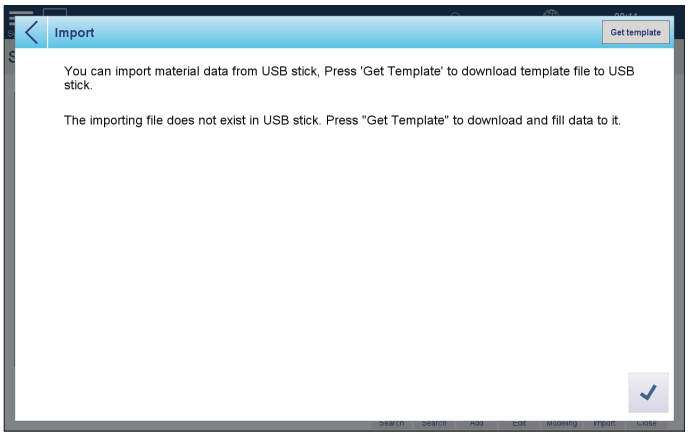
Material data can be imported to the InVision system in batches, using a USB memory device. This makes it unnecessary to create material data separately in each InVision system, and permits the most reliable model data to be shared.

1. Connect the USB memory device to a USB port on the IND970 Elo box using the USB extension cable provided.

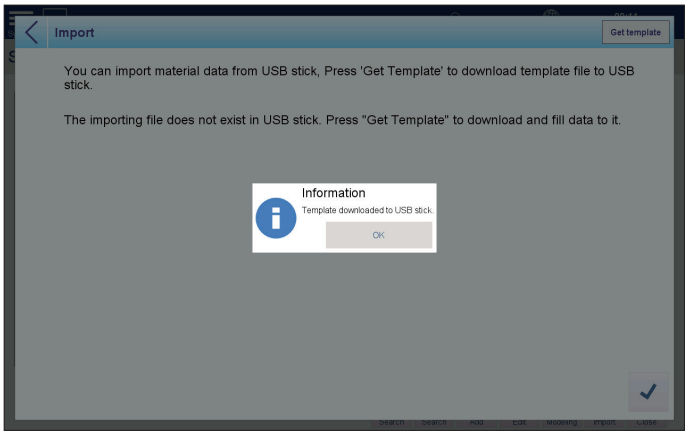
2. Press **Import** in the Material List screen.



3. In the Import screen, press **Get Template** to download a material data template to the USB memory device.



4. Once the download has succeeded, the following message appears.



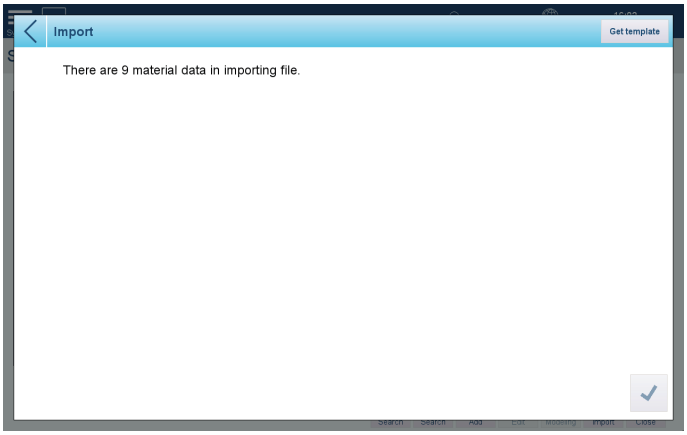
5. Press **OK**.

6. Remove the USB memory device and connect it to your computer. The material data template is in **InVision > Data** and saved as material.csv.

7. Fill in the part number, description and APW values of the materials. Then save the file.

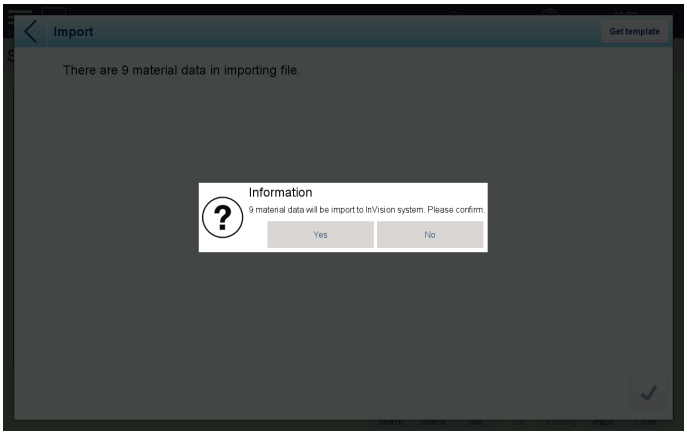
Part Number	Description	APW(g)
132424	CONNECTOR,TERM,PLUG,SCREW,90,F,3P,3.81mm	2
132425	CONNECTOR,TERM_HDR,M,3P,3.81mm,180,THD	1
132426	CONNECTOR,TERM,PLUG,SCREW,90,F,4P,3.81mm	3
132606	CONNECTOR,TERM_HDR,M,3P,3.81mm,90,THD	0.5
138350	CONNECTOR,TERM,HEADER,M,3P,5.08mm,90,THD	1
138355	CONNECTOR,TERM_HDR,M,10P,3.81mm,90,THD	2.5
139963	CONNECTOR,TERM_SCR,F,2P,7.50mm,90,THD	3
144351	CONNECTOR,TERM_SPRG,F,4P,5.08mm,90,THD	3.5
144352	CONNECTOR,TERM_SCR,F,4P,5.08mm,90,THD	4.5

8. Repeat step 2 and return to the Import screen. Now there is a message showing the number of available material data.



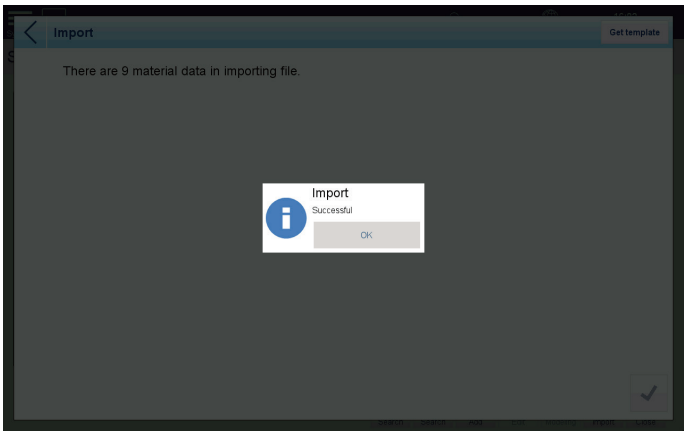
9. Press ✓.

10. A confirmation message appears as shown below.



11. Press **Yes**.

12. When importing is successful, a dialog appears as shown below.



13. Press **OK**. The Material List screen will display.

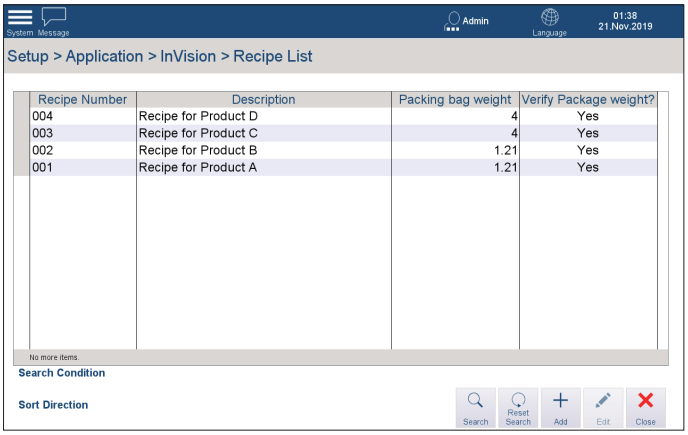
14. The imported material data are on top of the material list.

IMPORTANT: If a part number in the material.csv conflict with one that already exists in the Material List, the system will rewrite this material, i.e. the system will use the **description** and **APW** value imported from the USB memory drive.

3.3 Managing Recipes

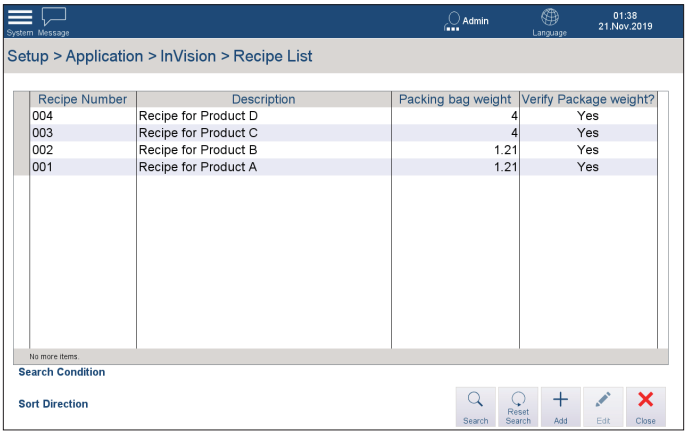
The Recipe List screen allows users to manage all stored recipes. To enter this screen, Select **Setup > Application > InVision > Recipe List**.

The Recipe List screen shows the general information of all recipes, including recipe number, descriptions, packing bag weight and package weight verification choices.

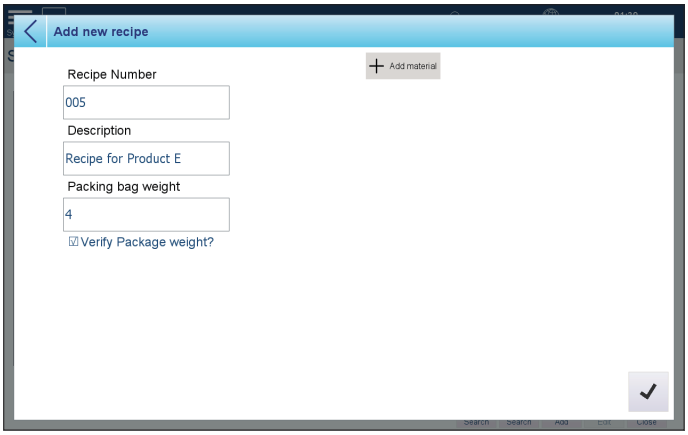


3.3.1 Adding a New Recipe

1. Press **Add**.

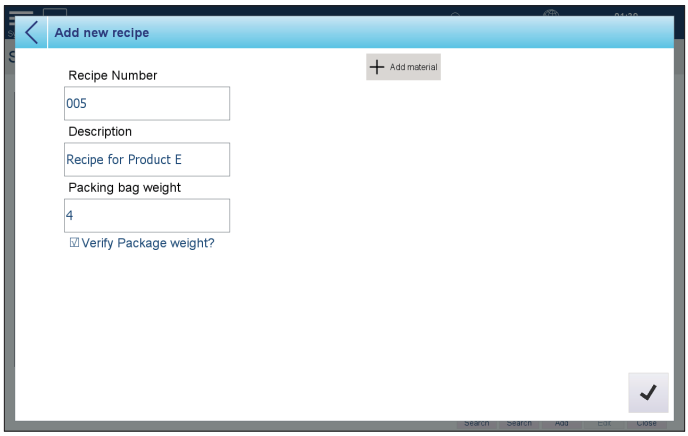


2. Enter information of the new recipe in the Add A New Recipe dialog.
   - ⇨ Enter Part Number and Description of the recipe.
   - ⇨ Enter Packing Bag Weight.
   - ⇨ Tick Verify Package Weight to check the total package weight after Pick & Pack.

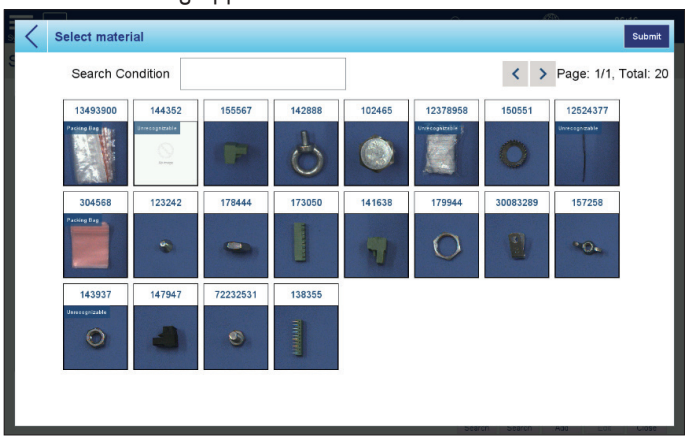


3.3.1.1 Adding Materials to a Recipe

1. Press **Add Material** in the Add New Recipe screen.



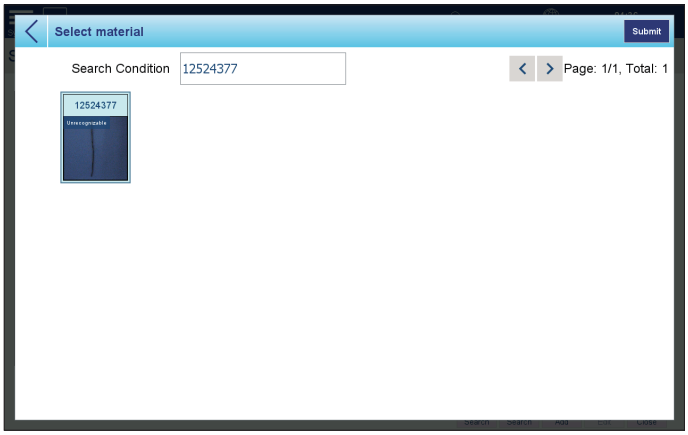
2. The Select Material dialog appears.



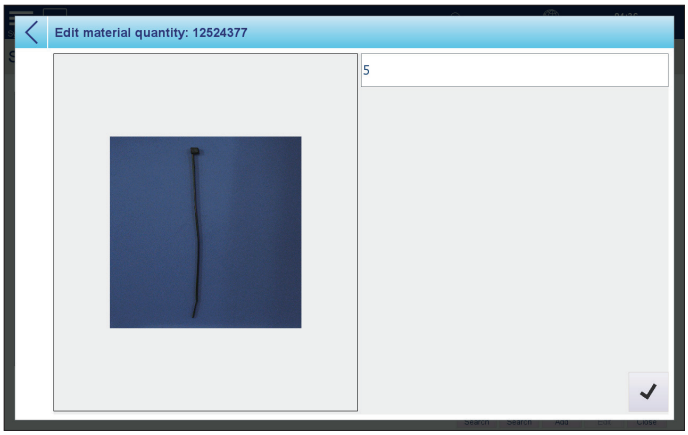
3. Enter the part number of a material in the **Search Condition** text field.

4. The screen will display the search result(s).

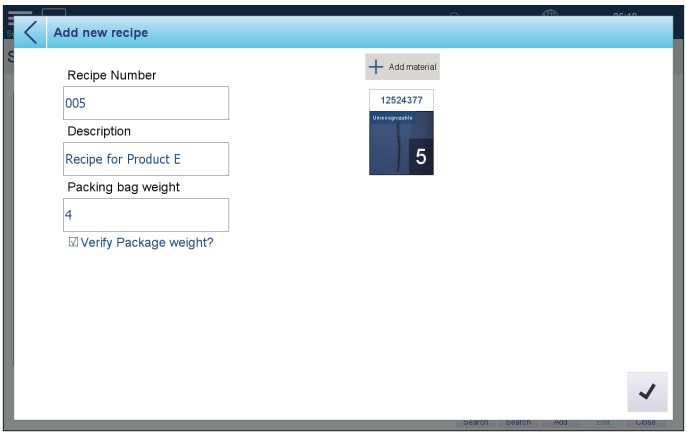
5. Press to select the material from the search results. The selected material is highlighted in blue.



6. Press the blank text field and enter the quantity of the material. Then press ✓.

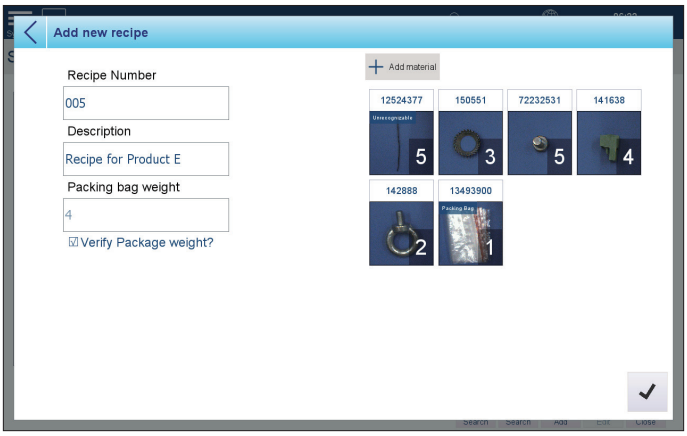


7. The Material will appear in the Add New Recipe screen.



8. Repeat steps 1 to7 to add more materials to the recipe.

IMPORTANT: If a packing bag is selected as a material for the recipe, its weight value will overwrite the Packing Bag Weight which was set manually in the Add New Recipe screen.

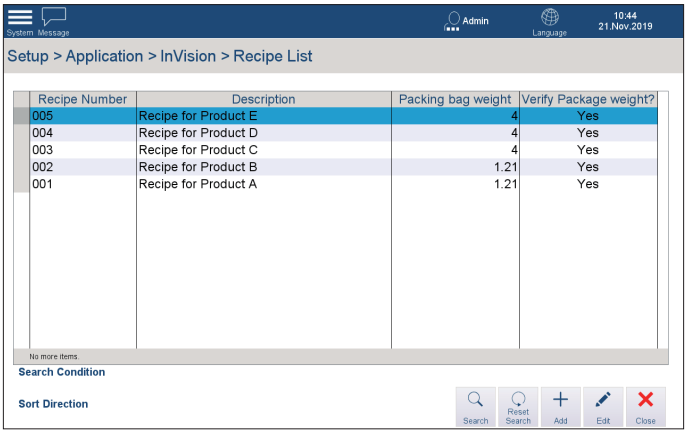


9. Press ✓.

10. The system will display the Recipe List screen again.

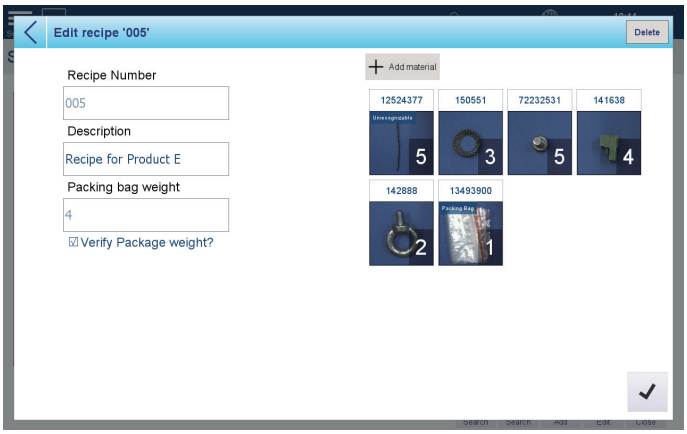
3.3.2 Editing a Recipe

1. Press to select the target recipe from the Recipe List, then press **Edit**.



2. Edit recipe information in the Edit Recipe dialog, then press ✓.

IMPORTANT: The Recipe Number cannot be edited.



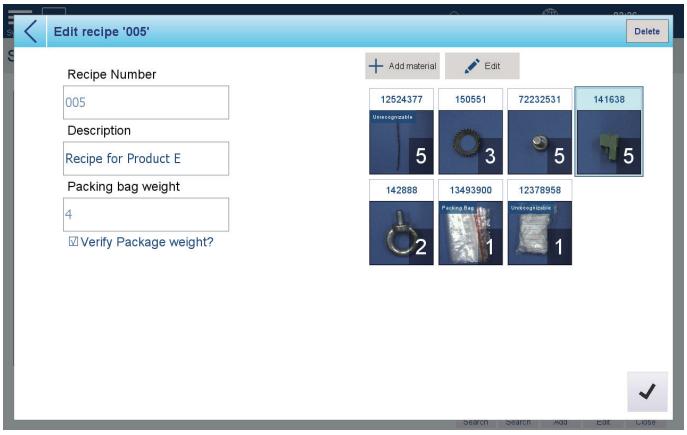
The following sections explain how to add, edit or delete materials , and how to delete a recipe.

3.3.2.1 Adding Materials

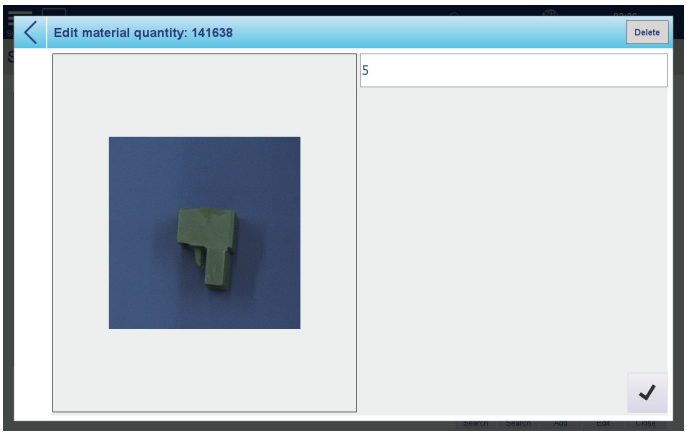
Refer to section **3.3.1.1 Adding Materials to a Recipe**.

3.3.2.2 Editing or Deleting Materials

1. Press to select the target material in the Edit Recipe screen, then press **Edit**.



2. In the Edit Material Quantity screen, edit the material quantity in the text field, or press **Delete** to remove this material.



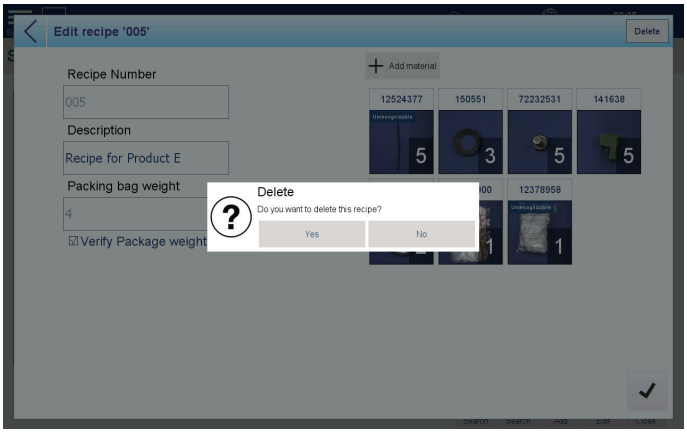
3. When the modification is complete, press ✓ to confirm.

4. The system returns to the Edit Recipe screen. The selected material will display the new quantity value, or (if deleted) the material will no longer appear.

3.3.2.3 Deleting a Recipe

1. In the Edit Recipe screen, press **Delete** to remove the selected recipe.

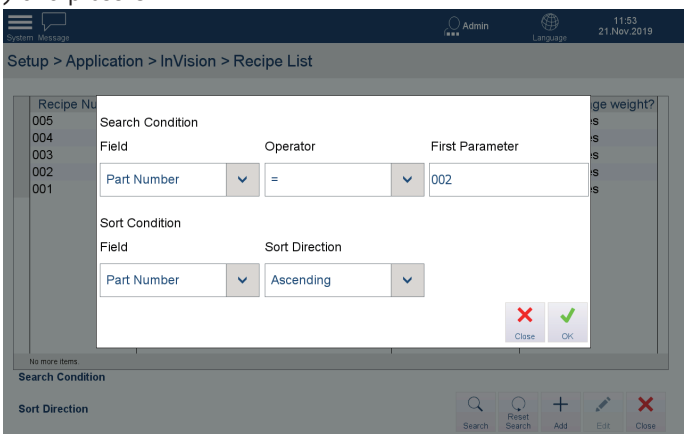
2. A confirmation dialog will display. Press **Yes** to delete the recipe, **No** to retain in.



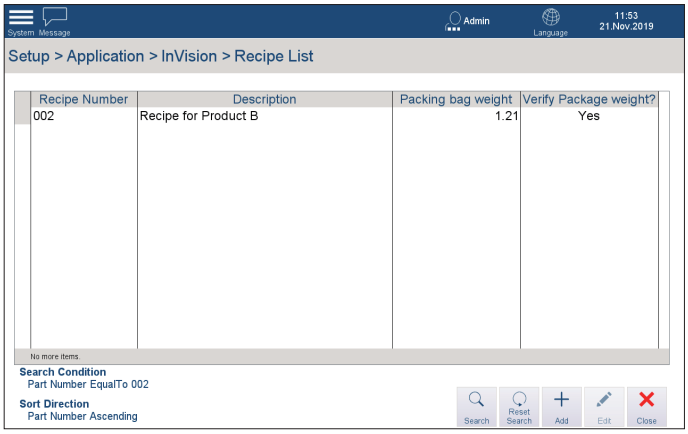
3.3.3 Searching for a Recipe

1. Press **Search** in the Recipe List.

2. In the dialog which displays, define the **Search Condition** (enter the full recipe number) and press **OK**.



3. The Material List will display the result of the search.



4. Press **Reset Search** to refresh this view, or **Close** to end the search.

4 Operation

4.1 Pick & Pack

The InVision system enters the IND970 start-up screen automatically when it is booted up.

Figure 4-1: Start-up Screen

Press the button when a blue triangle appears ( ), then the system navigates to the Pick & Pack Order Selection page.

The Order Selection screen shows orders on the selected date (default: the current date). These orders include those downloaded from the ERP system and those created locally. The ERP orders and the local orders share the same Pick & Pack operations. The only difference is that a local order requires the user to add recipes to the order through the user interface, whereas an ERP order will already be configured with recipes. Chapter 5, Communications provides more information about how to export orders to InVision from an ERP system.

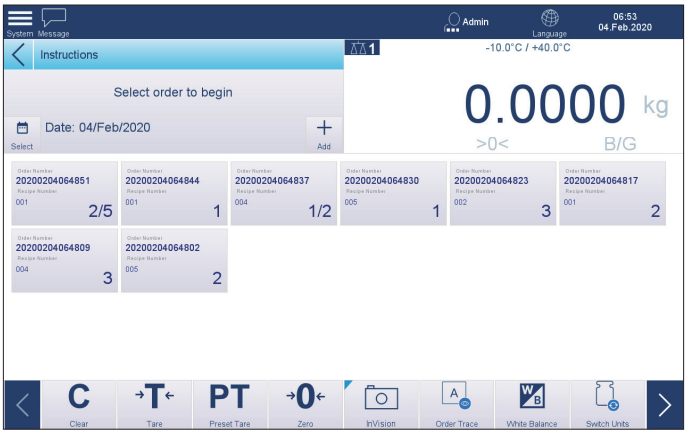
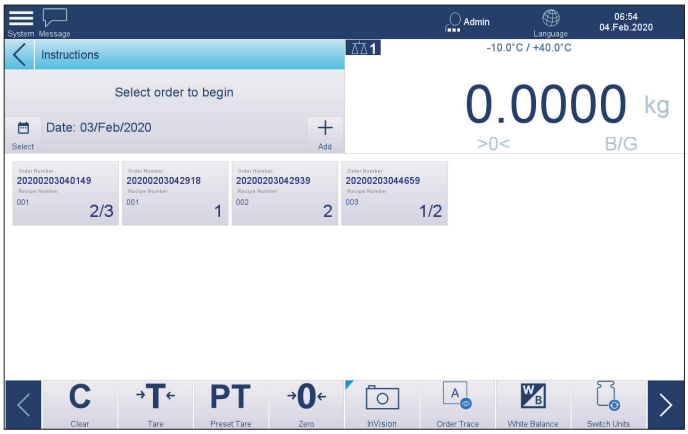


Figure 4-2: Order Selection Screen

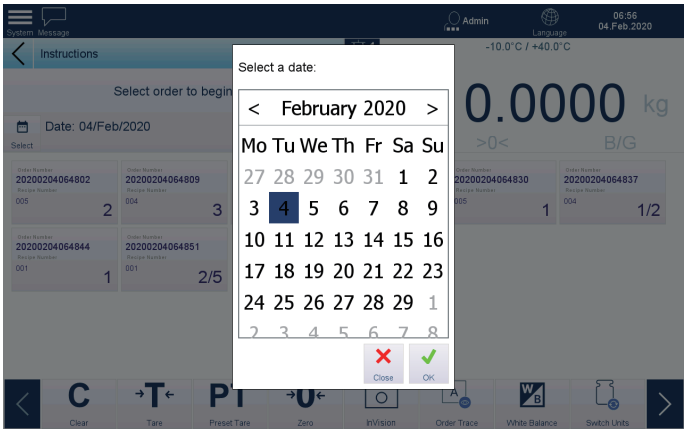
4.1.1 Selecting Order Production Date

To assign a date on which orders must be produced, follow these steps:

1. Press Select in the Order Selection screen.



2. Select a date from the calendar, then press **OK**.

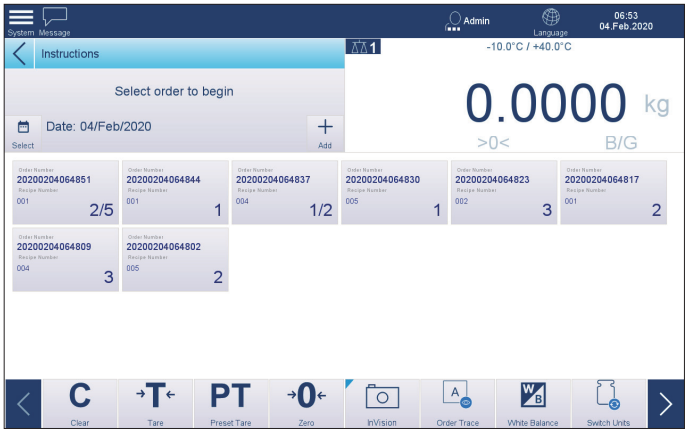


4.1.2 Adding Local Orders

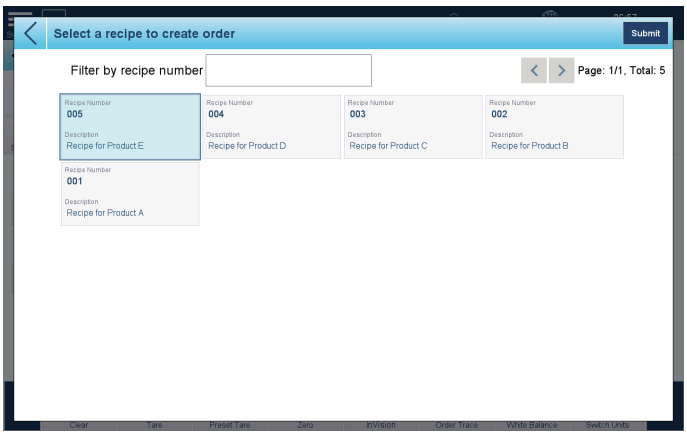
To add local orders, follow these steps:

1. Assign a date on which the orders are to be produced (refer to section **4.1.1 Selecting Order Production Date**, above.).

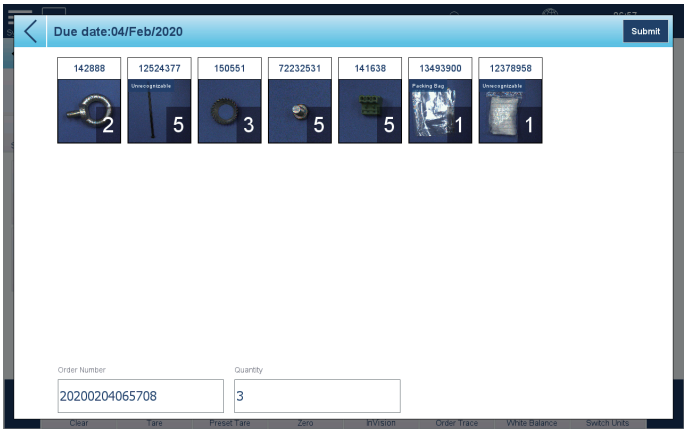
2. In the Order Selection screen, press Add.



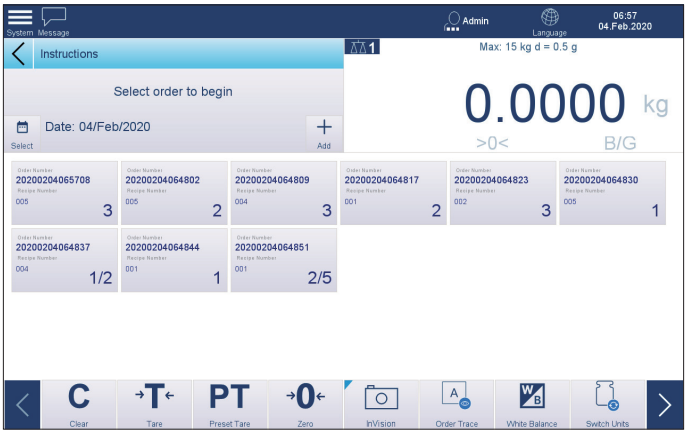
3. Press to select a recipe from the 'Select a recipe to create order' dialog, and press Submit.



4. In the Due Date dialog, define **Quantity** of the recipe, and press Submit.



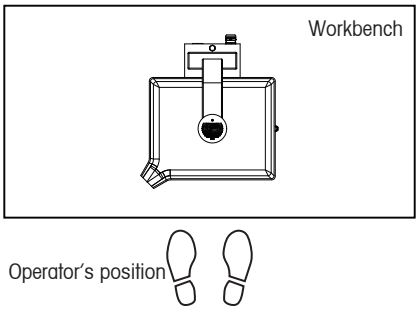
5. Repeat steps 2 to 4 to add more orders to be produced on the selected date.



4.1.3 Pick & Pack Operation

Before producing any orders with Pick & Pack, ensure the following requirements are met:

- **It is highly recommended that the operator stand in front of the weighing platform during operation.**

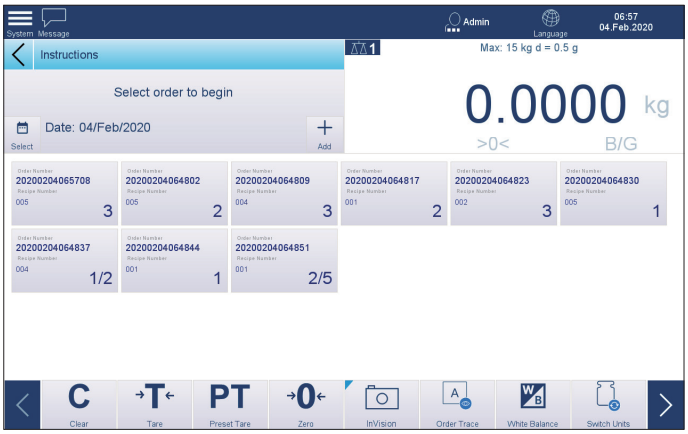


- **There is no object or human body around which can easily produce shadow or darkness over the platter, causing recognition errors.**

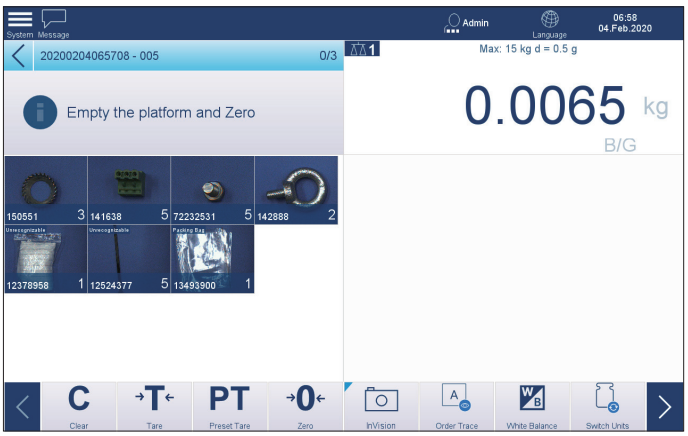
To produce an order, follow these steps:

1. Select the correct order production date (Refer to **4.1.1 Selecting Order Production Date**).

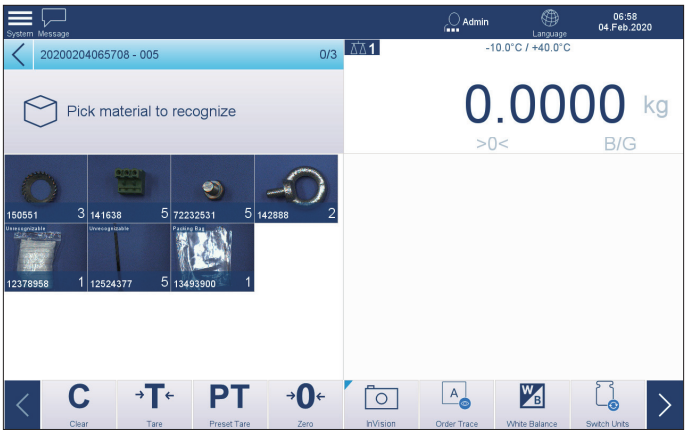
2. Press to select an order. The selected order is highlighted in blue.



3. The system navigates to the Pick & Pack screen. Empty the platter and zero the scale by pressing →0←.



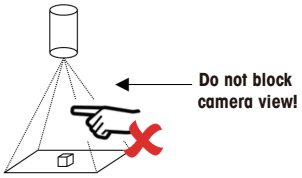
4. When the message of "Pick material for recognition" appears, pick any kind of recognizable materials and place them on the platter for weighing and recognition.



📖 See "**2.5.1 Adjusting White Balance**" for more information about the white balance adjustment.

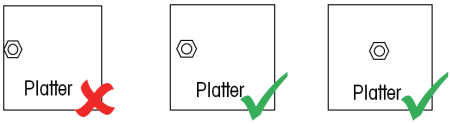
IMPORTANT: Check the ambient lighting constantly during operation. If the lighting conditions change, please readjust the white balance using the WB softkey on the screen.

IMPORTANT: Do not block the camera's view when a material is being weighed and recognized.

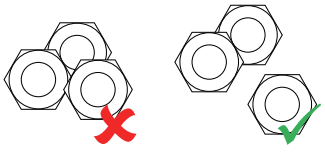


IMPORTANT: Start weighing and recognizing with any recognizable material in the order. There is no necessary sequence among recognizable materials. Unrecognizable materials will be weighed after all recognizable materials are completed.

IMPORTANT: Make sure that all materials are away from the edges of the platter, otherwise, recognition errors may occur.



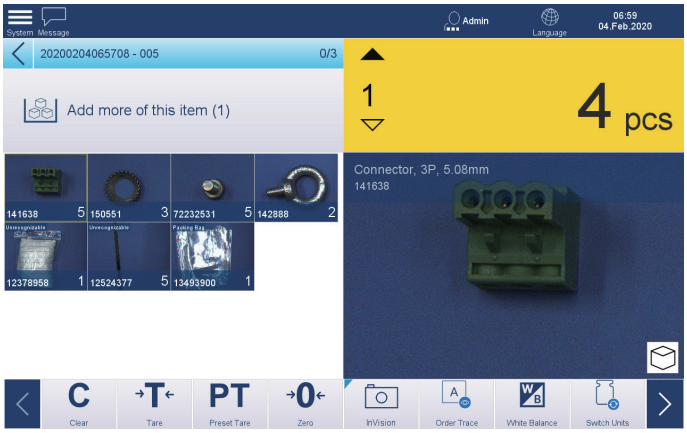
IMPORTANT: For any material that is newly placed on the platter, ensure that at least one piece of the material is not in contact with any other material, otherwise, recognition errors occur



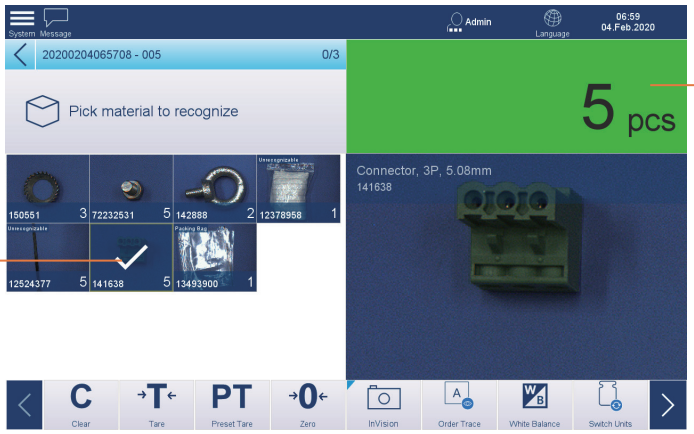
Yellow quantity indication area means that the actual quantity on the platter is below the target quantity of the material.

Red quantity indication area means that the actual quantity on the platter is above the target quantity of the material.

5. If this material does not meet its target quantity, the quantity indication area shows in yellow or red.



6. Keep adding more or remove surplus pieces, until the material reaches its target quantity, i.e. the quantity indication area shows in green.



A "√" mark appears when the material is completed.

Weighing/ Counting indicator shows **green** when the matrial is completed.

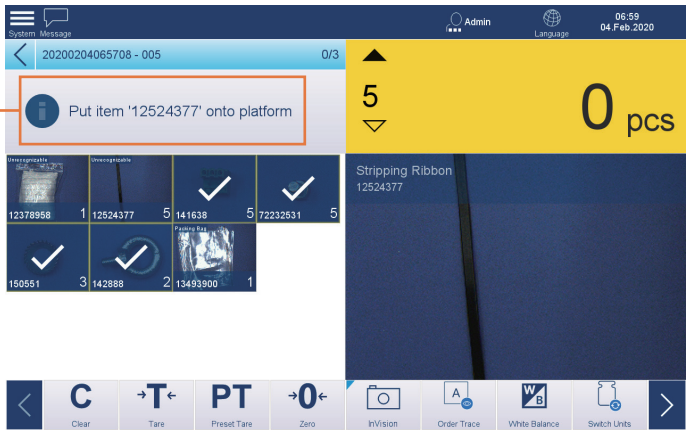
IMPORTANT: Do NOT remove any piece of material from the platter when the quantity area shows **green** and a "√" mark appears on the material portait.

IMPORTANT: Ensure that the current material is recognized and meets its target amount (judging by the "√" mark on the material portrait and the **green** weighing /counting indicator) before you move to the next material. Otherwise, reconition errors occur.

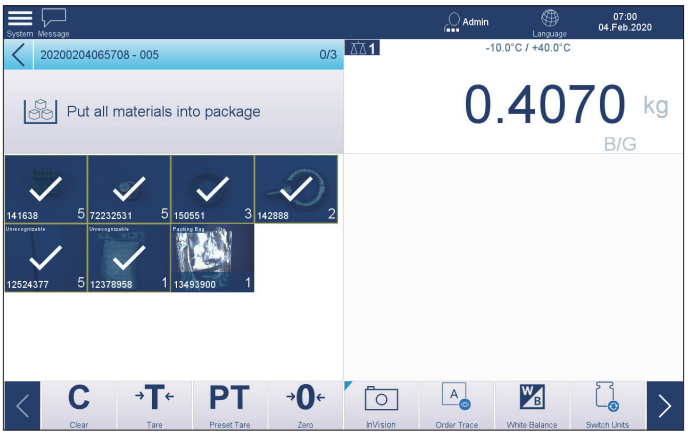
7. The completed material will move to the end of the recipe and right before the packing bag, if there is any.

8. Repeat steps 4 to 7 until all recognizable materials have been weighed and recognized successfully. Then follow the instructions to weigh the unrecognizable materials.

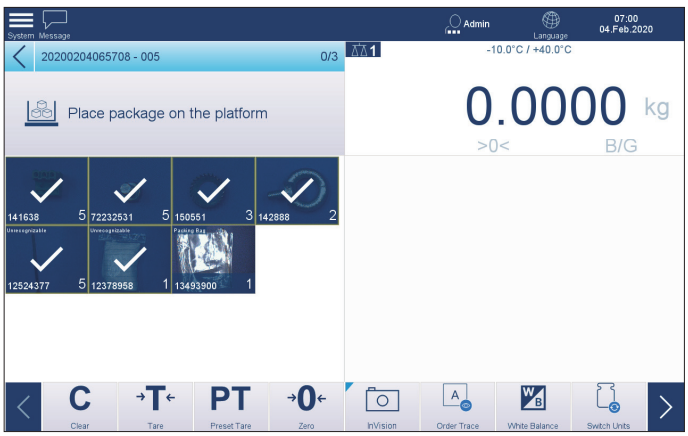
Follow on-screen prompt to weigh unrecognizable items



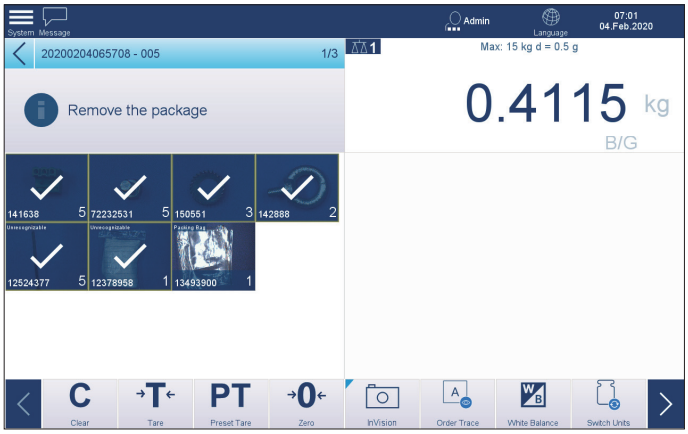
9. If the recipe requires weight verification, pack up all the materials. If the recipe does not require weight verification, skip this step and step 10, continuing at step 11.



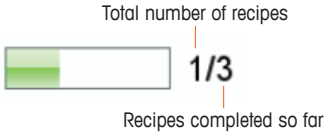
10. Place the entire package back on the platter for verification.



11. Remove the materials or the package and continue with next recipe.



12. Check the progress indicator 1/3 for Pick & Pack progress, if necessary.



13. Repeat steps 3 to 12 to complete the remaining recipes in the selected order.

14. When the entire order has been completed, the system automatically displays the Order Selection screen, and the completed order is removed from the order list.

4.2 Order Trace

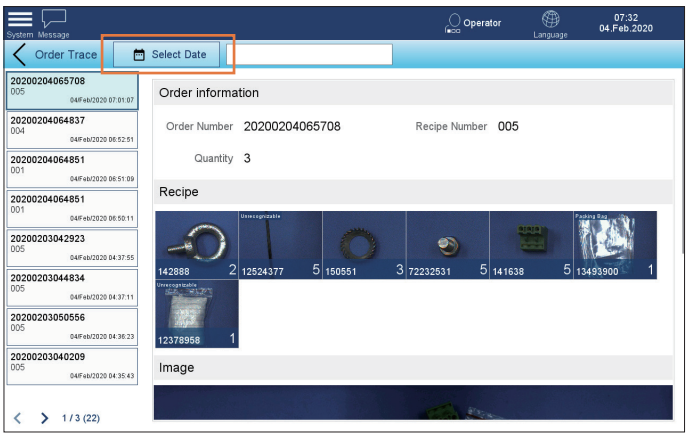
Order Trace guarantees traceability of orders by storing the basic information and the snapshot picture of each order completed.

To enter the Order Trace screen, press A in the start-up screen.

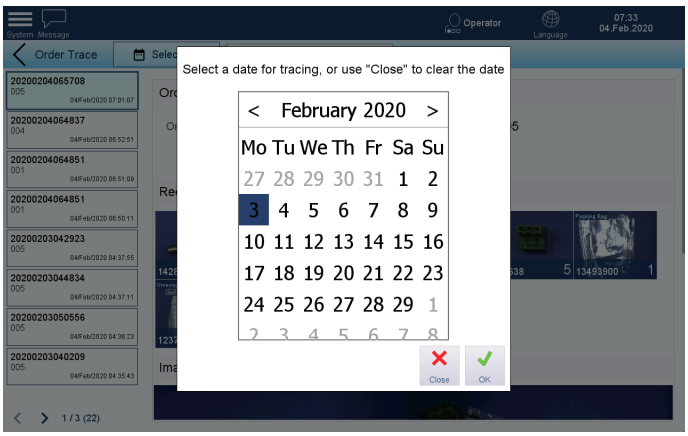
All orders (listed in the left side of the screen) in Order Trace is sequenced chronologically with the newest on the top. You may search for a particular order through its completion date, order number or recipe number.

4.2.1 Searching Orders through Completion Date

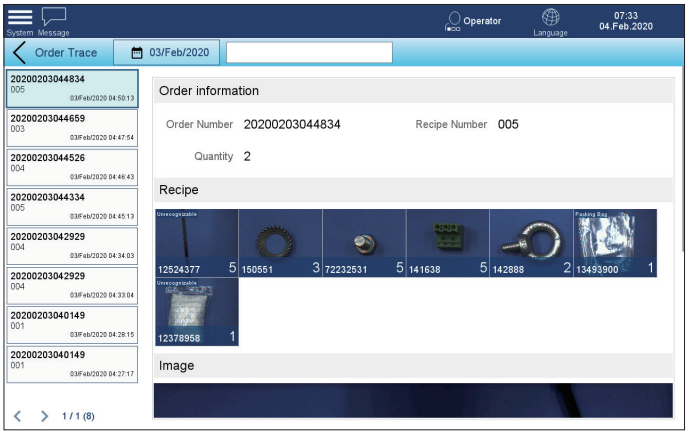
1. Press '**Select Date**'.



2. Select the completion date of the target order.



3. Then all the orders completed on the selected date are shown, with the first highlighted in blue.

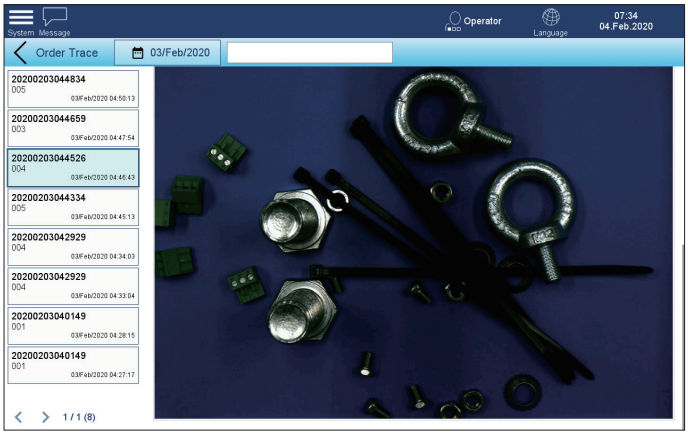


4. Select the target order.

   ⇨ User '<' '>' to see more orders.

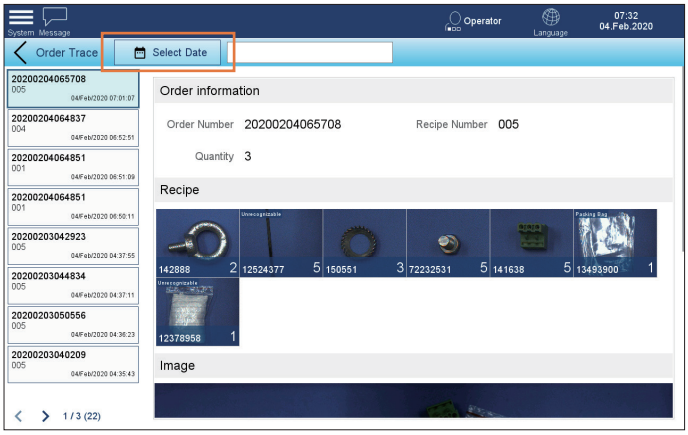
   ⇨ Refer to **4.2.2 Searching Orders by Order Number** and **4.2.3 Searching Orders by Recipe Number** for instructions on searching orders by order number or recipe number.

5. Scroll the screen to see detailed information of the selected order. Information includes order number, recipe number, quantity, recipe, and the image of the completed recipe.

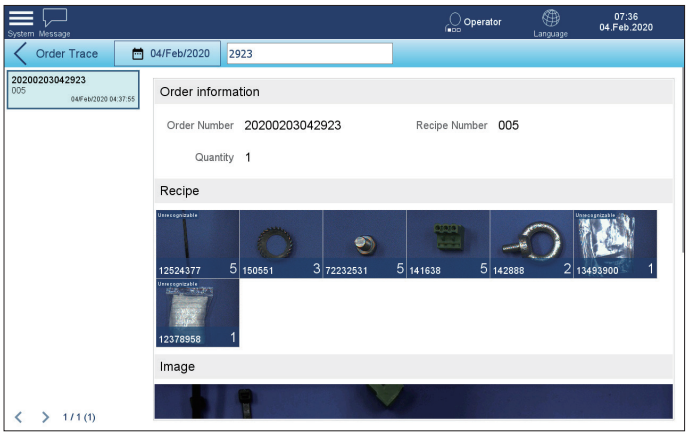


4.2.2 Searching Orders by Order Number

1. Press '**Select Date**', then select the completion date of the target order.



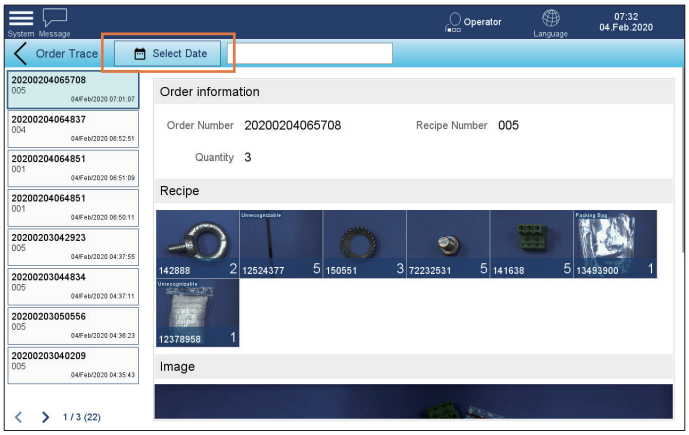
2. Key in the order number in the search field. Fuzzy search is supported.



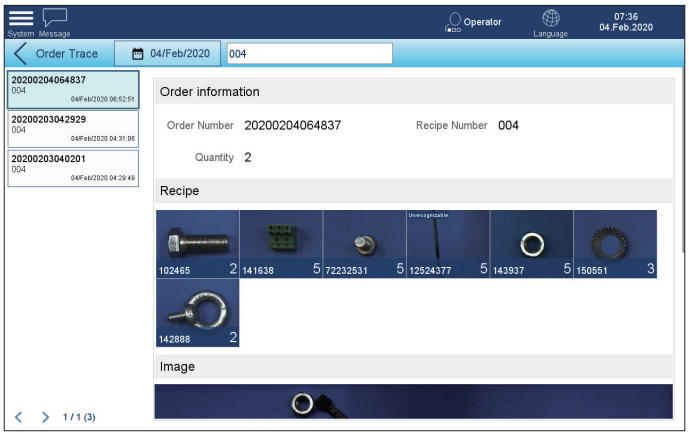
3. The search result(s) are shown in the left side of the screen, with the first order highlighted in blue.

4.2.3 Searching Orders by Recipe Number

1. Press '**Select Date**', then select the completion date of the target order.



2. Key in the recipe number in the search field. Fuzzy search is supported.

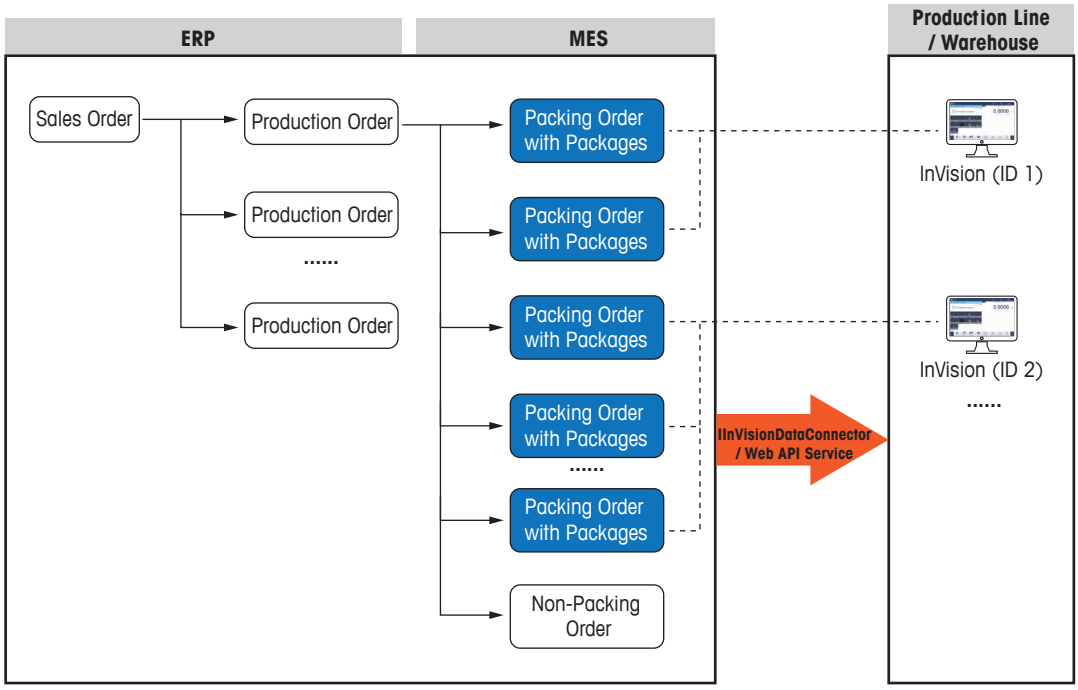


3. The search result(s) are shown in the left side of the screen, with the first order highlighted in blue.

5 Communications

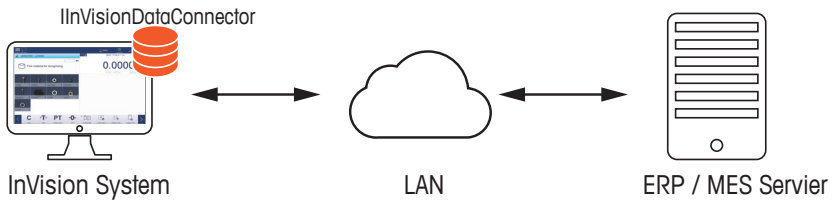
The InVision Pick & Pack system is designed for weighing and packing at production lines or warehouses, and supports connection with ERP or MES production planning system.

The following diagram shows the data flow from ERP/MES to InVision. When a sales order is finally converted to a/multiple packing orders (with packages), which are suitable for InVision Pick&Pack system, a communication method is required to synchronize there packing order information to InVision. In this chapter, we introduce two ways to synchronize the packing orders from ERP/MES to InVision: IInVisionDataConnector or Web API Service.



5.1 IInVisionDataConnector Mode

IInVisionDataConnector is a development kit provided by METTLER TOLEDO. It is in Visual Studio project template format and allows customers to generate the plug-in file necessary for connection between InVision and an ERP or MES system.

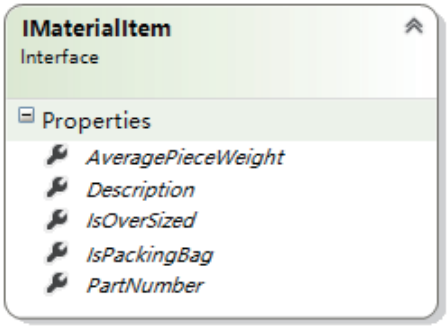


5.1.1 IInVisionDataConnector Data Structure

5.1.1.1 Material

A material item describes a tangible material with the following information:

- Part number, string,
- APW (average piece weight), double,
- Description, string,
- Whether the material is over-sized, bool, and
- Whether the material is a packing bag, bool.

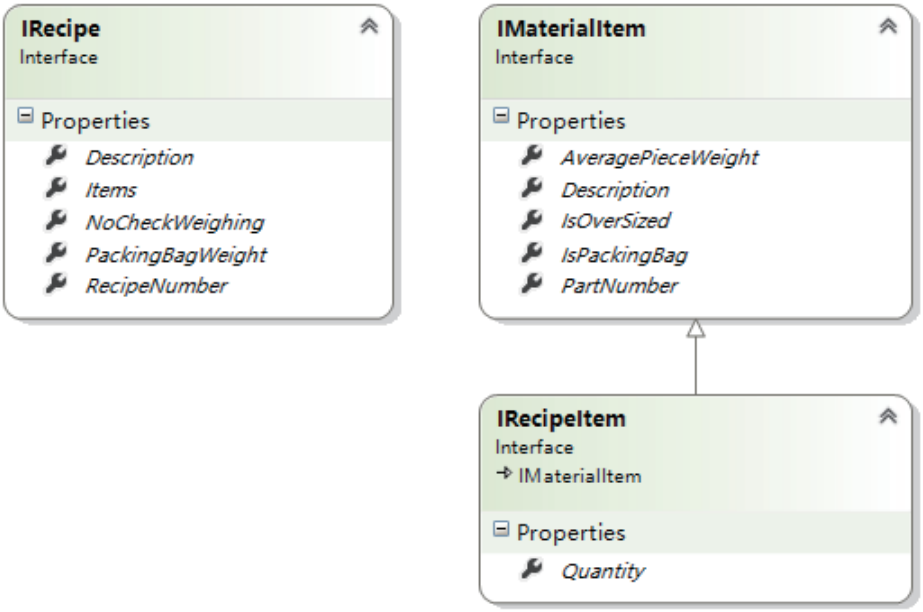


5.1.1.2 Recipe

A recipe includes a list of materials and pre-defined quantity value of each material, and describes itself with the following information:

- Recipe number, string,
- Description, string,
- Whether the recipe requires weight verification after packing, bool,
- Packing bag weight needed for weight verification, double, and
- A list of recipe items, list of IRecipeItem.

A recipe item refers to a specific material in the recipe and the quantity of this material.



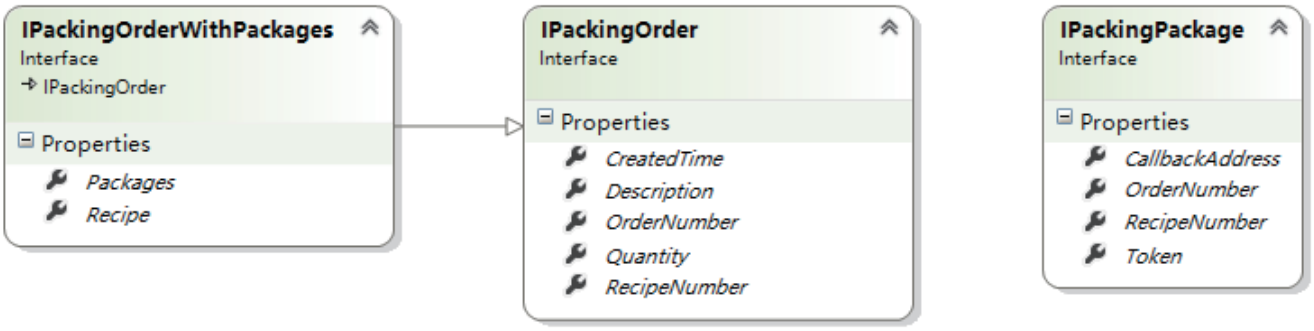
5.1.1.3 Packing Order with Packages

Packing order with packages describes the packing order, the recipe and associated packages. Currently, a packing order only support one recipe.

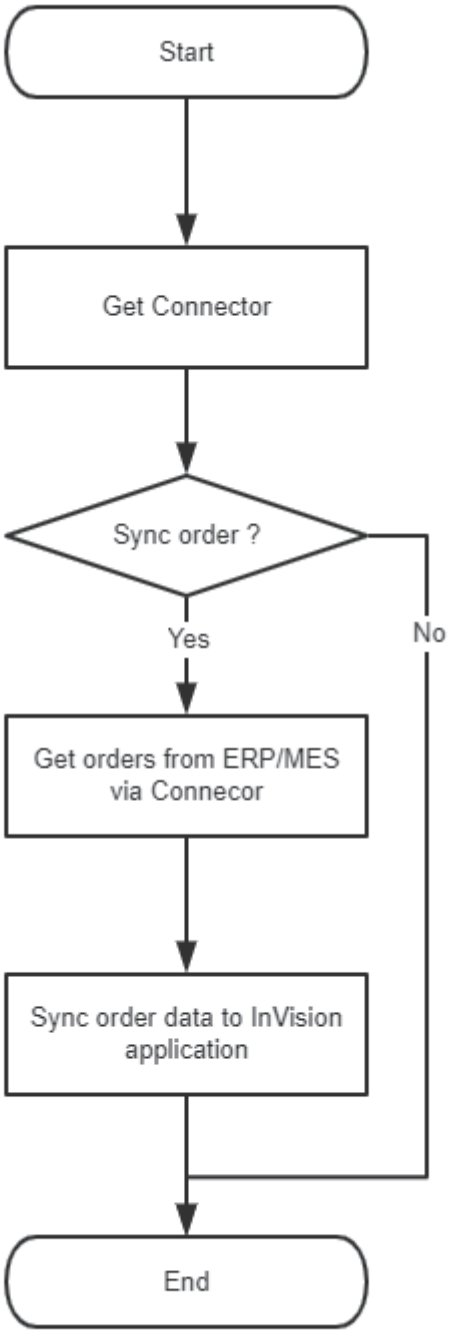
Packing order is a product request issued by a production planning system to produce a specific quantity of recipes within a certain timeframe, and includes the following information:

- Order number, string,
- Description, string,
- Recipe number, string, and
- Quantity, int.

Packing package is a complete recipe packaged together in a package bag or container.



5.1.2 Data Sync Flowchart



5.1.3 Interfaces

Connector Type

Connector type determines what kind of data in InVision will be synced with ERP or MES.

- **None**: neither packing order data nor recipe data in InVision will be synchronized with ERP or MES.
- **Packing Order**: Only packing order data in InVision will be synchronized with ERP or MES.

Connector Key

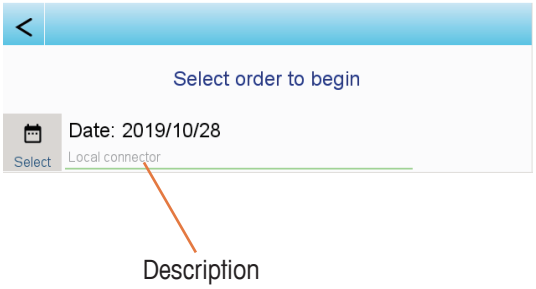
InVision supports installation of multiple connectors, but uses only one connector at a time. Each connector distinguishes itself from the others by its Key, defined as its GUID.

Icon Badge

Icon badge tells the origin of a recipe on the Order Selection screen. A "Web" icon badge indicates the order is sent through web API service.

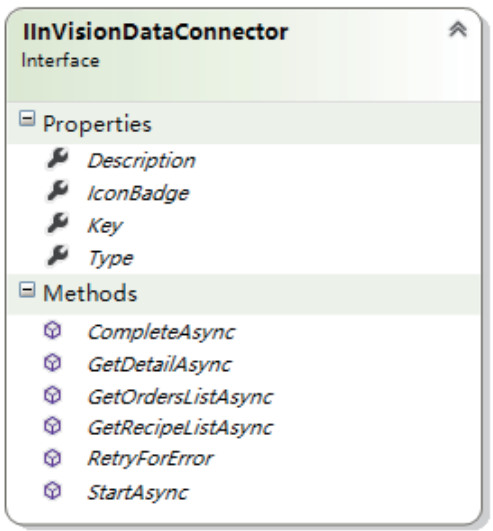
Description

Description is the name of the IInVisionDataConnector and shows in Instruction window.



5.1.4 Methods

The developer must implement the IInVisionDataConnector interface, provided in SDK. IInVisionDataConnector includes the following kinds of methods:



5.1.4.1 Order-Related Methods

GetOrderListAsync: gets a list of orders of a selected date from ERP. This method returns a list of IOrderInformation.

GetDetailAsync: gets all detailed information of a selected order from ERP. This method returns IOrderInformationWithDetail.

5.1.4.2 Package-Related Callbacks

StartAsync: reports to ERP that a package has been started in InVision. This method receives IOrderPackage argument, which has a token provided by ERP.

CompleteAsync: reports to ERP that a package has been completed in InVision. Th

RetryForError: processes all the errors that happened in invoking StartAsync or CompleteAsync and is implemented through IInVisionDataConnector by the customer.

InVision system supports up to five retries of a callback after an invoking failure. Each retry happens in the time interval of $3^{n} \times 20$ minitues.

5.1.5 Example

5.1.5.1 Defining Entities

Material Item

```
public class Material : IMaterialItem
{
    public string PartNumber { get; set; }

    public string Description { get; set; }

    public double AveragePieceWeight { get; set; }

    public bool IsPackingBag { get; set; }

    public bool IsOverSized { get; private set; }
}
```

Recipe

```
public class Recipe : IRecipe
{
    public string RecipeNumber { get; set; }

    public string Description { get; set; }

    public bool NoCheckWeighing { get; set; }

    public List<IRecipeItem> Items
```

```
    {
        get { return _items; }
    }

    public double PackingBagWeight { get; private set; }
}
```

Packing Package

```
public class PackingPackage : IPackingPackage
{
    public string Token { get; set; }

    public string OrderNumber { get; set; }

    public string RecipeNumber { get; set; }

    public string CallbackAddress { get; set; }
}
```

Packing Order

```
public class PackingOrder : IPackingOrder
{
    public string OrderNumber { get; set; }

    public int Quantity { get; set; }

    public string RecipeNumber { get; set; }

    public string Description { get; set; }

    public DateTime CreatedTime { get; set; }
}
```

PackingOrderWithPackages

```
public class PackingOrderWithPackages : PackingOrder,
IPackingOrderWithPackages
{
    public IRecipe Recipe { get; private set; }

    public IEnumerable<IPackingPackage> Packages { get;
private set; }
}
```

5.1.5.2 Implementing a IInVisionDataConnector

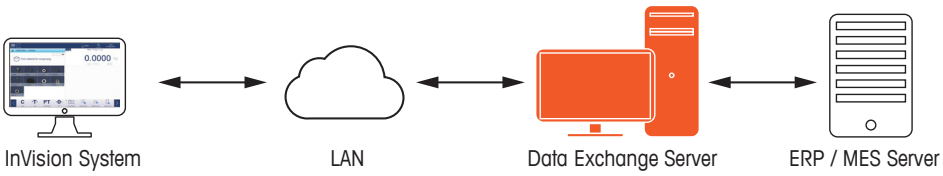
```
public class LmesDataConnector : IInVisionDataConnector
{
    private readonly LmesDataService _dataService;

    public LmesDataConnector()
    {
        _dataService = new LmesDataService();
    }

    public string Description
    {
        get { return "MT LMES Data connector"; }
    }

    public string IconBadge
    {
        get { return "LMES"; }
    }

    public Guid Key
    {
        get { return Guid; }
    }

    public ConnectorType Type
    {
        get { return ConnectorType.Both; }
    }

    public Task<IEnumerable<IPackingOrder>>
GetOrdersListAsync(DateTime date)
    {
        return _dataService.GetOrdersListAsync(date);
    }

    public Task<IPackingOrderWithPackages>
GetDetailAsync(IPackingOrder packingOrder)
    {
        return _dataService.
GetDetailAsync(packingOrder);
        }

        public Task StartAsync(IPackingPackage package,
DateTime startTime)
        {
            return _dataService.StartAsync(package,
startTime);
        }
```

```
        public async Task CompleteAsync(IPackingPackage
package, DateTime completeTime, string imageFilePath)
        {
            PrintAsync(package);

            await _dataService.CompleteAsync(package,
completeTime);
        }

        public Task RetryForError()
        {
            return _dataService.RetryForError();
        }
```

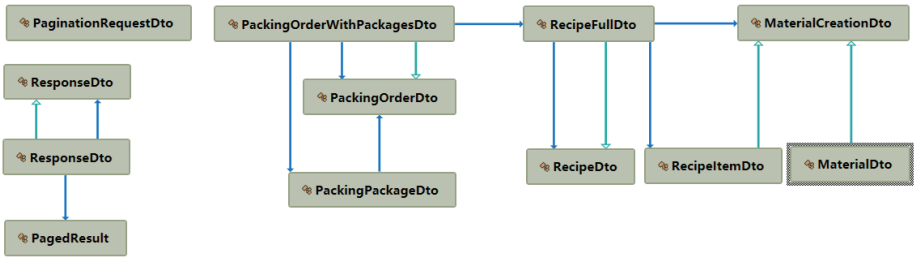
5.2 Web API Mode

5.2.1 Data Exchange Server

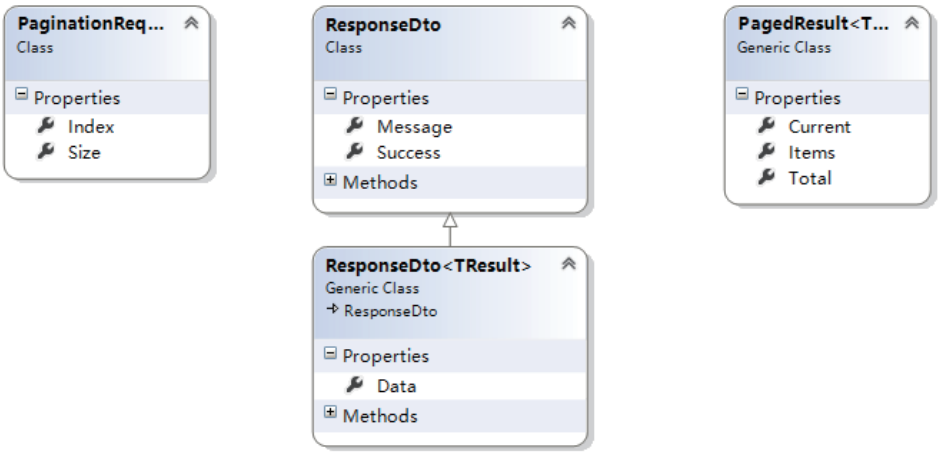
Data Exchange Server will have to be developed by the customer. It pushes packing orders to InVision and receives callbacks through HTTP invoke.



5.2.2 Data Transfer Object



5.2.2.1 Request / Response Wrapper



All request data have no wrapper.

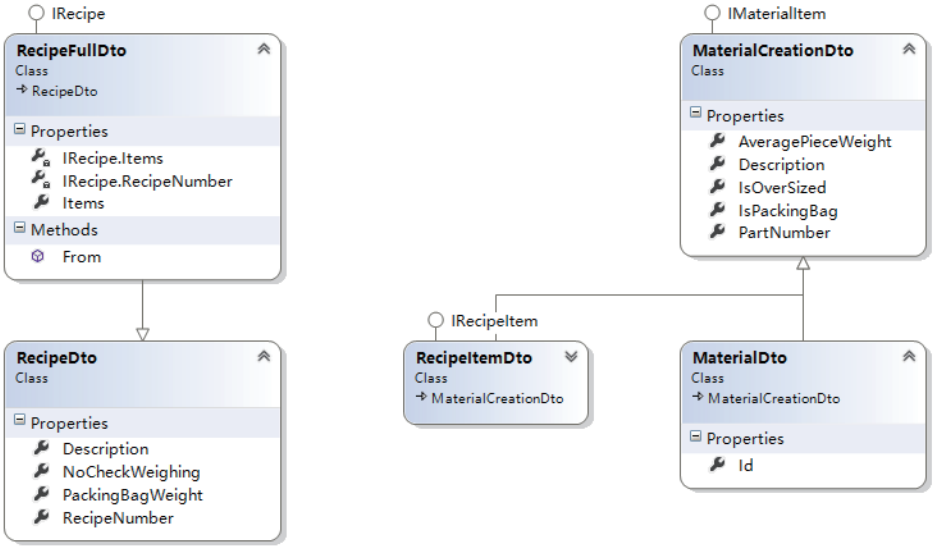
All response will be wrapped by ResponseDto.

The Success property of ResonseDto has two values:

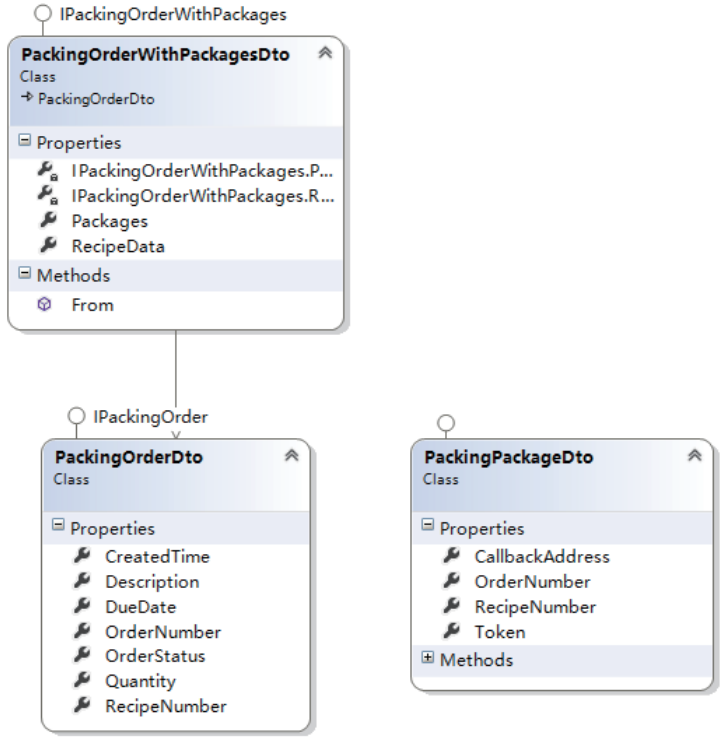
- A "true" Success value means the operation is successful.
- A "false" Success value means the operation failed. The failure reason can be found from the Message property.

The return value of an operation can be found from Data property of ResponseDto<TResult>.

5.2.2.2 Material and Recipe



5.2.2.3 Packing Order



5.2.3 Web API

The following chapters introduce how to obtain data from the InVision system through Web API.

5.2.3.1 Getting Material List

To get all materials:

URL	/api/materials	Method	GET
Request		Content-type	
Response	List<MaterialDto>	Content-type	application/json

5.2.3.2 Adding a Material

To create a new material and set its information, including part number, description, APW, classifying it as a packing bag or an oversized material:

URL	/api/material	Method	POST
Request	MaterialCreationDto	Content-type	application/json
Response	MaterialDto	Content-type	application/json

5.2.3.3 Editting a Material

To edit information of an existing material, including description, APW, and classifying it as a packing bag or an oversized material:

URL	/api/material/{id}	Method	PUT
Request	MaterialDto	Content-type	application/json
Response	MaterialDto	Content-type	application/json

5.2.3.4 Getting a Recipe List

To get all recipes:

URL	/api/recipes	Method	GET
Request		Content-type	
Response	List<RecipeDto>	Content-type	application/json

5.2.3.5 Getting Recipe Data

To get all information of a specific recipe, including all the recipe items/materials and quantity of each recipe item/material:

URL	/api/recipe/{id}	Method	GET
Request		Content-type	
Response	RecipeFullDto	Content-type	application/json

5.2.3.6 Getting a List of Completed Orders

To get a list of completed orders by page:

URL	/api/orders	Method	GET
Request	PaginationRequestDto	Content-type	application/json
Response	PagedResult<PackingOrderDto>	Content-type	application/json

5.2.3.7 Pushing a Packing Order to InVision

To import a packing order to InVision:

URL	/api/order	Method	POST
Request	PackingOrderWithPackagesDto	Content-type	application/json
Response	String	Content-Type	application/json

5.2.3.8 Deleting a Packing Order

To delete a packing order from InVision:

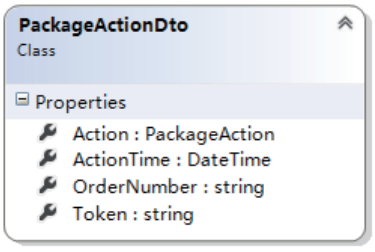
URL	/api/order/{orderNumber}	Method	DELETE
Request		Content-Type	Application/json
Response	String	Content-Type	Application/json

5.2.3.9 Callback from InVision

There will be a separate callback on the status change of a packing package when picking is started and when packing is completed.

Package token will have to be set in the authorization field in HTTP header and is used for user identification.

Request DTO



Start Picking

This callback occurs when picking is started. The Action value is "Start".

URL	CallbackAddress	Method	POST
Request	PackageActionDto	Content-type	multipart/form-data
Response	ResponseDto	Content-Type	application/json

Complete Packing

This callback occurs when packing is completed. The Action value is "Complete".

URL	CallbackAddress	Method	POST
Request	PackageActionDto	Content-type	multipart/form-data
Response	ResponseDto	Content-Type	application/json

Invoke all Failed Callbacks

URL	/api/callback/invoke	Method	GET
Request		Content-Type	
Response		Content-Type	Application/json

5.2.4 Example

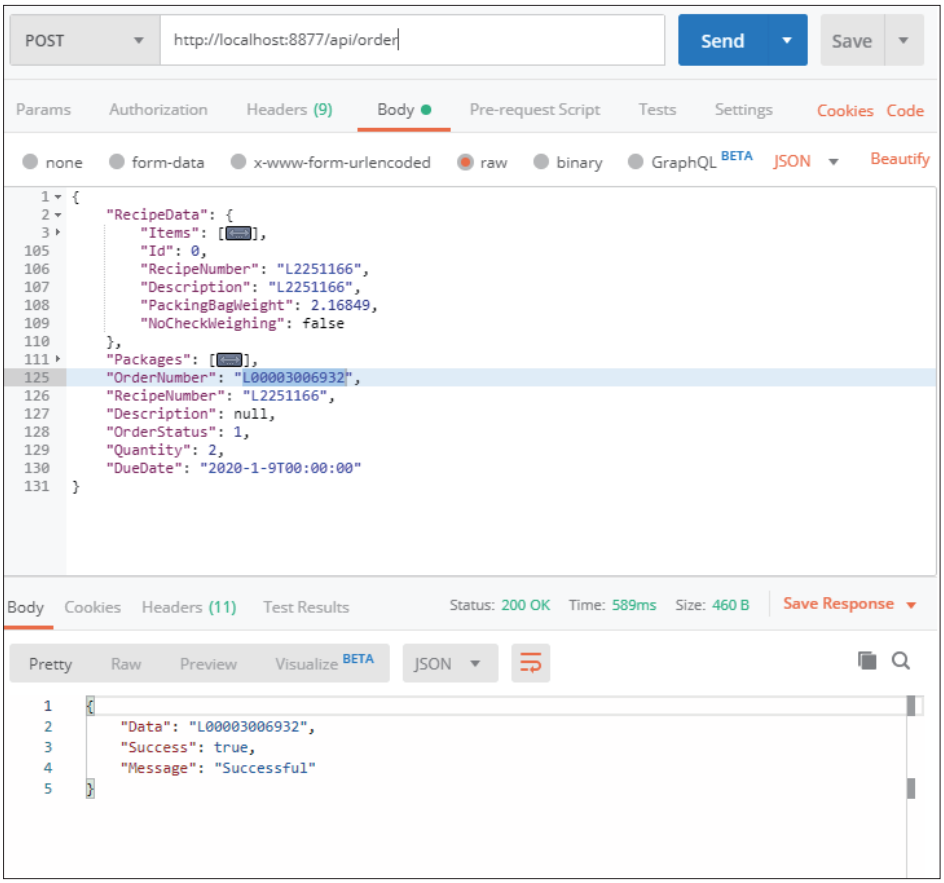
The following example shows how to post a PackingOrderWithPackages to InVision.

PackingOrderWithPackages:

```
{
        "RecipeData": {
            "Items": [
                {
                    "Quantity": 1,
                    "MaterialId": 41,
                    "ImagePath": "",
                    "PartNumber": "127013",
                    "Description": null,
                    "AveragePieceWeight": 4.515987,
                    "IsPackingBag": false,
                    "IsOverSized": false
                },
                {
                    "Quantity": 2,
                    "MaterialId": 43,
                    "ImagePath": "",
                    "PartNumber": "128010",
                    "Description": null,
                    "AveragePieceWeight": 4.677892,
                    "IsPackingBag": false,
                    "IsOverSized": false
                },
                …
                {
                    "Quantity": 4,
                    "MaterialId": 75,
                    "ImagePath": "",
```

```
                "PartNumber": "72237672",
                "Description": null,
                "AveragePieceWeight": 1.381742,
                "IsPackingBag": false,
                "IsOverSized": false
            }
        ],
        "Id": 0,
        "RecipeNumber": "L2251166",
        "Description": "L2251166",
        "PackingBagWeight": 2.16849,
        "NoCheckWeighing": false
    },
    "Packages": [
        {
            "OrderNumber": "L0000300602",
            "RecipeNumber": "L2251166",
            "Token": "1953070743",
            "CallbackAddress": null
        },
        {
            "OrderNumber": "L0000300602",
            "RecipeNumber": "L2251166",
            "Token": "1953070744",
            "CallbackAddress": null
        }
    ],
    "OrderNumber": "L0000300602",
    "RecipeNumber": "L2251166",
    "Description": null,
    "OrderStatus": 1,
    "Quantity": 2,
    "DueDate": "2019-12-30T00:00:00"
}
```

Screenshot - Post via Postman



6 Service and Maintenance

This chapter describes how to service and maintain the InVision camera boom and platter. For information about servicing or maintaining the IND970 terminal or PBD769-AB15 weighing scale, please refer to their respective user manual or service manual.

6.1 Precautions

	⚠ WARNING **BEFORE SERVICING, DISCONNECT POWER FROM THIS DEVICE.**
	⚠ WARNING **THE PROTECTIVE GROUND CONNECTION MUST BE CHECKED AFTER SERVICE WORK IS PERFORMED. PERFORM THE CHECK BETWEEN THE PROTECTIVE GROUND CONTACT ON THE POWER PLUG AND THE HOUSING. THIS TEST MUST BE DOCUMENTED IN THE SERVICE REPORT.**
	⚠ WARNING **ONLY PERMIT QUALIFIED PERSONNEL TO SERVICE THE DEVICE. EXERCISE CARE WHEN MAKING CHECKS, TESTS AND ADJUSTMENTS THAT MUST BE MADE WITH POWER ON. FAILING TO OBSERVE THESE PRECAUTIONS CAN RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.**
	⚠ WARNING **WHEN THIS EQUIPMENT IS INCLUDED AS A COMPONENT PART OF A SYSTEM, THE RESULTING DESIGN MUST BE REVIEWED BY QUALIFIED PERSONNEL WHO ARE FAMILIAR WITH THE CONSTRUCTION AND OPERATION OF ALL COMPONENTS IN THE SYSTEM AND THE POTENTIAL HAZARDS INVOLVED.** **TO ENSURE SAFE OPERATION AT ALL TIMES, THE DESIGN OF THE OVERALL INSTALLATION SHOULD INCLUDE PROPERTY SAFETY DISCONNECT EQUIPMENT SUCH AS EMERGENCY STOP SWITCHES AND POWER DISCONNECTS.** **FAILURE TO OBSERVE THE PRECAUTION COULD RESULT IN BODILY HARM AND/OR PROPERTY DAMAGE.**
	⚠ CAUTION **BEFORE CONNECTING/DISCONNECTING ANY INTERNAL ELECTRONIC COMPONENTS OR INTERCONNECTING WIRING BETWEEN ELECTRONIC EQUIPMENT ALWAYS REMOVE POWER AND WAIT AT LEAST THIRTY (30) SECONDS BEFORE ANY CONNECTIONS OR DISCONNECTIONS ARE MADE. FAILURE TO OBSERVE THESE PRECAUTIONS COULD RESULT IN DAMAGE TO OR DESTRUCTION OF THE EQUIPMENT AND/OR BODILY HARM.**
	⚠ NOTE **OBSERVE PRECAUTIONS FOR HANDLING ELECTROSTATIC SENSITIVE DEVICES.**

6.2 List of Required Tools

The following tools are required for service and maintenance of the InVision camera boom and platter.

- Microfiber cloth
- Mild glass or plastic cleaning solution
- Lens blower brush
- Lens cleaning fluid
- Voltage meter
- Antistatic mat and armband

6.3 Cleaning

⚠ WARNING

BEFORE SERVICING, DISCONNECT POWER FROM THIS DEVICE.

Refer to the user's guides provided with the IND970 terminal and the PBD769-AB15 scale for information about how to clean the terminal and scale base.

Clean the InVision camera boom and platter using the following methods when the column hardware, camera, lens or platter become dirty.

6.3.1 Cleaning the Camera Boom and Platter

To clean the camera boom, you may need:

- Microfiber cloth
- Mild glass or plastic cleaning solution

⇨ Wipe down the column hardware and the platter with the microfiber cloth. If the dirt persists, place a few drops of cleaning solution on the cloth, then wipe it down.

NOTE:

- Do not spray the cleaning solution directly onto the hardware.
- Do not open devices to clean them.

6.3.2 Cleaning the Camera and Lens

To clean the camera and the lens, you may need:

- Microfiber cloth
- Lens blower brush
- Lens cleaning fluid

To clean the camera and the lens:

1. Remove the camera housing by loosening the M3 screws atop and sliding it off from

the camera boom.

IMPORTANT: Avoid using slippery gloves and exercise extra care while uninstalling the camera housing

2. Wipe the camera with the microfiber cloth.
3. Clean dust and dirt off the lens with the blower brush, then wipe lightly with the microfiber cloth. If the lens still cannot be cleaned adequately, try using a few drops of lens cleaning fluid.

NOTE:

- When using the leans cleaning fluid, always place the fluid on the cloth, rather than directly on the lens.

4. Reinstall the camera housing after cleaning is done.

6.4 Maintenance

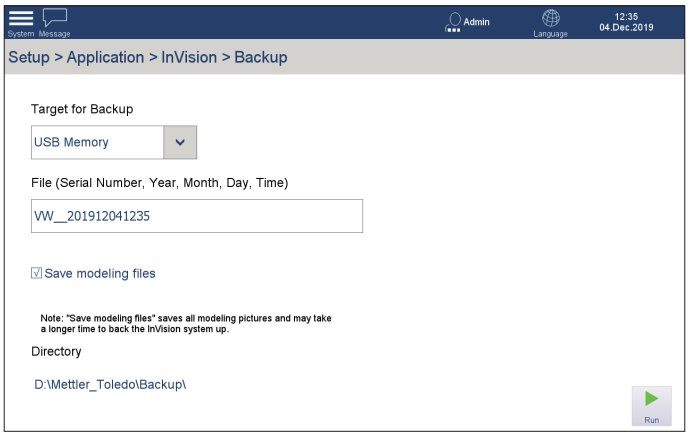
6.4.1 Data Backup

NOTE:

Ensure you have **Admin** access level before entering Setup.

We recommend you backup or restore InVision data through a USB memory device (memory stick or USB hard drive).

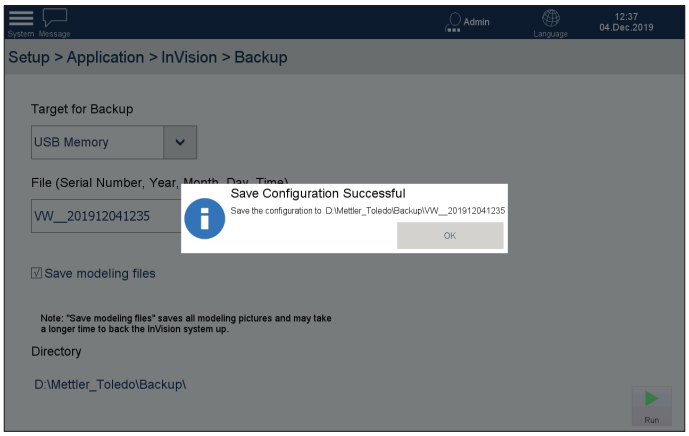
1. Connect the USB memory device to a USB port on the IND970 ELO Box. A USB connection cable, part no. 22017604 (0.2 m) or 22017608 (3 m), may be required for this. Otherwise, open the ELO Box and connect the USB memory device directly to one of the USB ports on the main board.
2. Access **Setup > Application > InVision > Backup.**
3. Select 'USB Memory' from the Target for Backup list.
4. The system automatically defines the backup file name, or you may define the file name in the File textfield.



5. Tick 'Save modeling files' if you wish to save all modelling pictures.

6. Press 'Run'.

7. When backup is successful, the following dialog appears. Press 'OK'.



6.4.2 Data Restore

NOTE:

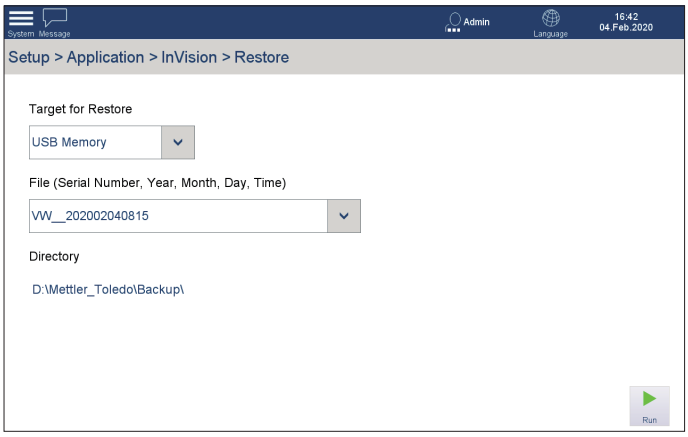
Ensure you have **Admin** access level before entering Setup.

1. Connect the USB memory device containing InVision backup data file to a USB port on the IND970 ELO Box. A USB connection cable, part no. 22017604 (0.2 m) or 22017608 (3 m), may be required for this. Otherwise, open the ELO Box and connect the USB memory device directly to one of the USB ports on the main board.

2. Access **Setup > Application > InVision > Restore.**

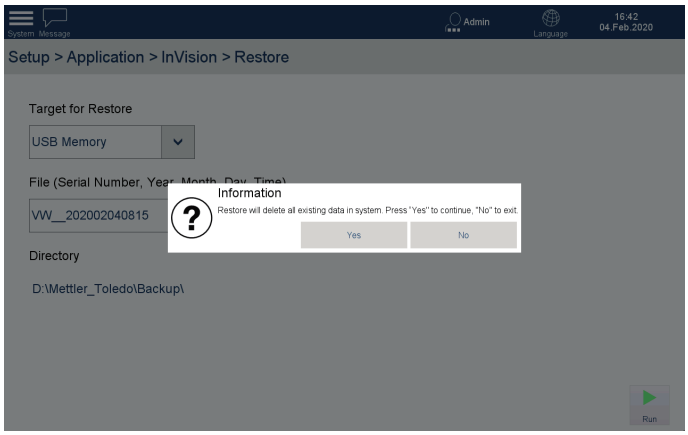
3. Select 'USB Memory' from the Target for Restore list.

4. Select the target data file from the File dropdown list.

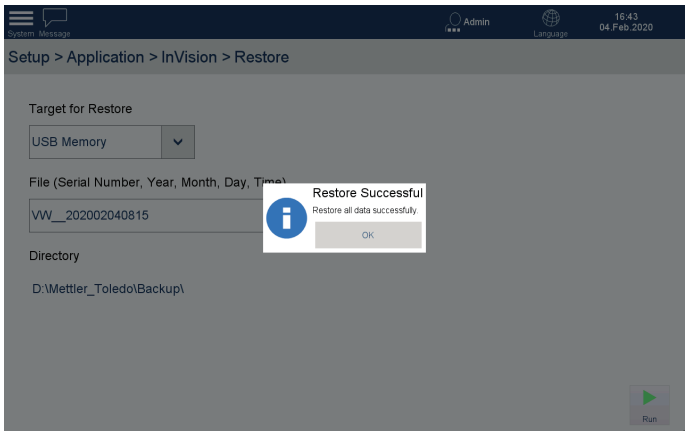


5. Press 'Run'.

6. The following information dialog appears. Press 'Yes' to continue (Or press 'No' to abort).



7. The following dialog appears when the data file is restored successfully. Press 'OK'.



6.4.3 Software Update

We recommend updating InVision through a USB memory device (memory stick or USB hard drive). To update the software, an update file with the suffix of .mtapp is required.

1. Create a **Mettler_Toledo\Update** folder in the root directory of the USB memory device.

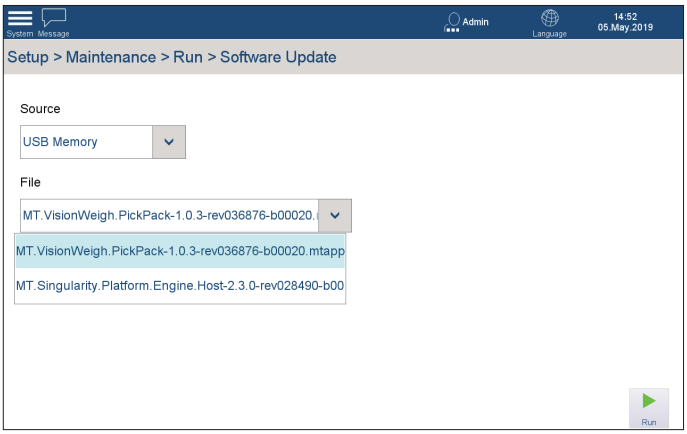
2. Copy the .mtapp update file into the folder.

3. Connect the USB memory device to a USB port on the IND970 ELO Box. A USB connection cable, part no. 22017604 (0.2 m) or 22017608 (3 m), may be required for this. Otherwise, open the ELO Box and connect the USB memory device directly to one of the USB ports on the main board.

4. Access **Setup > Maintenance > Run > Software Update**.

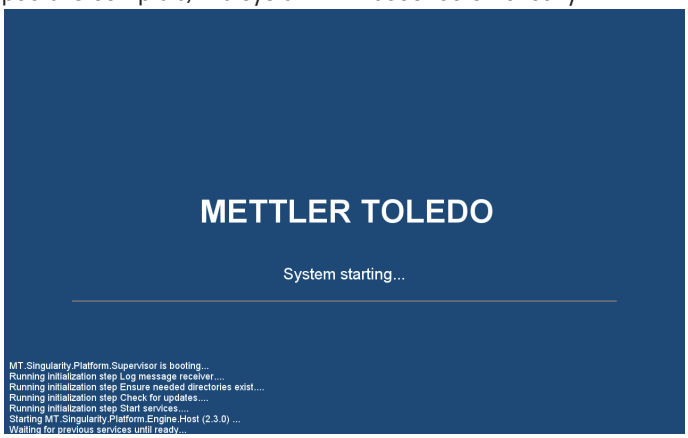
5. Select 'USB Memory' from the Source dropdown list.

6. Select the update file from the File dropdown list.



7. Press 'Run' to start updating. The update may take 5 minutes.

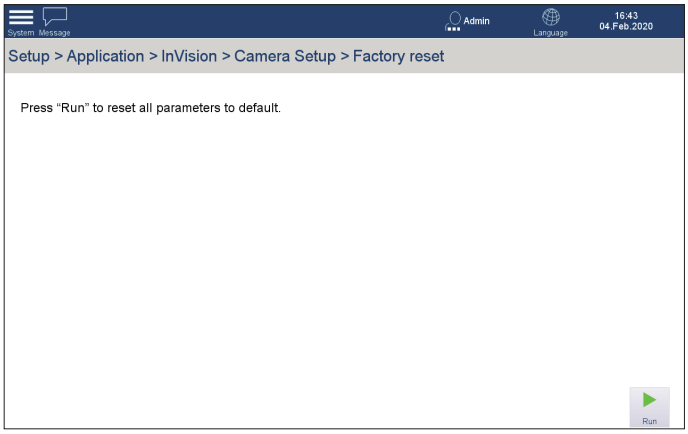
8. Once the update is complete, the system will reboot automatically.



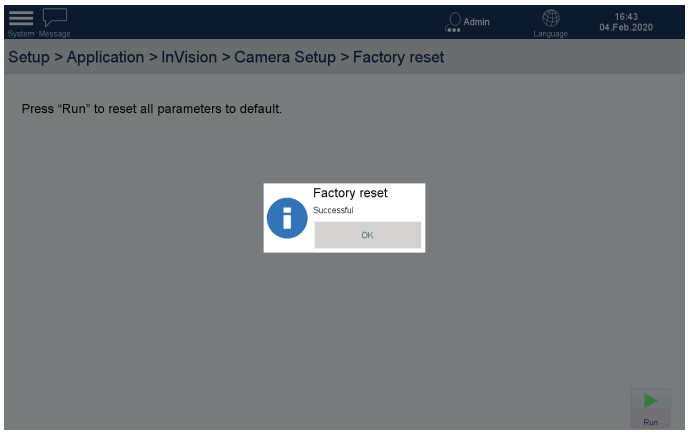
6.4.4 Camera Reset

1. Access **Setup > Application > InVision > Camera Setup > Factory Reset.**

2. Press 'Run' to reset the camera to factory settings.



3. When the reset is successful, the following dialog appears. Press 'OK'.



6.5 Events and Corrective Responses

Occured When	On-Screen Prompt	Cause	Remedy
Creating a new material or editing material information	Please enter material part number.	• Part number is empty.	⇨ Enter the part number of the material.
	Part number is too long.	• Part number contains more than 20 characters.	⇨ Ensure that the part number contains no more than 20 characters.
	Description is too long	• Description contains more than 50 characters.	⇨ Ensure that the description contains no more than 50 characters.
	Please enter material APW.	• A negative APW value is entered.	⇨ Enter an APW value that is above zero.
	This part number already exists. Please define a new part number.	• The part number entered conflicts with one that already exists in the system.	⇨ Define a new part number for the material.
Modelling	Empty the platform and zero.	• The platter is not empty and the scale is not zeroed when the "Modelling" button is pressed.	⇨ Empty the platform and zero the scale.
	Too many modelling files.	• The system has more than 8000 pieces of modelling pictures or a material has more than 96 single-pose pictures.	⇨ Delete obsolete modelling pictures.
	Failed to save current image file to disk. Press "Yes" to reboot now to solve it. Press "No" to manually reboot later.	• Camera failure during modelling.	⇨ Follow the on-screen prompt to reboot the system.
	Some parts are on the edges. Please put all parts in the center of the square.	• Material part is touching the marking lines of the modelling grid during modelling.	⇨ Ensure each material part is placed in a cell of the modelling grid and away from the marking lines.
		• White balance issue.	⇨ Readjust white balance settings.
	Modelling error.	• Fail to store modelling pictures.	⇨ Reboot the system and try again.

Occured When	On-Screen Prompt	Cause	Remedy
Creating a new recipe or editing recipe information	Recipe number is empty	• Recipe number is empty.	⇨ Enter the recipe number of the recipe.
	Recipe number is too long.	• Recipe number contains more than 20 characters.	⇨ Ensure that the recipe number contains no more than 20 characters.
	Description is too long.	• Description contains more than 50 characters.	⇨ Ensure that the description contains no more than 50 characters.
	The recipe number already exists. Please define a new recipe number.	• The recipe number conflicts with one that already exists in the system.	⇨ Define a new recipe number for the recipe.
	All items weight out of scale range.	• The total weight of all items exceeds 15 kg.	⇨ Ensure the total weight of all recipe items is less than 15 kg.
	There are too many materials in the system. Currently support 30 materials.	• A recipe contains more than 30 kinds of materials.	⇨ Ensure that the recipe contains no more than 30 kinds of materials.
Pick&Pack operation	Failed to get weight from scale.	• The system failed to get weight from the scale during Pick&Pack operation.	⇨ Check the RS422 cable connection between the scale and the Elo box.
	Failed to find camera. Please check.	• The system failed to find the camera during Pick&Pack operation.	⇨ Check the RS232 connection between the camera boom and the Elo box. ⇨ Check the Ethernet connection between the camera boom and the Elo box.
	Capturing image or recognizing error.	• Camera failure during Pick&Pack operation.	⇨ Check the Ethernet connection between the camera boom and the Elo box. ⇨ Reboot the system.
	Alarm! Completed material is removed.	• A material that has been weighed and recognized by the system is removed from the platter during Pick&Pack operation.	⇨ Place the removed material back to the platter. ⇨ Remove all materials from the platter and start weighing and recognizing again.

Occured When	On-Screen Prompt	Cause	Remedy
White Balance	White balance adjustment failed. Please try again.	• Wrong calibration board is used.	⇨ Use the calibration board (non-graphic side) provided.
		• Light frequency issue.	⇨ Check the light.
	Lighting is too strong.	• The light is too strong and exceeds the requirements listed in **2.1.2 Ambient Conditions.**	⇨ Ensure that the light meets the requirements listed in **2.1.2 Ambient Conditions**.
	Lighting is too weak or the lens cover is not removed. Please check and try again.	• The light is too weak and exceeds the requirements listed in **2.1.2 Ambient Conditions.**	⇨ Ensure that the light meets the requirements listed in **2.1.2 Ambient Conditions.**
		• The f-stop is not in the correct value.	⇨ The f-stop must be set to 2.8. Refer to **Figure 2-2: f-stop should reach f/2.8**
		• Wrong calibration board is used.	⇨ Use the calibration board (non-graphic side) provided.
		• Lens cover is not removed.	⇨ Remove the lens cover.
Back and Restore	Backup file exists, please rename.	• The backup file already exists in the USB memory drive.	⇨ Define a new name for the backup file.
	Failed to save configuration, please see if the disk space is enough or check if you have the right permission.	• Not enough space in the USB memory drive.	⇨ Use a USB memory drive with enough space and try agian.
	Failed to backup InVision data.	• Backup error.	⇨ Try to backup again.
	Invalid backup file path.	• The backup file name is using invalid characters.	⇨ Use alphanumeric characters and "_" to name the backup file.
	Failed to restore configuration. Please check if the source file is valid or if you have the right permission.	• Backup file is damaged.	⇨ Prepare a new backup file.

A Appendix

A.1 Coefficient of Variation Calculation Example

The following example shows how to calculate the coefficient of variation using the illuminance values measued on the platter.

Example: Suppose you have obtained the illuminance lux values according to 2.4.3 Measuring Illuminance on the Platter.

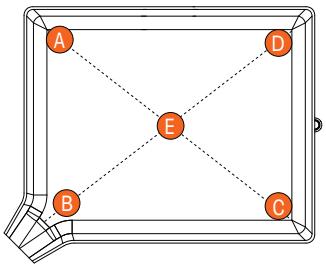
$A=466\ lux$

$B=456\ lux$

$C=476\ lux$

$D=464\ lux$

$E=415\ lux$



1. Work out the mean of these values.

$$\frac{466 + 456 + 476 + 464 + 415}{5} = 455.4$$

2. Subtract the mean from each value, and divide each difference by the mean to calculate the CV value of each point.

$$CV\ value\ at\ Point\ A: \quad \left|\frac{466 - 455.4}{455.4}\right| \approx 2\%$$

$$CV\ value\ at\ Point\ B: \quad \left|\frac{456 - 455.4}{455.4}\right| \approx 0\%$$

$$CV\ value\ at\ Point\ C: \quad \left|\frac{476 - 455.4}{455.4}\right| \approx 5\%$$

$$CV\ value\ at\ Point\ D: \quad \left|\frac{465 - 455.4}{455.4}\right| \approx 2\%$$

$$CV\ value\ at\ Point\ E: \quad \left|\frac{415 - 455.4}{455.4}\right| \approx 9\%$$

3. Each CV value should be within 20%. If any CV value is higher than 20%, adjust the lighting, remeasure the illuminance lux values at the five points, then recalculate the CV values.

A.2 Glossary

Material

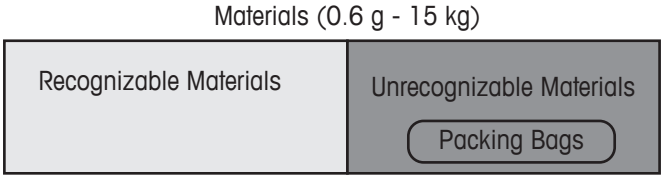
A material refers to a part, component or substance used in the production or manufacturing process of an end product.

Recognizable / Unrecognizable Material

A recognizable material is one that can be weighed and recognized by the InVision system and must meet all these requirements:

- ≥0.6g in weight.
- ≤80mm in height.
- ≤80mm in length.
- ≤80mm in width.
- Not transparent nor semi-transparent.
- Not easily changeable in physical features. For instance, cables or wires are not recommended for modelling because their shape bends easily.

A material that is out of the weighing or recognition range of the InVision system, i.e. any of the above requirement is not met, is defined as unrecognizable. Packing bags belong to the category of unrecognizable materials.



Recipe

A recipe is a list of materials and their quantities needed for production.

Package

A package is a complete recipe packaged together in a package bag or container.

Order

An order is a product request issued by a product planning system to produce a specific quantity of recipe within a certain timeframe.

Pose

A pose is a particular way that a material stands.

www.mt.com/InVision

For more information

METTLER-TOLEDO GMBH
Im Langacher 44
CH-8606 Greifensee, Switzerland
Tel.: +41 (0) 44-944 22 11
Fax: +41 (0) 44-944 45 10
www.mt.com

Subject to technical changes.
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Document No. 30566274 B

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