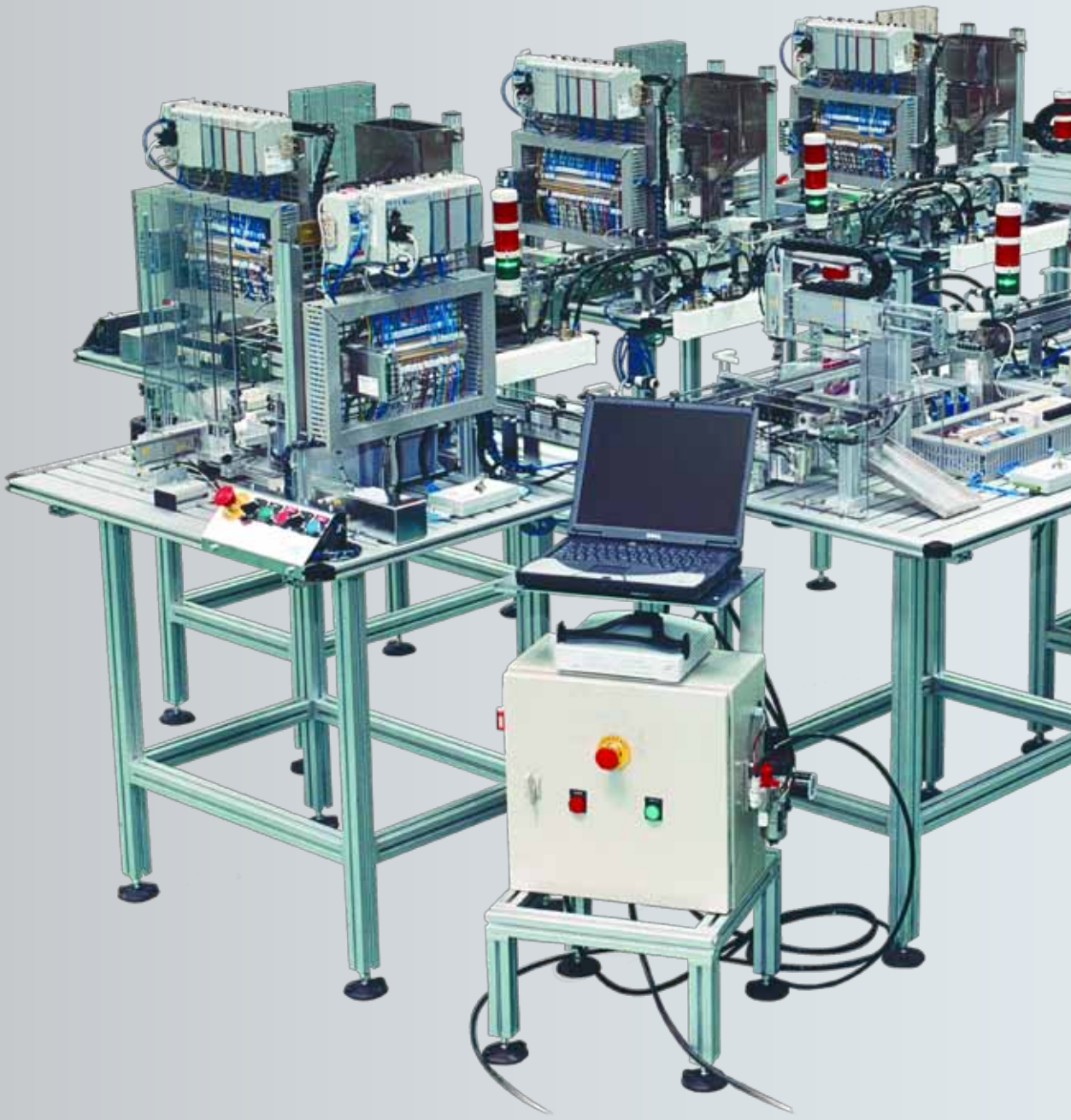
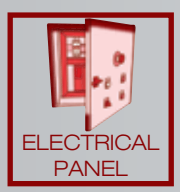
HAS-200

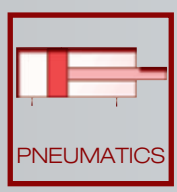
Highly automated system

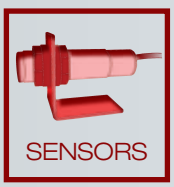
HAS-200 reproduces a real production process with full production management



In the following TECHNOLOGIES...







SMC
INTERNATIONAL TRAINING

Develop the SKILLS...

ANALYSIS

TROUBLESHOOTING

DESIGNING

TECH DOCUM. CREATION

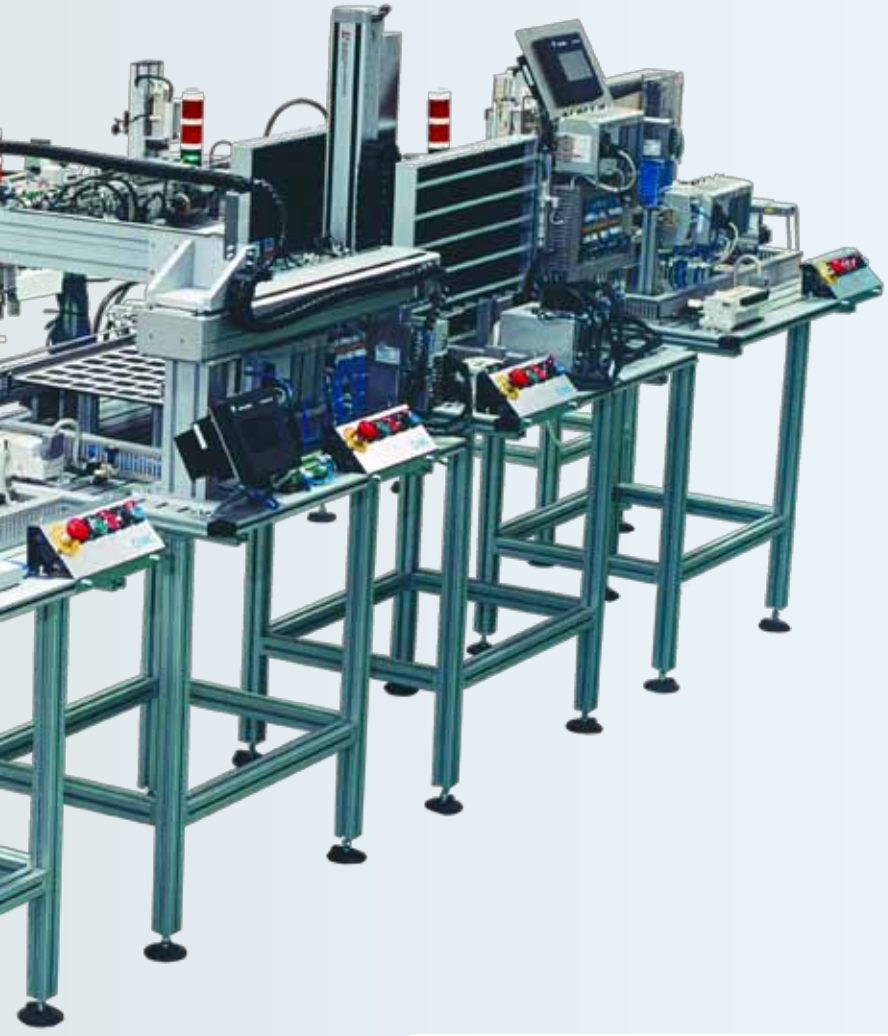
TECH DOCUM. UNDERSTANDING

OPERATION

PROGRAMMING

SETTING UP

Tomorrow's factory within the education system's grasp



Scale the summit of the automation pyramid

INDUSTRIAL COMMUNIC.

MOTION CONTROL

SCADA / HMI

M.E.S.

E.R.P.

AUTOMATED SYSTEMS

HAS-200 - Highly automated system

The HAS-200 system reproduces a production process with a high level of automation which helps to develop the professional capacities required in diverse sectors (automotive, semiconductors, food, pharmaceutical, etc.).

Aspects such as aesthetics, user motivation and the development of transversal skills (such as teamwork etc.) have also been taken into account in the conception and design process.

At university level, the HAS-200 system represents a powerful development platform for research projects.

The product/ process

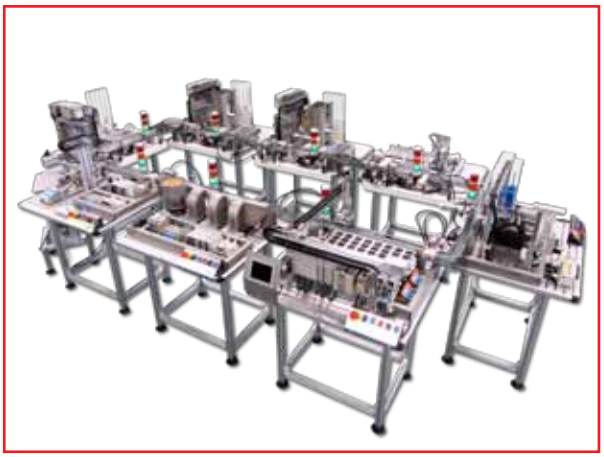
HAS-200 allows the user to manufacture 19 different products. The raw material includes containers with four types of label (red, blue, yellow and multi-coloured). Each label has a bar code to identify the product throughout the process.

Varying quantities of “beads” are poured into these containers, enabling the combination of 19 different “recipes”.

Once the requested quantity has been filled, the containers are covered with a lid and a label is added that includes the manufacturing date, etc. The product is then sent to the dispatch station or warehouses.

Within the process, both the material weight and height is measured. These two variables are analysed by Statistical Process Control (SPC) for decision-making and will be stored in the database for generation of logs, etc.

The modular system



HAS-200 is fully modular system of up to 11 workstations, a raw material store station and the control cabinet. Each workstation has a section of conveyer belt which allows great flexibility in layout design.

All the stations have a control panel/ keypad as well as a three- colour indicator tower and a top-of-the-range PLC which controls in manual or integrated mode.

The connection between the station and the management system is via an Ethernet network that enables great speed in the data flow and standardisation on a worldwide level.

Each of the HAS-200 system stations carries out part of the process.

• HAS-201: Multi-coloured container feeding

This station supplies the system with empty containers to be filled with multicoloured beads in the production stations.

• HAS-202, HAS-203 and HAS-204: Production

The production stations perform the feeding, filling and weighing of the blue (HAS-202), yellow (HAS-203) and red (HAS-204) containers, respectively. This also enables filling the multi-coloured containers coming from station HAS-201.

• HAS-205 and HAS-206: Checking

These two stations have to measure the height of the raw material contained in the containers.

The HAS-205 station uses a linear encoder for measuring, whilst the HAS-206 station takes the measurement using a linear potentiometer.

• HAS-207: Lid positioning

In this station the lid is positioned on the container and a label is printed with the manufacturing date and/or other information in order to identify the final product.

• HAS-208: Vertical storage

This station makes it possible to store containers, either semi-manufactured or as a finished product. It can hold up to 81 containers. The storage cells are arranged vertically.

• HAS-209: Horizontal storage

This station stores containers, either semi-manufactured or as a finished product. It can hold up to 56 containers. The storage cells are arranged horizontally.

• HAS-210: Palletizing

This station removes the final product from the process, placing it in two ramps for palletizing and dispatch.

• HAS-211: Raw material store

This station allows the storage of raw material: containers, lids and “pearls” in different colours: blue, yellow and red.

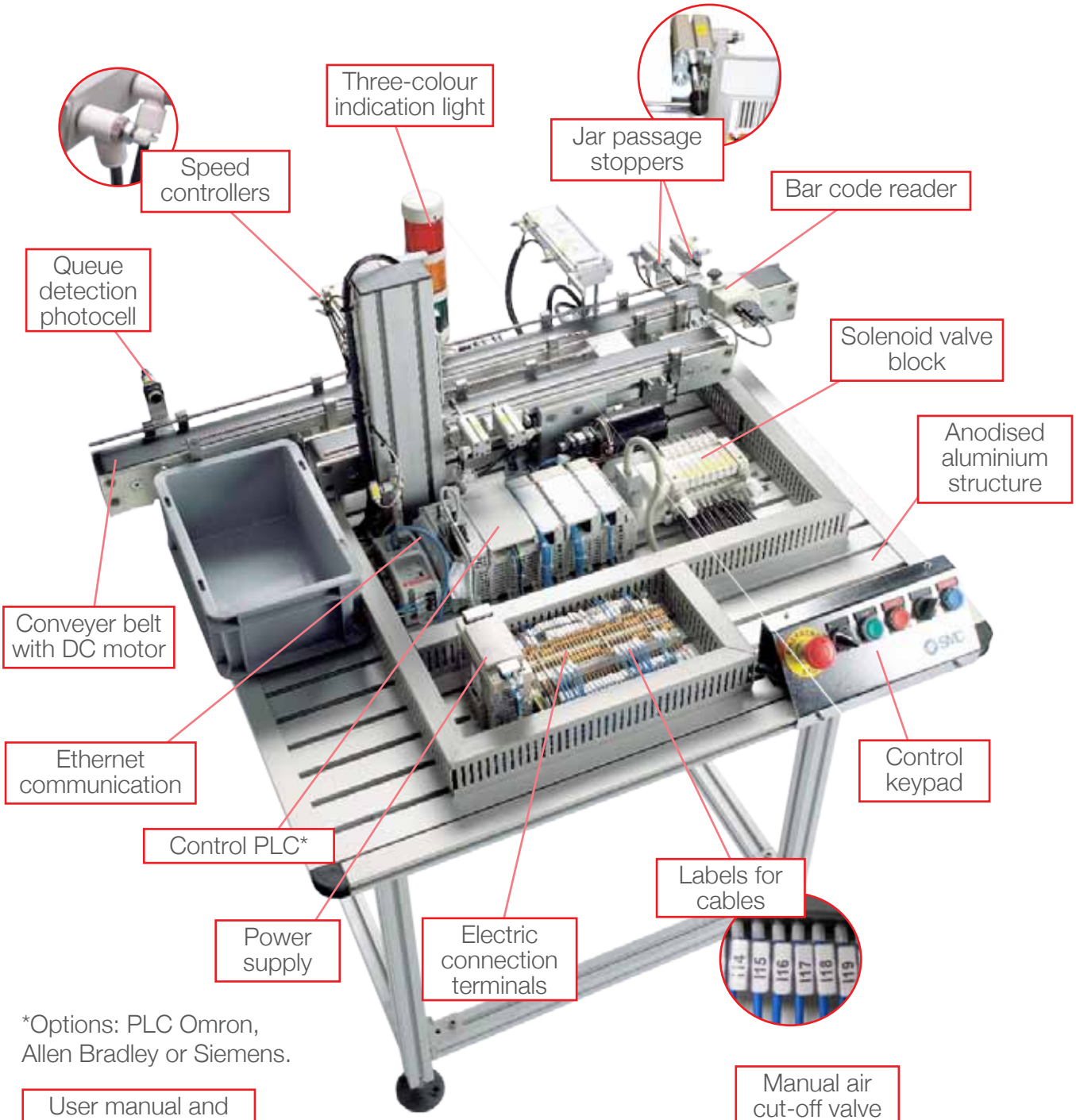
• HAS-212: Recycling station

This station classifies the mixed raw material used in HAS-200 according to the colour.

• Control cabinet

This includes the general air supply and electric network, general emergency and switch the Ethernet network.

Common element in all stations



*Options: PLC Omron, Allen Bradley or Siemens.

User manual and practice manual

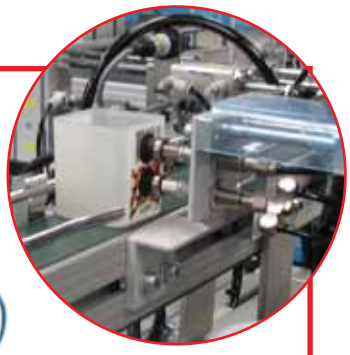
Manual air cut-off valve

HAS-201 - Multi-coloured container feeding

This station supplies the system with multicoloured empty containers to be filled in the production stations.

The containers are stored in a gravity feeder and are extracted from it by a pneumatic cylinder. They are moved to the conveyor belt by a series of pneumatic actuators.

The troubleshooting simulation system TROUB-200 is included, which generates up to 16 different breakdowns to be diagnosed by the user.



Breakdown simulation system

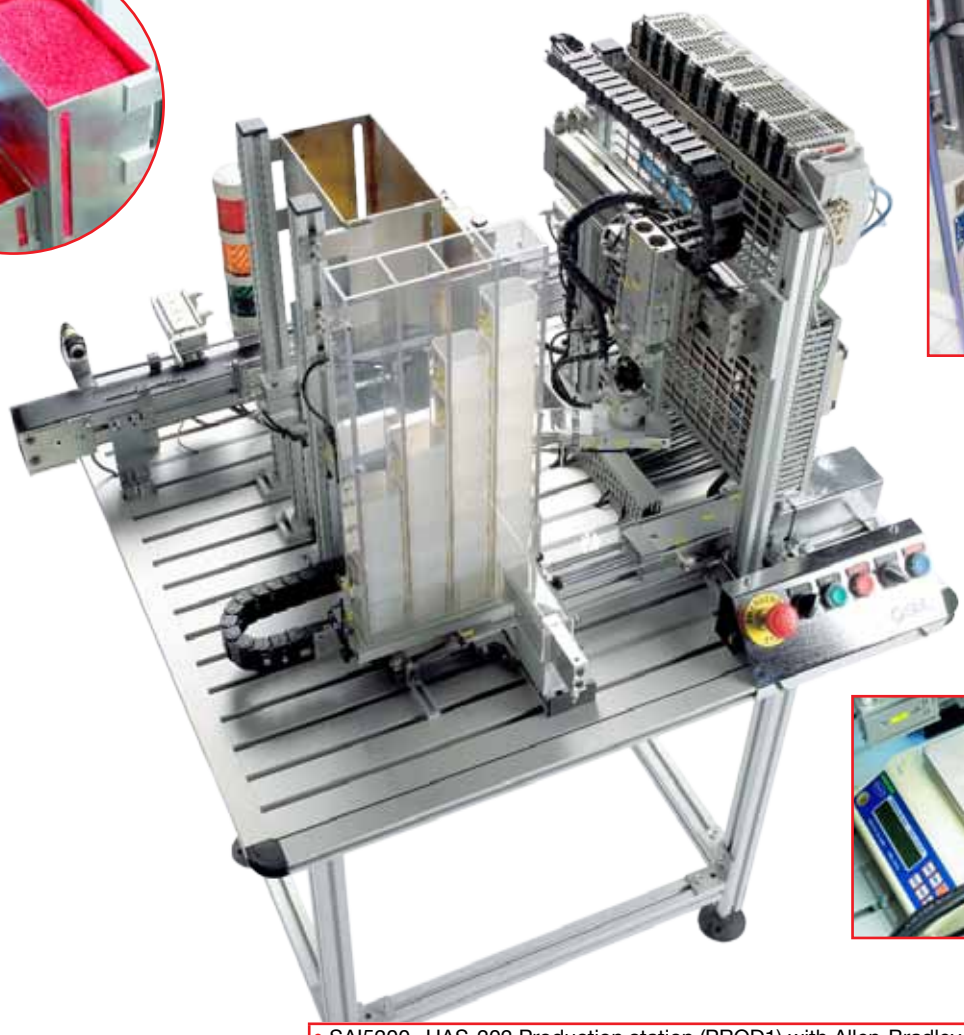
•	SAI5100	HAS-201 Multicoloured container feeding station with Allen-Bradley PLC / ETHERNET
•	SAI5110	HAS-201 Multicoloured container feeding station with Siemens PLC / ETHERNET
•	SAI5120	HAS-201 Multicoloured container feeding station with Omron PLC / ETHERNET

HAS-202, HAS-203 and HAS-204 - Production

The production stations perform the feeding, filling and weighing of the blue (HAS-202), yellow (HAS-203) and red (HAS-204) containers, respectively. This also fills the multi-coloured containers from station HAS-201.

The containers are stored in a gravity feeder. They are extracted from it by pneumatic cylinder. The containers are filled with primary material stored in the hoppers and are then taken to the conveyor belt.

These stations have precision scales fitted with an RS-232 interface to output the data to the PLC and with LCD display for visualization.



Precision scales

- SAI5200 HAS-202 Production station (PROD1) with Allen-Bradley PLC / ETHERNET
- SAI5230 HAS-202 Production station (PROD1) with Siemens PLC / ETHERNET
- SAI5240 HAS-202 Production station (PROD1) with Omron PLC / ETHERNET
- SAI5300 HAS-203 Production station (PROD2) with Allen-Bradley PLC / ETHERNET
- SAI5310 HAS-203 Production station (PROD2) with Siemens PLC / ETHERNET
- SAI5320 HAS-203 Production station (PROD2) with Omron PLC / ETHERNET
- SAI5400 HAS-204 Production station (PROD3) with Allen-Bradley PLC / ETHERNET
- SAI5410 HAS-204 Production station (PROD3) with Siemens PLC / ETHERNET
- SAI5420 HAS-204 Production station (PROD3) with Omron PLC / ETHERNET

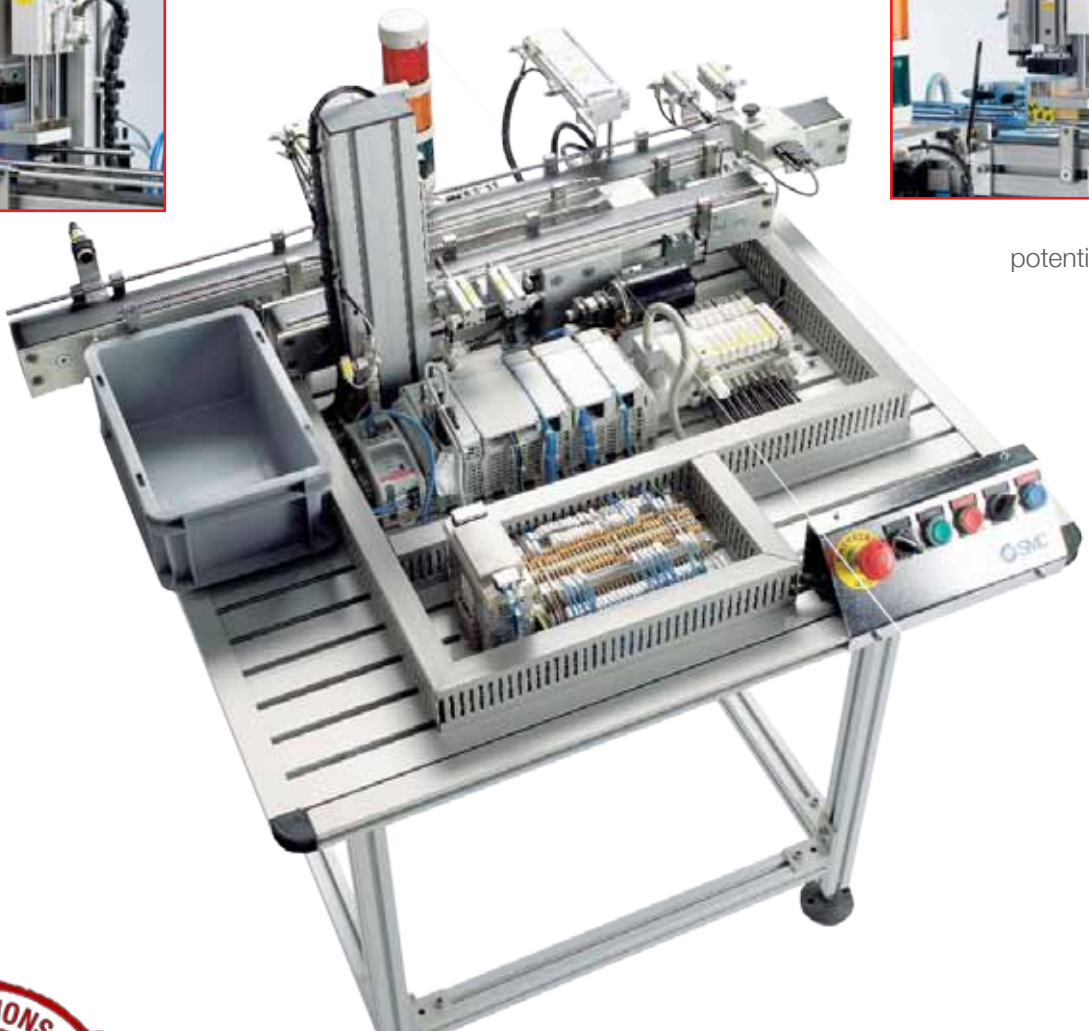
HAS-205 and HAS-206 - Checking

These two stations have to measure the height of the raw material contained in the containers. They are differentiated by how they measure the height: one of them uses a linear encoder (HAS-205), while the other takes the measurement using a linear potentiometer (HAS-206), which generates an analogue measurement in proportion to the displacement.

The design of the module allows the study of concepts related to bottle necks, quality control, buffers, statistical control of processes etc.

Linear encoder

Analog potentiometer



•	SAI5500	HAS-205 Checking station (CHECK1) with Allen-Bradley PLC / ETHERNET
•	SAI5510	HAS-205 Checking station (CHECK1) with Siemens PLC / ETHERNET
•	SAI5520	HAS-205 Checking station (CHECK1) with Omron PLC / ETHERNET
•	SAI5600	HAS-206 Checking station (CHECK2) with Allen-Bradley PLC / ETHERNET
•	SAI5610	HAS-206 Checking station (CHECK2) with Siemens PLC / ETHERNET
•	SAI5620	HAS-206 Checking station (CHECK2) with Omron PLC / ETHERNET

HAS-207 - Lid positioning

In this station the lid is correctly positioned and a label is printed with the manufacturing date and/or other information in order to identify the final product.

The lids are stored in a gravity feeder, from which they are extracted and fitted onto the container. A printer produces the labels to be attached to the top of the lid once the container is closed. The user can modify the PLC program to personalize this label with the type of legend to be printed (date, expiry date, etc.).

• SAI5700	HAS-207 Positioning of the lid station with Allen-Bradley PLC / ETHERNET
• SAI5710	HAS-207 Positioning of the lid station with Siemens PLC / ETHERNET
• SAI5720	HAS-207 Positioning of the lid station with Omron PLC / ETHERNET

HAS-208 - Vertical storage

Comprised of two electric servo controlled shafts, this warehouse is able to store up to 81 semi-finished or finished containers. It has an operator terminal (HMI) to view the contents of the warehouse. The HMI will also let the user manoeuvre a container between different cells, transfer from or to the conveyer belt.

This station reliably reproduces an industrial automated storage system.

Operator terminal HMI

• SAI5800	HAS-208 Vertical storage station with Allen-Bradley PLC / ETHERNET
• SAI5820	HAS-208 Vertical storage station with Siemens PLC / ETHERNET
• SAI5830	HAS-208 Vertical storage station with Omron PLC / ETHERNET

HAS-209 - Horizontal storage

It has a servo controlled electric shaft and another actuated by a stepper motor. It allows up to 56 containers to be stored, both finished and semi-finished.

It has an operator terminal (HMI) to view the contents of the warehouse. The HMI will also let the user manoevre a container between different cells, transfer from or to the conveyer belt.

Operator terminal HMI

• SAI5900	HAS-209 Horizontal storage station with Allen-Bradley PLC / ETHERNET
• SAI5910	HAS-209 Horizontal storage station with Siemens PLC / ETHERNET
• SAI5920	HAS-209 Horizontal storage station with Omron PLC / ETHERNET

HAS-210 - Palletizing

This station removes the final product from the process, placing it in two ramps for palletizing and dispatch.

The final product is grouped in blocks of four units which are dispatched when the lot has been completed.

The troubleshooting simulation system TROUB-200 is included, which generates up to 16 different breakdowns to be identified by the user.

Breakdown simulation system

• SAI5000	HAS-210 Palletising station with Allen-Bradley PLC / ETHERNET
• SAI5011	HAS-210 Palletising station with Siemens PLC / ETHERNET
• SAI5020	HAS-210 Palletising station with Omron PLC / ETHERNET

HAS-211 - Raw material store

This manages the storage of raw material: containers, lids and “pearls” in different colours: blue, yellow and red. The station comes with 144 containers (36 of each type), 144 lids and 6kg of “pearls” of each colour.

The feeders for the containers and lids have the same characteristics as the process stations so changes can be made quickly once any one of the feeder stations is emptied. The tanks with “pearls” are also easy to extract in order to refill the production stations.

EASY EXTRACTION

• SAI5050	HAS-211 Raw material store

• SAI5070	Red “pearls” (2kg)
• SAI5071	Blue “pearls” (2kg)
• SAI5072	Yellow “pearls” (2kg)

• SAI5078	Set of 50 containers
• SAI5079	Set of 50 lids

HAS-212 - Recycling station

HAS-212 completes the production process by recycling the primary material to be used again.

This station classifies the primary material mixed in different containers by colour. The mixed “pearls” are put into the container by vibration and a turning movement. It then sends them one by one on to a conveyor belt and then, using chromatic sensors and blowing, they are separated by colours into hoppers.

• SAI5980	HAS-212 Recycling station with Allen-Bradley PLC / ETHERNET
• SAI5979	HAS-212 Recycling station with Siemens PLC / ETHERNET
• SAI5978	HAS-212 Recycling station with Omron PLC / ETHERNET

Control cabinet

The control cabinet includes the general air supply and electric network, emergency stop button and green and red indicator lights. It also includes, on the right side of the cabinet, an air treatment unit, and the main power switch on the left side.

There is also an Ethernet switch on the cabinet to communicate between stations. A stainless steel tray is fixed to the top, large enough to hold a lap-top computer.

A laptop is offered as an option with all the required programs already installed. Please consult for availability.

- SAI5950 Control cabinet without PC

3Dsupra: 3D supervisor

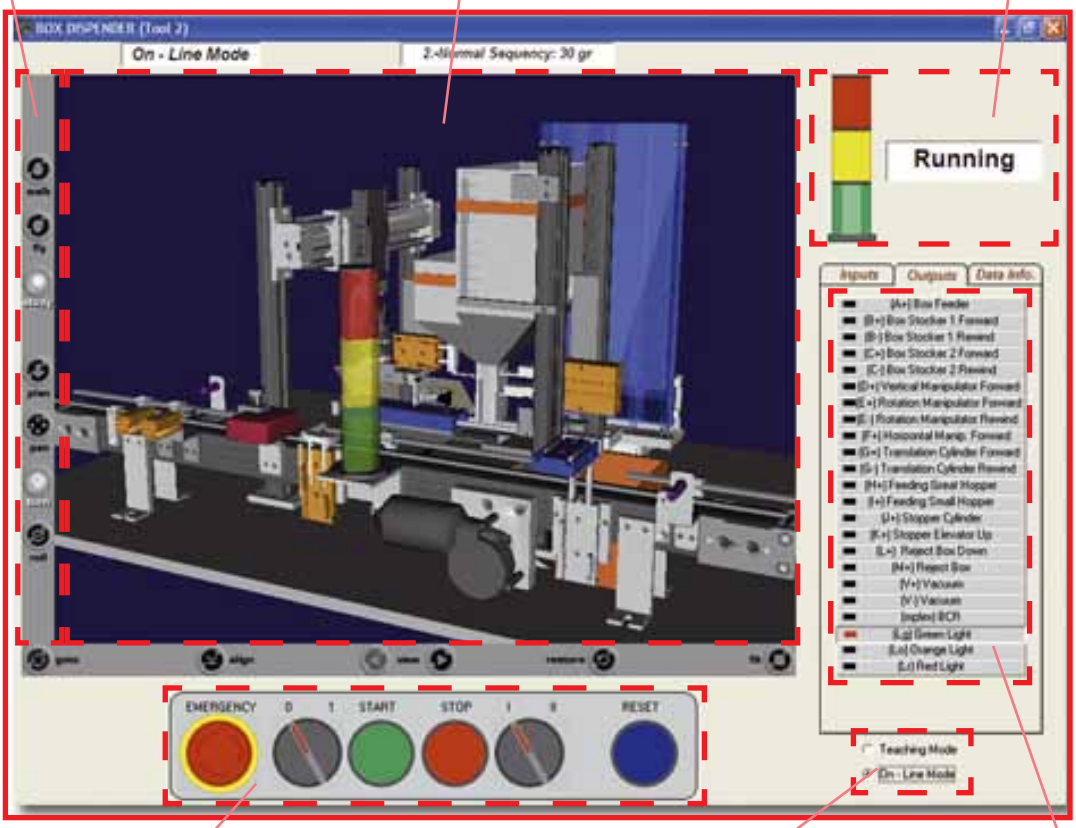
One of the applications included in the HAS-200 system is the 3D supervisor. Its design takes into account various aspects which make it extremely attractive and useful in a training environment.

On-screen visor control (zoom, rotation, etc.).

Interactivity in three dimensions!

3D display of the operation in each workstation.

Information regarding signal tower status.



Reproduction of the workstation control panel. Facility to operate push buttons.

Information concerning the status of the inputs/outputs and the relevant variables (bar code, weight, etc.).

- ONLINE mode (operation of the station).
- TEACHING mode (allowing the simulation of the on-screen movement).

• SAI5062 3Dsupra: 3D supervisor

3Dsupra has been developed by CGIP-UPC for SMC International Training

** If the chosen configuration includes Allen Bradley PLC is necessary to add: SAI5060 - RSLINX OEM OPC SERVER FOR ALLEN BRADLEY.*

Ed-MES - Educational Manufacturing Execution System

EdMES is modular software that reproduces real situations and the most relevant functions associated with the “Manufacturing execution / management system”. All the modules have an ONLINE mode (control over the machine) and a TEACHING mode which allows the user to study concepts associated with a specific module.

• SAI5063 EdMES: Educational manufacturing execution system

Integrated production management!

Functions	Assignment
Order & Dispatcher	Sends out the work orders and programming for all orders in the system.
Material Movement	Necessary to introduce the user to the plant lay-out.
Data Collector	Responsible for compiling all the information generated and/or required by the system.
Inventory Tracking & WIP	Necessary to carry out traceability for the products produced.
Statistical Process Control (SPC)	It is used to check the quality of both process and product.
Maintenance Management	Function for preventive, predictive and corrective maintenance.
Alarm Summary	Single viewer for all warnings, notifications and errors in the production system.
Overall Equipment Efficiency (OEE)	This function analyses the system's efficiency.
Data Base Tool	The Ed-MES system includes the motor and the database viewer and integrates all the production data through a relational database.

In addition, Ed-MES includes Agents (Buffer agent, Raw material agent and Maintenance agent) that, tied in with its teaching aims, are functions that generate problems in parts of the system.

HAS-200 - With this system you could...

HAS-200 comes up with different practical activities targeting skills in the technologies featuring in the table (below).

TECHNOLOGIES

SKILLS

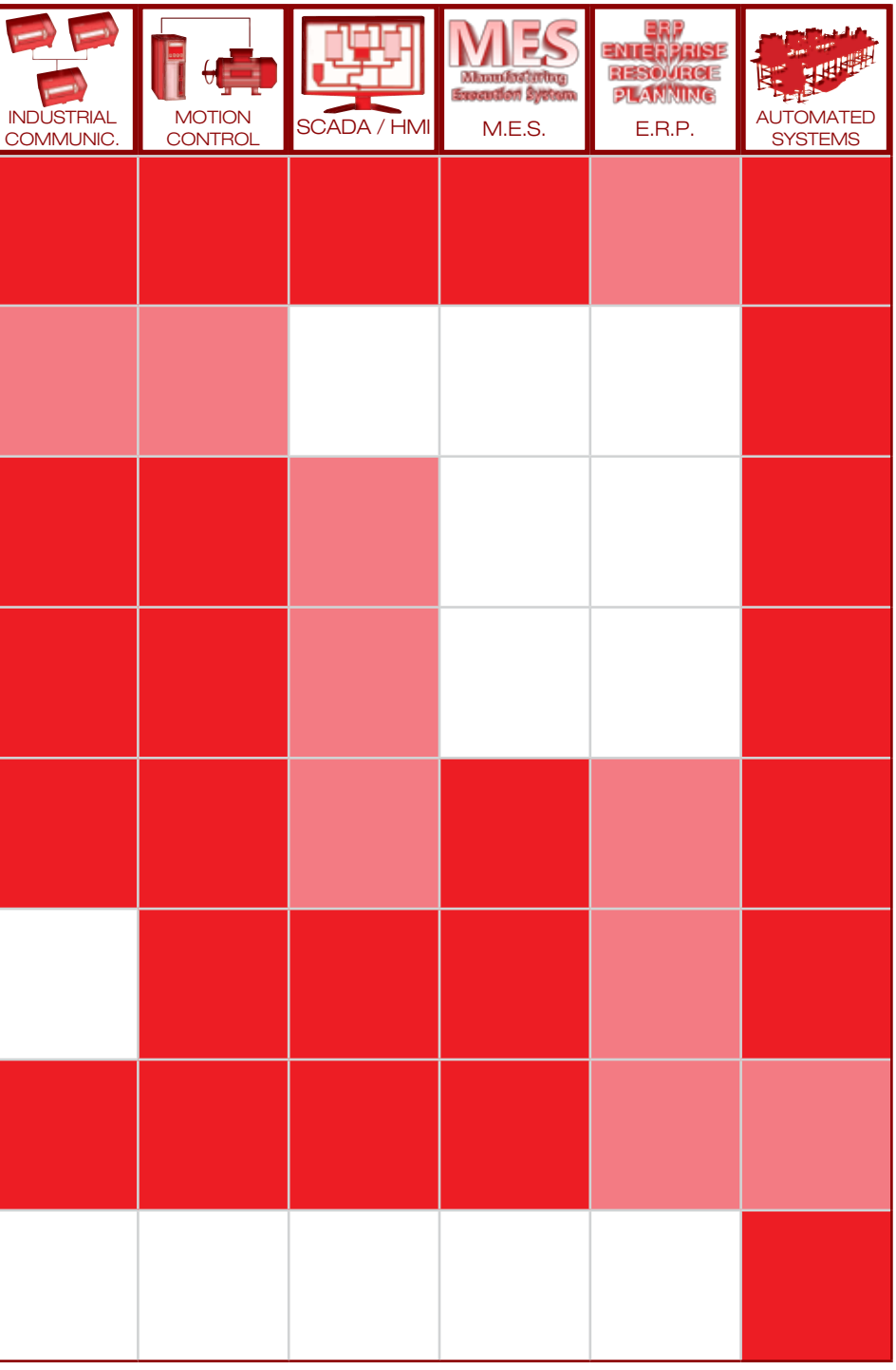
	ELECTRICAL PANEL	PNEUMATICS	VACUUM	ELECTRIC MOTORS	SENSORS	IDENTIFICATION SYSTEMS	PROGRAMM. CONTROLLERS	MANIPULATORS
ANALYSIS	■	■	■	■	■	■	■	■
TROUBLESHOOT.	■	■		■	■		■	■
DESIGNING	■	■	■	■	■	■	■	■
TECH DOCUM. CREATION	■	■	■	■	■	■	■	■
TECH DOCUM. UNDERSTANDING	■	■	■	■	■	■	■	■
OPERATION	■	■		■		■	■	■
PROGRAMMING						■	■	
SETTING UP								

■ This shows how the HAS-200 is suitable to develop skills in the specific technology.

■ This shows that HAS-200 can help develop skills in the specific technology even though there are other more appropriate products in the range.

eLEARNING-200

Find out more about the theory behind the technologies developed in HAS-200 with our eLEARNING-200 courses.



RELATED eLEARNING-200 COURSES

- Introduction to industrial automation (SMC-100)
- Principles of pneumatics (SMC-101)
- Introduction to electricity (SMC-102)
- DC electricity (SMC-103)
- Solid state (SMC-105)
- Introduction to wiring (SMC-106)
- Sensors technology (SMC-108)
- Programmable controllers (SMC-109)
- Motion control (SMC-112)
- Industrial communications (SMC-114)
- Supervision and control systems (SMC-115)

**See eLEARNING-200 chapter for more information*

HAS-200 - Options

HAS -200 has a series of optional extras.

• Programming tools

The programming tools comprise the appropriate programming software, the industrial system communication programming software and cables for the chosen PLC.

*See Programming Tools chapter

• Portable computer

The control cabinet, in the upper part includes a tray for supporting a laptop.

• SAI5064 Portable computer

HAS-200 - Configuration

Getting the right HAS-200 specification is as easy as:

PRODUCT DOWNLOAD www.smctraining.com CONFIGURATOR

• Steps to follow

1.- Choose the PLC.

2.- Select the required stations.

3.- Add any optional extras.

• Considerations

- Any station can operate independently and be purchased separately.
- In order to work with the full system, you will need at least:
  - A production station: HAS-202, HAS-203 or HAS-204.
  - HAS-207 station: Positioning of the lid
  - HAS-210 station: Palletizing
  - The control cabinet
- Integrated configurations should have an even number of stations. It is possible to include an empty station with a conveyor belt for the containers to move around.

Possible configurations

Complete configuration - 10 stations

+ HAS-211 station: Raw material store
+ HAS-212 station: Recycling station

8 station configuration

6 station configuration

4 station configuration

HAS-200 - Technical features

HAS-201
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Container feeding Container displacement Conveyer belt	Auto switch, Reed type (x13) Barrier type photocell (x2) Proximity photocell (x1) Vacuum pressure switch (x1)	Digital 22/16

Other devices (quantity)	Actuators (type & quantity)
Breakdown simulation system (x1) Vacuum pad(x2)-Vacuum ejector(x1) BCR serial device (x1) Reject container (x1)	Pneumatic linear (x7) Pneumatic rotary actuator (x1) DC motor (x1)

HAS-202
HAS-203
HAS-204
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Container feeding Container displacement Hoppers Scales Conveyor belt	Auto switch, Reed type (x15) Barrier type photocell (x2) Proximity photocell (x2) Reflex photocell (x1) Vacuum pressure switch (x1)	Digital 26/22

Other devices (quantity)	Actuators (type & quantity)
Vacuum pad(x2)-Vacuum ejector(x1) BCR serial device (x1) Scales serial device (x1) Reject container (x1)	Pneumatic linear (x13) Pneumatic rotary actuator (x1) DC motor (x1)

HAS-205
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Digital measuring module Buffer Conveyor belt	Auto switch, Reed type (x8) Proximity photocell (x1) Vacuum pressure switch (x1)	Digital 15/14 Fast counting 1/0

Other devices (quantity)	Actuators (type & quantity)
Vacuum pad(x1)-ejector(x1) Buffer motor starter relay (x1) BCR serial device (x1) Pressure regulator (x1) Reject container (x1)	Pneumatic linear (x8) Cylinder with stroke reading (x1) DC motor (x2)

HAS-206
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Analog measuring module Buffer Conveyor belt	Auto switch, Reed type (x8) Proximity photocell (x1) Vacuum pressure switch(x1)	Digital 15/14 Analog 1/0

Other devices (quantity)	Actuators (type & quantity)
Vacuum pad(x1)-Vacuum ejector(x1) Buffer motor starter relay (x1) Linear potentiometer (x1) BCR serial device (x1) Reject container (x1)	Pneumatic linear (x9) DC motor (x2)

HAS-207
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Lid feeding Feeding labels and handling lids Conveyor belt	Auto switch, Reed type (x10) Barrier type photocell (x1) Proximity photocell (x1) Vacuum pressure switch(x3)	Digital 20/15

Other devices (quantity)	Actuators (type & quantity)
Vacuum pad(x5)-Vacuum ejector(x3) Blower using a roller valve (x1) BCR serial device (x1) Thermal printer (x1) Reject lid container (x1)	Pneumatic linear (x10) DC motor (x1)

HAS-208
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Warehouse Conveyor belt	Auto switch, Reed type (x5) Proximity photocell (x1) Vacuum pressure switch(x1)	Digital 32/27

Other devices (quantity)	Actuators (type & quantity)
Vacuum pad(x2)-Vacuum ejector(x1) HMI operator terminal (x1) BCR serial device (x1) Positioning driver (x2) Pressure regulator (x1)	Pneumatic linear (x4) Pneumatic rotary actuator (x1) Servo-controlled electric axis (x2) DC motor (x1)

HAS-209
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Warehouse Conveyor belt	Auto switch, Reed type (x3) Proximity photocell (x1)	Digital 29/25

Other devices (quantity)	Actuators (type & quantity)
Pneumatic rotary actuator (x1) HMI operator terminal (x1) BCR serial device (x1) Positioning driver (x2) Pressure regulator (x1)	Pneumatic linear (x4) Servo-controlled electric axis (x1) Step-step motor electrical axis (x1) DC motor (x1)

HAS-210
900x762x865mm

Modules	Sensors (type & quantity)	Input / Output
Container movement manipulator Platform module Conveyor belt	Auto switch, Reed type (x9) Proximity photocell (x1) Vacuum pressure switch(x1)	Digital 16/12

Other devices (quantity)	Actuators (type & quantity)
Breakdown simulation system(x1) Vacuum pad(x1)-Vacuum ejector(x1) BCR serial device (x1)	Pneumatic linear (x10) DC motor (x1)

HAS-211
600x762x865mm

Modules
Pearl container cylinder (x3) - 6kg/colour Container loader (x4)- 36 containers/colour Lid loader (x1) - 144 lids

HAS-212
900x762x865mm

Modules	Other devices (quantity)
Vibrating feeder Sorting conveyor belt Conveyor belt	Blower using a valve (x3) Vibrating feeder (x1) Motor starter relay (x1) Pressure regulator (x1)

Sensors (type & quantity)	Input / Output
Digital fibre colour sensor (x3)	Digital 8/8

CONTROL CABINET
205x407x400mm

Modules	Sensors (type & quantity)
Power Distribution, Air	Pressure switch (x1)

Other devices (quantity)
Filtering unit + Air Treatment (x1) Switch for the Ethernet network (x1) General emergency button (x1)