

SV01

TOMATO GRADING SYSTEM

The evaluation and grading of tomatoes entering the processing plant, an operation which used to be carried out by the "forecourt overseer", today, thanks to the introduction of our SV01 automatic waste and quality evaluation system, has become extremely more objective and full of evaluation parameters. The data gathered, not only provides a more rewarding economical evaluation of the delivered product, but also makes it possible to send the various loads to the most suitable processing lines and can be used to help with the making of agronomic decisions in the future. Furthermore, the information provided by our instrumentation is indispensable in the realization of food-chain traceability in accordance with Standard UNI 10939 for "Controlled Tomato Quality".

The modularity of the whole structure means it can be adapted to suit the individual characteristics of the reception area, while the various combinations of instruments installed inside the prefab module are able to meet all the requirements of company directives.

The automatic probe for taking samples of the tomatoes delivered in bulk loads (mod. CC02), is indispensable for taking a representative sample of the whole load on which all evaluations will then be based. The coring element must be able to pick up the correct quantity of product from the overall load without any "grey areas" and without altering the characteristics of the product itself.

Although there are a series of "compulsory" parameters, needed for establishing the conformity and quality of the tomatoes, the grading station can be set up to a high level of personalization, making sure it meets the most specific needs of the processor and the producer.

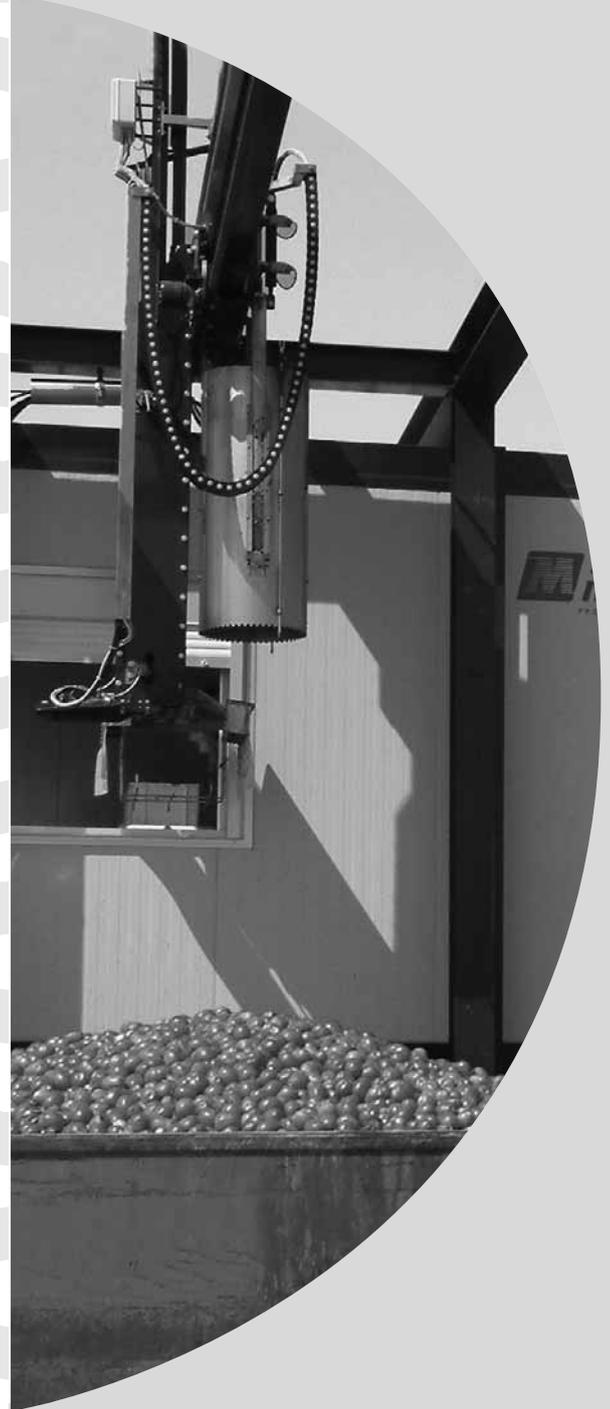
The standard system for evaluating the batches of tomatoes is based on determining the percentage of "waste" (percentage of inert substances and certain fruit defects) and on the qualitative remuneration of the °Brix value, read to the second decimal point.

Further parameters which can be measured, such as pH, colour and lycopene content, are used to improve management of the processing phases and for evaluating the tomatoes' potential.

At the end of the cycle the system will:

- print out a provisional document for the deliverer which includes the personal data of the producer, the load data and the results of the relative evaluation;
- interface with the central IT systems;
- store the data on a hard disk for later processing in support of agronomic evaluation.

The entire evaluation cycle for a load can be carried out by a single person from inside the prefab module, but should the time available be less than the "linear" duration of the cycle, a second operator can be employed to partially overlap the cycle phases, thus significantly reducing execution times.



Examples of installation structures and layouts



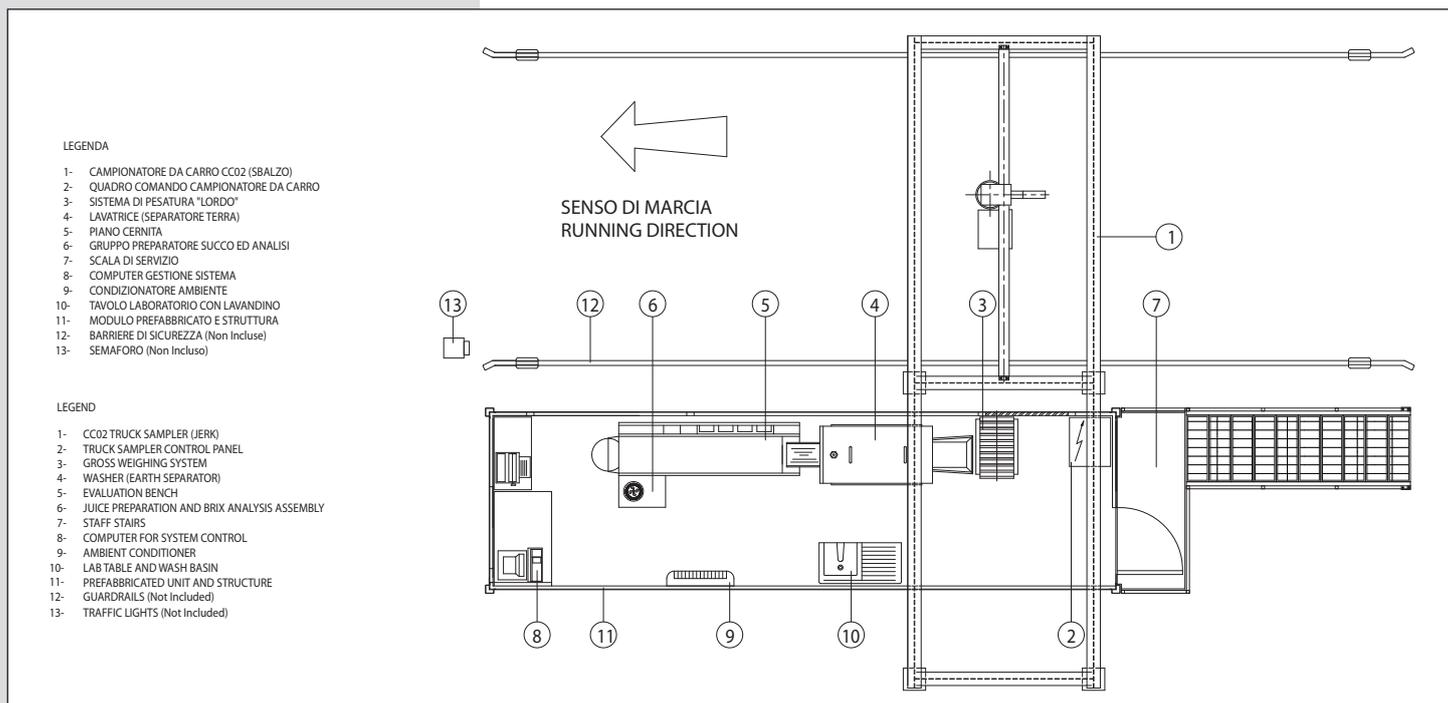
Fig. A
"Grading Station" with overhanging CC02 (standard):
view of the exterior.



Fig. B
"Grading Station" with bridge crane CC02:
view of the exterior.

The prefab module is positioned on a raised steel support structure, this means that the operator is in a position to see the load being examined. The layout of the machines and devices inside the prefab is arranged to suit the "direction" of entry of the delivery vehicles in order to achieve maximum fluidity of operations. The choice of the CC02 sampling system, overhanging (fig. B) or bridge crane (fig. A and C), depends on the respective limits of application: maximum length of the overhang and impediments to the free transit of vehicles in the forecourt. The number of entrances into the prefab and consequently the number of access staircases, is evaluated on an individual basis, depending on plant requirements and the layout of the forecourt. Should the weighing platform be located opposite the prefab, the operator in the SV01 is also in a position to manage the weighing phases by including a weighing terminal. The prefab is provided with air conditioning and windows to make sure the operator's workplace is comfortable and practical.

Over the course of numerous evaluation system installations, Maselli Misure has met and solved many specific requirements, providing support for the customer through all the modifications and updates which legislation and internal requirements have imposed. As a result, we feel that we can be considered a reliable and long-lasting partner, which for a purely seasonal and "summer" sector, represents an aspect which is of the utmost importance. We provide pre-campaign and campaign assistance for all our systems issuing, whenever necessary, ISO certification for the calibration of all measuring devices installed inside the prefab. Companies, which thanks to the SV01 system have already acquired a "history archive" covering decades, today use the system not only for "fiscal" purposes, but also to assist in the making of agronomic decisions, tracing back through the production chain in order to improve the quality of end products.



Description of components inside the prefab module

“Gross” weighing system and auger tomato washer ST01 (Fig. C)

The “Gross” weighing system allows the Grading Station to carry out the first weighing of the tomato sample to be analysed. The weighing system is connected to a data acquisition computer, via a special programmable microcontroller receiver (water-tight IP56) with a display designed to show the weight. Successively the weighed product is tipped into the hopper of the tomato washer which removes inert substances. The suitably sized washer makes it quick and easy to operate with large particles of both green and grey inert substances.

“Grading and weighing” bench (Fig. D)

The grading bench, equipped with load cells, makes it possible to carry out manual grading and automatic weighing of the product to be assessed and analyzed. The tomato sample is automatically sent by the rotation of the tomato washer “Outfeed mouth” to the Bench after it has been washed. Acquisition of the weight determines the inert substances and the gross weight of successive rejects. The operator carries out the selection of “rejects” in a sequential manner, placing them in the special differentiated trays and finally separating the tomatoes which are suitable for analysis. The system acts by subtracting the product from the initial gross quantity by pressing the relative buttons. The weighing system is connected to a special receiver with an alphanumeric display designed to show and process all the weighing data, which will also be transmit-

ted to the data acquisition system. At the end of the procedure, the grading bench automatically empties the trays on the table, washing is carried out and waste material evacuated.

TR01 juice preparation and analysis unit (Fig. E)

A part of the sample, already reduced by the removal of rejects, is sent to the automatic grinder so that analyses can be carried out concerning concentration (°Brix), pH, and colour (lycopene). The relative data is then sent to the data acquisition system. The °Brix, pH and colour measurements of the tomatoes are carried out by the UR24 Digital Refractometer, the RM9700pH pH-meter and the UK04 spectrophotometer which are installed in the juice preparation and analysis unit. At the end of analysis procedures, the TR01 unit is drained and washed in automatic mode so that it is ready to execute a new cycle.

Evaluation data acquisition and processing computer (Fig. F)

The computer found inside the Grading Station, connected via serial RS232 to the PLC located in the system control and management cabinet, acquires and processes the data relative to all the weighing operations and measurements taken during the evaluation cycle, regulates the interface with the operator and calculation of waste percentages and administers data archiving. Furthermore it can be connected to the plants central IT system via varied interface systems.



Fig. C



Fig. D



Fig. E



Fig. F

EXAMPLES OF SPECIAL INSTALLATIONS



Fig. G
"SVO1 Grading Station" with prolonged beam CC02:
view of the exterior.



Fig. H
"Double SVO1 Grading Station" with standard
bridge crane CC02 and special bridge crane
with raised section for bins: view of the exterior.

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TECHNICAL FEATURES

Ambient characteristics

Temperature limits:
Ambient: 5 °C...45 °C.
Storage: -20 °C...+70 °C.
Humidity limits:
Ambient: 5%...95% (R.H. non-condensing).
Storage: 5%...95% (R.H. non-condensing).

Conformity to Directives and Standards:

MSD: 2006/42/EC and subsequent amendments.
LVD: 2006/95/EC and subsequent amendments.
EMC: 2004/108/EC and subsequent amendments.
Electrical system:
Created in total compliance with the Standards and Legislation currently applicable (in Italy), especially with regards to:
- Law 46 of 5.3.90 (Plant Safety Standards).
- PDR 447 of 6.12.91 regulation for implementation of Law 5.3.90 No. 46 concerning plant safety.
- PDR 547 of 27.4.55 (Standards for prevention of accidents in the workplace).
* CE mark shows conformity to listed EU Directives.

Weights sampled and duration of cycles:

Probe sample: approximately 100 kg.
Accuracy: > ± 0.02%.
Reading resolution: 10 g.
Quantity of gradable tomato: ~20 kg recommended.
Quantity of grindable tomato: ~4 kg/cycle.
Sample washing time: on average 60 s with 20 kg.
Grinding duration: 60 s.
Grinding and analysis duration: 125 s.
Overall cycle duration: on average 4 min. with 20 kg

Concentration measurement:

Measurement limits: 0...10 Brix.
Accuracy: maximum accuracy ±0.15 Brix.
Measurement scale: "BRIX" - ICUMSA (1974).

pH measurement:

Measurement limits: 2...14 pH.
Accuracy: ±0.05 pH.
Reading resolution: 0.01/0.1 pH.

Colour/lycopene measurement

Indices: a/b - L
Lycopene measurement limits: 0...80 mg/100 g.
Accuracy: higher than ±5% of the given reading.
Maximum accuracy: 0.5 mg/100 g.
Lycopene repeatability: Higher than ±0.25 mg/100 g.

GENERAL SPECIFICATIONS

Power supplies

Electrical:
AC 3/N/PE 400V ±10% 50...60Hz 10kW.
Connections by means of junction box.
Pneumatic:
Dehydrated air 6...10 bar (87...145 psi),
expected consumption ~2l/min;
Connection via "quick-release coupling" for plastic
tube with diameter 6x4 mm.

Water:

Water 1.5...4 bar (22...58 psi), expected consumption
~75 l/evaluation cycle; connection to relative
manifold provided by means of "2" Female Threaded
Union.

CONSTRUCTION FEATURES

Support structure

Features: prefabricated module in galvanized steel.
- 8 pillars with supporting flanges for fixing to plinths.
- Flat supporting base for the prefabricated module.
- Metal staircase with service gangway.
- Metal staircase with reception gangway (optional).

Prefabricated module

Features:
- Steel uprights, cover made of 50-mm thick insulated panels.
- Base consisting of frame made up of galvanized tubular elements and cross beams made from 2.0-mm thick galvanized sections
- Flooring made from water- and fire-resistant chip-board (19 mm thick) and 3-mm thick aluminium tread.
- Service door: 1/2 glass with safety bars.
- 3 sliding windows complete with roller shutters, mosquito netting, 4 + 4 mm break-proof glass and anodized aluminium frames.
- Split-type air conditioner, 18000 BTU/h, with heat pump
- Neon ceiling light fittings; differentiated circuits protected by means of "Automatic Magnetothermal circuit breakers", "Differential circuit breakers" and "Fuses".
- PLC control panel with Touch Screen
- Central Compressed Air Treatment Unit
Furnishings:
- Desk complete with "writing table" and drawers.
- Magnetic wall-mounted blackboard.
- INOX AISI 304 work bench with built-in sink and draining board for glassware.
Dimensions: 8500 or 9200 (b) x 3090 (h) x 2500 (p).
Weight: max. 4000 kg wired at full load.

"Gross" weighing rollerway

Features:
- Structure in INOX AISI 304 with rollerway and weighing table;
- 1 Load cell (IP65)
- Receiver with weight indicator, using six 14-mm digits with 7 segments, connected to the rollerway.
Dimensions: 700 (b) x 1600 (h) x 770 (p), ~50 kg.

Rotating drum tomato washer

Features:
- INOX AISI 304 structure with water collection tank.
- Tomato feed with auger rotating drum.
- Washing system using water from the mains and recirculated water.
- Variable auger speed with adjustment by means of reduction gear; max. 240kg/h.
- Centrifugal pump complete with regulator valve.
- Removable filter grille to protect recirculation pump.
Dimensions: 1840 (b) x 1750 (h) x 780 (p), ~200 kg.

Automatic grading and weighing bench

Features:
- INOX AISI 304 structure with self-weighing grading table disengaged from the structure.
- 3 load cells (IP65) bracketed onto the weighing table.
- 5 grading trays installed on a tilting system
- Automatic unloading of the grading tray
- Table spray washer
- Receiver with weight indicator, using six 14-mm digits with 7 segments, connected to the table.
Dimensions: 2500 (b) x 1055 (h) x 650 (p), ~150 kg.

Juice preparation and analysis system

For the relative features please refer to the TR01 brochure.

Data acquisition system

Hardware:
- Personal computer complete with accessories and printer
Software:
- Customized operating software
- "Microsoft® Windows XP" operating system.