Q-Chain® Surface Scanner Automatic

Technical Description

ORONTEC
the measurement and process experts

1. Task of the Surface Scanner

   The Q-Chain® Surface Scanner Automatic is a measurement machine, which automatically measures horizontal painted test panels (standard coated panels of metal or plastic) in a pre-defined measurement grid. The integrated software allows a statistic evaluation of the gained data.

   It uses hand-held paint surface measurement instruments, which are controlled by the software of the surface scanner.

   There are multiple functions for the Q-Chain® Surface Scanner Automatic. It can measure and evaluate colour panels just for a pure colour evaluation or panels from spray-outs - both lab and process ones - for e.g. film thickness evaluation. It also allows the combination of a measurement method of different instruments and this allows the interpretation of the combined correlation of film-thickness, colour, surface structure and even mottling. Thus, this machine allows the complete evaluation accordingly to the ISO 28199 part 1 – 3 standard (prediction of the process stability of new paint systems).

   Fields of application are, among others, styling of new colours, colour development, process optimization, quality and process control, prognosis of process characteristics.

   The Q-Chain® Surface Scanner of the Company ORONTEC GmbH & Co. KG is based on 20 years of experience with automatic measurement of surface characteristics and evaluations. It is available as a standard solution, but due to its modular construction, it can be modified to the needs of the concrete application (e.g. measurement of special colour master panels).

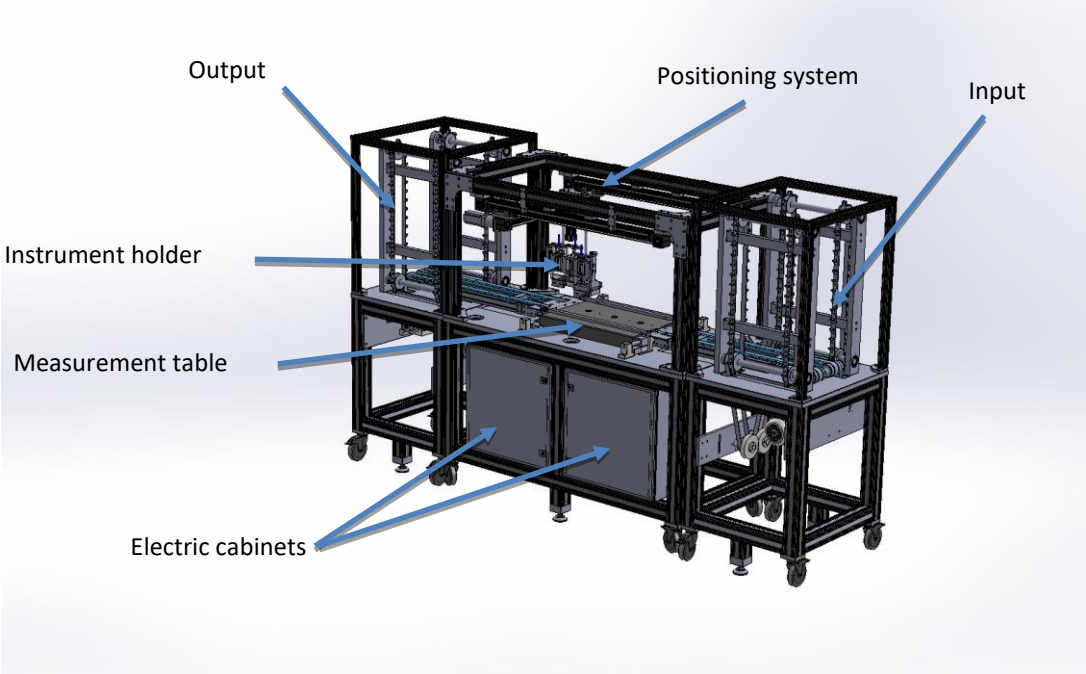
2. Basic construction

   In its basic version, the Q-Chain® Surface Scanner Automatic consists of three hardware modules where the test panels are stored, transported and measured.

   Panels can be put into the input module during the measurement. A belt system conveys them on the measurement table, where they are fixed. A positioning system moves the measurement instruments to the points according to the measurement grid and presses automatically each single instrument on the panel. The software releases the programmed measurements and reads and stores the data. After the measurement is finished, the belt system conveys the panel into the output module (storage magazine) where it can be taken out manually.

2.1. Modules

The following picture shows the basic modules of the Q-Chain® Surface Scanner Automatic (Drawing without housing):

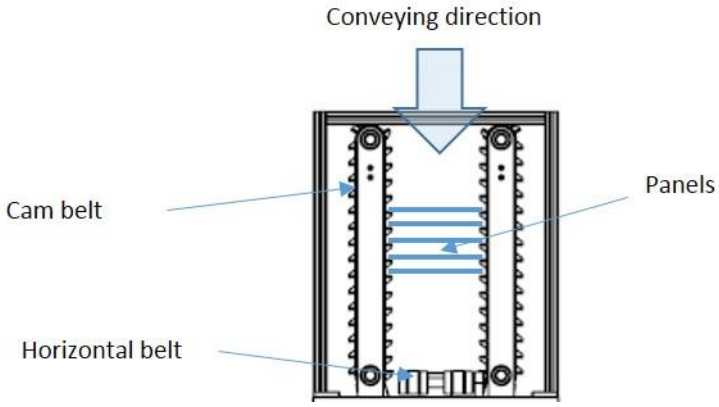


Picture 1: Basic modules of the Q-Chain® Surface Scanner Automatic

The modular construction of the Q-Chain® Surface Scanner Automatic makes it possible to use different combinations of input, measurement table and output module. This depends on the requirements of the customer and of the measuring process and the amount of panels. Therefore, there are different options possible: Measurement table alone or the combination of the measurement table with an input or output module are possible. Other modifications can be either a larger table or a combination of an input and output in one module.

2.1.1. Input of the panels

The panels are manually put into a so-called paternoster system, which is based on counter rotating cam belts. The panel is put onto the belt under it, which starts conveying, if the panel has reached it (see picture 2). Up to 15 panels according to ISO 28199 part 1 – 3 can be stored (standard panel measure = 570 x 300 mm).



Picture 2: Construction of the input module

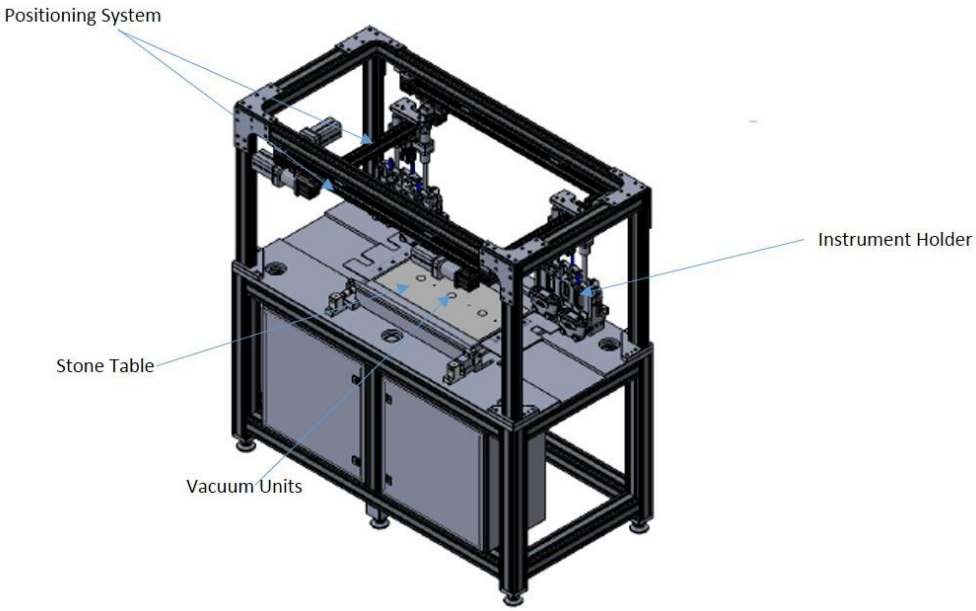
A camera underneath the horizontal belt gathers the information of the label, which is created (by the computer system) and put onto the panel. This can be a QR or matrix code. After the identification of the panel, the software loads the linked measurement grid, which belongs to the panel and the belt conveys the panel onto the measurement table.

A so-called closing mechanism protects the input module from external interference and it can be released by a switch button. This can be done during the measurement process.

2.1.2. Measurement Table

The measurement table consists of handling devices, belts and a stone made table in the middle. Two parallel bars align the panel on the stone table after it was conveyed by the input belt. A vacuum unit under the stone table ensures the stability of the panel by holes during the measurement. The stone plate is enforced on the table by precisely manufactured metal feet.
The whole measurement table is autonomous and it can be run independent from the input and output unit. This means, that only the measurement table can be operated and installed without any input and output module. In this case, the panels are put in manually. The software can send an E-Mail once the measurements are finished.

Picture 3 shows the positions of the different components.



Picture 3: Overview of the measurement table

2.1.3. Positioning System

The positioning system handles the measurement instruments and ensures a repeatable measurement accordingly to a chosen the grid. This is defined during the preparation of the panel in so-called “measurement jobs”.
It consists of two linear axes, which are driven by servomotors and toothed belts. The instrument holder (Picture 3) is moved in the X - and Y horizontal directions. A pneumatic system presses the instruments onto the panel and, depending on the instrument, a point measurement or a line measurement will be done. Dampers can adjust the power of the contact pressure. For each instrument, either the weight of its own or an adjustable pneumatic pressure can be chosen for the contact pressure.

2.1.4. Output of the panels

Within the standard version, the design of the output is equal to the input. A horizontal belt after the stone table conveys the panel into the cam belt of the output module. This belt moves in the opposite direction to the input cam belt and the panels are stored into the belt between the cams. The operator can take the panels out by pressing a door opener button (see point 2.1.1).

2.2. Measurement Instruments

In the standard version, the Q-Chain® Surface Scanner can be operated with up to four different (optical) measurement instruments. The instruments are not physically bound to the Surface Scanner, which means, that any instrument of each type can run on its own the

system without modification. Some owners of a Q-Chain® Surface Scanner Automatic are using the instruments for hand held measurements as well. The serial numbers of instruments themselves do not interfere with the Scanner during the use and therefore if wanted and the circumstances allows it, a use for both purposes (in the scanner and as hand held instruments) no additional instruments have to be bought.

The standard measurement instruments are as follows:

2.2.1. Film Thickness device on a magnetic basis:

The measurement of the film thickness is done by pressing the gauge onto the panel. On the Q-Chain® Surface Scanner this gauge is mounted in the front of the instrument holder and connected with the electronic system, which is connected to the PC. Standard suppliers are the companies “Elektrophysik” and “Fischer”.

2.2.2. BYK-mac i Color Measurement Instrument

The BYK-mac i is a portable spectrophotometer for colour measurement, which uses directed optics in the angles 15° / 25° / 45° / 75° / 110° and additionally the -15° under the gloss angle (aspecular).
In addition, a camera can measure the sparkle- and graininess behaviour of special and normal effect pigments. The measurement itself is done tactilely. The BYK-mac i is integrated in a gimballed system and can be changed quickly. This ensures that the instrument is always oriented in parallel to the panel.
In addition, the Byk mac i can detect if there is a fluorescent colour which can shift the colour measurement. A compensation software is therefore integrated within the Byk mac i system.

2.2.3. BYK Wavescan dual

This instrument is a portable device for the measurement of paint surface structure. The values Wa – We (short ones to longer wave length ones within 5 filters) DOI and Dullness are calculated from different ranges of wavelength. Even the old known Long-Wave, Short-Wave can be still calculated. The Wavescan dual device can also be used with mid-glossy surfaces. The measurement is done in a linear movement which means that the instrument is pressed down and moved linear in one direction. It is also integrated into a quick-release holder.

2.2.4. BYK cloud-runner

The portable BYK cloud-runner measures the so-called „Cloudiness“, which is an undesired defect of effect colors. The BYK cloud-runner simulates the visual impression of different observing angles and characterizes cloudiness after size (micro and macro

mottling) and visibility in an objective way. The measurement principle is the same as the BYK Wavescan dual. It can also be put on a quick-release holder.

The following instruments can also be integrated:

2.2.5. BYK Micro Tri Gloss µ

This portable instrument measures the gloss over three different angles. It is equipped with an additional gauge (directly beside the objective lens system and optical aperture) for film thickness measurement. The measurement is done in a tactile way and integrated into a gimballed system.

2.2.6. OptiSense PaintChecker Automation

An additional instrument for a touchless film thickness measurement is the PaintChecker. The measurement principle is based on an impulse thermography and it can be run with a high frequency of measurements. It can be used for a large number of film thickness measurements in a very short time.

The calibration and control measurements are done at a separate calibration panel, which is put into the Surface Scanner the same way as the normal panels.

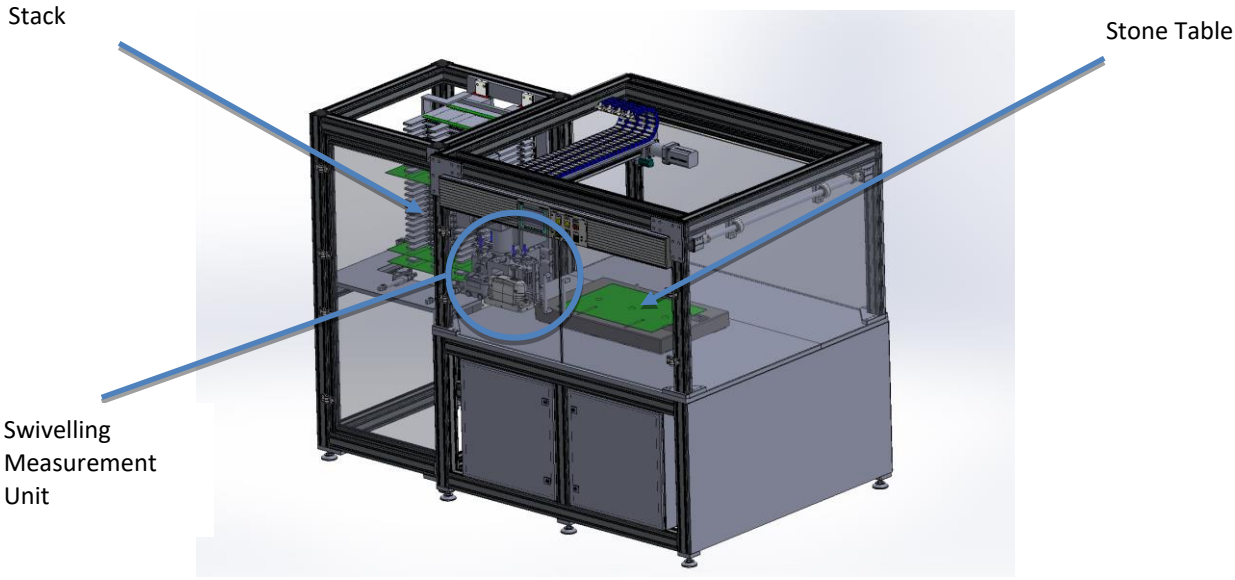
3. Q-Chain® Surface Scanner Automatic - Large

   This configuration makes it possible to measure panels up to 1 m length and 500 mm width. A 90° measurement can be integrated as well.

   Due to its bigger dimensions and the resulting forces, the Stone table is mounted on a separate rack. In- and Output follow the same principle as the “Basic” version of the Surface Scanner.

4. Q-Chain® Surface Scanner Automatic – Flexi

   The “Flexi” version of the Surface Scanner comes with a different In- and Output module having the same features and options as the “Large” version. Picture 4 shows the basic setup of this version.
   The stack with 25 spaces is filled from the side of the machine. Individual sizes can be supplied.



Picture 4: Q-Chain® SSA Flexi

The door of the stack can be opened during the operation of the machine. The PLC releases the the door and the stack can be manually moved up and down for filling or taking off samples.

LEDs on each stack level show the status of the measurement and the operator can see immediately if a sample has been measured properly.

The samples are taken by two grippers and moved on the stone table. It is only temporarily connected with the measurement unit and parked during the measurement process. The samples are returned be the grippers after measurement.

Different dimensions up to 400 x 600 mm can be used, higher dimensions on request. Smaller samples are possible with the use of caddies.

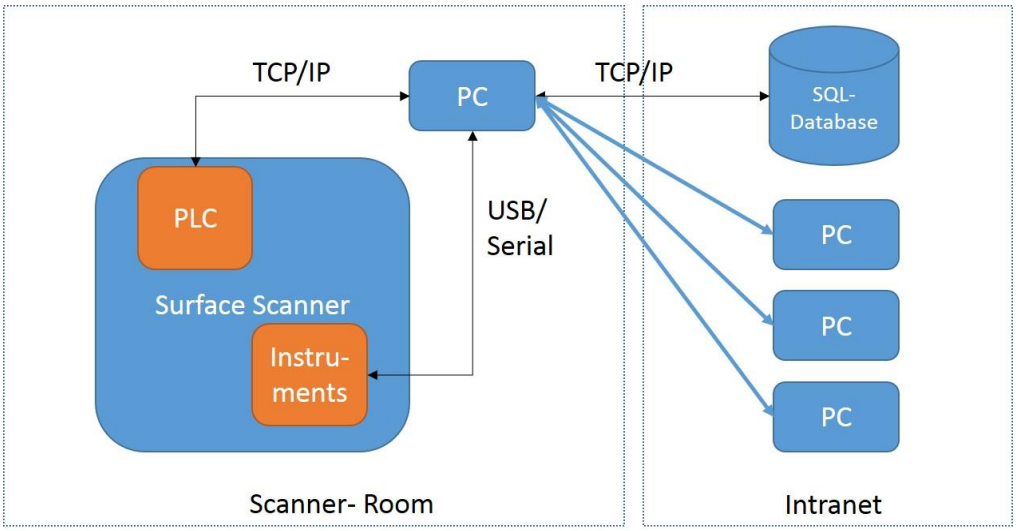
5. Software

A conventional PC is the central control unit of the system. It communicates with a PLC, which is integrated into the Surface Scanner. The PLC controls all mechanical and pneumatic elements and the status of the system can be seen on a display. For maintenance purposes, the Surface Scanner can be run by the PLC only.
All measurement instruments are directly connected with the PC by USB ports. The PC releases the measurements and reads the measurement data.
The data is stored in a SQL database, which can be either on the PC itself or in an intranet (Picture 5). This architecture allows also, that the measurement jobs are created on other PCs in the intranet. The Surface Scanner can be operated even if the PC is not connected to the intranet.

The process of creating measurement jobs is fully supported by a software package. Jobs can be created in a separate design tool, an explorer overview shows the status of different jobs and the control software gives a quick overview on controls and measurement instruments.

After each measurement job, a report is generated automatically and stored local or in the intranet. A large variety of reports is available and individual reports can be created together with ORONTEC.

There are also interfaces to other standard software tools e.g. ColorCare.



Picture 5: Control- and software principle

6. Features of the different modules

Features	Basic	Large	Flexi
Measurement Table	☑	☑	☑
Input Magazine	☑	☑	☑
Output Magazine	☑	☑	
Software for 4 Instruments	☑	☑	☑
Options:			
Basic Training Module: Measuring and reporting according to “Fingerprint“	☑	☑	☑
Training for the observation in a light chamber	☑	☑	☑
Integration additional Instruments	Max. 1	On Request	On Request
Option cross measurement		☑	☑
Air supply (oil-free, cleaned)	6 bar	6 bar	6 bar
Voltage	230 VAC	400 VAC	400 VAC
Dimensions (L x H x W) in mm, approx.	3000 x 850 x 1850	2560 x 1430 x 1800	2560 x 1430 x 1800
Weight approx. [kg]:	400	600	700

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