

REFLECTIONS

Magazine of photometry and colorimetry

MINOLTA
SPECTROPHOTOMETER
CM-3600d



CM-3600d: a new class
of spectrophotometers for
the laboratory

A magic black box

The CM-512m3 in Smartville

Smart colours

Quality testing of paper

White on white

CRT Image Analyzer IA-1000

One for all

Colour measurement for complex
printing processes

Dream team



MINOLTA

A new class of spectrophotometers for the laboratory

The CM-3600d: a magic black box

The CM-3700d was the first desktop spectrophotometer from Minolta. It came onto the market in 1993 and very soon acquired a reputation as a state-of-the-art reference instrument. It was followed shortly afterwards by another desktop instrument, the CM-3500d with its exclusive top-port concept that was of special interest to the food and chemical industries.

Following these successes, Minolta began development of a model designed for the middle price range while retaining the quality and universal applicability of the CM-3700 series. The result is the CM-3600d, a new laboratory spectrophotometer with a hitherto unimaginable price/performance ratio. With a MIOS (Minolta Innovative Optical System) at its core, this model contains a series of patented world innovations that impressively demonstrate Minolta's know-how and expertise in the field of optical electronics.

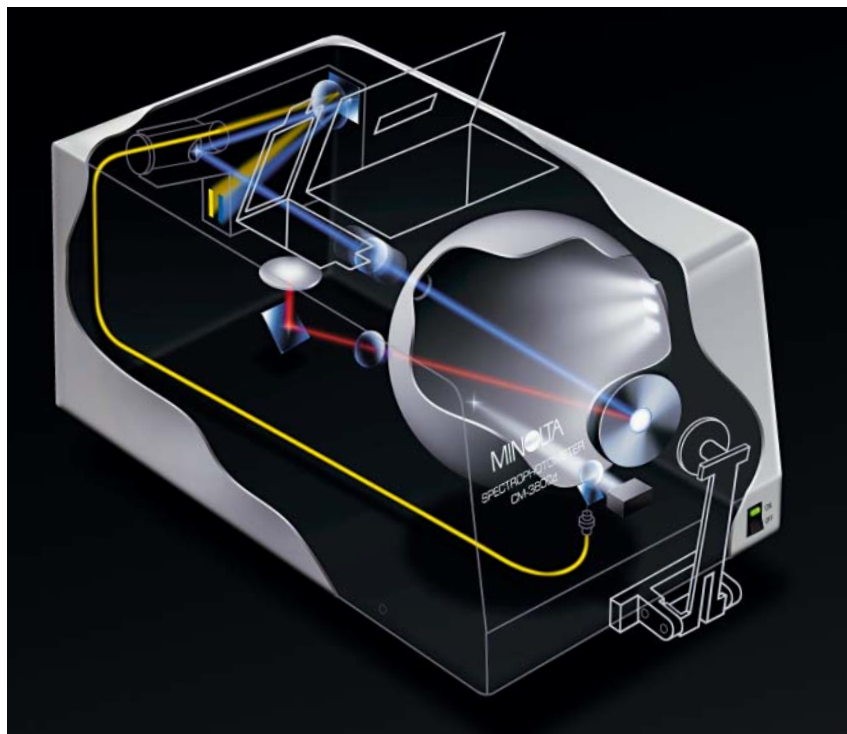
Numerical gloss correction NGCr and UV test NUVCr

The technical trick consisted in minimising the number of moving parts by means of solutions that were both innovative and cost-saving. The sphere has a diameter of

15.2 cm and $d/8^\circ$ geometry. It contains a second flashlight in place of a conventional motor-driven gloss trap. It is located below the measurement window and, thanks to the precise focusing of its optical system, illuminates only that part of the sphere on which the gloss trap is usually placed. This means that it measures only the specimen's reflection without the gloss. Together with the first flashlight, that measures the total diffuse reflection, the CM-3600d takes less than five seconds to compute the results with and without gloss. This is an enormous step forward in terms of convenience and flexibility, and simultaneously opens up new horizons for the compatibility of measuring instruments.

Minolta is also setting new standards with its NUVCr technology for UV calibration and measurement of fluorescent specimens (textiles, paper, detergents). This has hitherto needed equipment that was complex and far from user-friendly: a UV blocking filter had to be introduced into the illumination beam path via a stepper motor to set the required UV energy. The meter had to be extremely accurate with a correspondingly sophisticated mechanical system, quite apart from the time spent on repeatedly calibrating the instrument every time the filter was adjusted.

Minolta Innovative Optical System: a total of four flashlights allows simultaneous measurement with and without gloss as well as fully automatic UV calibration.



Two flashlights replace a complex mechanical system

The NUVCr system uses two flashlights, one of them with 100% UV energy and a UV blocking filter (400 nm). The meter is calibrated for UV by a single measurement against the UV standard, whose reference values are specified in the software. The results of the sequential flashes – one with full UV energy and

one with the blocking filter – yield two curves. The standard curve of the specified UV component is then derived from these by calculation. Calibration can subsequently be performed for either spectral, white or tint values. A calculation based on reflection values also allows other types of light to be analysed. Another highlight of the CM-3600d is a soft-flash power circuit that avoids triplet absorption in optically lightened specimens. The software also controls the intensity and duration of the flash.

The measurements cannot be affected by either moving mechanical parts or incorrect operation. All the mathematical calculations are performed by a virtual black box (device driver) located between the meter and the software. This brings cost benefits, as EPROMs can be dispensed with, but also allows other methods of optical calculation to be integrated, for example in order to improve compliance between instruments.

A class of its own in terms of performance and features

The measurement range of the newly developed monolithic polychromator extends from 360 to 740 nm (resolution 10 nm) for the specimen and reference channels. This new grid polychromator with a photodiode array has the advantages of much better stability and significantly lower noise sensitivity than systems based on CCD sensors.

Because it can measure opaque, translucent and transparent specimens, the CM-3600d has a practically unlimited range of applications in numerous industrial sectors. Three measuring diaphragms (4, 8 and 25 mm) adapt it to different specimen sizes. The motor-driven zoom optics, the only movable part in the CM-3600d, adjusts the spot for each diaphragm. The specimen is observed via a mirror system equipped with internal illumination, thus allowing simple and reliable positioning for spectacle wearers too. Specimens with larger than A4 format can be accommodated by swinging the specimen holder down by 90° and locking it in place.



Transparent liquids or solid specimens can be simply and reliably measured in an extendible transmission chamber.

State-of-the-art technology for optimal instrument compatibility

Weighing twelve kilograms and with compact dimensions, the CM-3600d is an extremely attractive reference instrument. It is distinguished by Minolta's proverbial ability to produce results that are totally comparable with those of its other spectrophotometers. Despite the fact that the various instrument series operate on different monochromator principles, Minolta offers a guarantee of optimal data compatibility, irrespective of where and when the instrument was purchased. This allows easy exchange of measured data between manufacturers, customers and suppliers. Thanks to its MIOS technology, the CM-3600d offers maximum flexibility, precision and reference-class features at an unbeatable price.

A small magic cube packs a powerful punch of high-tech.



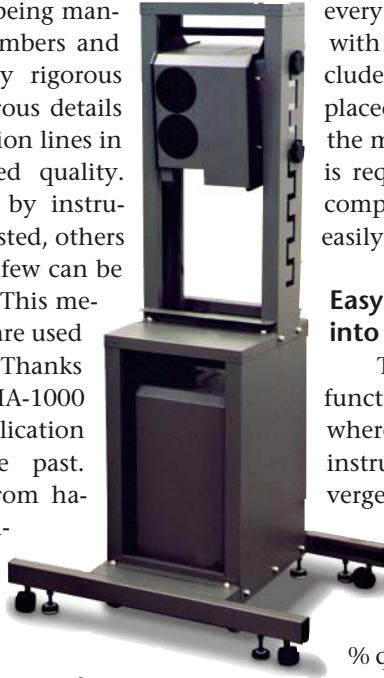
Easy observation of specimens via a mirror system under bright illumination.

CRT Image Analyzer IA-1000 for monitor production

One for all

The IA-1000 is a universal on-line meter for measuring all quality parameters of computer monitors.

Computer monitors are being manufactured in ever greater numbers and must satisfy correspondingly rigorous quality requirements. Numerous details are fine-tuned in the production lines in order to attain the required quality. Some criteria are measured by instruments and are manually adjusted, others are visually assessed, while a few can be adjusted fully automatically. This means that several instruments are used in the same production line. Thanks to the new Image Analyzer IA-1000 from Minolta, such duplication could be a thing of the past. Numerous benefits accrue from having a single sophisticated instrument that can quickly perform all these measurements.



117 points in just 0.3 of a second

The IA-1000 works extremely fast while maintaining high accuracy: it needs precisely 0.3 seconds to measure the misconvergence at 117 different points. It does so by using the same principle as Minolta's CC-100, a recognised standard in the industry.

This instrument can be easily integrated into existing production lines. A single measurement yields information on the misconvergence and geometrical distortion of the entire screen. Whereas conventional systems require hardware reconfigurations to deal with changing measuring points, the IA-1000 measures

every monitor up to a size of 21 inches with a single programme. A stand is included within the scope of delivery. It is placed at a distance of one meter from the monitor, so that no further hardware is required to set up the instrument. It compensates distance fluctuations as easily as tilting of the monitor.

Easy integration into the production line

Thanks to its diverse range of functions, the IA-1000 can be fitted anywhere in the production line. Thus, one instrument can be used to align the convergence while another adjusts the geometry and a third records the data for the final inspection. As a result, the efficiency of the line is dramatically improved and a 100 % quality inspection can be performed.

In the event that an instrument becomes defective, a back-up unit can be inserted at any desired position.

The first software version supports adjustments of convergence and geometry. (The second version will also take into account beam landing and white uniformity.) It offers a broad range of processing paths and display options for the recorded data. A complete alignment can be performed with the aid of up to 48 windows. Thanks to the graphical user interface and the option of programming measurement sequences, it can be adapted to any production line.

The CRT Image Analyzer IA-1000 measures all relevant parameters:

- Misconvergence
- Geometrical distortion (Screen size, Centering, Linearity, Screen tilting, Trapezoidal distortion, Parallelogram distortion, Orthogonality, Pincushion/barrel distortion)
- Beam landing
- White uniformity



Manufacturing food colourings at Hansen

Colours in harmony with nature

A full-bodied aroma and an attractive appearance are the two most important features that influence a customer's decision to buy and consume food. This is an appropriate use for food colourings: firstly to compensate for the colour loss sustained during production, secondly to avoid variations due to seasonal or batch factors, thirdly to return the colour to colourless foods and fourthly to bring out or intensify specific tastes.

The eye is also involved in the eating process

Chr. Hansen GmbH of Lübeck is one of the world's leading manufacturers and suppliers of natural food colourings. Hansen aims to help its customers in the food industry to optimise their colours in all relevant aspects, namely further development of product quality, customer service and quality awareness.

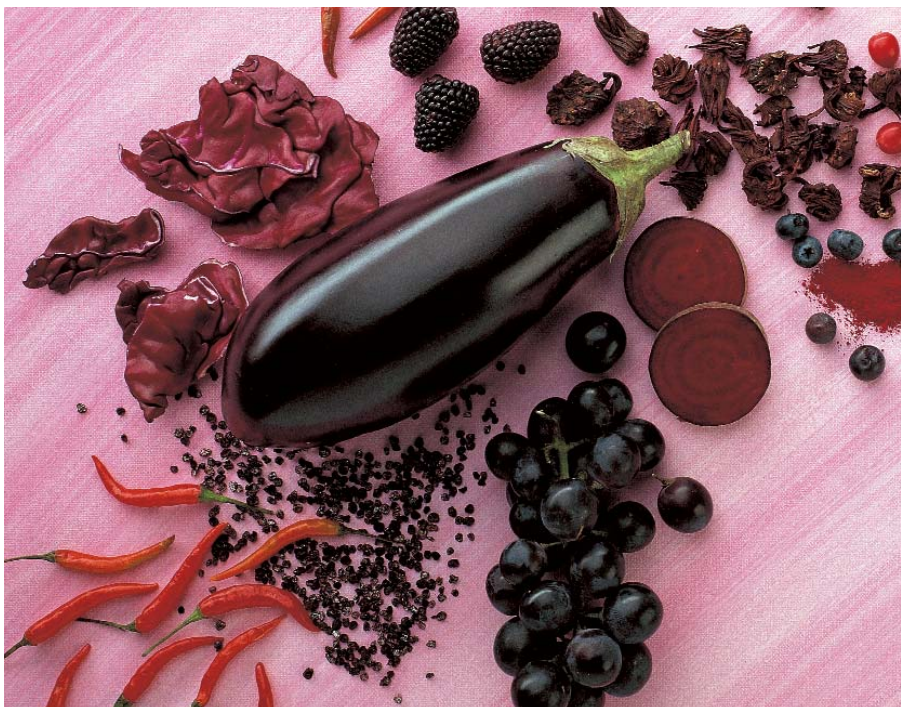
A CR-300 Chroma Meter from Minolta has been used for many years in the fields of development and quality assurance. This rugged three-range colour meter is particularly well



suited to laboratory use. A xenon flashlight illuminates the specimen with artificial daylight (standard light type D65), whereupon three sensors evaluate the reflected light according to eye sensitivity curves. The CIELAB system subsequently displays the measured colour, thus allowing objective colour communications on the basis of international standards.

Versatility of the CR-300

Hansen uses the CR-300 for the evaluation and fine adjustment of colours that must corre-

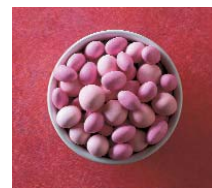
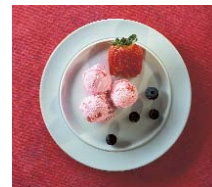


spond as far as possible to samples submitted by the customer. Another important factor is the stability of the colours during storage or under the influence of light. The specimens are exposed over a specific time to a defined light stress in a sun tester. The stability of the colours is tested principally by measuring the chroma value that clearly reflects changes in colour saturation. Mr Krüger from applications technology remarks: "Our successes in colorimetry have now allowed us to co-ordinate our measurements with our sister companies so that our products are internationally optimised."

Keen interest in the CM-3500d from the food industry

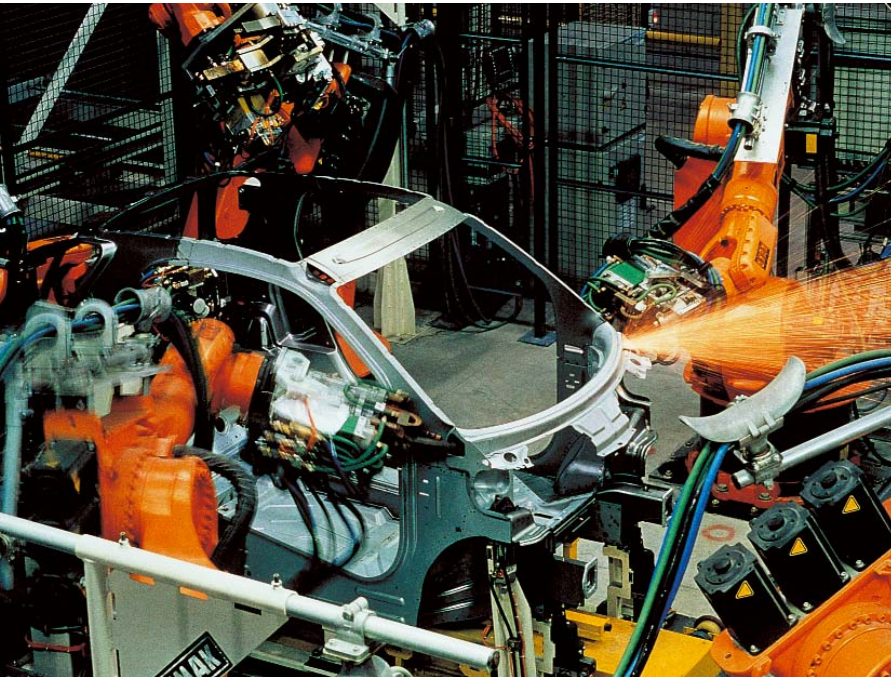
In response to the growing interest in colorimetry over a number of years, Minolta has complemented the CR-300 by developing a new model, the CM-3500d. This laboratory spectrophotometer allows simple colour measurements to be made on solids or liquids, in both reflection and transmission modes. Opaque substances are placed in a Petri dish on the upper measurement window of the photometer globe, whereas transparent liquids can be placed in a container and measured in transmitted light.

The CR-300 monitors the quality of natural colorants for foods.



Quality control in Smartville with the CM-512m3 from Minolta

Smart cars in smart colours



Smart production technology for manufacturing the car body.

Smartville – that's the nickname that the town of Hambach in Lorraine acquired last autumn. It was then that Micro Compact Car (MCC), a joint venture between Daimler-Benz and SMH, held a press conference and invited the world to watch the first Smart car roll off the production line.

They were not celebrating the new car alone, but equally much a new and pioneering production concept that links the most diverse

partners on a truly international scale. All sub-contractors are located on the spot – at the production site in Smartville – so that state-of-the-art manufacturing processes from numerous sectors are concentrated within a minimum space. Maximum flexibility, short production times and optimised production runs are thus simultaneously ensured.

Innovation and quality as driving forces

SMH Automobile, a member of the SMH Group that has become well known thanks to its Swatch watches, is the innovative force behind this revolutionary concept in car manufacture. The Smart is full of surprises. Like the Swatch, it can also be optically matched to its surroundings: its two-colour scheme allows its owner to individualise the look of his vehicle. By simply replacing a few of its parts, the Smart can be yellow today and red tomorrow.

Basic scheme plus bright colours for that individual look

At the start of production, the Smart will be available in two basic colours: anthracite and brilliant silver. These are then complemented by the bright colours of the replaceable parts. Surtemas, a member of the Eisenmann Group, is responsible for applying the basic colours. It specialises in applying enamel powder coatings. This procedure comprises numerous steps: degreasing, corrosion protection, hardening I,

The powder coating for priming and surface enamelling represents a genuine technical innovation.



chipping-protection coating, hardening II, smoothing, powder application and painting.

The use of powder coatings in place of liquid enamels produces a very special light effect. The sun's light is split up into its various spectral colours to create a shimmering multi-coloured effect.

Smart measurement technology from Minolta

This powder coating process was developed by Wörwag in Stuttgart and Eisenmann in Böblingen. It produces the same surface structures as liquid enamel, but the additional gloss effect is unique. However, this makes the quality inspection at the colour application stage a real tough nut to crack.

Only instruments equipped with leading-edge technology can be used to analyse such special-effect enamels in a way corresponding precisely to the visual impressions. The project managers finally opted for the CM-512m3 multi-angle spectrophotometer from Minolta. It is used in the final processing stage to measure the colour shade in parallel to the coating thickness, the gloss and the orange peel effect.

Quality control with the CM-512m3

Thanks to its innovative technology, the CM-512m3 spectrophotometer introduced by Minolta in 1997 offers users a number of outstanding benefits. It includes a measuring geometry with 0° observation and all-round illumination as well as three xenon flashlights placed at three illumination angles (25°, 45°, 75°) as specified in the DIN recommendations. Each angle is implemented as a ring of 18 high-performance optical fibres.

Other features of the CM-512m3 are its ideal ergonomics oriented to genuine single-hand operation as well as the absence of any mechanical moving parts.

Subcontractors join the team

The CM-512m3 can be used to measure both flat and curved surfaces directly at the production site without any distortions caused by alignment of the aluminium plates or curvature of the specimens. Surtemas uses the spectrophotometer for process and compliance tests in order to satisfy the high quality requirements of



the Micro Compact Car. But the subcontractors, who also play a part in ensuring the perfect colour of the Smart, also put their trust in the CM-512m3 from Minolta.

*Reduce to the max:
the Smart in its
bright, cheerful livery.*



Simple colorimetry for complex printing techniques

A dream team: Coates Lorilleux and Soplaril, Minolta and SPC

With almost forty factories around the world, turnover of 4 billion French francs (approximately 1 billion SFr), annual production of 130,000 tonnes and 5,000 employees, Coates Lorilleux is one of the world's leading manufacturers of products for the printing industry.

Monsieur Trevette and the head of the printing inks department, Monsieur Poupon, run the colorimetric laboratory at one of the company's main plants north of Paris. There, they develop databases for the colorimetric parameters that are used by both the factory and its customers. Coates Lorilleux also advises its customers on suitable printing inks, on colour-dosing stations or computer-controlled tinting systems as well as on the optimal utilisation of the residual colours remaining after print orders.

Soplaril prints inks from Coates Lorilleux onto packaging film

Soplaril specialises in manufacturing printed films for food packaging. Seven factories in France, Italy, Spain and Portugal with a total workforce of 1,100 print more than 300 million

square meters of flexible packaging film annually (enough to go round the earth 7.5 times) and produce over 170 million plastic bags. When Soplaril was on the look-out for an innovative and high-class supplier of printing inks with an international scope of operations, it opted for Coates Lorilleux.

Coates Lorilleux and Soplaril faced major problems at the outset: a colour-matching system was needed for the laboratory, quality control had to be introduced to the production facilities, and the databases had to be capable of administering colour and sample orders so that the specifications could be used to control the Dromont colour-dosing system.

CM-2002 and CM-508i from Minolta integrated in the hardware ...

The production department operates around the clock, 365 days a year. "That's why I decided to go to Minolta for the colour meters and to SPC for the software and the data server", says project leader Poupon. The issue was significantly decided by the proverbial reliability of Minolta's instruments. At Coates Lorilleux,

all colorimetric data is now generated via a portable CM-2002 spectrophotometer from Minolta. Soplaril uses two portable CM-508i's – one for finding the right colour hue and the other for handling quality control during production. An important point: because the technical parameters of the instruments deviate only minimally, data can be exchanged between all branches of Coates Lorilleux and Soplaril.

... Isomatch and Isocolor from SPC integrated in the software

On the software side, Monsieur Poupon opted for two products from SPC's range: Isomatch

Isomatch Windows sets a new standard for the dosing of pigment applications.



and Isocolor. Isomatch is a colour-matching/correction software for the laboratory offering the option of an order management system and a link to a Dromont colour-dosing system. Isocolor is a production software designed for checking colour matching in all samples. In the event of excessive deviations in shade, corrections can be made by adding suitable colours.

The French company SPC with headquarters near Paris specialises in colour-measuring systems, runs its own research and development department and sells system solutions for the pigments industry. Its range includes software for quality control (raw materials and production), for colour-matching and for colour-dosing systems at sales points. The software is available either for stand-alone systems or as a network version under Windows NT.

Partnership between Minolta and SPC software

A strategic alliance with Minolta allows SPC software to cover all colorimetry applications for the pigments industry: plastics, enamels and printing inks. Depending on the marketing organisation in the various countries, Minolta and SPC share the sales and marketing activities with the aim of providing an optimal service for their customers.

The software is available with various functions depending on whether it is to be used by a specialist in the laboratory or by an employee for production control tasks. The operating interface can be adapted to the user and his requirements via a password system. The screen masks always contain only those functions and displays that are designed for the relevant sector.

Up to 60 percent of printing inks recycled

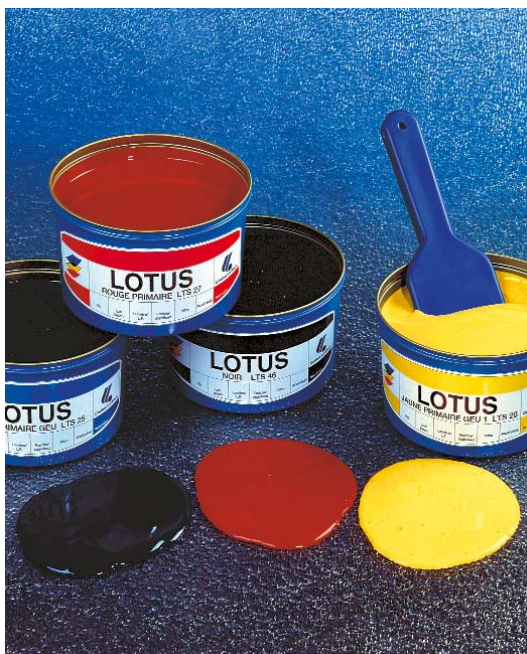
Isomatch and Isocolor allow residual colours to be utilised in a simple and efficient way. The laboratory sends the fabrication orders to the server in the form of master formulas. The CM-508i – controlled by the Isocolor control software – continuously monitors the quality in every production line and initiates corrections where required. The original formula is calculated from the basic colours before these reach the printing press in order to produce a particular colour shade. As soon as the



printing order is completed, the operator feeds the residual colours back to the material stream: up to 60% of them can thus be reprocessed in new orders – an enormous cost saving.

Highly accurate measurements, interference-free operation of different software solutions alongside each other, automatic dosing of the printing inks and protocolling of all its production stages give Soplaril a direct technological and economic edge on the international market.

The diversity of the packaging materials makes extreme demands on colour dosing.



For new or residual colours: Isomatch guarantees maximum dosing accuracy and cost-effectiveness.

Quality testing of paper at Haindl of Augsburg

Proven white on white



Fast routine testing in the laboratory with the CM-3730d and the Paper Control software...

The Haindl company has been based in Augsburg since 1848. With an annual production capacity of 2.5 million tonnes, it is one of Europe's leading manufacturers of newsprint paper containing wood and recycled paper. Every Haindl plant (Augsburg, Schongau, Duisburg, Schwedt, the Netherlands and Austria) specialises in the manufacture of a particular type of paper: coated papers for offset and roto-gravure, newsprint papers or special papers for periodicals, catalogues and leaflets. Its special know-how also includes the use of large quantities of recycled paper of all qualities.

The CM-3730d from Minolta and Paper Control in Windows

Colour testing based on the latest measuring technology is among the most important quality criteria for the manufacture of high-quality paper. The use of recycled paper, together with new wood pulp and other additives such as optical bleachers, makes accurate inspection of a white surface a particular challenge. The CM-3730d spectrophotometer from Minolta and the Paper Control software in Windows designed for quality control applications are customised to meet the special requirements of the paper-processing industry.

The wood pulp is evaluated by equipment at the development laboratory in Augsburg, while other systems are located directly adjacent to the production line. The following parameters are measured on the upper and grid sides: brightness Y, chromaticity values x and y, white to R457, opacity, colour shade and colour saturation.

Faster, simpler and more reliable thanks to software control

The colorimeters from Haindl are continuously monitored to ensure exact mutual conformity. Every instrument is calibrated daily by means of a black and white standard. The illumination is then checked against a standardised illumination sample (Ganz/Griesser brightness definition). The instruments are UV-calibrated every three months with Hohenstein white standards to ensure that the optical lighteners produce a constant stimulus in response to the flashlights.

The UV filter in the meter can be adjusted via the software in only a few minutes. Depending on the task, individual test routines are executed automatically in a faster and simpler way as a kind of macrofunction. As Paper Control can monitor all the meter's functions, misadjustments are practically impossible. The specially designed opacity holder simplifies specimen insertion and allows measurements to be made against either black or white backgrounds. A supplementary software function also permits the colour location for the D50 illuminant to be calculated. Work is currently under way to create standards for calibrating the meters to D50.

... and round-the-clock monitoring during production ensure high quality.



The CR-15 colour reader boosts sales in DIY centres

Digital colour chart for domestic use

How does one go about finding the right colour at the DIY centre, for instance the lavender blue of the bath or the green tinged with grey of the garage door? Colour catalogues are unreliable, as they are manufactured with conventional printing inks and rarely reproduce the right colour shade. At a pinch, a lampshade could be brought into a shop equipped with a colour dosage system and a meter from Minolta (see Reflections No. 3: "CR-300: colours à la minute"). But the bath ...

Electronic colour chart ousts technical jargon

For such cases, Minolta has developed the CR-15, a kind of digital colour catalogue with a measuring head and built-in computer. The electronic colour chart is used in paint shops as well as at interior decorators' establishments by those who talk about colours rather than colorimetric values. The CR-15 measures the colour in exactly the same way as the human eye perceives it in daylight, and immediately picks out from 6,500 stored reference colours the two shades that match the measured sample most closely. The two colours are then assigned an identifier that shows just how accurately the specified colour shade was matched.

The integrated database of 6,500 reference colours can be individually adapted and may also be supplied with an NCS colour chart of the second generation (Minolta is a licensee of NCS). This means that manufacturers of paints, enamels, ceramic tiles or floor coverings can enter their own colour shades and configure the CR-15 to their individual colour chart. Creation and editing of the colour data presents absolutely no problems with the separate data management software DMS.

Flexible database keeps up with all colour fashions

The CR-15 is big in terms of performance and storage capacity, but small when it comes to dimensions, weight and – above all – price. It has a large easy-to-read LCD display and weighs 400 grams, and can thus be held snugly in the hand thanks to its ergonomic shape. The operating



Identifying and assigning colours: the CR-15 is a digital colour reader that can be used anywhere at any time.

instructions are so concise that they fit easily on the housing.

And here are a few hints for professionals: the CR-15 is a standardised meter containing a photometer globe with $d/8^\circ$ measurement geometry at 10° standard observation. The 8-mm measuring field and the contact ring allow reliable measurements to be made on very small samples as well as those with irregular surfaces. Four 1.5-V standard (or rechargeable) batteries make the instrument independent of the main supply.

Architects and colour consultants already use the CR-15 in their daily work. It boosts sales in DIY centres: customers can take it home with them, measure the colour of their bath and return it to the shop with the reference colour shade already identified.



Measuring glossiness economically with the Unigloss UG-60

Brilliant simplicity

Minolta UG-60: the inexpensive gloss meter for the coat pocket.



Glossiness is a subjective sensation, just like colour. It is affected by the composition of the surface, the type of illumination, the angle of observation and the observer's individual perception.

The gloss effect is produced by light reflecting from the surface of a specimen. The stronger the reflection, the more intense the impression of glossiness. Because the degree of glossiness of different materials varies enor-

mously – from the high gloss of a polished metal surface via shiny enamels to the muted sheen of coated paper – diverse international standards (ISO, DIN, ASTM) define measurement angles of 25°, 60° and 85°. The rule of thumb is: the higher the degree of glossiness, the smaller the angle. The MG-268 from Minolta is a universal instrument that measures glossiness levels at all three measurement angles and thus covers a wide range.

Standard angle 60°

By far the most economical solution is the new Unigloss UG-60 with a standard angle of 60°. It is suitable for plastic and enamel surfaces with a mean glossiness level of between 10 and 70 gloss units. Like the MG-268, the UG-60 is also compact, handy and easy to use (with only one button). Calibration is performed on the basis of an integrated standard by pressing a button. Up to 99 measurements can be stored and statistically evaluated.

International trade fair programme

Where you can meet the experts from Minolta

12–15 May	Control	Quality Management	Sinsheim/Germany
12–16 May	Eurotech	Plastics	Brussels/Belgium
29–31 May	Converflex	Paper	Milan/Italy
2– 4 June	Pun Paper 98	Paper	Helsinki/Finland
8–11 June	Fatipac	Paint	Interlaken/Switzerland
21–24 June	IFT	Food	Atlanta/USA
23–24 June	Surfex 98	Coatings	Horrogate/England
23–25 June	Zellcheming 98	Paper	Baden-Baden/Germany
24–25 June	Asia Pacific Coating Show 98	Coatings	Bangkok/Thailand
30 Sept.–2 October	Eurocoat	Paint/Finishing	Barcelona/Spain
5– 9 October	Het Instrument 98		Utrecht/Netherlands
19–23 October	IPA – GIA	Food additives	Paris/France
21–23 October	Central European Coating Show	Paint & Plastics	Katowice/Poland
22–29 October	K 98	Plastics	Düsseldorf/Germany
3– 5 November	F1 Europe	Food	Frankfurt/Germany
5– 8 November	Chemistry	Chemistry	Helsinki/Finland
16–20 November	Emballage	Packaging	Paris/France
17–19 November	EID 98	Display	Sandown Park/England

Masthead

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Masthead

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