MCS 600

**The intelligent approach to
successful measurement**

ZEISS

We make it visible.

Technical Specifications

Specifications Spectrometer Units

Spectrometer	MCS 601 UV-NIR	MCS 651 UV	MCS 651 VIS	MCS 651 NIR	MCS 621 UV	MCS 621 UV-VIS	MCS 621 VIS II	MCS 611 NIR 1.7 HR	MCS 611 NIR 2.0	MCS 611 NIR 2.2 WR
Spectral Range / nm	190−1015	200−620	360−780	695−1100	195−390	190−720	310−1100	950−1700	1340−2000	910−2200
Polychromator	MCS	MCS	MCS	MCS	MMS	MMS	MMS	PGS	PGS	PGS
Diode Array Chip	Hamamatsu S3904	Hamamatsu S3904	Hamamatsu S3904	Hamamatsu S3904	Hamamatsu	Hamamatsu	Hamamatsu	Hamamatsu G9203-01	Hamamatsu G9203-02	Hamamatsu G9203-02
Peltier Cooling	−	−	−	−	−	−	−	1 Stage	2 Stages	2 Stages
# Diodes	1024	512	512	512	256	256	256	256	256	256
Mean Spectral Pixel Pitch / nm	0.8	0.8	0.8	0.8	0.8	2.2	3.2	3	3	6
Spectral Resolution (half width at 1/10 max) / nm	2.4	2.4	2.4	2.4	2.4	7	10	10	10	18
Wavelength accuracy / nm < 500 nm	0.50	0.50	0.50	−	0.50	0.50	0.50	−	−	−
Wavelength accuracy / nm > 500 nm	1.00	1.00	1.00	1.00	−	1.00	1.00	1.00	1.00	1.00
Wavelength reproducibility / nm	0.05	0.05	0.05	0.10	0.05	0.05	0.05	0.10	0.10	0.10
ADC Resolution / bit	16	16	16	16	16	16	16	16	16	16
Minimum Integration Time / ms	12	6	6	6	3	3	3	0.1	0.1	0.1
Fibre Coupler	SMA 905	SMA 905	SMA 905	SMA 905	SMA 905	SMA 905	SMA 905	SMA 905	SMA 905	SMA 905
Size	28	28	28	28	14	14	14	14	14	14

Specifications Lamp Units

Lamp Unit	CLH 600	CLH 606 F	CLH 606 A	BLX 600	BLX 606	CLD 600
Wavelength Range (nm)	380 − 2400 nm	360 − 2400 nm	380 − 2400 nm	220 − 800 nm	220 − 800 nm	215 − 620 nm
Light Source	Halogen	Halogen	Halogen	Pulsed Xenon	Pulsed Xenon	Deuterium
Color Temperature	2900 K	3500 K	2900 K	5500 K	5500 K	–
Typ. Life time	3000 h	3000 h	3000 h	10^6 pulses	10^6 pulses	1000 h
Wattage	10 W	20 W	20 W	0.6 WS	0.6 WS	25 W
Lamp Voltage	5 V	10 V	10 V	–	–	85 V DC
Operating Lamp current	1.88 A	1.86 A	–	–	–	300 mA
Warm-up time	10 min	10 min	10 min	0 min	0 min	15 min
Number of Outputs	1	6	6	1	6	1
Fiber Connection	SMA	SMA	SMA	ZEISS 6mm or SMA	SMA	SMA
Balancing Filter	–	Yes	–	–	–	–
Pulsed Operation	–	–	–	up to 30 Hz	up to 30 Hz	–
Size	21 TE	21 TE	21 TE	21 TE	21 TE	21 TE

MCS 600 – Spectroscopic performance and flexibility

Innovate with the finest photodiode array technology available for spectroscopy – the new MCS 600 series from Carl Zeiss. With these process-tested spectrometers perform even the most challenging measurements in the UV/VIS/NIR spectral regions quickly, efficiently and precisely.

The cost-effective MCS 600 systems feature the time-tested, modular principle of the MCS 500 series with a number of major enhancements. Highlights of the new design include an increased signal-to-noise ratio, improved wavelength accuracy and an intelligent housing system, allowing different UV/VIS/NIR spectrometers to be directly combined for the very first time – covering the spectral range from 190 to 2200 nm.

Additionally, the MCS 600 sets a new standard for data processing through robust communications with peripheral systems and databases employing protocols such as OPC. You will also enjoy excellent ease of use thanks to specially tailored software packages such as processXplorer.

The result: utilizing one instrument, you can simultaneously record high quality spectra from a variety of spectral regions, multiple probes and external sensors with a single, modern process monitoring interface.

MCS 600 – Dedication to detail as well as the total solution

- State-of-the-art optics and electronics
- Outstanding performance in photometry, noise, linearity
- Wide range of spectrometer and lamp modules
- Extremely stable, microprocessor-controlled light sources
- Innovative housing system providing high versatility

- Modular design with intelligent diagnostics
- Superb ease of operation, maintenance and servicing
- Industry standard interfaces (Ethernet, Wireless LAN)
- Comprehensive selection of accessories
- Multiple system versions to accommodate a variety of applications
- Interoperability with third party chemometric software packages

MCS 600 – Assurance of optimum results in a variety of applications

With proven speed, safety and reliability, MCS 600 spectrometers allow you to perform measurements not only in the laboratory but also in process, under actual industrial conditions.

Glass Industry / Coatings

- Measurement of coatings on architectural glass
- In-line inspection of sputter processes
- Reflectance and transmittance measurements of coated lenses and optics
- Transmittance and color measurement of bottles, ampoules and containers
- Measurement of antireflective coatings on TFT and monitors
- Emission measurements of light sources and LEDs
- Color measurement of coated paper, textiles and plastics
- Layer thickness measurement of transparent coatings

Pharmaceutical and Chemical Production

- Blend uniformity and component concentrations during mixing operations
- Moisture and end-point determination within drying processes
- On-line concentration measurement of active and secondary ingredients in tablets, powders and liquids
- In-situ reaction monitoring via probe or stand-off interfaces
- In-line process inspection of polymerization processes
- Inspection of extrusion processes (polymer blends)
- Incoming materials QA/QC
- Cleaning validation (CIP)

Agricultural and Food Industries

- Content measurement of sugar, alcohol, starch, water, protein, fat and oil in foodstuffs and agricultural products
- Quality inspection of beverages
- Incoming and quality inspection in malt houses and breweries
- Measurement of constituents in individual grains

Rely on our history of optical and spectroscopic excellence for the best technical support and application-specific solutions in the industry.

MCS 600 – Modularity coupled with processor control

An MCS 600 spectrometer system consists of individual, impeccably matched components. The new MCS housing forms the basis of the system – depending on application and measuring environment, 19" racks, lab housings or special protective housings are available. The housing comprises a controller unit (ECC) with master processor and back plane utilizing a plug-in interface to effortlessly mate spectrometer and lamp cassettes. The ECC features an Ethernet connection and, if desired, also communicates via Wireless LAN. The special benefits of the new housing system include not only its lower power consumption, but also the possibility of accommodating up to 4 spectrometer cassettes in a single housing.

Spectrometer cassettes

Different industrial requirements and applications necessitate a variety of spectroscopic designs. We offer a wide selection of spectrometer cassettes equipped with a blend of both proven and newly developed technologies. Specifically in the NIR region, new polychromators with extended wavelength ranges are now available with coverage out to 2200 nm. An integrated processor for performance monitoring and control has been included in the design of MCS 600 series spectrometers. Enhanced signal-to-noise ratio, wavelength repeatability and linearity, combined with minimal drift, are only some of the outstanding properties of these modules. Excellent resolution and repeatability for process monitoring is the hallmark of all Zeiss spectrometers. With state-of-the-art electronic components and optimized heat dissipation, the spectrometer cooling unit functions with high stability and efficiency.

Spectrometer cassettes are available in two classes of thermoelectrically (TE) controlled housings:

within the 14 TE housing:

Spectrometer:	Wavelength range: (Polychromator Class)
■ **MCS 611 NIR 1.7**	**950 ... 1700 nm (PGS)**
■ **MCS 611 NIR 2.0**	**1340 ... 2000 nm (PGS)**
■ **MCS 611 NIR 2.2**	**910 ... 2200 nm (PGS)**
■ **MCS 621 VIS**	**310 ... 1100 nm (MMS)**
■ **MCS 621 UV**	**195 ... 390 nm (MMS)**
■ **MCS 621 UV-VIS**	**190 ... 720 nm (MMS)**

within the 28 TE housing:

Spectrometer:	Wavelength range: (Polychromator Class)
■ **MCS 601 UV-NIR**	**190 ... 1015 nm (MCS)**
■ **MCS 651 VIS**	**360 ... 780 nm (MCS)**
■ **MCS 651 UV**	**200 ... 620 nm (MCS)**
■ **MCS 651 NIR**	**695 ... 1100 nm (MCS)**
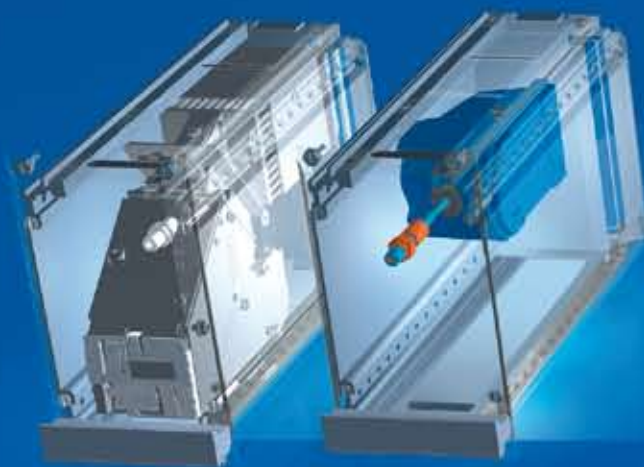
MCS 611
with PGS-Module

MCS 621
with MMS-Module

EC-Controller
with Masterprozessor
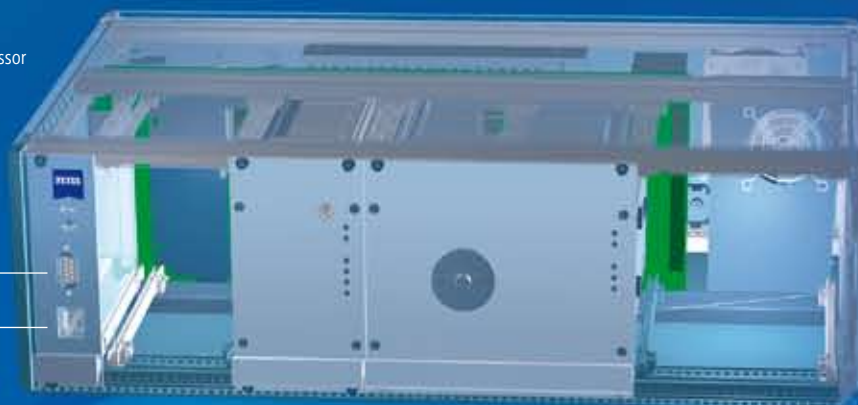
Housing

**19" rack, lab housing,
options for other housing types**

- Lower power consumption
- Only one sort of cassette for all housing types
- Up to 4 cassettes plus bulb in one housing

Lamp (BLX 606)

MCS 651
with MCS-Module

Lamp cassettes

**The following lamp cassettes provide highly stable
and intense illumination within the spectral range of 195 to 2200 nm:**

☀ **UV-VIS range sources:** **Deuterium light source CLD 600**
Xenon flash light BLX 600, BLX 606
☀ **VIS-NIR range sources:** **Halogen light source: CLH 600, CLH 600 F, CLH 606 A**

Specific spectroscopic advantages are gained through the use of Zeiss lamp modules; an integrated signal processor controls and guarantees high stability and dynamic response. The lamps are designed with overload and short circuit protection as well as a soft-start feature to increase their service life. Communication of parameters and status with application software eliminates set up concerns and potential confusion due to multiple light sources.

BLX 606 and CLH 606 light sources allow the simultaneous and homogeneous illumination of up to 6 channels.

MCS 600 –
Built-in functional intelligence

Each component of the MCS 600 has intelligence in the form of a built-in signal processor. After startup, the system initializes and performs a self-test in order to identify the system components, determine their availability and check their functional interaction.

Intelligent control of the instrument is based upon the integration of a master processor into the controller unit (ECC). Communications occur with all processors in the spectrometer and lamp cassettes via the back plane. Additionally, the master processor manages a continuous flow of data and forwards it to the controlling computer via Ethernet or Wireless LAN connection.

The benefits of built-in intelligence:

- Optimal reliability of the system through self-test routines and precise problem detection, e.g. aging or surface fouling of the bulb

- Rapid exchange or expansion of modules with automatic recognition by the controller

- Ability to buffer a large number of spectra within the spectrometer system offers new, high frequency data collection features

- Time stamped spectra and nearly instantaneous measurement triggering permits precision data collection with appropriate software packages

Sample configuration:

Transmission
of the data
to the PC

ECC with
interface unit

SP

SP

LP

Interface:
- Ethernet
- Wireless LAN

Back plane with
plug-in board
for all cassettes

SP

Tasks of spectrometer processor:

- Monitor all spectrometer functions
- Self-test routines and error reports
- Continuous transmission of measured
  values (triggered also possible)

LP

Tasks of lamp processor:

- Monitor all lamp functions
- Implement algorithms for stabilization and regulation of source
- Status and error reports
- On/off query function
- Service hour counter
- Shutter control (with appropriate equipment)

Protection from the toughest conditions

Powerful analytical technologies are gaining importance in process applications. Here, spectral measuring techniques in the UV/VIS/NIR regions offer excellent versatility, particularly for in-line analyses. The MCS 600 provides a photodiode array spectrometer system adaptable to the needs of a broad spectrum of different industries due to its inherent reliability, precision and flexibility. Extreme durability and high thermal stability permit integration in the toughest process environments.

Zeiss offers tailored integration solutions for our spectroscopic systems within special housings – adapting instrumentation for the actual environment in which it is used. This entails a variety of protective housings including GMP and Eexp housings for particularly demanding environments as well as ATEX or NFPA certifications. MCS 600 systems are prepared to deliver extensive spectroscopic information about a process safely and reliably.

MCS 600 in the GMP housing for the in-line inspection of cleaning processes in the pharmaceutical and chemical industries

CleanScan

MCS 600 in the IP 65 protective housing

Optimized accessories for the entire spectrum of measuring tasks

With their modular design and extensive selection of measuring heads and accessories, the MCS 600 systems offer maximum flexibility for your measuring tasks. Regardless of whether you are performing transmittance or reflectance measurements, or in what wavelength range you want to work, in short order, the measuring heads can be changed and the systems turned around for new measuring tasks. In addition, special accessories for lab analyses ensure that you are always optimally equipped to meet quality assurance requirements in the lab. Simply select the right accessory for your needs:

Measuring heads for reflectance measurements

OMK 500
The OMK 500-H is a reflectance measuring head with an integrated halogen bulb for the measurement of diffuse reflectance.

Hand measuring head 10°/10°
The 10°/10° reflectance measuring head is used for directional reflectance and color measurement on coated, transparent specimens.

OFR D/8°
The OFR D/8° measuring head was specially developed for the non-contact measurement of reflectance on diffusely scattering and/or glossy samples for on-line quality assurance.

ATR Probes
ATR probes are used for highly concentrated, strongly absorbing specimens and solutions for which measurements using traditional immersion probes are no longer possible.

Reflectance optics

The MCS 600 allows the use of all standard optics of the MCS 500 series. Optics with different images and measurement spot sizes are available. SMA or Zeiss connectors are used for light guide attachment.

Diffuse reflectance probe

The MCS 600 accessory program now also includes a process-capable diffuse reflectance probe with an effective measuring surface of 3-5 mm. It is ideally suitable for the measurement of strongly scattering specimens, e.g. powder, polymers, opaque liquids or solids.

OFK 30 measuring head

For space, application or energy reasons, some specific applications require reflectance measuring heads with an integration sphere, the maximum diameter of which measures 30 mm. The OFK 30 measuring head has therefore been added to the MCS 600 accessory program.

Measuring heads for transmittance

Transmittance optics

The MCS 600 allows the use of all standard optics of the MCS 500 series. Optics with different images and measurement spot sizes are available. SMA or Zeiss connectors are used for light guide attachment.

Cell holder/cuvette holder, temperature controlled

SMA fiber connection, suitable for standard cells to 20 mm, temperature control to +/- 0.5 °C

Immersion probes

A wide selection of transmittance probes is available for measuring the optical density or concentration of liquids. The offering includes immersion probes with different path lengths and wavelength ranges.

OFT

The OFT measuring head was specially developed for non-contact transmittance measurement on transparent materials and layers, flat glass or films.

Other accessory

Optical multiplexer

The optical multiplexer makes it possible to monitor several measuring areas with one spectrometer. MUX are available for 2 measuring areas (MUX 602) and for up to 16 measuring areas (MUX 6xx).

TURNSTEP rotary table

The TURNSTEP rotary table allows large quantities of specimen materials to be measured in a short time in the lab, therefore reducing sample-taking errors. This makes the measurement of quality-defining ingredients and parameters (e.g. paint) considerably more accurate and makes it easier to achieve a uniformly high standard of quality in the specimen material.

Ready-to-use software
made to measure

**Tailor-made, ready-to-use software packages
are available for a wide variety of tasks:**

processXplorer

ASPECT PLUS

The versatile, universal spectroscopy program from Zeiss. Easy to use and equipped with extensive functions, its offers options such as color metrics, layer thickness computation and macro programming language that allow use in applications that exceed standard routine analysis.
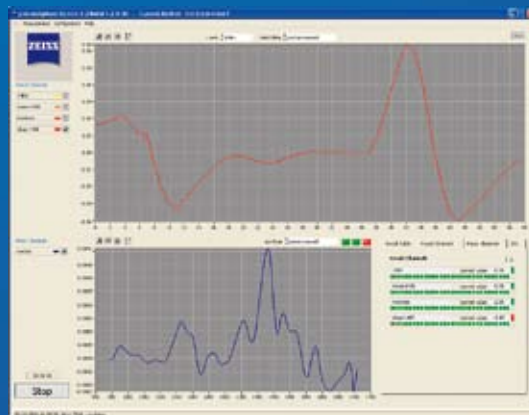
processXplorer

The new, flexible monitoring software from Zeiss, specially developed to meet the requirements of the chemical and pharmaceutical industries. The processXplorer can be individually adapted to an extremely wide variety of applications. It offers a broad spectrum of evaluation, analysis and data processing capabilities for on-line process display, as well as functionality for user, data and incident management. Seamless integration of chemometric models produced with Unscrambler® or GRAMS32® is now available. The processXplorer complies with the stipulations of CFR 21 Part 11.

LABCOAT

The ideal software interface for measuring layer thickness of transparent coatings or materials in the range of 0.1 to 100 µm on the basis of white light interference. The program is suitable both for routine analysis and research and for in-line use. User friendliness and high measuring and evaluating speeds are its outstanding features.

GRAMS®32

In conjunction with its numerous supplementary packages, e.g. PLS PLUS/IQ, GRAMS/3D and SPECTRAL ID, this is the ideal data processing and management software for advanced applications in spectroscopy. GRAMS®32 from Thermo Galactic meets the requirements of CFR 21 Part 11 and suitable for applications in the pharmaceutical industry.
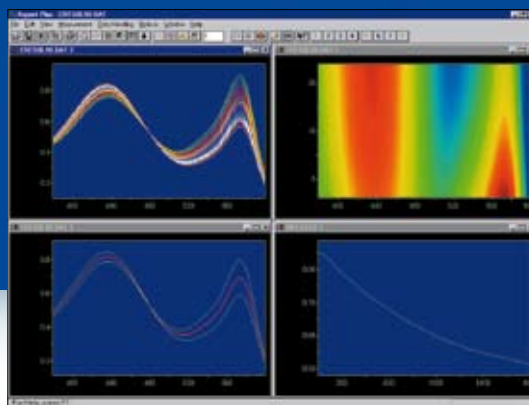
UNSCRAMBLER®

Extremely user-friendly and continually enhanced chemometric software from Camo. With Unscrambler®, you can concentrate on the interpretation of results and produce multivariate calibration models quickly and reliably. Unscrambler® offers Principal Component Analysis (PCA), Regression and Prediction (PLS-R, MLR, PCR, 3-way PLS-R) as well as Classification (SIMCA, PLS-DA).

Labcoat

ASPECT PLUS