



More Precision

thicknessGAUGE // Sensor system for inline thickness measurements



Sensor system for precise inline thickness measurements

thicknessGAUGE

Compact complete solution for precise inline thickness measurements up to 50 mm

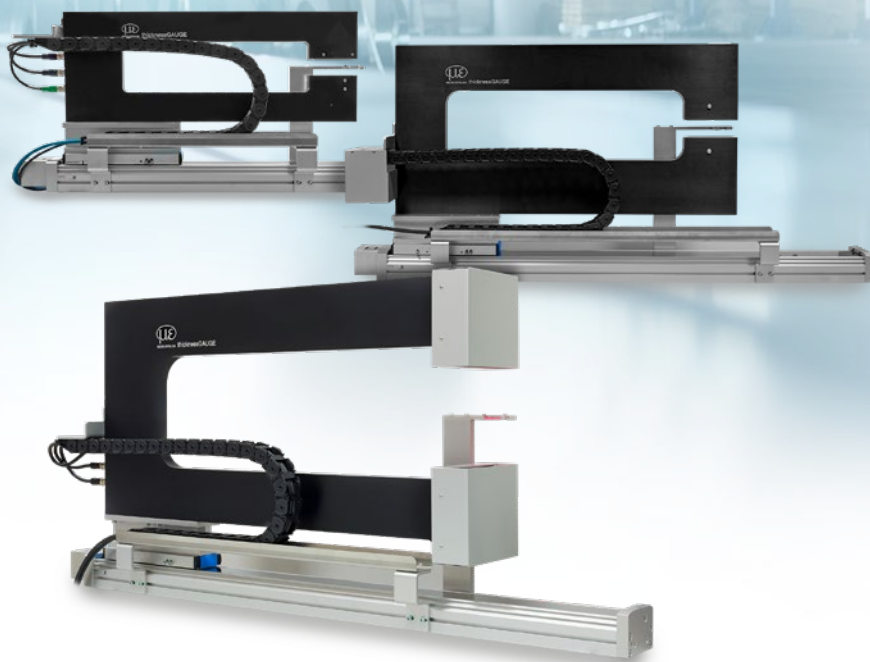
For many types of surfaces / materials due to different sensor technologies

Traversing sensors on linear axis

Fully automatic calibration

24 V supply for the entire system

Integrated software



Thickness measurement with high precision

thicknessGAUGE sensor systems are used for precise thickness measurements of strip materials, plates and sheets up to 50 mm. Several models with different sensor types, measuring ranges and measuring widths enable inline thickness measurements of different materials and surfaces based on an unmatched price/performance ratio.

This fully assembled system comprises a stable frame on which two optical distance sensors are fixed, that detect the thickness of the measuring object according to the difference principle. The sensors are perfectly aligned to each other and calibrated during the assembly. Furthermore, thickness calibration at the factory ensures high precision.

A linear axis moves the sensor system from the parking position to the measuring position where a measurement standard for fully automatic calibration is placed.

Operating principle of thickness measurement

The principle of dimensional, geometric thickness measurement includes one optical distance sensor on each side of the material. The distance (=working distance) between the two sensors is determined in a calibration process. The basis of the calibration is a DAkkS-certified measurement standard, to the thickness of which the sum of the distance values is added to determine the operating range.

Compact complete system for easy integration

These compact systems are comprised of an integrated linear unit including motor control, a compact bus terminal box, an automatic calibration unit as well as a multi-touch PC with pre-installed software. The entire system is powered via a 24 V source.

Examples of customized modifications:

- Selectable cable lengths
- Customer-specific axis length
- Encoder
- Interface for fieldbus connection
- Digital inputs/outputs



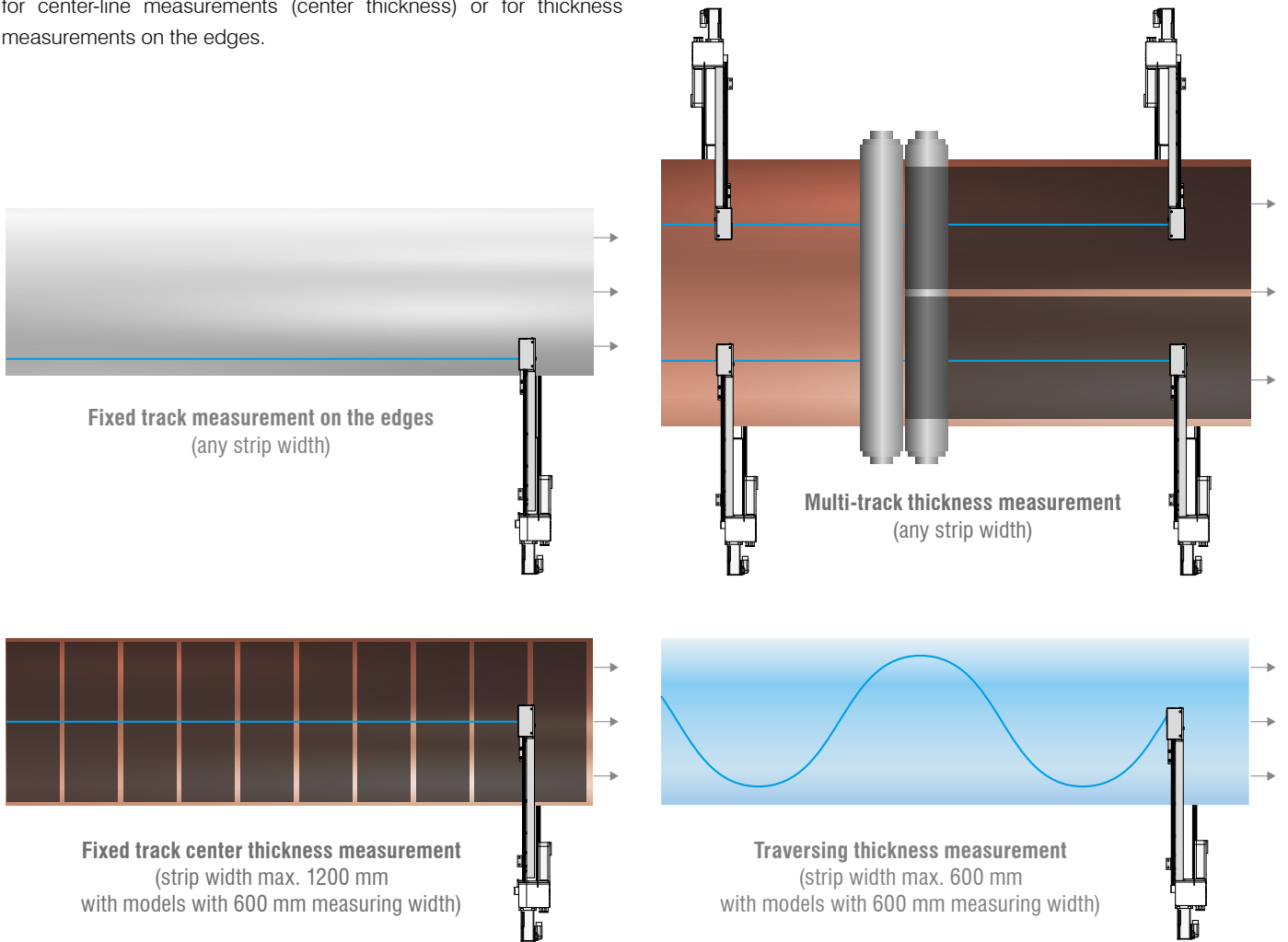
Fully automatic calibration enables reliable measurements (here: thicknessGAUGE C.LP)

Automatic calibration and temperature compensation

To compensate for effects of fluctuating temperatures, the thicknessGAUGE systems are equipped with an in-situ calibration, which is carried out in the parking position. Calibration is performed automatically and at freely selectable intervals. In addition to temperature compensation, in-situ calibration enables proper functioning of the system.

The new class for inline thickness measurements

thicknessGAUGE sensor systems are used for precise thickness measurement in numerous strip materials, plates and sheets. A linear unit with electromechanical drive enables thickness measurements in traversing mode. Alternatively, fixed track measurements are possible for center-line measurements (center thickness) or for thickness measurements on the edges.



100% quality control during production

The thicknessGAUGE sensor systems are designed in such a way that they can be used as both initial equipment and for retrofitting of existing facilities. Based on high precision and equipped with intelligent sensor technology, these systems are used in various industries.



Metal production

Thickness measurement of metal film, metal strips and metal plates



Energy industry

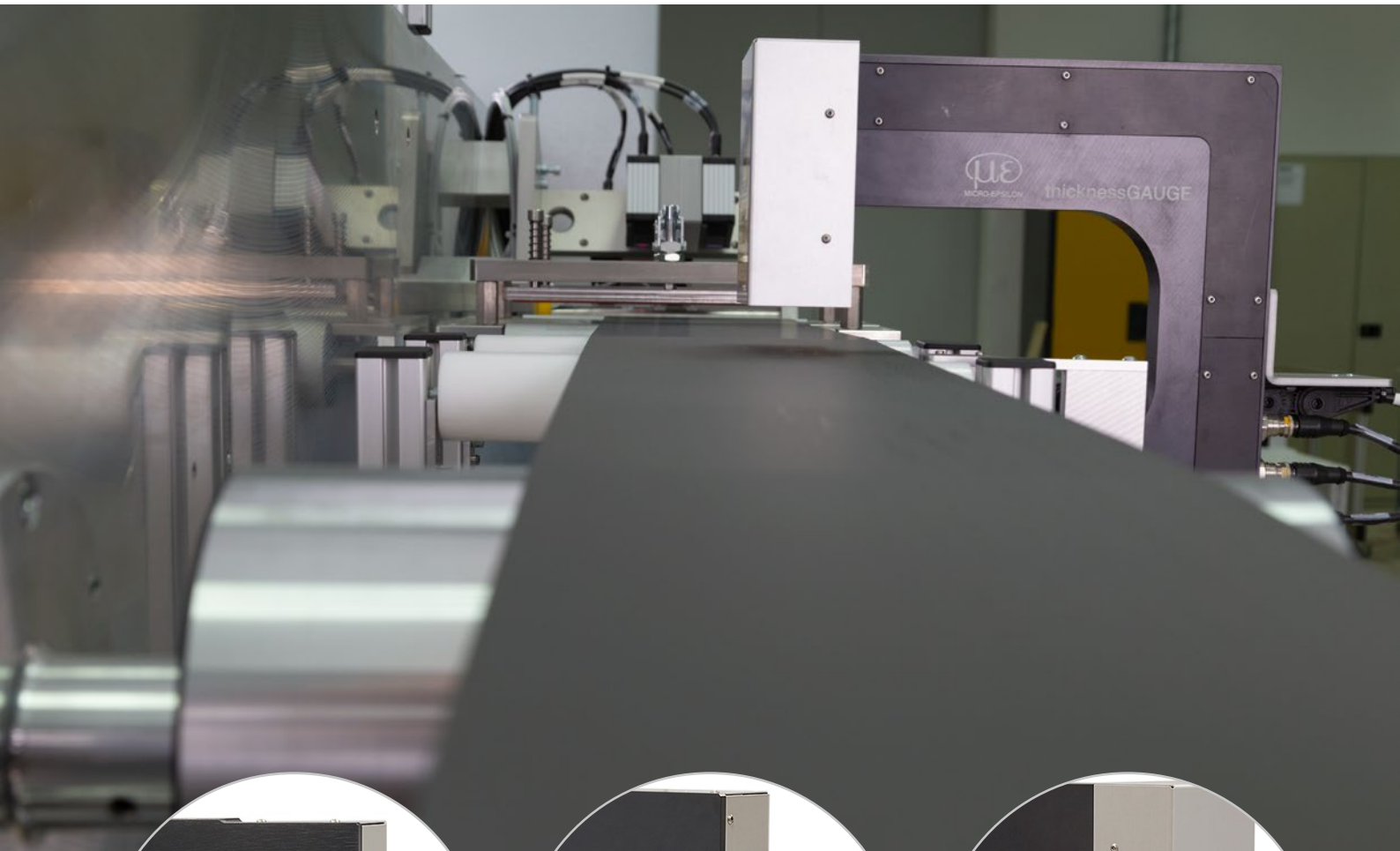
Thickness measurement of fuel cells and battery film (coated and uncoated)



Material engineering

Thickness measurement of film, plastic plates, woven materials, wood and ceramics

Models
thicknessGAUGE



thicknessGAUGE C.LL

Sensor technology used:
 Laser triangulation displacement sensors

- Measuring range (thickness): 6 / 50 mm
- Accuracy: $\pm 1 / \pm 5 \mu\text{m}$
- Measuring rate: up to 10 kHz

For common surfaces from plastic to metal

Compact design meets high performance & excellent price/performance ratio



thicknessGAUGE C.C

Sensor technology used:
 Confocal chromatic displacement sensors

- Measuring range (thickness): 2.5 mm
- Accuracy: $\pm 0.4 \mu\text{m}$
- Measuring rate: up to 10 kHz

For common surfaces as well as mirroring and shiny objects

High performance: fast and high resolution



thicknessGAUGE C.LP

Sensor technology used:
 Laser profile sensors

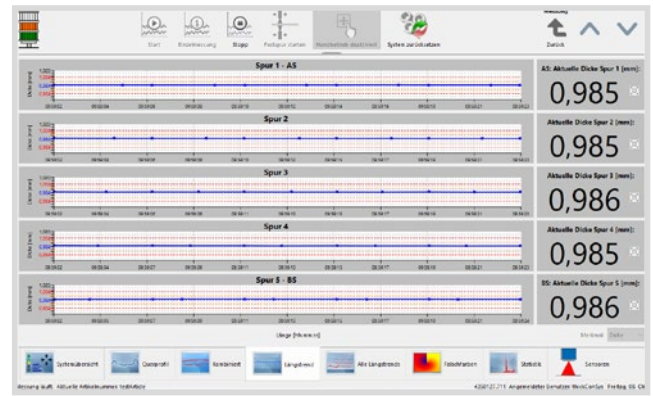
- Measuring range (thickness): 15 mm
- Accuracy: $\pm 1.2 \mu\text{m}$
- Measuring rate: up to 100 Hz

For common surfaces as well as for structured materials such as perforated plate or embossed plates

Compensation for tilted strips

Powerful analysis and control software

The thicknessGAUGE systems include a multi-touch-capable industrial PC with a comprehensive software package. This allows production data to be displayed, monitored, analyzed and archived. The software offers a wide range of views and measurement modes, such as the display of a fixed-track thickness measurement at any position, a transverse profile view, longitudinal trend display, single value display or measurement chart using false color representation. In addition, individually automatable test equipment capability monitoring and statistical process control (SPC package) are available.

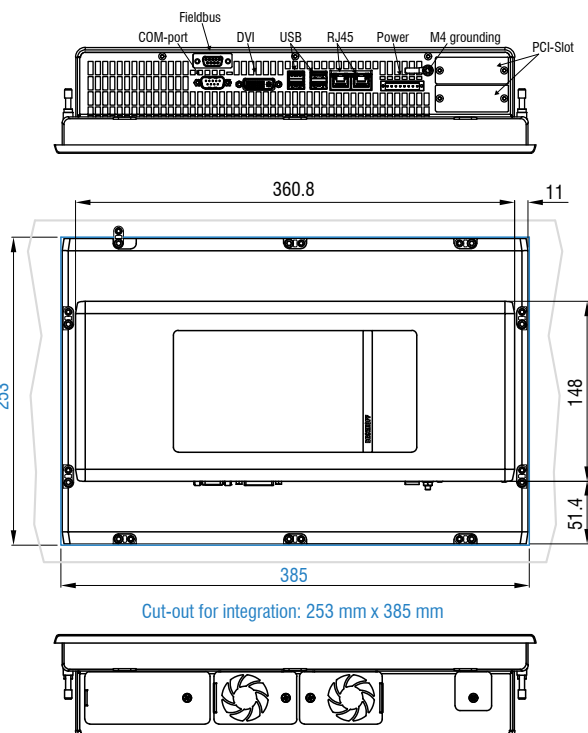
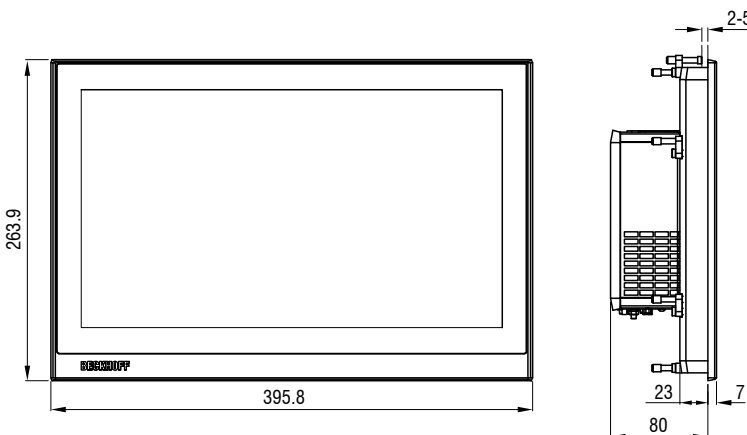


Software features:

- Article database
- Production archive
- Statistical evaluations
- Limit value monitoring with return back to production
- Fieldbus interfaces (optional)
- Verification of gauge/test equipment capability



Size and installation dimensions of the industrial PC with touchscreen



Dimensions in mm, not to scale.

Sensor system for precise thickness measurement (laser triangulation sensors) thicknessGAUGE C.LL

Sensor technology used:
Laser triangulation displacement sensors

Laser class 2, no special safety precautions required

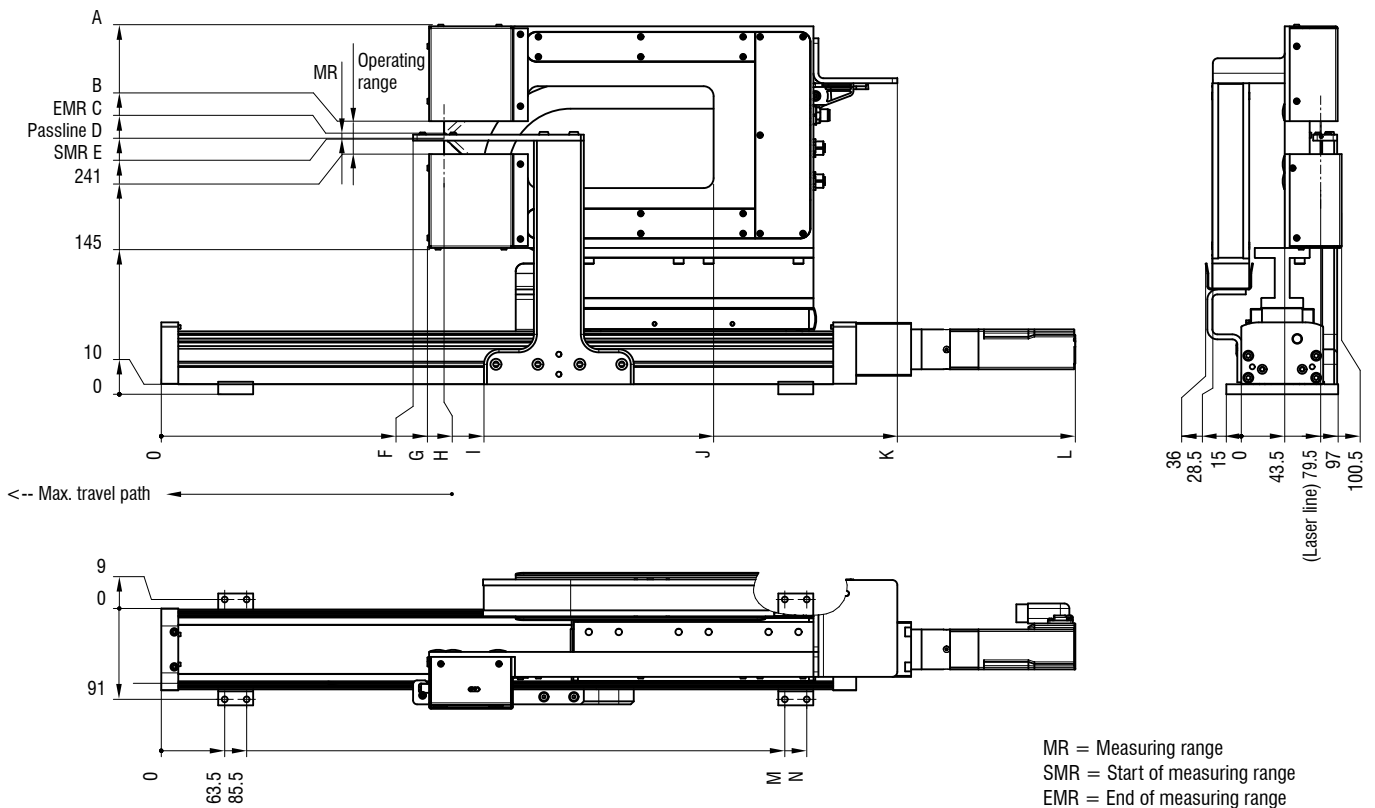
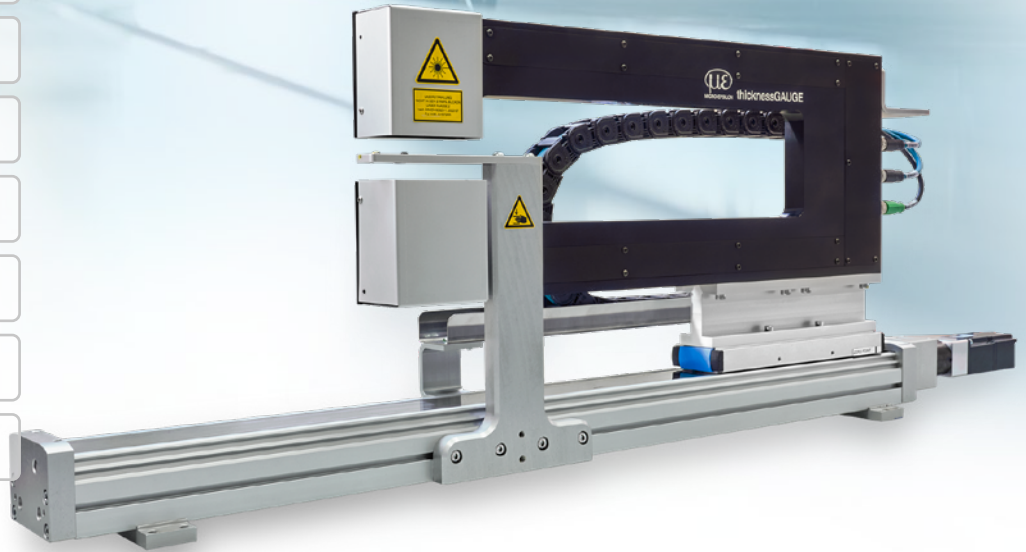
Measuring range (thickness) 6 / 50 mm

Accuracy: $\pm 1 / \pm 5 \mu\text{m}$

Measuring rate; up to 10 kHz

For numerous materials, e.g., plastics, wood and metals

Compact design meets high performance & excellent price/performance ratio



MR = Measuring range
SMR = Start of measuring range
EMR = End of measuring range
Dimensions in mm, not to scale.
Drawing of industrial PC, see page 5.

| Model | A | B | C | D | E | F | G | H | I | J | K | L | M | N |
|-------------|-----|-----|-------|-------|-------|-------|-----|-------|-------|-------|--------|--------|--------|--------|
| C.LL-6/200 | | | | | | 252 | 267 | 283 | 323 | 553 | 737 | 916 | 624.5 | 646.5 |
| C.LL-6/400 | 370 | 274 | 261.5 | 256.4 | 255.5 | 232 | 247 | 263 | 303 | 733 | 937 | 1115 | 824.5 | 846.5 |
| C.LL-6/600 | | | | | | 235 | 249 | 265.5 | 305.5 | 916 | 1140 | 1316 | 1024.5 | 1046.5 |
| C.LL-50/200 | | | | | | 252 | 268 | 283 | 323 | 553 | 737 | 916 | 624.5 | 646.5 |
| C.LL-50/400 | 458 | 362 | 328.5 | 286 | 278.5 | 232 | 247 | 263.2 | 303 | 713.2 | 937.2 | 115.5 | 824.5 | 846.5 |
| C.LL-50/600 | | | | | | 234.5 | 249 | 265.5 | 305.5 | 915.5 | 1139.5 | 1315.5 | 1024.5 | 1046.5 |

| Model | | C.LL-6/200 | C.LL-6/400 | C.LL-6/600 |
|---------------------------------|--------------------------------|--|-------------|-------------|
| Article number | | 4350127.811 | 4350127.812 | 4350127.813 |
| Measuring width | | 200 mm | 400 mm | 600 mm |
| Operating range | | 33 mm | | |
| Measuring range | | 6 mm | | |
| Max. travel path ^[1] | | 380 mm | 580 mm | 780 mm |
| System accuracy ^[2] | | ± 1 µm | | |
| Resolution | | 0.1 µm | | |
| Measuring rate | | up to 10 kHz | | |
| Calibration | | Automatic | | |
| Weight | Axis, motor and C-frame | 13.7 kg | 17.2 kg | 20.4 kg |
| | Bus terminal box and panel IPC | 14 kg | | |
| Supply voltage | | 24 V | | |
| Humidity | | 5 % RH ... 95 % RH (non-condensing) | | |
| Protection class (DIN EN 60529) | | IP40 (bus terminal box IP54) | | |
| Temperature range | Storage | -20 ... 65 °C | | |
| | Operation | 5 ...45 °C | | |
| Control and display elements | | Panel-IPC with thicknessCONTROL software included in the scope of supply | | |
| Special features | | Compact bus terminal box measuring just 300 x 300 x 210 mm | | |

^[1] Other lengths on request

^[2] 2 Sigma; data valid for diffusely reflecting, metallic measuring standard (DAkkS certified)

| Model | | C.LL-50/200 | C.LL-50/400 | C.LL-50/600 |
|---------------------------------|--------------------------------|--|-------------|-------------|
| Article number | | 4350127.820 | 4350127.821 | 4350127.822 |
| Measuring width | | 200 mm | 400 mm | 600 mm |
| Operating range | | 121 mm | | |
| Measuring range | | 50 mm | | |
| Max. travel path ^[1] | | 380 mm | 580 mm | 780 mm |
| System accuracy ^[2] | | ± 5 µm | | |
| Resolution | | 1 µm | | |
| Measuring rate | | up to 10 kHz | | |
| Calibration | | Automatic | | |
| Weight | Axis, motor and C-frame | 15.2 kg | 19.9 kg | 23.6 kg |
| | Bus terminal box and panel IPC | 14 kg | | |
| Supply voltage | | 24 V | | |
| Humidity | | 5 % RH ... 95 % RH (non-condensing) | | |
| Protection class (DIN EN 60529) | | IP40 (bus terminal box IP54) | | |
| Temperature range | Storage | -20 ... 65 °C | | |
| | Operation | 5 ...45 °C | | |
| Control and display elements | | Panel-IPC with thicknessCONTROL software included in the scope of supply | | |
| Special features | | Compact bus terminal box measuring just 300 x 300 x 210 mm | | |

^[1] Other lengths on request

^[2] 2 Sigma; data valid for diffusely reflecting, metallic measuring standard (DAkkS certified)

Sensor system for precise thickness measurement (confocal chromatic sensors) thicknessGAUGE C.C

Sensors used:
Confocal chromatic displacement sensors

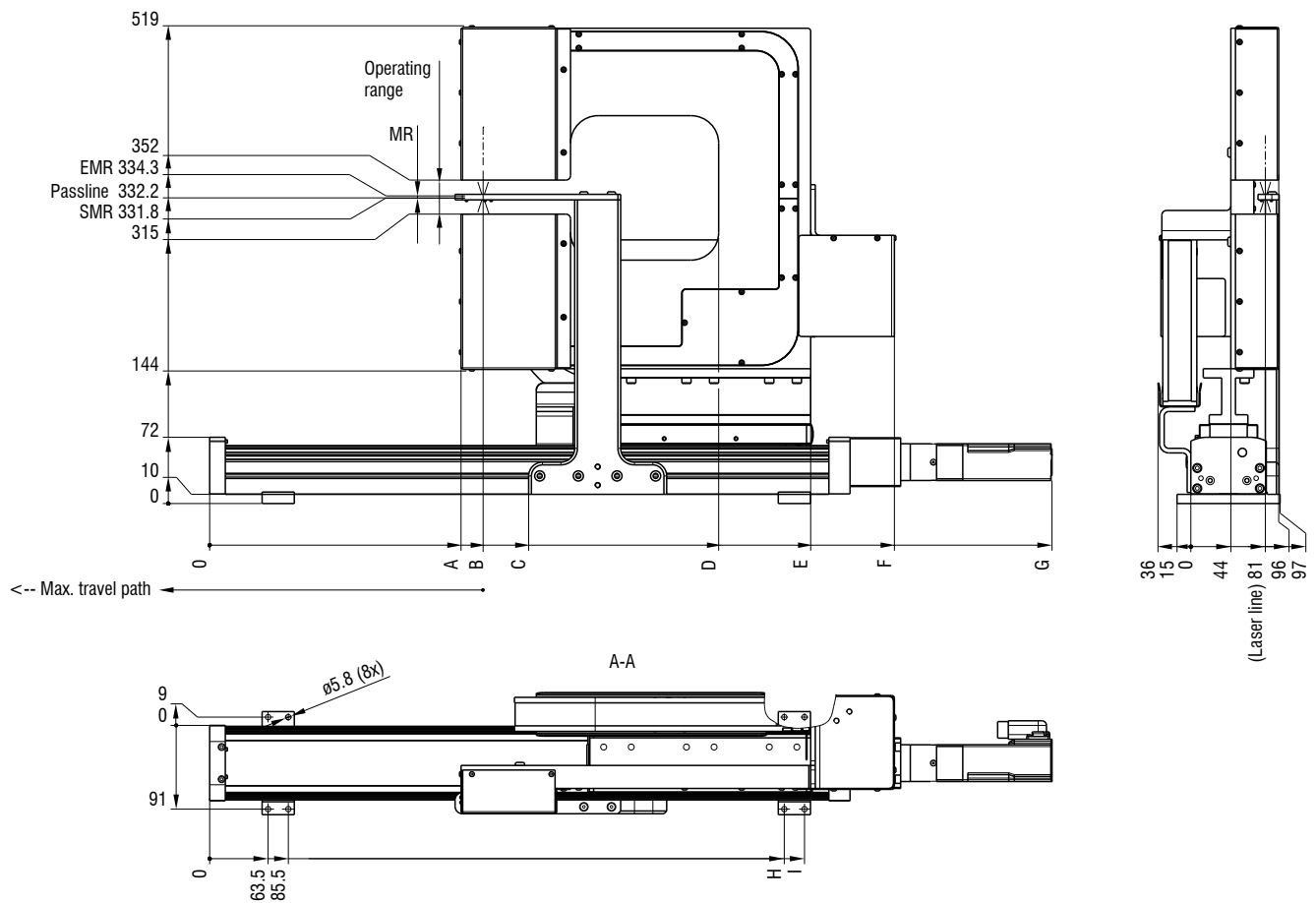
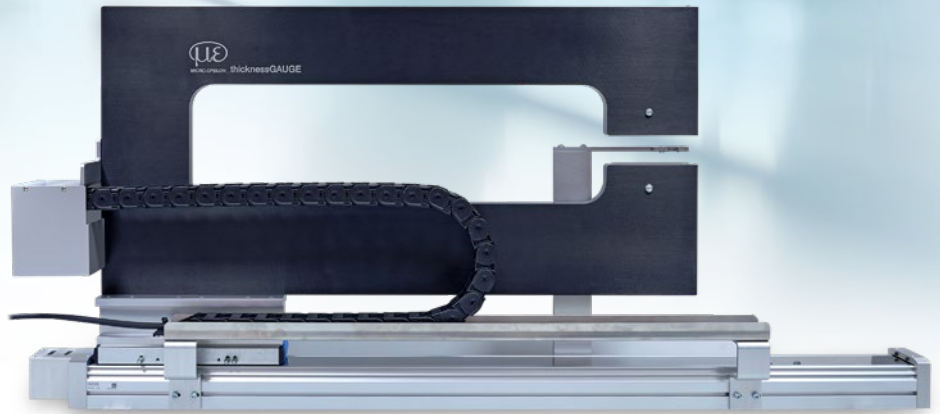
Measurement with white light, no safety precautions required

Measuring range thickness: 2.5 mm

Accuracy: $\pm 0.4 \mu\text{m}$

Measuring rate: up to 10 kHz

Precise thickness measurement on mirroring and shiny surfaces



| Model | A | B | C | D | E | F | G | H | I |
|--------------|-----|-----|-----|-------|-------|-------|------|--------|--------|
| C.C- 2,5/200 | 273 | 297 | 347 | 653 | 553 | 744 | 916 | 624.5 | 646.5 |
| C.C- 2,5/400 | 273 | 297 | 347 | 853.2 | 753.2 | 945.9 | 1116 | 824.5 | 846.5 |
| C.C- 2,5/600 | 276 | 300 | 349 | 1056 | 941 | 1147 | 1315 | 1024.5 | 1046.5 |

MR = Measuring range
SMR = Start of measuring range
EMR = End of measuring range
Dimensions in mm, not to scale.
Drawing of industrial PC, see page 5.

| Model | | C.C-2.5/200 | C.C-2.5/400 | C.C-2.5/600 |
|---------------------------------|--------------------------------|--|-------------|-------------|
| Article number | | 4350127.920 | 4350127.921 | 4350127.922 |
| Measuring width | | 200 mm | 400 mm | 600 mm |
| Operating range | | 32 mm | | |
| Measuring range | | 2.5 mm | | |
| Max. travel path ^[1] | | 380 mm | 580 mm | 780 mm |
| System accuracy ^[2] | | ±0.4 μm | | |
| Resolution | | 40 nm | | |
| Measuring rate | | max. 10 kHz | | |
| Calibration | | Automatic | | |
| Weight | Axis, motor and C-frame | 19.8 kg | 24.3 kg | 28.4 kg |
| | Bus terminal box and panel IPC | 15.9 kg | | |
| Supply voltage | | 24 V | | |
| Humidity | | 5 % RH ... 95 % RH (non-condensing) | | |
| Protection class (DIN EN 60529) | | IP40 (bus terminal box IP54) | | |
| Temperature range | Storage | -20 ... 65 °C | | |
| | Operation | 5 ... 45 °C ^[3] | | |
| Control and display elements | | Panel-IPC with thicknessCONTROL software included in the scope of supply | | |
| Special features | | Compact bus terminal box measuring just 300 x 400 x 210 mm | | |

^[1] Other lengths on request

^[2] 2 Sigma; data valid for high-gloss, metallic measuring standard (DAkkS certified)

^[3] The temperature range for bus terminal boxes is limited to 5 ... 40 °C

Sensor system for precise thickness measurement (laser profile sensors)

thicknessGAUGE C.LP

Sensor technology used:
Laser profile sensors

Laser class 2M, no special safety precautions required

Measuring range thickness: 15 mm

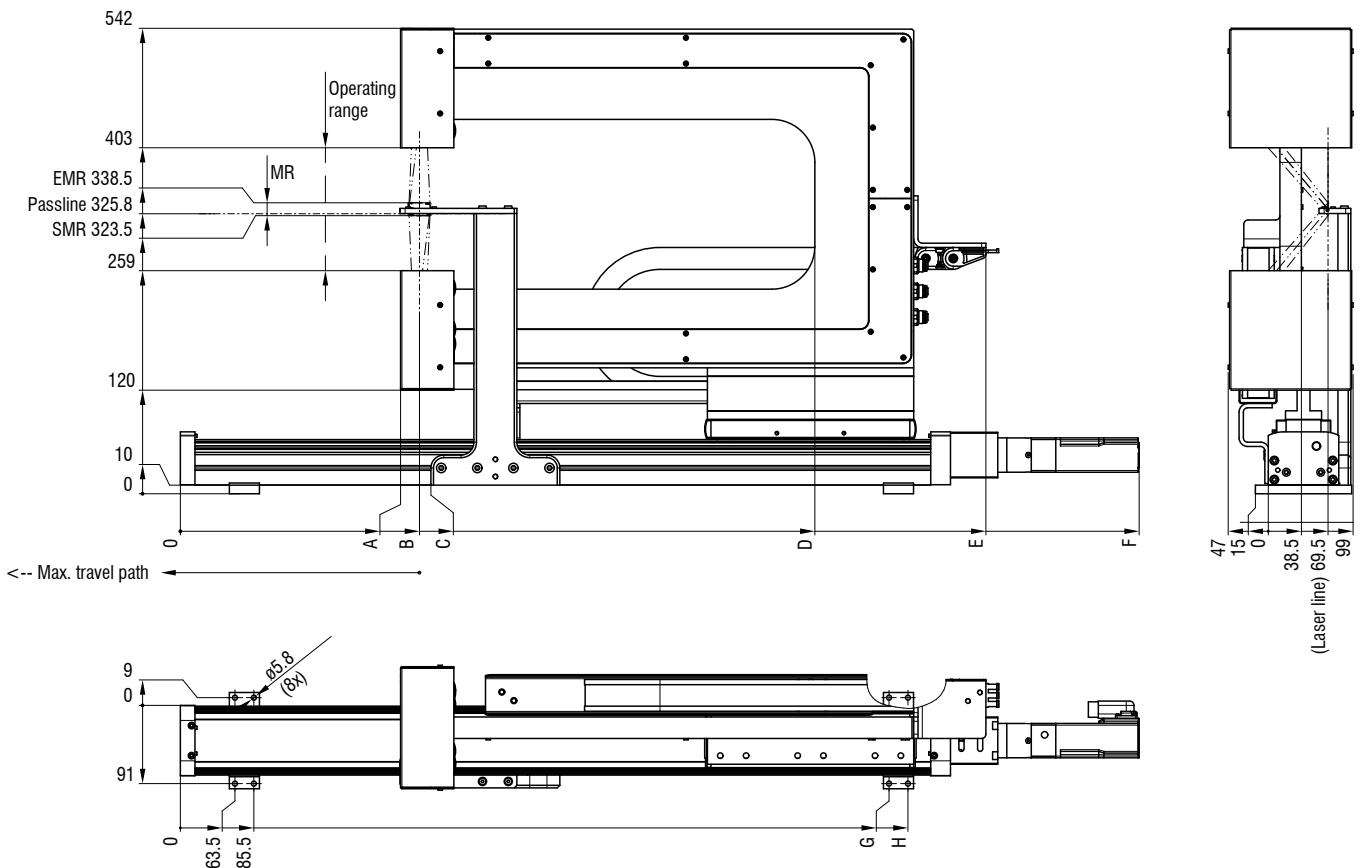
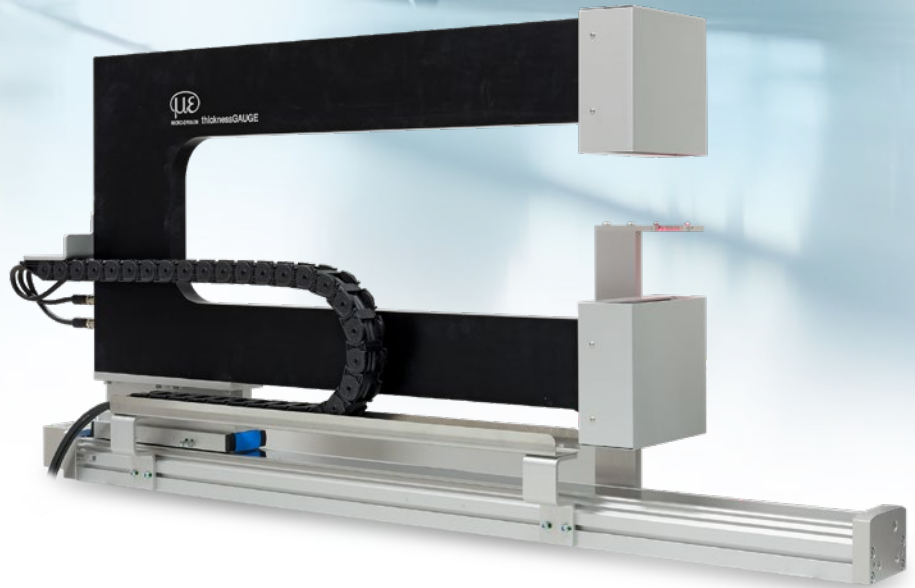
Accuracy: $\pm 1.2 \mu\text{m}$

Measuring rate: up to 100 Hz

For structured materials, e.g., perforated and embossed plates

Best-fit line possible

Compensation for tilted strips



| Model | A | B | C | D | E | F | G | H |
|-------------|-----|-------|-----|-----|------|------|--------|--------|
| C.LP-15/200 | 271 | 293.2 | 307 | 563 | 737 | 916 | 624.5 | 646.5 |
| C.LP-15/400 | 256 | 278 | 292 | 738 | 937 | 1115 | 824.5 | 846.5 |
| C.LP-15/600 | 224 | 245.5 | 259 | 916 | 1140 | 1316 | 1024.5 | 1046.5 |

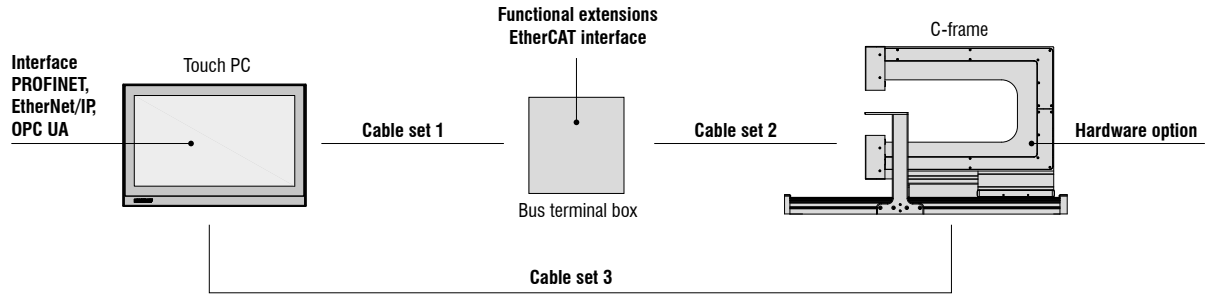
MR = Measuring range
SMR = Start of measuring range
EMR = End of measuring range
Dimensions in mm, not to scale.
Drawing of industrial PC, see page 5.

| Model | | C.LP-15/200 | C.LP-15/400 | C.LP-15/600 |
|---------------------------------|--------------------------------|--|-------------|-------------|
| Article number | | 4350127.720 | 4350127.721 | 4350127.722 |
| Measuring width | | 200 mm | 400 mm | 600 mm |
| Operating range | | 144 mm | | |
| Measuring range | | 15 mm | | |
| Max. travel path ^[1] | | 380 mm | 580 mm | 780 mm |
| System accuracy ^[2] | | ± 1.2 μm | | |
| Resolution | | 0.2 μm | | |
| Measuring rate | | 100 Hz | | |
| Calibration | | Automatic | | |
| Weight | Axis, motor and C-frame | 17.6 kg | 22.3 kg | 26.8 kg |
| | Bus terminal box and panel IPC | 14.1 kg | | |
| Supply voltage | | 24 V | | |
| Humidity | | 5 % RH ... 95 % RH (non-condensing) | | |
| Protection class (DIN EN 60529) | | IP40 (bus terminal box IP54) | | |
| Temperature range | Storage | -20 ... 65 °C | | |
| | Operation | 5 ... 45 °C | | |
| Control and display elements | | Panel-IPC with thicknessCONTROL software included in the scope of supply | | |
| Special features | | Compact bus terminal box measuring just 300 x 300 x 210 mm | | |

^[1] Other lengths on request

^[2] 2 Sigma; data valid for diffusely reflecting, metallic measuring standard (DAkkS certified)

System design



Standard accessories

Can be used for the following thicknessGAUGE models

| | Description | Article number | C.LP-xx | C.LL-xx | C.C-xx |
|-----------------------|---|----------------|---------|---------|--------|
| Cable set 1 | free length 5 m | 4350318 | ✓ | ✓ | ✓ |
| | free length 10 m | 4350318.01 | ✓ | ✓ | ✓ |
| | free length 20 m | 4350318.02 | ✓ | ✓ | ✓ |
| Cable set 2 | free length 3 m | 4350930 | ✓ | | |
| | free length 5 m | 4350930.01 | ✓ | | |
| | free length 8 m | 4350930.02 | ✓ | | |
| | free length 3 m | 4350932 | | ✓ | |
| | free length 8 m | 4350932.01 | | ✓ | |
| | free length 3 m | 4350933 | | | ✓ |
| | free length 8 m | 4350933.01 | | | ✓ |
| Cable set 3 | free length 3 m | 4350931 | ✓ | | |
| | free length 8 m | 4350931.01 | ✓ | | |
| | free length 18 m | 4350931.02 | ✓ | | |
| Functional extensions | Extension digital I/O (8x input, 8x output) | 4350934 | ✓ | ✓ | ✓ |
| | Extension encoder input RS422 (5 V) | 4350935 | ✓ | ✓ | ✓ |
| | Extension encoder input HTL (24 V) | 4350936 | ✓ | ✓ | ✓ |
| Interfaces | Interface EtherCAT (additional bus terminal required) | 4350937 | ✓ | ✓ | ✓ |
| | Interface PROFINET | 4350917 | ✓ | ✓ | ✓ |
| | Interface EtherNet/IP | 4350924 | ✓ | ✓ | ✓ |
| | Interface OPC UA | 4350938 | ✓ | ✓ | ✓ |
| Hardware option | thicknessGAUGE C-drive turned | 4350940 | ✓ | ✓ | ✓ |

- When using several extensions or with the EtherCAT interface, a larger bus terminal box may be necessary (increased space requirement for the EtherCAT bus)
- Other interfaces or other cable lengths on request