NUMTEC
ALPINE METAL TECH

MD760

Compact inline wheel measurement

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Reliability for your production through 100% testing of all critical wheel characteristics on every single wheel.

MD760

Compact inline wheel measurement

The MD760 is a compact wheel test system, designed for integration in aluminum wheel production.

In order to meet the rising demands for quality in wheel production, the test system is the best prerequisite for 100% testing of wheels in a wide range of machining states. A type detection with A-value differentiation for the selection of the wheel type-dependent test parameters is integrated in the infeed. Optionally, a data matrix code reading system can be connected that enables a clear assignment of the measurement data to the wheels. The machine can test wheels between 14 and 24", completely mixed, without the need for retooling. The wheels are handled by a transfer carriage, which centers the wheels on the center of the cap and transports them on conveyors to the measuring module. There the wheel is placed on the respective measuring module for the intended test. The MD760 offers space for a measuring module for radial and axial runout measurement, center bore measurement or imbalance measurement. The measurement of the bolt holes can be combined with the wall thickness measurement. A marking by means of a punch point or a drilling unit with adjustable drilling depth limitation can be integrated on the radial and axial runout module. Depending on requirements, the wheels can also be marked using an inkjet printer or needle embossing. A label applicator for marking the match point is available for finished wheels. In order to decouple these marking options from the measurement, an additional runout area is added, which slightly extends the machine but does not affect the overall cycle. Due to its small size, the test system can be easily integrated into the production line. With a system capacity of approx. 5500 wheels per day very large production volumes can be tested. All measured data is collected and stored in a database.

YOUR ADVANTAGES

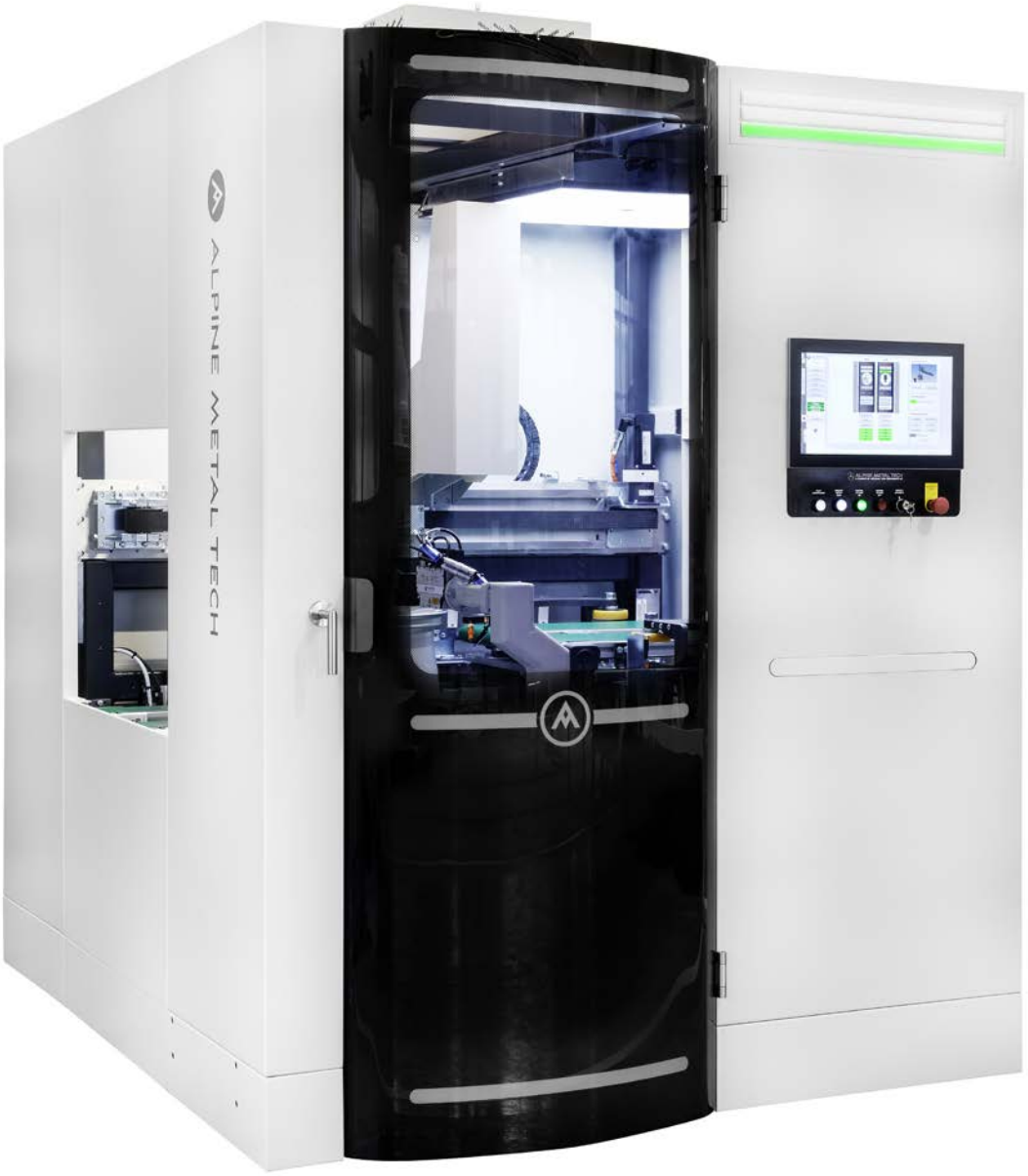
» Inline test system
100% check of all wheels before delivery

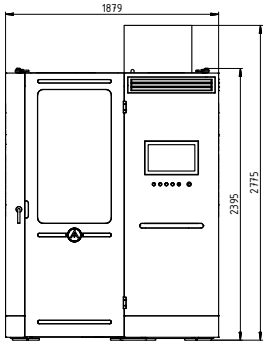
» Safe transport of the wheels
Centering and transport via conveyors

» Compact design
Type detection and measurement module in a compact design

» Fast process integration
Short commissioning time owing to pre-tested overall system

» Flexible use
Different tests at every stage of the manufacturing process


ALPINE METAL TECH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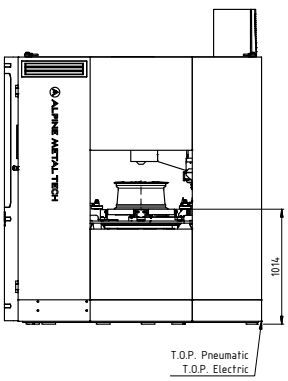
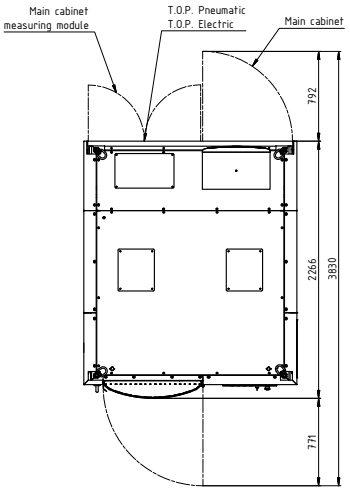
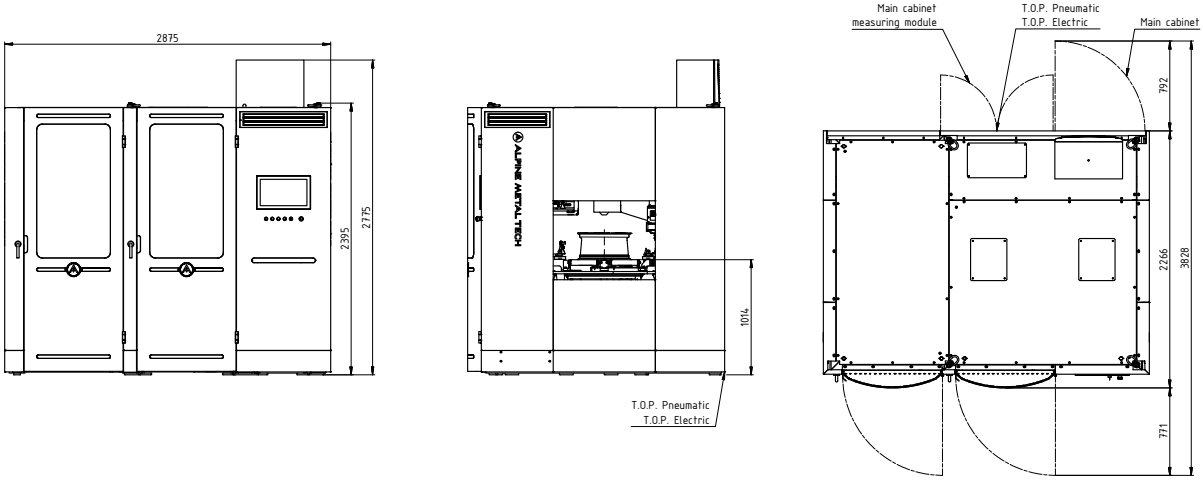

ALPINE METAL TECH
1014
T.O.P. Pneumatic
T.O.P. Electric

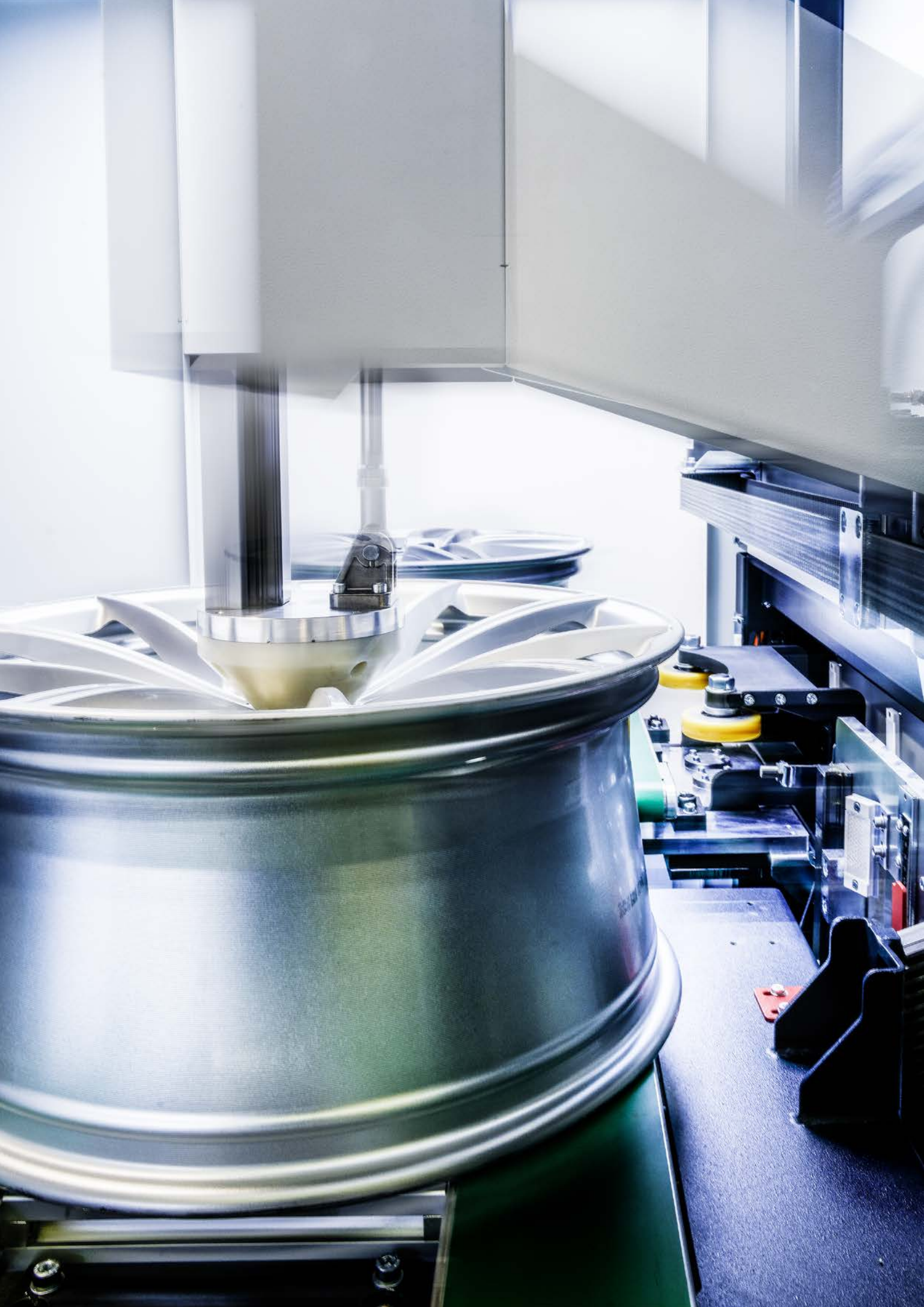

Main cabinet
measuring module
T.O.P. Pneumatic
T.O.P. Electric
Main cabinet
792
2266
3830
771

TECHNICAL DATA

Wheel parameters	wheel size	14 – 24"
	wheel height	3.5 – 14"
	A-value	up to 250 mm
	center bore diameter	52 – 86 mm (optional 49 – 130 mm)
Performance characteristics	capacity / cycle time	RUNA: 300 wheels/hour, 12 sec. BOLT: 240 wheels/hour, 15 sec. WALL: 300 wheels/hour, 12 sec. BORE: 300 wheels/hour, 12 sec. UBAL: 240 wheels/hour, 15 sec.
Technical components	HMI	19" touch display
	control system	industrial PC
	centering	pneumatic centering
	horizontal / vertical drive	servo motor
Interfaces	machine control system	Profibus, Profinet, EtherNet/IP, Parallele I/O
	data exchange	EtherNet
Media	electric connection	3 x 400 VAC, 50 Hz, 7 kVA optional 3 x 460 VAC, 60 Hz, 7 kVA
	pneumatic connection	at least 6 bar
Machine dimensions	L x W x H	1879 mm x 2266 mm x 2775 mm
	incl. optional marking unit	2875 mm x 2266 mm x 2775 mm
	feed-in height	1014 mm
Weight		approx. 2000 kg

MD760 incl. optional marking unit





MD760 MODULES

Infeed

» Loading station
» Design recognition, A-value measurement
» Detection of rotational position
» Optional: Data Matrix reader station

RUNA

» Radial and axial runout measurement
» Rim width measurement
» Harmonic calculation
» Optional: match point marking

BOLT

» Bolt hole measurement
» PCD diameter
» Optional: checking cap jump

WALL

» Wall thickness measurement

BORE

» Center bore measurement

UBAL

» Dynamic unbalance measurement
» Static unbalance measurement

Optional marking unit

» Marking options:
Inkjet marking
Pin marking
Needle marking
Label applicator (painted wheels)

RUNA

Radial and axial runout measurement

RUNA is the module used for 100% measurement of the radial and axial runout in the compact MD760 inline measurement system.

The measurement of the radial and axial runout in the production process is one of the most important quality measures during the manufacturing of wheels. The steel rollers mounted on the measuring unit are placed against the wheel contour, and the wheel is turned. High-precision sensors record the position of the rollers and thus determine the corresponding radial and axial runout parameters. Depending on the installation location, the measurement can take place before or after the painting of the wheels. For the marking of the geometrical match point, either a pneumatic needle marker or a drilling unit as a permanent marking is used; or a sticker applicator for painted wheels. For operation with constantly changing wheels, the wheel type is selected via the design detection system that is integrated in the MD760. The wheel data is entered centrally in the MD760 control system.

» Precision measurement

The measurement takes place with high-precision steel rollers; the rollers are placed at an angle of 45° to the corresponding wheel contour.

» Match point marking

Through the calculation of the harmonic, the match point can be displayed and/or marked in different ways on the wheel.

» Complete integration

HMI, data entry and logging take place via the central control system of the MD760.

» Short cycle time

With the measuring module RUNA, a total cycle time of approximately 12 seconds can be achieved.

100% measurement of radial and axial runout

FEATURES

Wide range clamping system

The clamping unit, which is already used in many MAKRA measuring machines, ensures an exact and repeatable clamping of the wheels with its high-precision rotary bearing. The very precise clamping is absolutely necessary for any high-quality radial and axial runout measurement. It is the only way to assure the required measured characteristics of the machine in the long term. With additional stepped jaws, fits of up to 130 mm can be clamped.

Precision rolls according E.T.R.T.O.

The actual recording of the measured values takes place with hardened and polished measuring rollers. The dimensions of the rollers comply with E.T.R.T.O., thus ensuring measurements conforming to standards. The spring-loaded rollers are leaned only slightly against the surface of the wheel in order to avoid damage to the wheel.

Harmonic and match point

The harmonic of the wheel and the geometrical match point are calculated from the measurement results of the individual channels. The match point can be marked on the wheel through various units that are optionally available (e.g. color point, sticker, punch mark, bore).

Graphical measurement result analysis

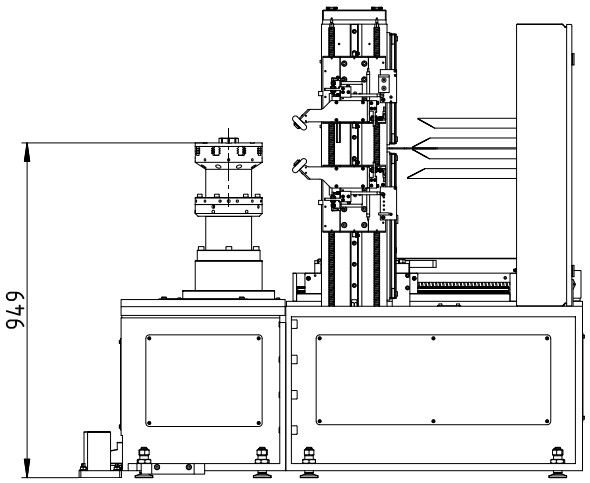
The measurements are saved with all detail data for exact analysis. This allows for an accurate graphical representation of all the measured curves even in retrospect. The problem analysis for scrap wheels is made immensely easier; in most cases, the curve shape allows conclusions to be drawn about any machining problems.

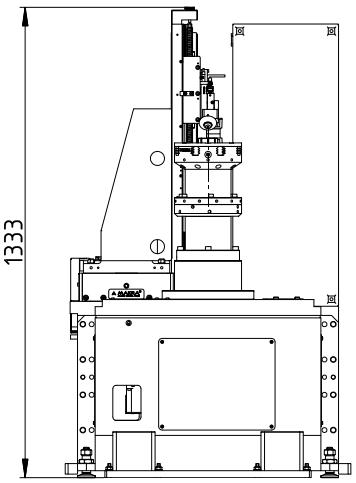
Adjusting and test parts

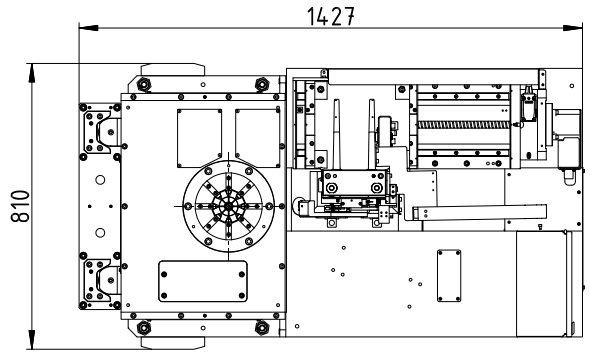
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.

TECHNICAL DATA

Machine features	measurement method	tactile through standard rollers
	measuring characteristics	radial and axial runout parameters
Wheel parameters	wheel size	14 – 24"
	wheel height	3.5 – 14" (depending on offset)
	center bore diameter	52 – 86 mm (optional 49 – 130 mm)
Performance characteristics	test characteristics on the wheel	radial runout inside/outside
		axial runout inside/outside
		offset
		rim width
		calculation of match point, 1 – 10 Harmonic
		match point marking (option)
Technical components	HMI	19" touch display
	control system	industrial PC
	input wheel parameters	via MD760 operating system
Machine dimensions	L x W x H	1427 x 810 x 1333 mm, module size
Weight		approx. 800 kg







BOLT

Bolt hole and pitch circle measurement

The BOLT module is used for 100% measurement of pitch circle and bolt parameters in the compact MD760 inline measurement system.

Next to the radial and axial runout measurement, the measurement of the pitch circle and bolt parameters is one of the most important quality assurance measures in wheel production. By means of the specially developed laser sensor, the entire PCD area is recorded three-dimensionally; from this, each bolt position (X, Y, Z) is calculated. The precise clamping of the fit is the reference for the entire measurement. Optionally, the fitting of the cap can be checked with an additional sensor. The wheels can be measured immediately after the machining or once they have been painted. The design detection system of the MD760 identifies the wheel type, which causes wheel-specific parameters and tolerances to be uploaded automatically. Each measurement is stored in a central database. This ensures the exact assignment of all measurements to a wheel. With this design of the control system and database, the MD760 is prepared for the future use of serial numbers on any wheel.

» Precision measurement

With the laser sensors developed by Alpine Metal Tech, the exact measurement of the individual characteristics is possible.

» 100% monitoring

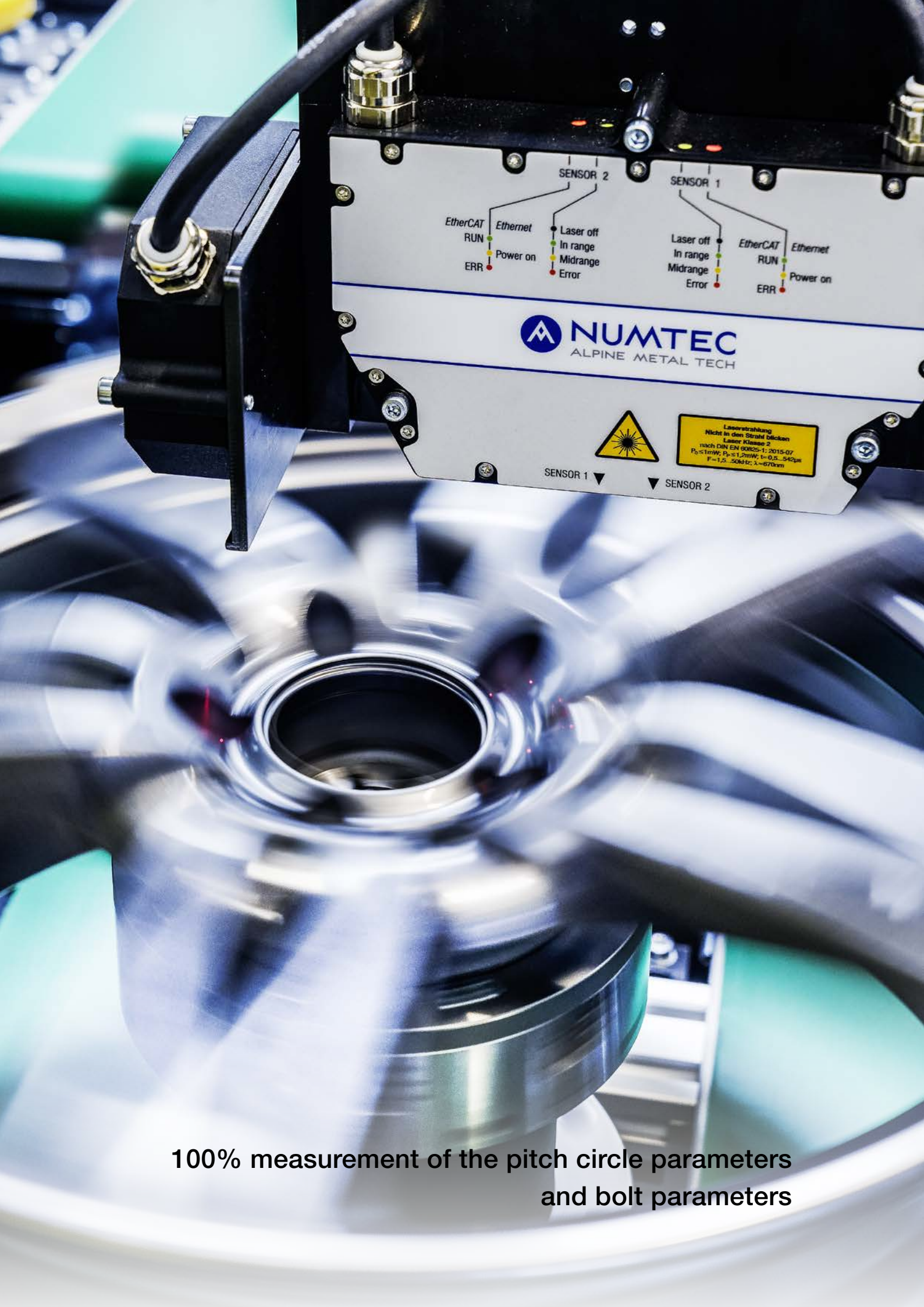
All bolt holes of a wheel are measured individually; therefore giving a 100% measurement of the wheel parameters, not a sampling measurement.

» Complete integration

HMI, data entry and logging take place via the central control system of the MD760.

» Short cycle times

The entire measurement of the bolt holes is done in 15 seconds. This allows up to 240 wheels per hour to be measured with only one single machine.



100% measurement of the pitch circle parameters and bolt parameters

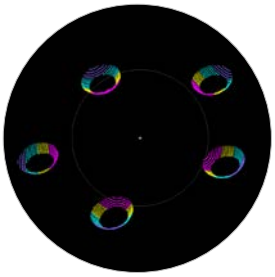
FEATURES

Bolt hole measurement

The wheel is placed on a MAKRA clamping system and centered via the center bore. The measurement of the height and position of the bolt holes as well as pitch circle parameters such as diameter and offset takes place via the 3-D laser measuring head developed by Alpine Metal Tech. Different bolt forms such as ball, tapered, flat or a combination of them can be configured specifically for each type of wheel.

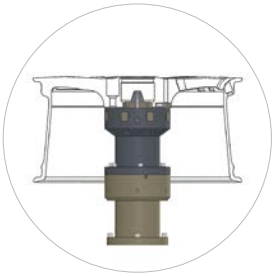
Position calculation

The picture shows the recording of the bolt holes used for the calculation. Through the sensors used, each individual bolt hole is measured in detail and the horizontal position is exactly determined. The technology also allows for the detection of residual chips in the bores. The respective wheels are then rejected with a corresponding error message.



Measurements in relation to the wheel center

Because the clamping on the clamping system is done via the center bore, the wheel support and the wheel center are used as reference surface. This type of mounting ensures that all measurement results are in relation to the wheel center. Any other type of center calculation or interpolation would automatically result in inaccuracies and errors in the measuring results.



Measurement of the cap area

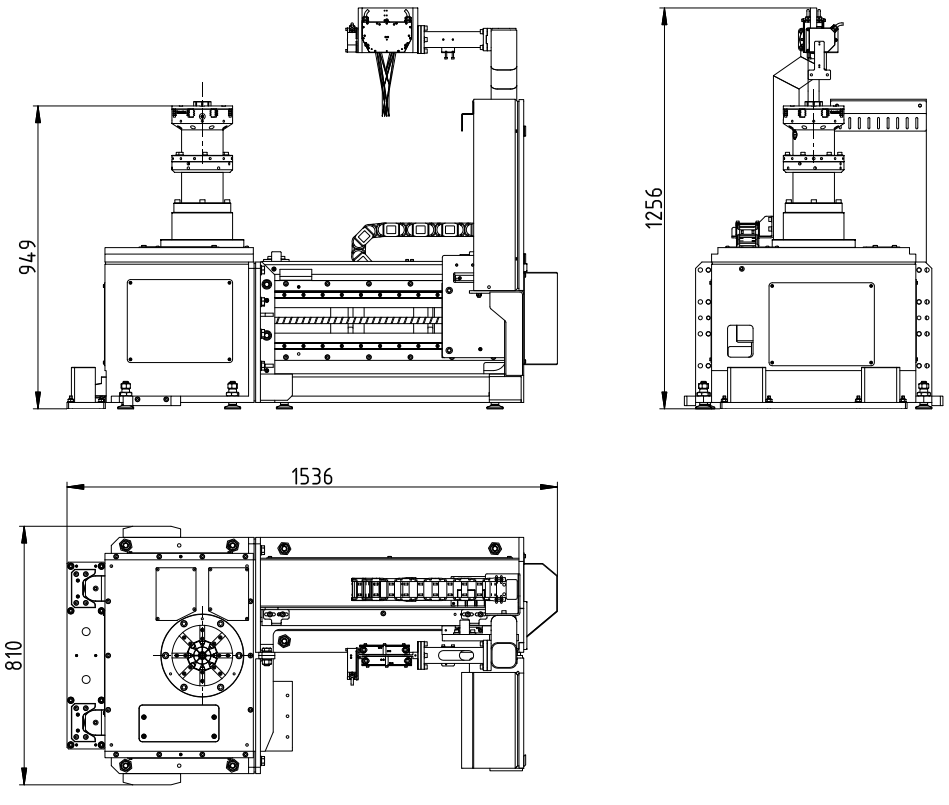
By means of a measurement unit that is optionally available, the cap area can also be checked. With a laser beam, the height and diameter of the cap fitting is measured and the wheels are evaluated in accordance with the specifications. This option slightly increases the entire cycle time.

Adjusting and test parts

Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.

TECHNICAL DATA

Machine features	measurement method	laser triangulation
	measuring characteristics	X, Y, Z position of the bolt hole pitch circle diameter and position
Wheel parameters	wheel size	14 – 24”
	center bore diameter	52 – 86 mm (optional 49 – 130 mm)
	bolt hole types	flat, tapered, ball with a radius of 12, 13 and 14 mm; 60°/90° adjustable
	number of bolt holes	3, 4, 5 and 6 (optionally up to 11)
Performance characteristics	max. channel depth of the bolt hole	75 mm
	test characteristics on the wheel	pitch circle diameter pitch circle position or pitch circle offset bolt hole, individual positions bolt depth of each hole optional: cap area, height and diameter
Technical components	HMI	19" touch display
	control system	industrial PC
	input wheel parameters	via MD760 operating system
Machine dimensions	L x W x H	1536 x 810 x 1256 mm, module size
Weight		approx. 600 kg



WALL

Wall thickness measurement

The WALL module is used for 100% measuring of the wall thickness in the compact MD760 inline measurement system.
The reduction of the wall thickness offers great potential to reduce the weight of an aluminum rim. At the same time, the requirements for ensuring the process reliability of specified wheel parameters are getting more stringent, which in turn requires the reliable testing of all wheels. The measurement takes place by means of high-precision line laser sensors and takes into account the angular position of this area in the well. Thus the “real” wall thickness, i.e. the thinnest point of the material, can be measured. Complete integration into the MD760 machine control is guaranteed, thus centralizing control system, data processing and measured value assignment.

» Precision measurement

With the use of new generation line laser sensors, the thinnest wall thickness can be measured on the wheel and faulty parts can be rejected.

» 100% monitoring

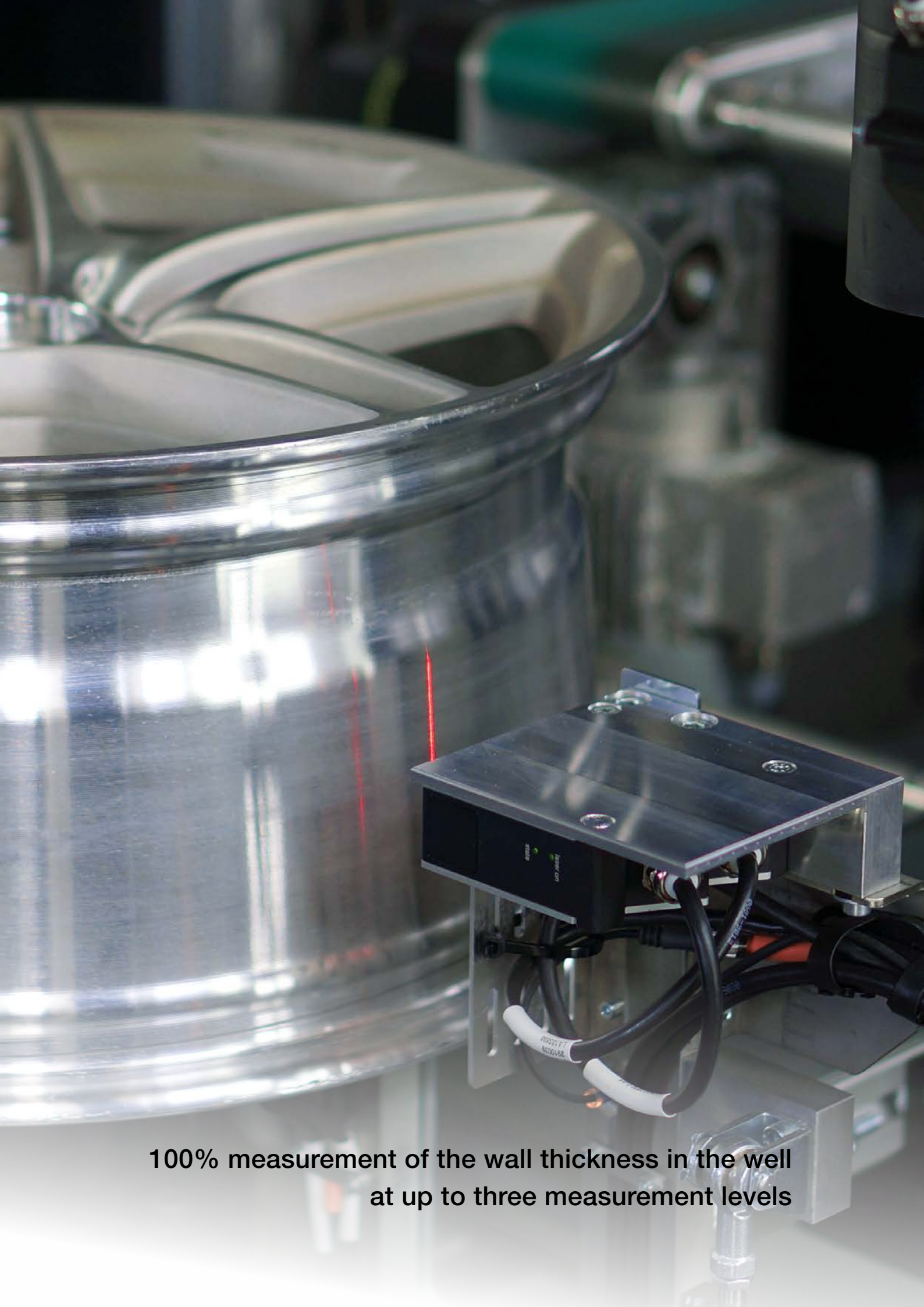
The wall thickness of each individual wheel is measured all around the circumference. Due to the possibility of measurements at several measurement levels, all critical positions are covered.

» Complete integration

HMI, data entry and logging take place via the central control system of the MD760.

» Short cycle times

The measurement of wall thickness in 3 levels takes place in a total cycle time of 12 seconds.



100% measurement of the wall thickness in the well
at up to three measurement levels

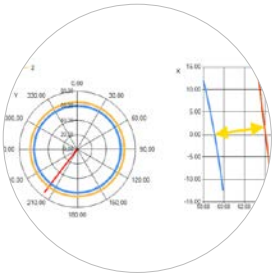
FEATURES

360 degree wall thickness measurement

The wheel is placed on a MAKRA clamping system and centered via the center bore. The measuring unit, consisting of two line laser sensors, scans the wheel around 360 degrees and determines the wall thickness.

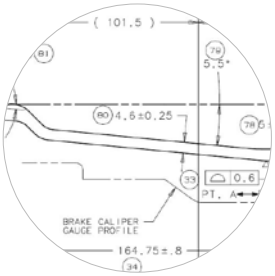
Minimum wall thickness

Taking into account the angular position of the well, the “true wall thickness” and thus the minimum material thickness is determined for each point.



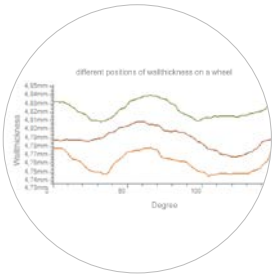
Absolute measurement

Through the calibration of the measuring sensors, the system is able to provide absolutely exact measurements. The position feedback is provided by glass measuring rods and rotary encoders. Through that the location of faults can be determined and visualized very precise.



Measurement at three levels

The measuring unit can be automatically positioned and approaches several different heights for each wheel type. This offers full flexibility in the evaluation of the wheels. If there is any contact between the measuring unit and the wheel, an integrated collision monitoring device immediately switches off the machine in order to avoid damage. Optionally, the inside hump can also be measured.

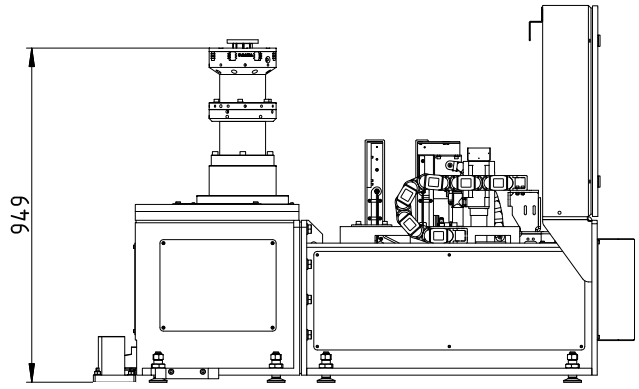


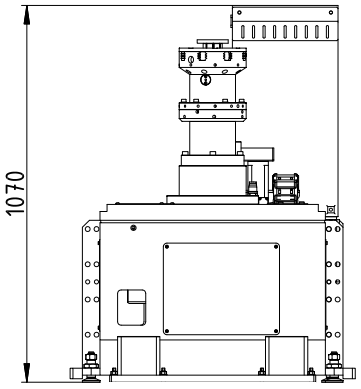
Adjusting and test parts

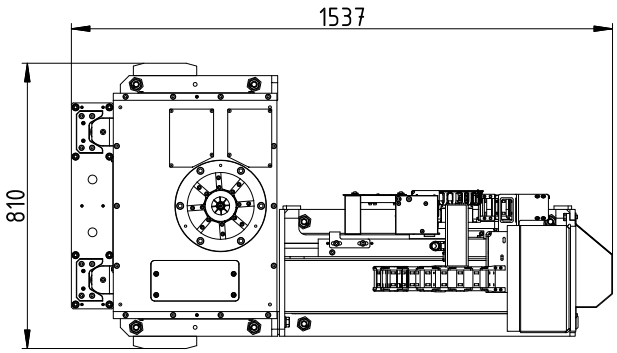
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.

TECHNICAL DATA

Machine features	measurement method	laser triangulation
	measuring characteristics	wall thickness, hump height
Wheel parameters	wheel size	15 – 24”
	center bore diameter	52 – 86 mm (optional 49 – 130 mm)
Performance characteristics	test characteristics on the wheel	minimum wall thickness all around the circumference at up to 3 levels
Technical components	HMI	19" touch display
	control system	industrial PC
	input wheel parameters	via MD760 operating system
Machine dimensions	L x W x H	1537 x 810 x 1070 mm, module size
Weight		approx. 600 kg







BORE

Center bore measurement

BORE is the measuring module for the 100% testing of the center bore in the compact MD760 inline measurement system.
Making the center bore results in increased steps and precision during production and machining because the required range of tolerance must be adhered to. Reliable monitoring and compliance with the center bore diameter in the final inspection are all the more important here. This task is performed by the BORE measuring module. Using the line laser sensor, the surface of the entire fitting area is scanned; from the result, the essential characteristics are calculated. The measuring process is extremely reliable and stable due to the installation of temperature-stable reference rings. In addition, the machine has the possibility of checking itself at regular intervals. By means of special calibration and adjustment rings, the system can be calibrated automatically.

» Precision measurement

Through the use of new generation line laser sensors, the entire fitting area can be precisely measured; from the result, the center bore diameter can be determined.

» 100% monitoring

Measurement of each individual wheel in mixed operation with variable measurement programs

» Complete integration

HMI, data entry and logging take place via the central control system of the MD760.

» Short cycle times

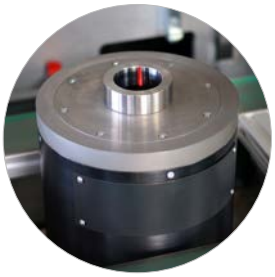
With the measuring module BORE, a total cycle time of approximately 12 seconds can be achieved.

100% measurement of the fit diameter
at production conditions

FEATURES

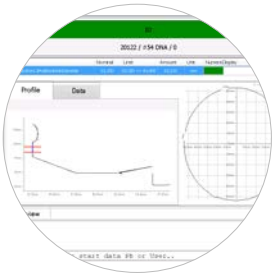
Absolute measurement

Through the calibration of the measuring sensors, the system is able to provide absolutely exact measurements. In addition, an integrated reference ring stabilizes the measurement process and offers the possibility that the measuring module checks itself at regular intervals.



Graphical analysis

All recorded data are graphically prepared for rapid analysis and stored for later evaluation. This makes the analysis of problematic wheels easier and supports the operator directly on the machine.



Adjustment tools

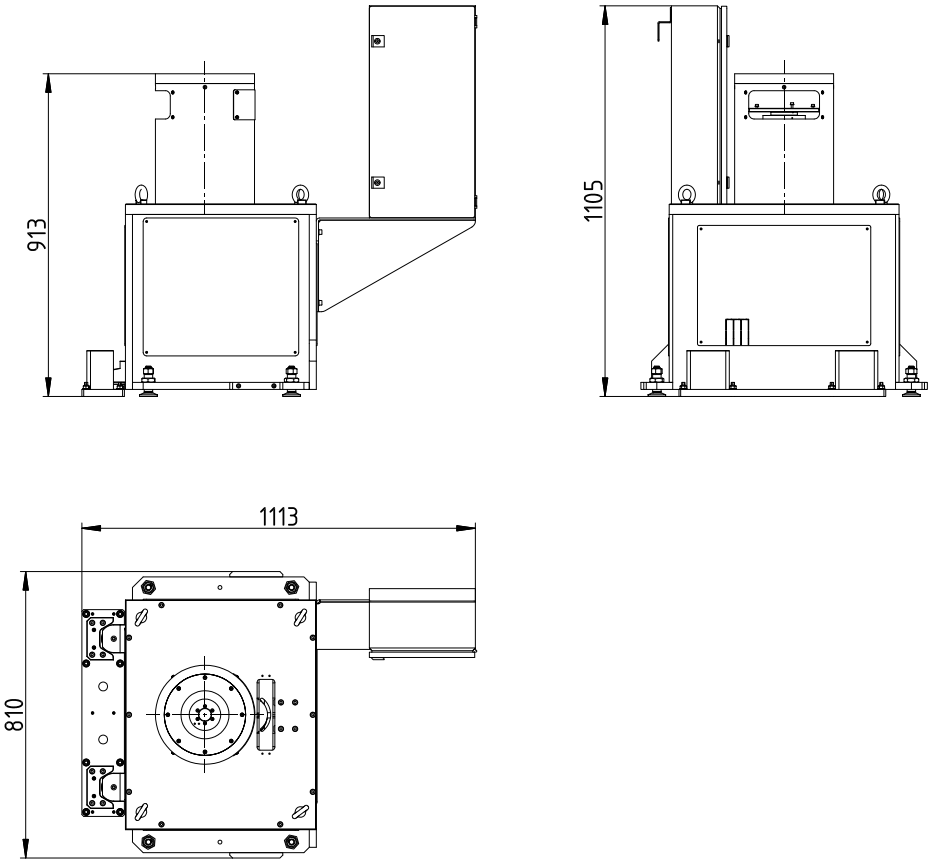
Using the supplied adjustment tools, the machine is adjusted after overhauling and is quickly ready for use again.

Adjusting and test parts

Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.

TECHNICAL DATA

Machine features	measurement method	laser triangulation
	measuring characteristics	center bore diameter
Wheel parameters	wheel size	14 – 24”
	center bore diameter	52 – 86 mm
Performance characteristics	test characteristics on the wheel	center bore diameter
Technical components	HMI	19" touch display
	control system	industrial PC
	input wheel parameters	via MD760 operating system
Machine dimensions	L x W x H	1113 x 810 x 1105 mm, module size
Weight		approx. 300 kg



UBAL

Unbalance measurement

UBAL is the module for the 100% test of the unbalance in the compact MD760 inline measurement system.

Any rotating mass has a certain production-related unbalance. Aluminum wheels undergo many processing steps in the production process that more or less impact their balancing properties. Excessive unbalance has a negative impact on the driving behavior of a vehicle. With the MD760 measuring module UBAL, the balancing values can be measured and evaluated. The measurement can be performed at two levels; thus the static and the dynamic unbalance are measured. The measurement programs can be flexibly adapted to the respective types of wheels; any position on the wheel can be measured. Thanks to the integrated valve receptacle option, the weight of a valve that is inserted later is already taken into account. The wheels are clamped on a MAKRA clamping unit via the center bore and rotated. The module is based on the proven Hofmann measurement technology. Equipped with an automatic calibration facility, the measuring module is able to calibrate new wheel types automatically at the first measurement. For a reliable measurement process, a cyclic self-check with adjustable interval can be enabled.

» Precision measurement

The use of the proven measurement technology from Hofmann allows the measurement of the static and dynamic unbalance on the inner and outer rim flange.

» Analysis

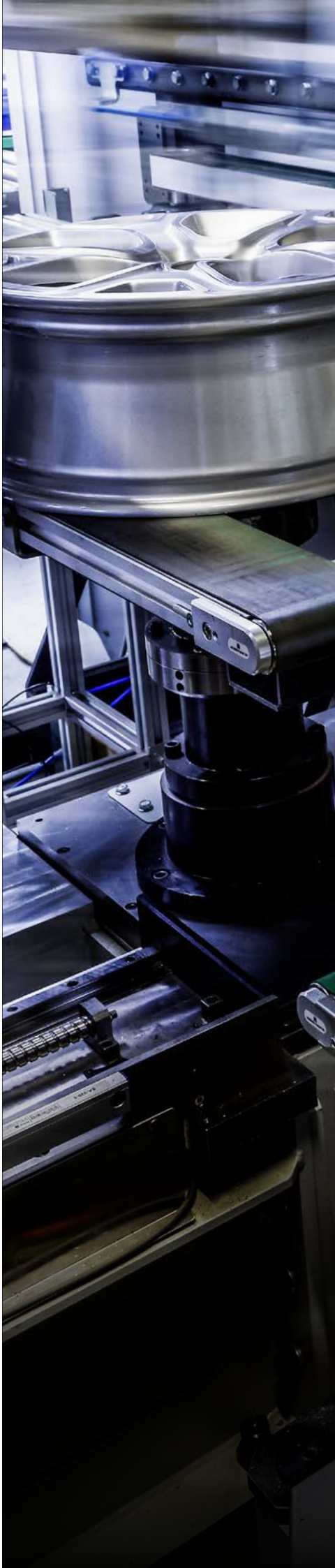
Separate evaluation of static and dynamic unbalance.

» Complete integration

HMI, data entry and logging take place via the central control system of the MD760.

» Short cycle times

The entire measurement is carried out within 15 seconds. This allows up to 240 wheels per hour to be measured with only one single machine.



100% testing of the static and dynamic unbalance
with integrated valve compensation

FEATURES

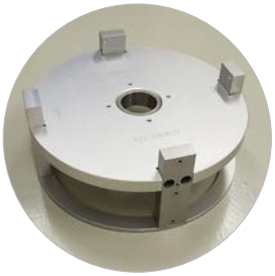
Wide range clamping system

The clamping unit, which is already used in many MAKRA measuring machines, ensures an exact and repeatable clamping of the wheels with its high-precision rotary bearing. Thanks to the small number of radial and axial runout errors, the clamping unit is the best basis for the measurement of the unbalance. It is the only way to assure the required measured characteristics of the machine permanently. With additional stepped jaws, center holes of up to 130 mm can be clamped.

Integrated calibration device

The unit integrated in the module allows the calibration of the machine for each serial part. This process takes place automatically at the first measurement of a wheel. In addition, there is the possibility of enabling a cyclic self-check. This means that specific procedures check whether anything has changed on the machine. Errors in the clamping of the wheels, for example caused by contamination or chips, can be easily detected this way.

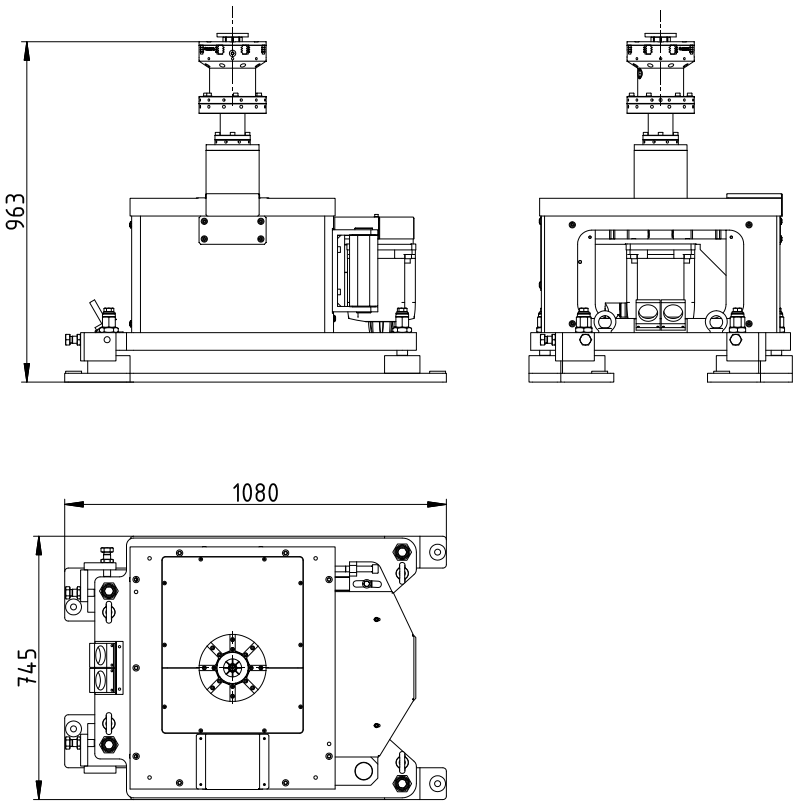
Adjusting and test parts



Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts. In addition, a kit of test weights is included in the delivery, with which the machine can be easily checked.

TECHNICAL DATA

Machine features	measurement method	unbalance measurement using plunger coil sensor
	measuring characteristics	unbalance and position
Wheel parameters	wheel size	14 – 24”
	center bore diameter	52 – 86 mm (optional 49 – 130 mm)
Performance characteristics	test characteristics on the wheel	position of the largest and smallest imbalance, static or dynamic, at two levels
Technical components	HMI	19" touch display
	control system	industrial PC
	input wheel parameters	via MD760 operating system
Machine dimensions	L x B x H	1080 x 745 x 963 mm, module size
Weight		approx. 700 kg



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