

MD860

Modular inline wheel measurement





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

MD860

Modular inline wheel measurement

Due to the increasing quality requirements for finished products in aluminum wheel production, it is necessary to check critical characteristics 100%. The MD860 inline test system offers exactly this option. In addition, it can be custom-tailored to the specific requirements of wheel manufacturers.

The test system can be integrated directly in the production line and uses a camera system or data matrix reader station to identify the respective wheel type. This means that the system has been designed for full mixed operation and that it can measure and test wheels from 14" to 24" without retooling. The greatest possible flexibility is achieved by the modular structure of the individual measuring modules. Modules for radial and axial runout, pitch circle and bolt hole measurement, wall thickness measurement, unbalance measurement and center bore measurement can be arranged in any order. Subsequent expansion and integration of additional measuring modules is possible at every position. Thanks to the compact design of the modules, the

basic machine is extended by no more than one meter for each additional measuring module. Roller conveyors, conveyor systems or buffer positions between the individual test modules are no longer required. The wheels are manipulated by a gripper system and then placed on the MAKRA wide range clamping system on a controlled basis. The highly dynamic vertical and horizontal movements take place using servo drives. With a production capacity of approx. 5500 wheels a day per machine, even large production volumes can be monitored by only one system. HMI and data entry is done via a central control unit, which can be placed as required so as to ensure the best possible insight into the machine. The measurement data generated is centrally collected, allowing easy integration in a customer database. If the wheels are equipped with a data matrix marking, all measured data can be uniquely assigned to the respective wheel. For maintenance purposes the measuring modules can be taken out from the machine. With a built-in centering fixture the module can be easily put back on its original place.

YOUR ADVANTAGES

- » Reliability of your production
100% check of all wheels before delivery
- » Optimized wheel handling
Maximum speed through form-fit gripping technology
- » HMI
Central HMI and data logging of all machine parts
- » Modular machine design
Full flexibility in the selection of measuring modules and their position
- » Prepared for the future
Simple integration of new measuring and test requirements

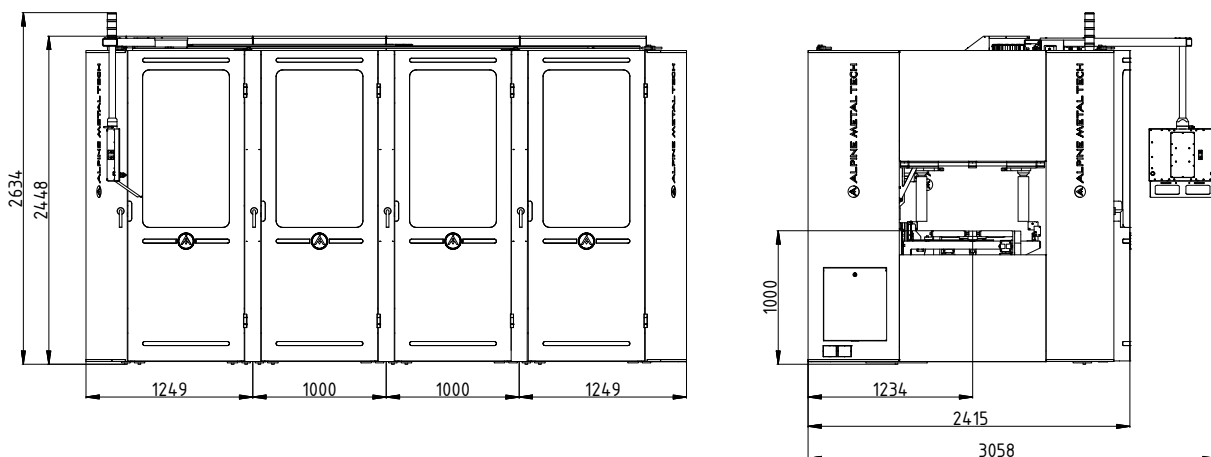


TECHNICAL DATA

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	capacity	approx. 240 wheels/hour
characteristics	cycle time	approx. 15 seconds, depending on the individual system
Technical components	HMI	19" touch display
	control system	Siemens S7 series
	wheel gripper	pneumatic gripper system
	horizontal drive	servo motor
	vertical drive	servo motor
Interfaces		Profibus, Profinet, EtherNet/IP, Parallel I/O
Media	electric connection	3 x 400 VAC, 50 Hz, 35 kVA
		optional 3 x 460 VAC, 60 Hz, 35 kVA
	performance depends on the configuration	
	pneumatic connection	at least 6 bar
Machine dimensions	length	1249 mm for infeed and outfeed module
		1000 mm per measuring module
	width	2415 mm
	height	2634 mm
	lifting height of table	400 mm
Weight		2900 – 4900 kg (depending on the configuration)

All rights reserved including errors and technical changes.

Example configuration with 3 measuring modules



MD860 MODULES





① Infeed

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



② RUNA

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



③ BOLT

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



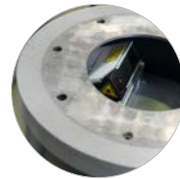
④ WALL

- » Wall thickness measurement



⑤ BORE

- » Center bore measurement



⑥ UBAL

- » Dynamic unbalance measurement
- » Static unbalance measurement



⑦ Outfeed

- » Marking options:
 - Inkjet marking
 - Pin marking
 - Needle marking



RUNA

Radial and axial runout measurement

RUNA is the module for 100% measurement of the radial and axial runout in the MD860 modular inline test 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 MD860. The wheel data is entered centrally in the MD860 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 MD860.

» Short cycle time

The entire measurement takes place within the total cycle time of the MD860 modular inline measurement machine. This allows up to 240 wheels per hour to be measured with only one single system.



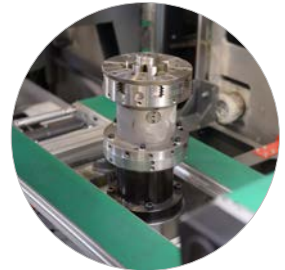


100% measurement of radial and axial runout

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.



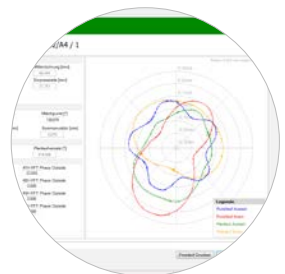
Harmonic and match point

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

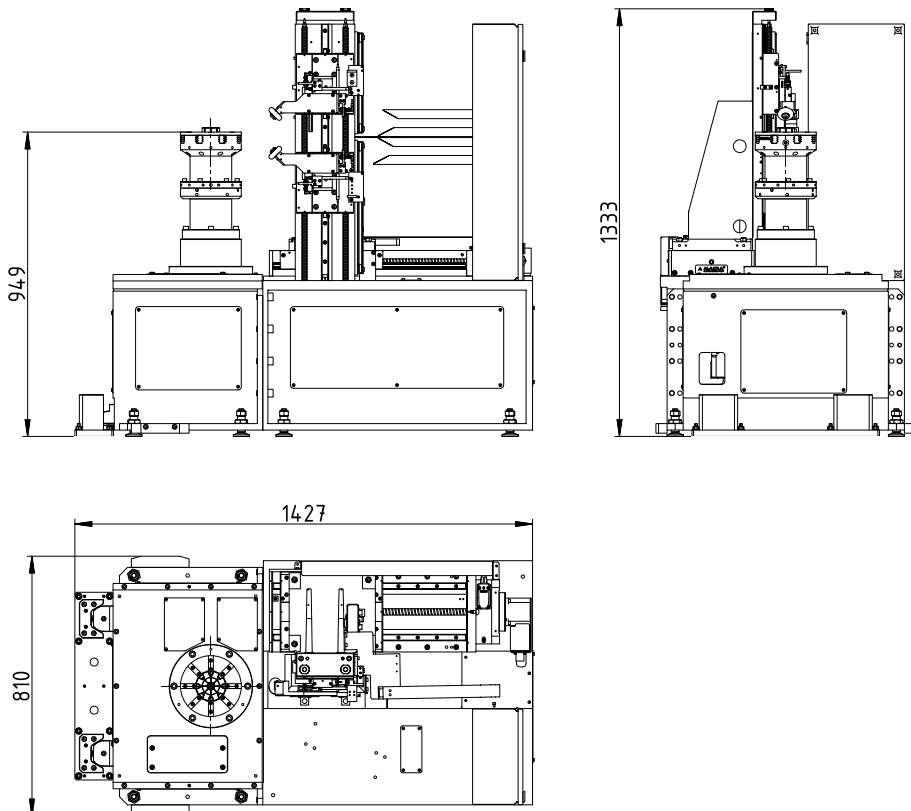
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.



TECHNICAL DATA

Machine features	measurement method measuring characteristics	tactile through standard rollers radial and axial runout parameters
Wheel parameters	wheel size wheel height center bore diameter	14 – 24" 3.5 – 14" (depending on offset) 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 control system input wheel parameters	via MD860 control panel industrial PC via MD860 operating system
Interfaces		Profibus for MD860
Media	electric connection pneumatic connection	3 x 400 VAC, 50 Hz, 2 kVA optional 3 x 460 VAC, 60 Hz, 2 kVA at least 6 bar
Machine dimensions	L x W x H	1427 x 810 x 1333 mm, module size
Weight		approx. 800 kg

All rights reserved including errors and technical changes.



BOLT

Bolt hole and pitch circle measurement

The BOLT module is used for 100% measurement of pitch circle and bolt parameters in the MD860 modular inline measuring 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 MD860 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 MD860 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 MD860.

» Short cycle times

The entire measurement takes place within the total cycle time of the MD860 modular inline measurement machine. This allows up to 240 wheels per hour to be measured with only one single system.





**100% measurement of the pitch circle parameters
and bolt parameters**

FEATURES

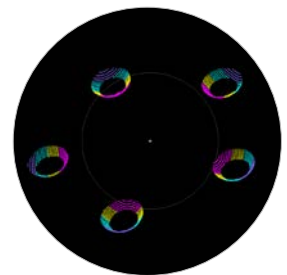
Bolt hole measurement

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.



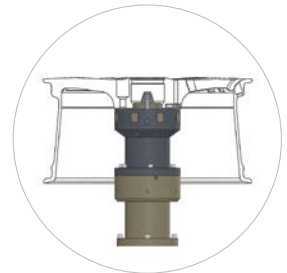
Position calculation

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

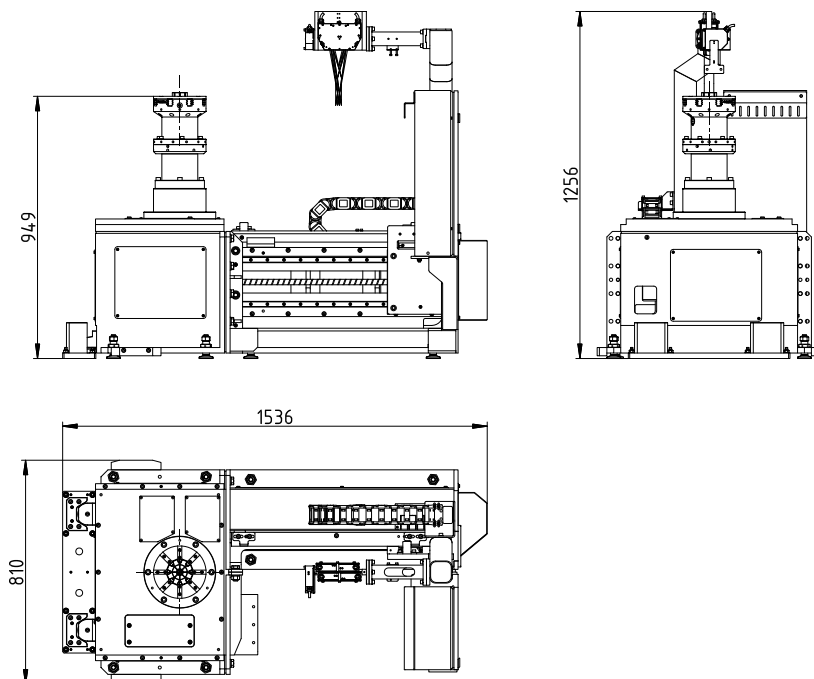
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.



TECHNICAL DATA

Machine features	measurement method measuring characteristics	laser triangulation X, Y, Z position of the bolt hole pitch circle diameter and position
Wheel parameters	wheel size center bore diameter bolt hole types number of bolt holes max. channel depth of the bolt hole	14 – 24" 52 – 86 mm (optional 49 – 130 mm) flat, tapered, ball with a radius of 12, 13 and 14 mm; 60°/90° adjustable 3, 4, 5 and 6 (optionally up to 11) 75 mm
Performance characteristics	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 control system input wheel parameters	via central MD860 control system industrial PC via MD860 operating system
Interfaces		Profibus for MD860
Media	electric connection pneumatic connection	3 x 400 VAC, 50 Hz, 7 kVA optional 3 x 460 VAC, 60 Hz, 7 kVA at least 6 bar
Machine dimensions	L x W x H	1536 x 810 x 1256 mm, module size
Weight		approx. 600 kg

All rights reserved including errors and technical changes.



WALL

Wall thickness measurement

The WALL module is used for 100% measuring of the wall thickness in the MD860 modular inline test 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. The system can measure the wall thickness all around within the set MD860 cycle time for up to three height positions in the well. Due to its compact design, the WALL module can be installed as an extension to the BOLT module (bolt hole and pitch circle measurement) or as an individual module. Complete integration into the MD860 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.

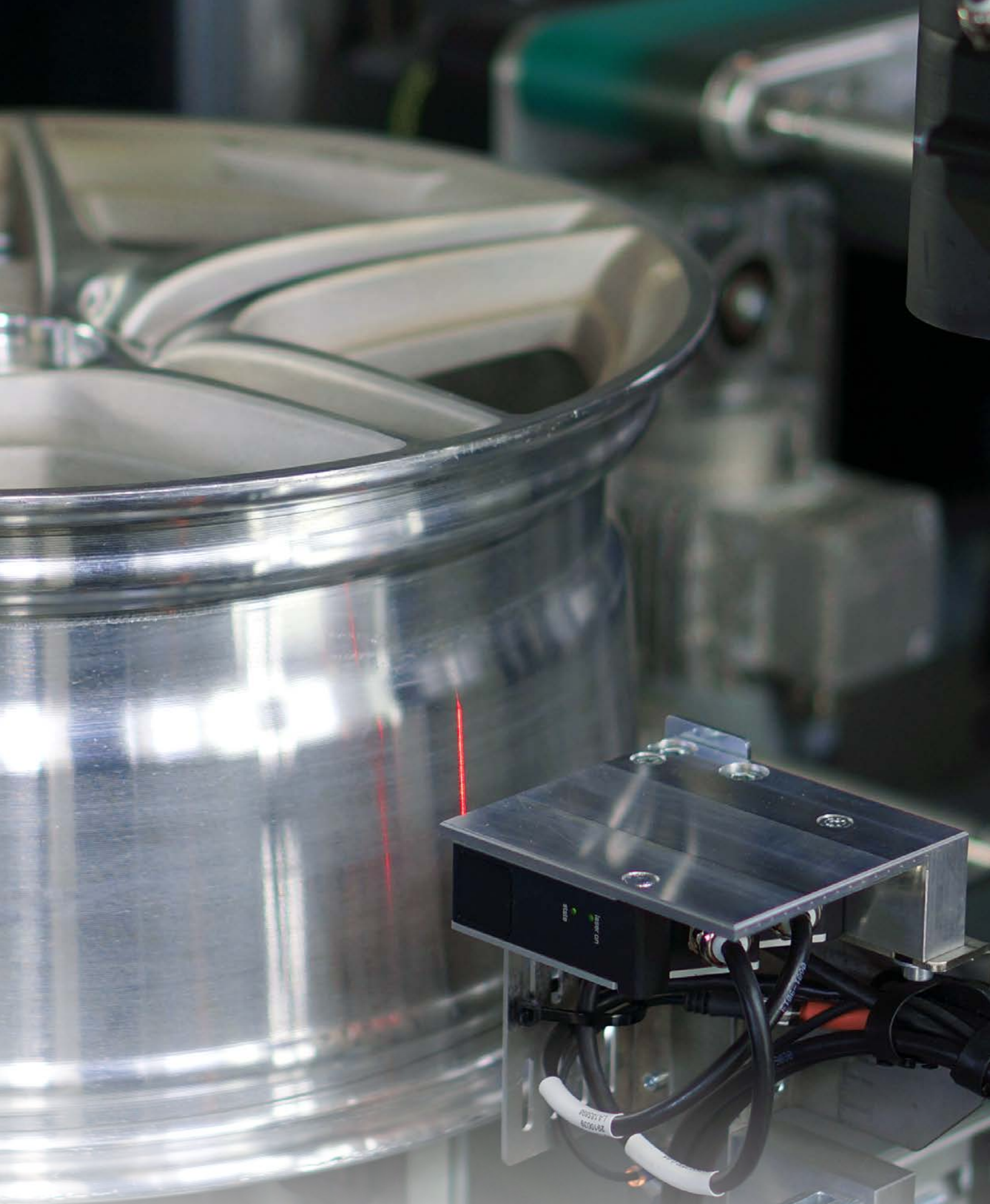
» Complete integration

HMI, data entry and logging take place via the central control system of the MD860.

» Short cycle times

The entire measurement takes place within the total cycle time of the MD860 modular inline measurement machine. This allows up to 240 wheels per hour to be measured with only one single system.





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

FEATURES

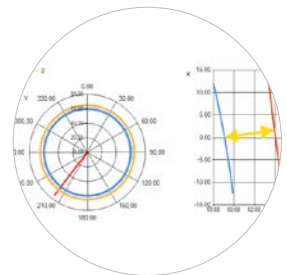
360 degree wall thickness measurement

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.



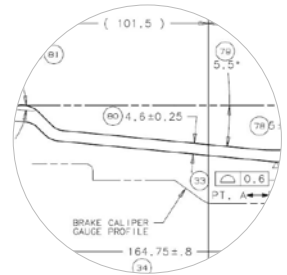
Minimum wall thickness

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



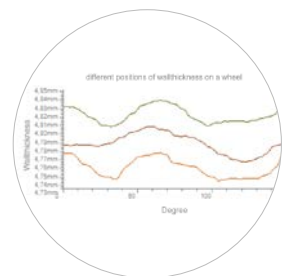
Absolute measurement

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 detimined 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. Up to three measurement levels can be measured within the overall cycle of the MD860. 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

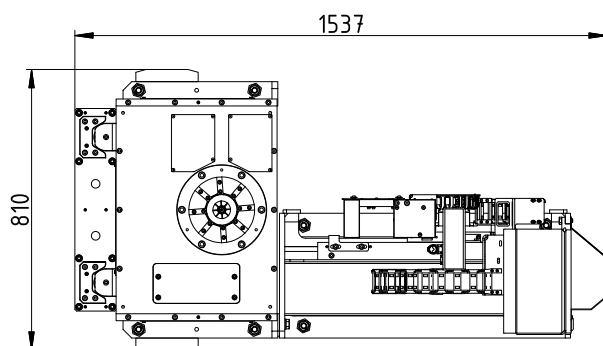
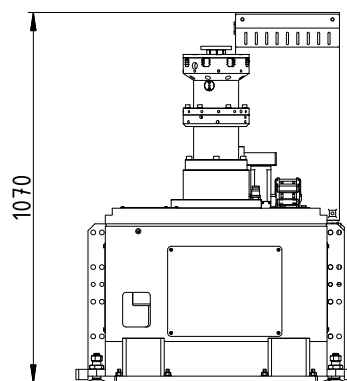
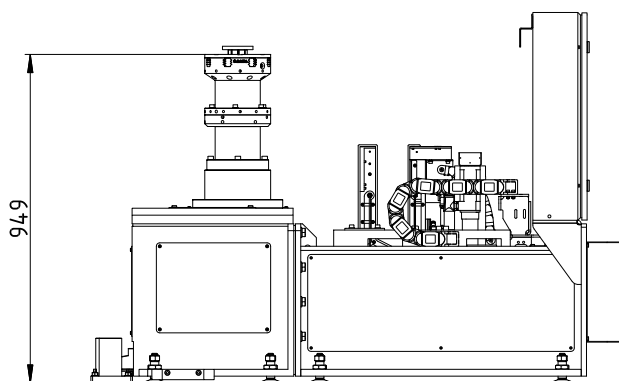
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.



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	via central MD860 control system
	control system	industrial PC
	input wheel parameters	via MD860 operating system
Interfaces		Profibus for MD860
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	1537 x 810 x 1070 mm, module size
Weight		approx. 600 kg

All rights reserved including errors and technical changes.



BORE

Center bore measurement

BORE is the measuring module for the 100% testing of the center bore in the MD860 modular inline 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 MD860.

» Short cycle times

The entire measurement takes place within the total cycle time of the MD860 modular inline measurement machine. This allows up to 240 wheels per hour to be measured with only one single system.



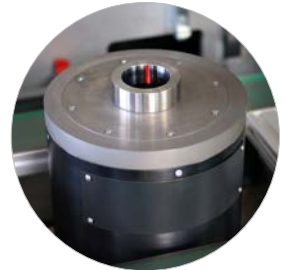


**100% measurement of the fit diameter
at production conditions**

FEATURES

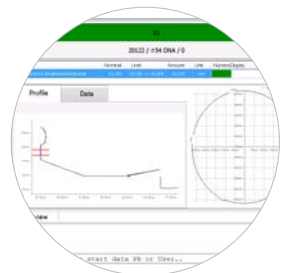
Absolute measurement

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.



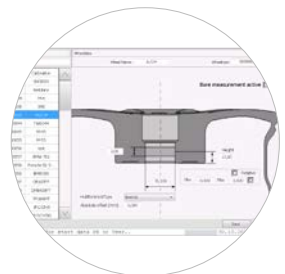
Adjustment tools

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



Integration in the MD860 software

With the central data entry, all measuring modules are supplied with the necessary data. The data management takes place through the module control of the MD860. With the integrated database, all requirements for an individual serial number and an assignment of all measurements to a single wheel are already given. This ensures quick and easy access to all measurement data and measurement results and makes wheel-specific analyses possible.



Adjusting and test parts

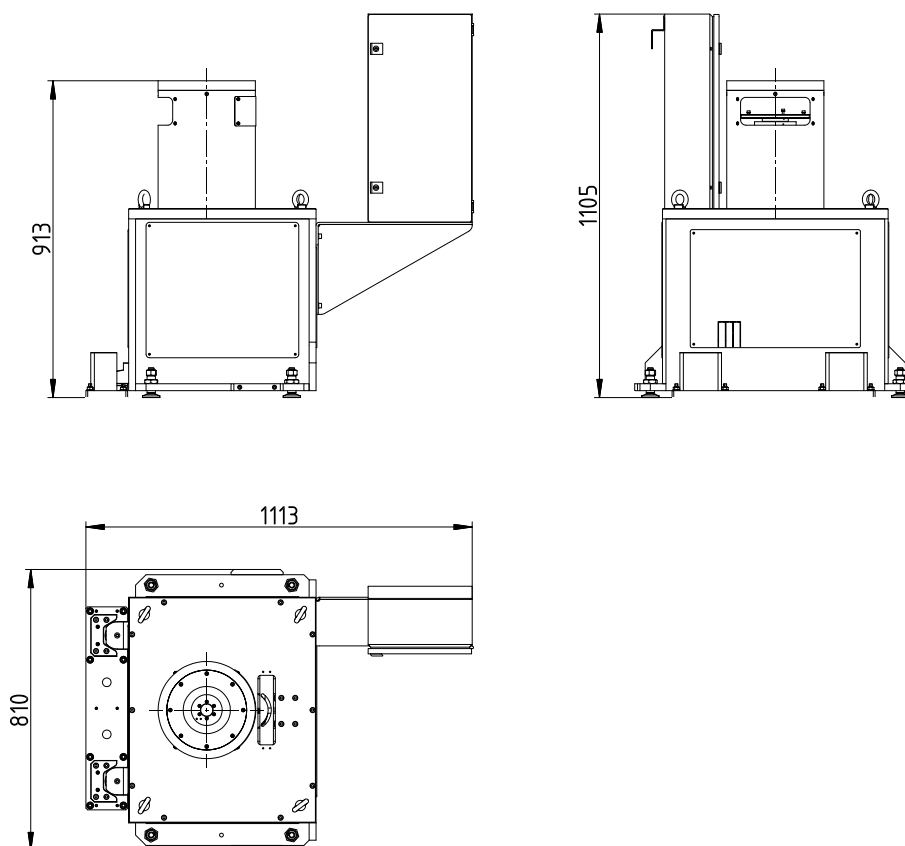
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts.



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	via central MD860 control system
	control system	industrial PC
	input wheel parameters	via MD860 operating system
Interfaces		Profibus for MD860
Media	electric connection	3 x 400 VAC, 50 Hz, 2 kVA optional 3 x 460 VAC, 60 Hz, 2 kVA
	pneumatic connection	at least 6 bar
Machine dimensions	L x W x H	1113 x 810 x 1105 mm, module size
Weight		approx. 300 kg

All rights reserved including errors and technical changes.



UBAL

Unbalance measurement

UBAL is the module for the 100% test of the unbalance in the MD860 modular inline test 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 MD860 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

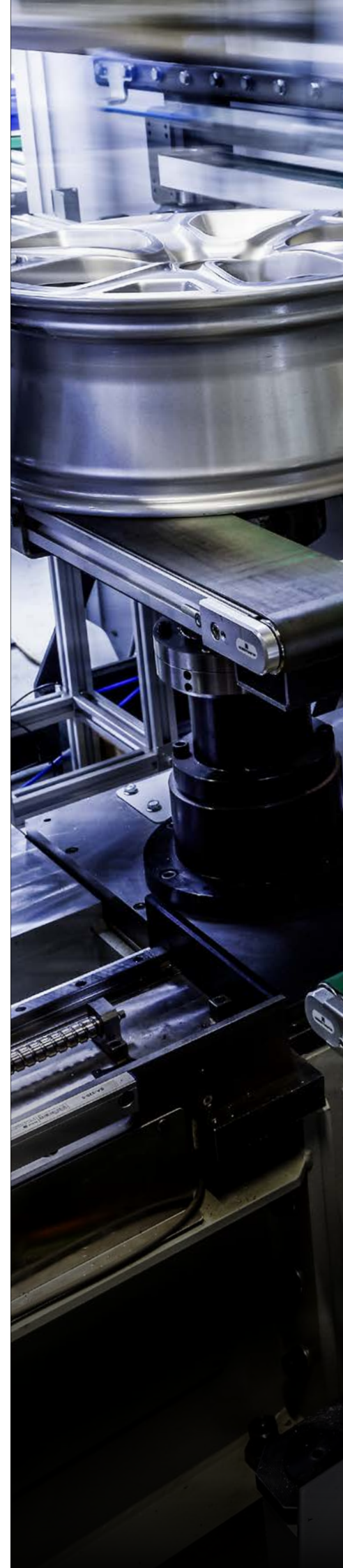
Separate evaluation of static and dynamic unbalance.

» Complete integration

HMI, data entry and logging take place via the central control system of the MD860.

» Short cycle times

The entire measurement takes place within the total cycle time of the MD860 modular inline measurement machine. This allows up to 240 wheels per hour to be measured with only one single system.



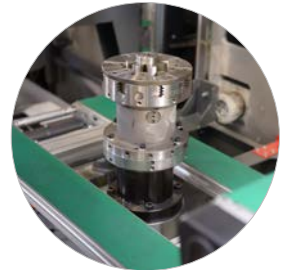


**100% testing of the static and dynamic unbalance
with integrated valve compensation**

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.



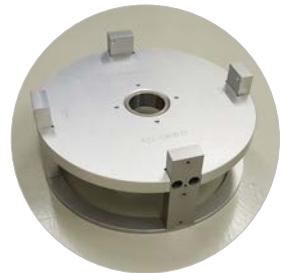
Integrated calibration device

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

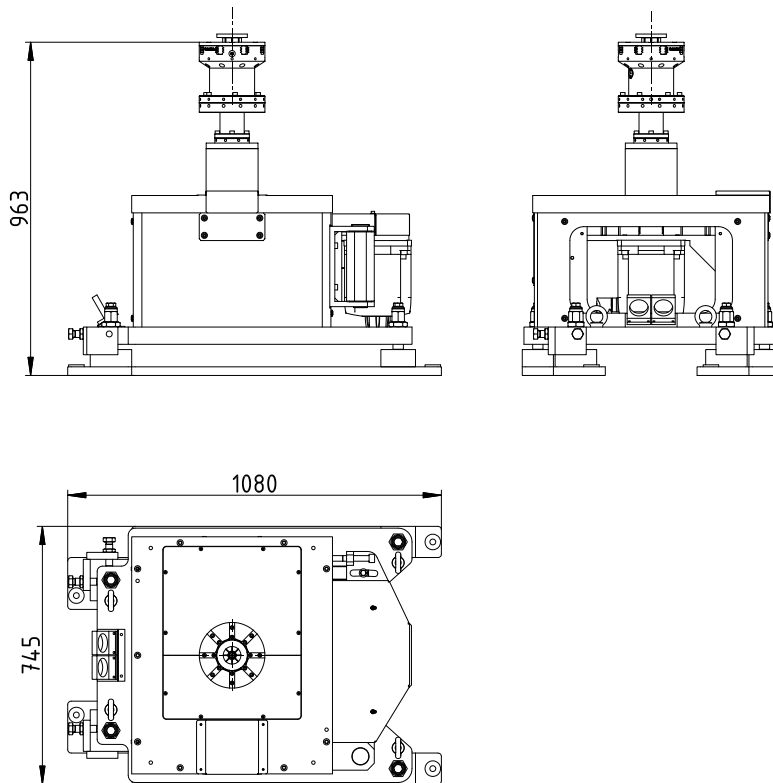
Adjusting and test parts for calibration and periodical machine checking are optionally available. A measurement protocol with all relevant test parameters is enclosed with the parts. In addition, a kit of test weights is included in the delivery, with which the machine can be easily checked.



TECHNICAL DATA

Machine features	measurement method measuring characteristics	unbalance measurement using plunger coil sensor unbalance and position
Wheel parameters	wheel size center bore diameter	14 – 24" 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 control system input wheel parameters	via central MD860 control system industrial PC via MD860 operating system
Interfaces		Profibus for MD860
Media	electric connection pneumatic connection	3 x 400 VAC, 50 Hz, 9.4 kVA optional 3 x 460 VAC, 60 Hz, 9.4 kVA at least 6 bar
Machine dimensions	L x W x H	1080 x 745 x 963 mm, module size
Weight		approx. 700 kg

All rights reserved including errors and technical changes.



Alpine Metal Tech GmbH

Buchbergstraße 11

4844 Regau, Austria

Tel.: +43 7672 78134-0

E-mail: office@alpinemetaltech.com

Web: www.alpinemetaltech.com

