

DITTEL
MARPOSS

**Balancing heads | AE-Sensors
Electronics | Condition Monitoring**

MARPOSS

Using wheel balancer and sensors for monitoring, controlling grinding applications and dressing processes, the efficiency and safety of your grinding and combi-machines will increase. The systems are suitable for surface grinding, external cylindrical grinding, internal circular grinding, gear grinding or tool grinding machines – whether grinding steel, ceramic or glass workpieces. Monitoring processes are essential when using CBN and diamond grinding wheels.

When DITTEL was founded in 1959, it was involved with the development and series production of avionics. The company is now active in the fields of balancing and monitoring technologies and power electronics. We provide our customers with individual advice in order to make their businesses more successful, covering topics from planning to training. We also pick up trends in our customers' markets and, in turn, develop new products in close co-operation with our customers. And ultimately, our network of highly effective alliances, industrial partners, university and research facilities, working groups and industrial associations, all serve to benefit you, the customer. Since the beginning DITTEL stands for precision, quality and reliability.

Since July 2012 Dittel Messtechnik GmbH is a part of Marposs S.P.A. and customer can now profit from the worldwide network of Marposs, present in 23 countries with sales offices and after sales service centers.

Marposs, established in 1952 by Mario Possati, is the leader supplier of precision instruments for dimensional and geometrical measurement of mechanical parts in the shop floor environment: gauges and control systems for machine tools, manual and automatic systems for manufacturing and assembly lines, hardware and software for data collection and process analysis, non destructive testing equipment and leak test systems, with particular reference to components of car engine, transmission and injection. The Headquarters and the main plant are located in Bentivoglio (BO).



Marposs - Bentivoglio (BO - Italy)

Dittel - Landsberg am Lech (Germany)



Depending on the type of grinding machines,
for new machines or in case of retrofit
on used ones, we have different possible applications:

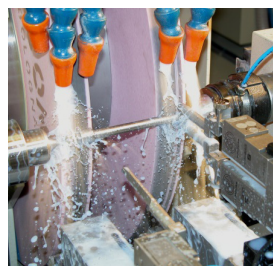


Balancing systems
(manual & automatic)

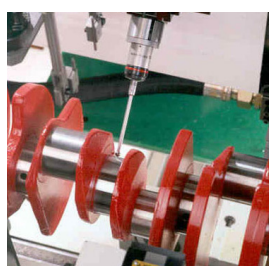


Monitoring systems
(acoustic emission)

Balancing systems
Acoustic Emission Sensors
Monitoring Systems



Measuring systems
(in-process and
post-process gauging)



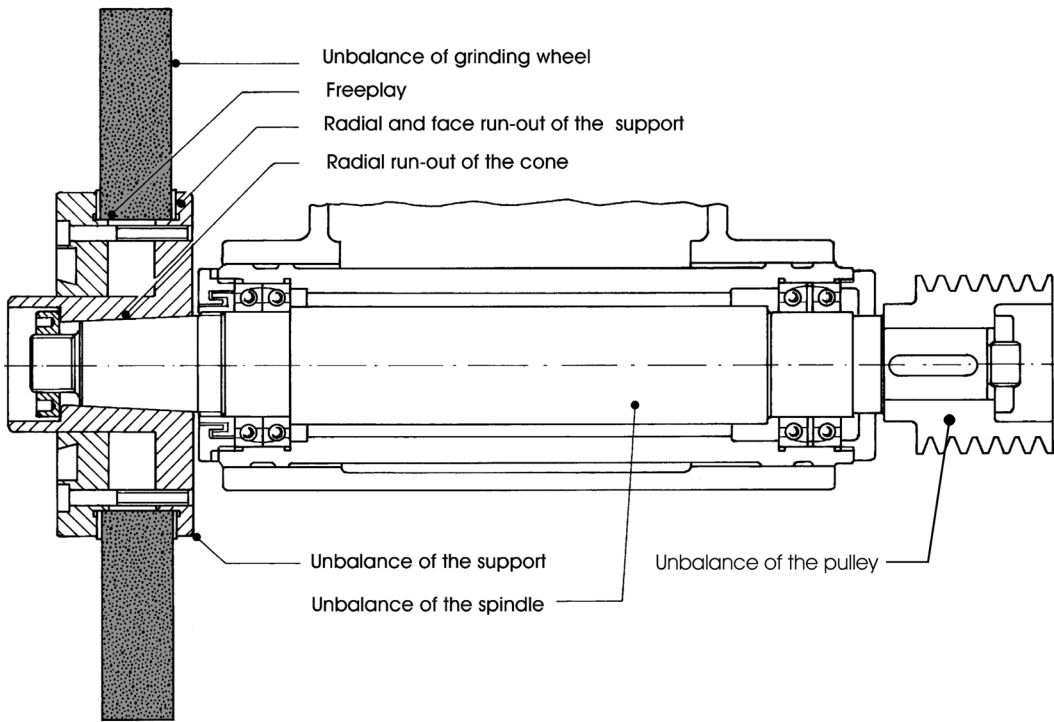
Touch probes
(automatic setting &
part probing)

in combination with
Measuring systems & Touch probes

Type of Grinding machine	Measuring	Balancing	Monitoring	Probing
O.D. Grinders	●	●	●	●
I.D. Grinders	●	●	●	●
Centerless Grinders	●	●	●	
Tool Grinders		●	●	●
Surface Grinders	●	●	●	●
Double Disk Grinders	●	●	●	●
Honing & Microfinishing	●			●
Gear-Grinding-Worm	●	●	●	●

Unbalance

Balancing systems are based on a highly precise mechanical balancing head and a well-established balancing strategy. The use of balancing systems ensures that imbalances are detected early and dealt with in time. This in turn provides our customers with a constantly high level of workpiece quality and long machine and tool life.



Why should the grinding wheel to be balanced:

Optimally balanced grinding wheels and drive elements are essential for consistent high workpiece quality and increase the service life of the grinding wheel and the life of the grinding spindle. Setup times will be minimized.

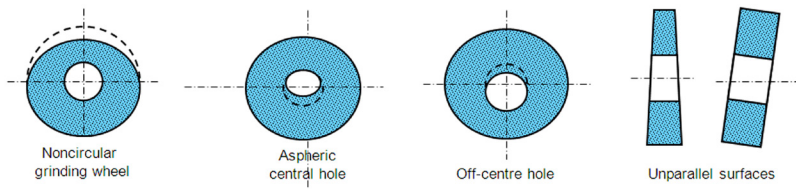
Unbalance - results from?

Each body fixed on a rotating axis has imbalances that manifest themselves as vibrations or oscillation and noise.

Unbalances occur whenever the material is not distributed symmetrically of rotating bodies. Especially at high speeds this results in increased wear of vibrations. The unbalance can be either static or dynamic form. In most cases, both forms occur simultaneously.

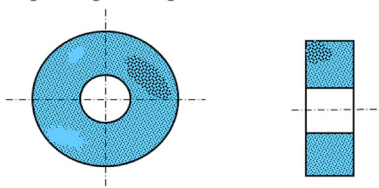
Imperfections in grinding wheel geometry

unbalances caused by grinding wheel



Grinding wheel heterogeneity

irregular grinding wheel structure/density distribution



Balancing

How works balancing on grinding machines?

Through the ramp-up of the spindle and the rotation of the grinding wheel this will generate an unbalance which brings the grinding wheel to oscillate.

Even slight imbalances of the wheel or as well the clamping of flange will generate centrifugal forces specially for high rpm.

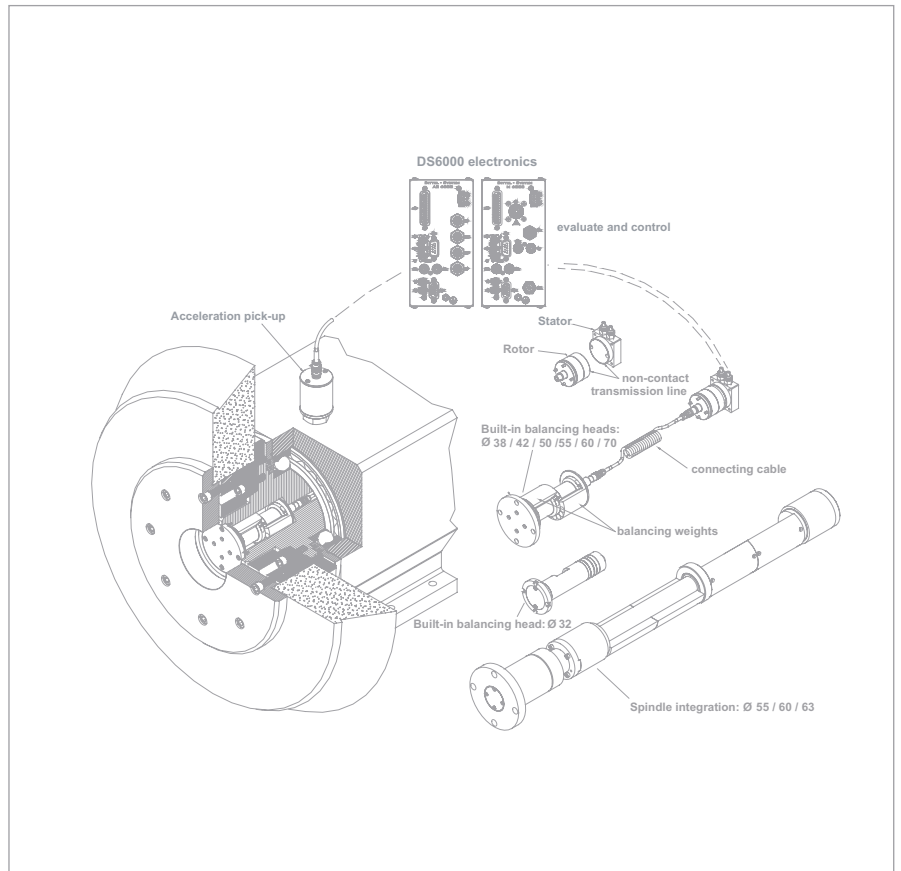
The vibration pick up will shown the vibration in $\mu\text{m}/\text{sec}$, and the balancing system will be detected and processed. The wheel will be balanced by adjusting the attaced masses (manual with weights or electromechanical with balancing head), as a kind of counterweight.

The balancing operation will repeated as soon as a new unbalance (set limit) is detected by the vibration sensor, or the grinding wheel is changed / renewed.

Benefits

the constant unbalance monitoring and continuous balancing or rebalancing leads to:

- desired workpiece surfaces (without chattermarks and wavy quality)
- low wearing of the spindle bearing
- prevents material fatigue and prevent failure function of important parts
- machine & spindle downtime will shortened
- low erosion of grinding wheels and less dressing operations
- Machine and user are better protected



The mechanical balancing system for the detection, counterbalancing and compensation of imbalances consists of a balancing head, a highly precise acceleration pick-up and the electronic module. Depending on the design of the balancing head it is possible to integrate an Acoustic Emission sensor. So the extension of the system by an Acoustic Emission Module due to modular design is easily made. This further optimizes the overall performance.

Electromechanical balancing heads can be mounted either in or, using customer designed flanges, on the end of the grinding spindle. The balancing heads are compact, cover a wide range of balancing capacities and are suitable for high RPMs. Signals and power are transmitted without physical contact, eliminating the need for virtually all system maintenance. Acoustic emission sensors can be integrated into the balancing head, significantly increasing the range of functions - and the benefits to the customer.

Electromechanical balancing heads - Flange Type (FT)

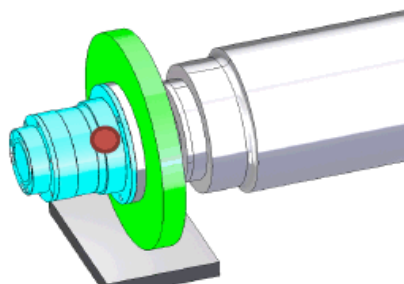
External balancing heads - Flange type (FT):

Applications:

For all grinding machines without automatic quick change

Advantages:

- Suitable for retrofitting
- RPMs up to 12,000 1/min
- Easy to assemble
- Compact design
- No maintenance
- AE sensor can be integrated

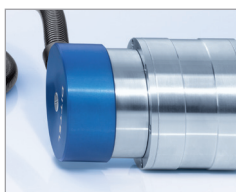


Retractable contacts (FTR)



Outer Ø [mm]	Capacity max. [cmg]	Max. rev. [min ⁻¹]	Transmission System
112	2000	3000	Marposs
132	6000	2000	Marposs
165	7500	1000	Marposs

Attached transmitter (AT)



Outer Ø [mm]	Capacity max. [cmg]	Max. rev. [min ⁻¹]	Transmission System
70	550	10.000	Dittel
80	800	10.000	Dittel
102	2.200	5.500	Dittel
122	4.500	4.000	Dittel
142	7.500	2.000	Dittel

Non-contact power transmission



Outer Ø [mm]	Capacity max. [cmg]	Max. rev. [min ⁻¹]	Transmission System
50	320	12.000	Dittel
70	550	11.000	Dittel
80	800	10.000	Dittel
102	2.200	5.500	Dittel
112	2.000	8.000	Marposs
122	4.500	4.000	Dittel
132	6.000	3.000	Marposs
142	7.500	2.000	Dittel

Electromechanical balancing heads - Spindle Type (ST)

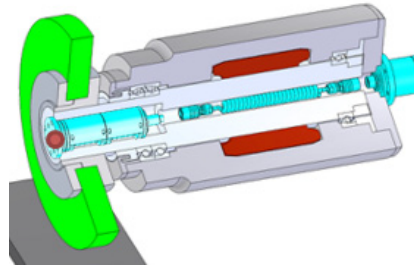
Built-in balancing heads - Spindle type (ST):

Applications:

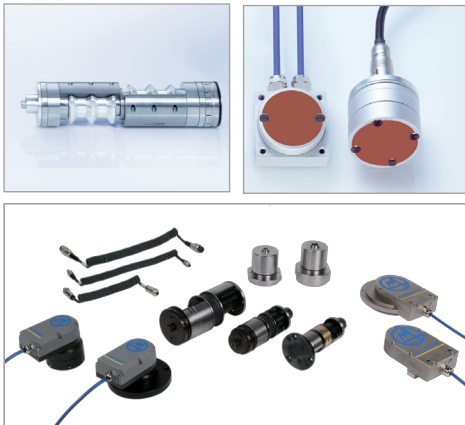
For all grinding machines with a frontal spindleboring

Advantages:

- Balancing head in the centre of imbalance
- RPMs up to 20,000 1/min
- Minimum interference
- No maintenance
- AE sensor can be integrated
- Non-contact power transmission



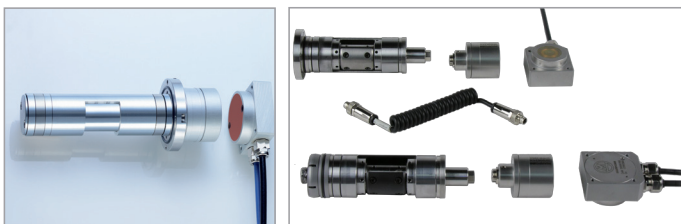
WB heads adjacent (two weights)



Outer Ø [mm]	Capacity max. [cmg]	Max. rev. [min -1]	Transmission System
38	400	20.000	Dittel/Marposs
42	640	15.000	Dittel/Marposs
50	1.300	10.000	Dittel/Marposs
55	1.500	8.500	Dittel/Marposs
60	2.200	7.500	Dittel/Marposs
70	3.300	6.000	Dittel/Marposs
81	8.500	1.400	Dittel/Marposs

Other types on request

WB heads coplanar (TF torque free)



Outer Ø [mm]	Capacity max. [cmg]	Max. rev. [min -1]	Transmission System
28	50	20.000	Dittel
32	110	20.000	Dittel/Marposs
38	140	11.500	Dittel/Marposs
42	500	10.500	Dittel/Marposs
50	950	6.800	Dittel/Marposs

Other types on request

E78/E82

Electromechanical balancing

The E78 and E82 balancer controller are microprocessor electronic amplifier that continuously controls the vibration of the grinding wheel.

All working parameters are easily programmable to ensure the maximum flexibility in all applications.

Basic functions:

The following parameters can be programmed:

- Vibration limits:
L1 = In tolerance;
L2 = Approaching out of tolerance;
L3 = Out of tolerance
- Vibration measurement:
Amplitude (micron & inch) or
Speed (mm/s)
- Operating modes:
Automatic; Manual and Programming data
- Dampening filters
- GAP, dressing and crash limits (E82)
- AE sensor frequency range (E82)
- Language:
English, German, French and Italian

Features:

A simple and clear message display for speed, alarm messages and programming information.

The E78 can be used with balancing heads retractable contacts (FTR and STR) while E82 with contactless transmission balancers and integrated grinding wheel acoustic check sensor (FTCG and STCG)
Both electronic units can be supplied with stand-alone box, rack mount for 19" drawer or with remote panel.



E78

M5100

Electromechanical balancing

The M5100M combines the monitoring and control electronics needed for electromechanical balancing in order to optimize grinding processes. The device is controlled via the menu displayed on an illuminated, monochrome LCD monitor.

Basic functions:

- Fully automatic grinding wheel balancing
- Static interface (digital I/O's) to machine controls
- Field balancing
- Presentation of grinding spindle's frequency spectrum

Additional functions:

- Remote control via RS232 interface with PC software for Windows user interface at machine controls.
- Separate remote control (M5000B)

Customer benefits:

- Prolongs the operating life of individual machine components (spindle, grinding wheel etc.)



M5100

M6000

Electromechanical balancing control

The M6000 electromechanical balancing control electronics have been developed especially for use in precision machine tools. The M6000 measures the quantity and position of any grinding wheel imbalance. Compensation is performed during grinding breaks using electromechanically adjusted balancing weights - with high precision, contact free and at operating RPMs.

Basic functions:

- Fully automated grinding wheel balancing
- Profibus and static interface to machine controls
- Compatible with previous M5000
- Improved balancing strategy
- Series set-up of multiple modules with all parameters
- "Open architecture" i.e. updates, software specific to customer and new functions can be integrated flexibly

Additional functions:

- Single plane and two plane field balancing
- Two plane automatic balancing
- Presentation of grinding spindle's frequency spectrum

Customer benefits:

- Optimization of workpiece quality
- Prolonged operating life of individual machine components (spindle, grinding wheel etc.)
- Grinding machine is more cost efficient



M6000

P6000

Pre-balancing

During „pre-balancing“, the unbalance is measured while the machine is running and compensated by shifting correction weights or by adding defined weights to the wheel clamping flange. The spindle is balanced in one plane or two planes, depending on the application.

Spread angle method: unbalance is compensated by shifting two equally heavy weights (sliding blocks) to the calculated positions.

Fixed position method: unbalance is compensated by adding defined weights (e.g. screws) at specific positions.

Basic functions:

- Profibus and static interface to machine monitoring system
- Series start-up of several modules for all parameters
- „Open system architecture“
- Intelligent graphical user prompting
- Continuous unbalance monitoring with 2 limits per measurement channel
- RPM monitoring with 1 limit per proximity switch
- RPM input from rotary encoder

Additional functions:

- Integration into customer applications possible.

Customer benefits:

- System developed specifically for use in precision tool machines
- Size and locations of unbalance are determined while the machine tool is running at operation speed
- Balanced grinding wheels, tool holders and spindles generate better surface accuracies



P6001

Spectrum

Software option M6000: Spectrum

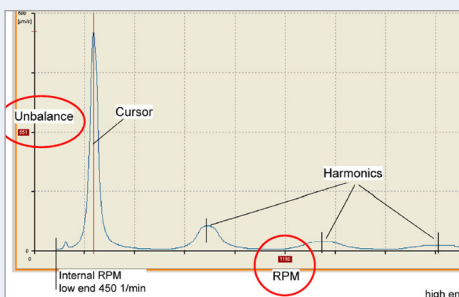
This function is an aid for the experts to analyse the rotational behaviour of machine spindles and to district between machine conditional unbalance and external disturbances. Performing a Spectrum sweep in a selected speed range generates an on-screen graphical representation of the amplitude of vibration monitored at each RPM range in the form of a curve.

This function can be very useful in diagnosing a machine condition. The function Spectrum will perform an automatic vibration sweep of an internal specified speed (frequency) range.

This happens when the operating speed is exactly or very close to the resonant frequency of the spindle. Such an unbalance can not be compensated with a balance system which leads, in turn, to unsatisfactory grinding results.

The speed range to be evaluated will vary by machine and process. On constant surface speed machines, the minimum and maximum RPM should be determined. The suggested range to evaluate is from 0.5 times the minimum speed up to at least 2.5 x maximum speed. This range is important because it includes probably all the frequencies which will have harmonic influence on the operating RPM range.

The Spectrum function is a useful tool to find out those critical frequencies or speeds.



Spectrum

Pre-Balancing

Software option M6000/H6000: Pre-Balancing

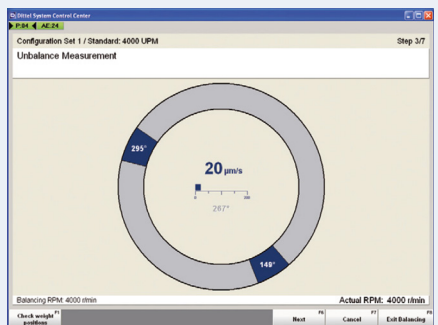
During „pre-balancing“, the unbalance is measured while the machine is running and compensated by shifting correction weights or by adding defined weights to the wheel clamping flange. The spindle is balanced in one plane, depending on the application.

This software option is additional for the M6000 mechanical balancing module as well as for the Hydro-System H6000.

This function will be used in the first step to pre-balance new grinding wheels on the machine. The second step will be the "finely" balance procedure with the electromechanical balancing head.

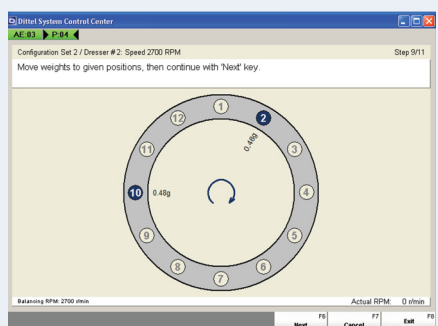
This solution will be useful for bigger wheels were the capacity of the balancing heads could not obtain.

Spread angle method: unbalance is compensated by shifting two equally heavy weights (sliding blocks) to the calculated positions.



Pre-Balancing: Spread angle method

Fixed position method: unbalance is compensated by adding defined weights (e.g. screws) at specific positions.



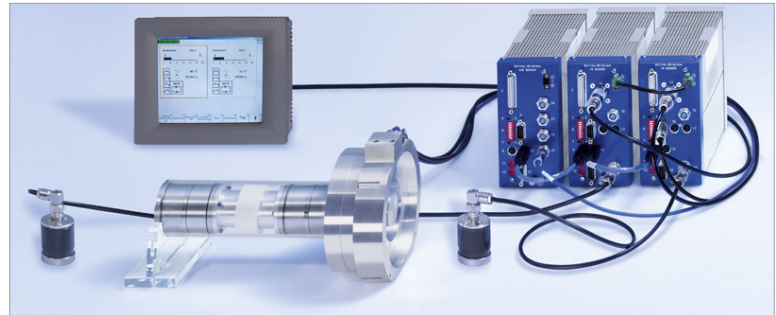
Pre-Balancing: fixed position method

Automatic 2-Plane-Balancing

Our 2-Plane-Balancing system is primarily developed for use on high precision grinding machines, two balance modules M6000 or M6001 enable detection, evaluation and monitoring of the unbalance on two spindles or unbalance of grinding wheels. Fast and precise compensation is performed by a dual plane external or internal contactless balancing system - fully automated and at operating speed.

Both units are connected via CAN-Bus to transmit information and signal together to realise the automatically balancing on two planes.

Necessary for the function will be the software-option: 2-Plane-Autobalancing.

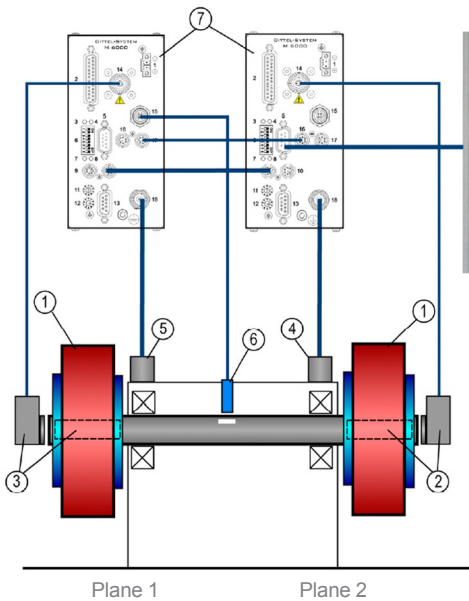


Applications:

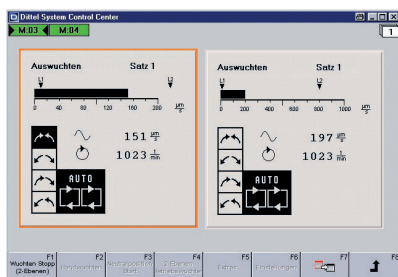
- For all grinding machines with spindleboring
- customized balancing heads

Advantages:

- 2-plane balancing head in the centre of imbalance
- RPMs up to 10,000 1/min
- particularly suited to wide grinding wheels or 2 wheels on one spindle
- Compact design
- No maintenance
- AE sensor can be integrated
- Contactless power transmission



- 1 Rotor
- 2 Balancing unit on plane 1
- 3 Balancing unit on plane 2
- 4 Vibration sensor plane 1
- 5 Vibration sensor plane 2
- 6 Proximity Switch
- 7 two identical balancing modules
- 8 Automation System, e.g. SINUMERIK



Softwareoption M6000/H6000: 2-Plane-Autobalancing

Primarily developed for use on high precision grinding machines, two Balance Modules enable detection, evaluation and monitoring of the unbalance on two spindle bearings, for example. Fast and precise compensation is performed by a dual plane external or internal non-contact Balance System - containing electromechanical adjustable compensating weights - fully automatic and at operating speed.

Manual 2-Plane-Balancing

Manual balancing with moving or fixing weights on the wheel flange is possible with additional software option on both **M6000** units for 2-plane systems as well as for machines with two separate spindles.

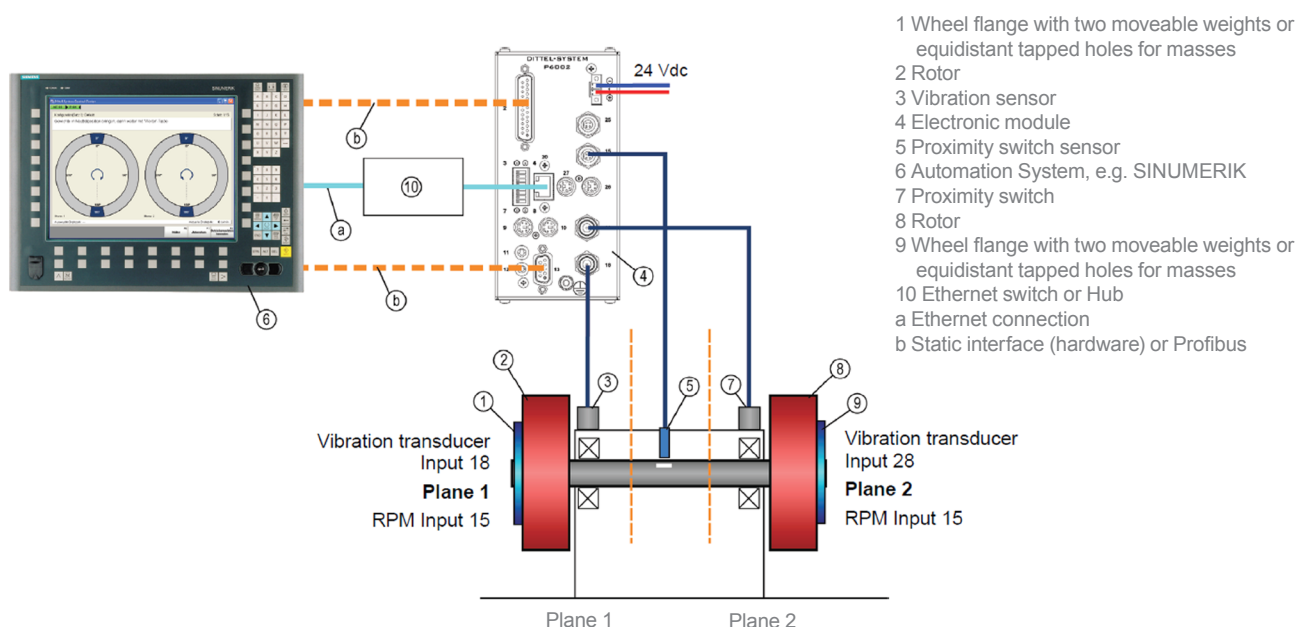
Also possible for manual balancing only will be the **P6002** module for two separate spindles or 2-plane-manual balancing. In this case no further software option will be needed.

Spread angle method:

unbalance is compensated by shifting two equally heavy weights (sliding blocks) to the calculated positions.

Fixed position method:

unbalance is compensated by adding defined weights (e.g. screws) at specific calculated positions.



Software option M6000/H6000: Manual-balancing / pre-balancing

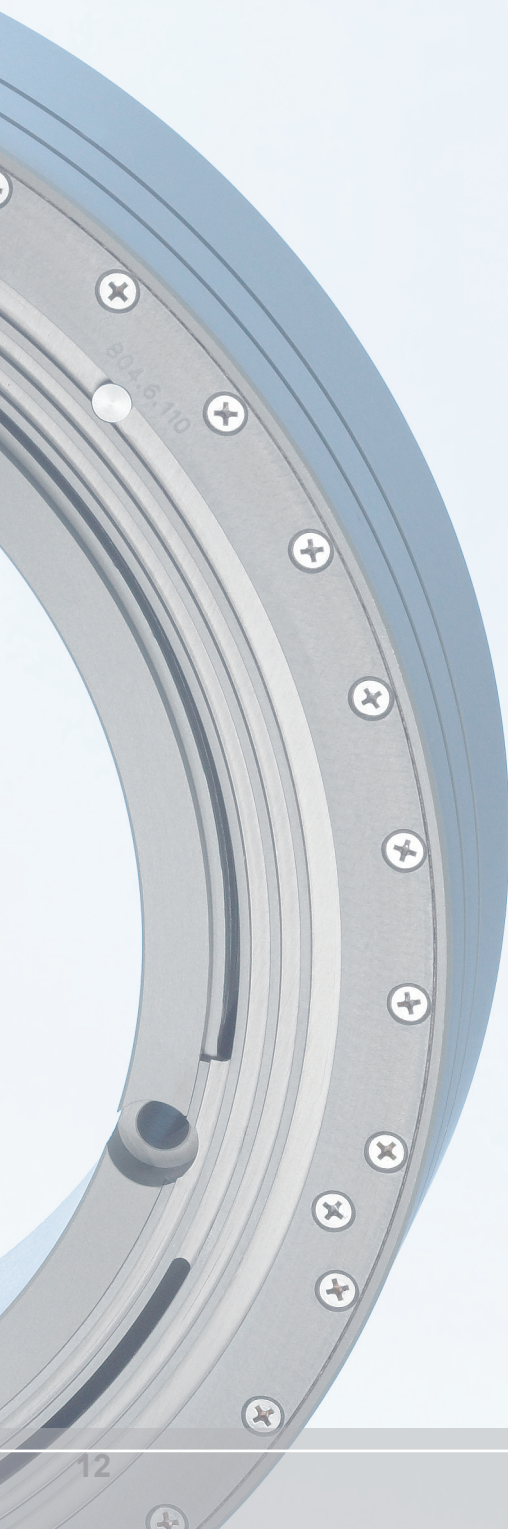
During „pre-balancing“, the unbalance is measured while the machine is running and compensated by shifting correction weights or by adding defined weights to the wheel clamping flange. The spindle is balanced in one plane planes, depending on the application.

This software option is additional for the M6000 mechanical balancing module as well as for the Hydro-System H6000.

This function will be used in the first step to pre-balance new grinding wheels on the machine . The second step will be the "finely " balance procedure with the eletcromechanical balancing head.

This solution will be useful for bigger wheels were the capacity of the balancing heads could not obtain.

Hydro-balancing



The hydro-balancing system can be used on any grinding machine. The imbalance is compensated for by injecting coolant or oil in 3 or 4 balancing chambers, which are integrated into a balancing container or directly into the grinding wheel flange.

The balancing container can be delivered in various designs depending on the specifications of customers' machines. This makes it very easy to retrofit the system on older machines which did not have any integrated automatic balancing system till now.

Installation options:

- Balancing tank mounted before grinding wheel, nozzle unit mounted in protective cover
- Balancing container mounted behind the grinding wheel, nozzle unit mounted on spindle housing
- Balancing chambers integrated into grinding wheel flange, nozzle unit mounted on wheel housing or protective cover

Applications:

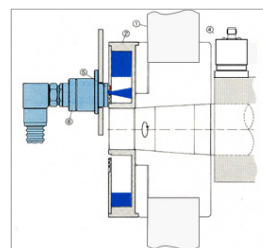
- For all grinding machines with automatic grinding wheel change
- For spindles where a standard balancing head cannot be mounted

Advantages:

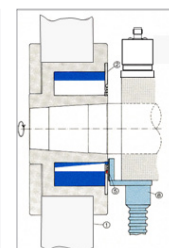
- Easy to retrofit
- Flexible design
- RPMs up to 30,000 1/min



Chambers
Hydro-Ring



Hydro-Tank in front of spindle



Hydro-Tank included
in wheel flange

Hydro-balancing control

The H6000 hydro-balancing control electronics have been developed especially for use in precision grinding machines not equipped with a balancing system at the centre of the grinding spindle. The H6000 continuously measures the size and position of any grinding wheel imbalance during breaks in the grinding process and calculates the size and position of the compensation weight. Cooling lubricant is then injected into one of the chambers of the balancing container - with high precision, contact free, fully automated and at operating RPMs.

Basic functions:

- Grinding wheel balancing is fully automated: coolant is injected into a three or four chamber balancing container
- Profibus and static interface to machine controls
- Improved balancing strategy
- Series set-up of multiple modules with all parameters
- "Open architecture" i.e. updates, software specific to customer and new functions can be integrated flexibly

Additional functions:

- Field balancing
- Presentation of grinding spindle's frequency spectrum

Customer benefits:

- Optimization of workpiece quality
- Prolonged operating life of individual machine components (spindle, grinding wheel etc.)
- Grinding machine is more cost efficient



H6000

Hydro-balancing system

The Hydro-balancing system HBA4000R is for retrofit of our worldwide known 19-inch rack mounted units HBA3001 and HBA4000 units.

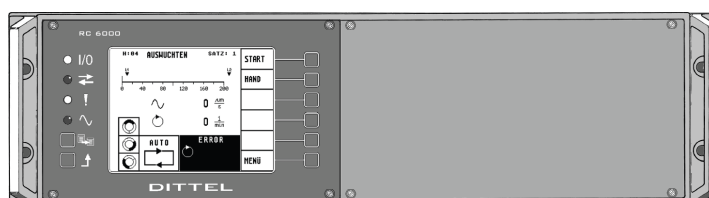
Primarily developed for use on high precision grinding machines, the HBA4000R enables detection, evaluation and monitoring of unbalance. Fast and precise compensation of the unbalance is performed by means of liquid media (coolant or oil). It is injected by nozzles into a 3- or 4-chamber circular container, which is mounted to the rotating wheel flange - balancing is done fully automatically, contactfree and at operating speed.

Basic functions:

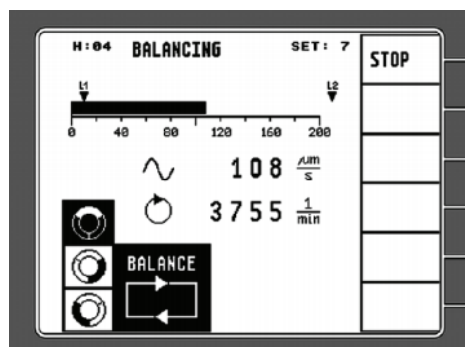
- Grinding wheel balancing is fully automated: coolant is injected into a three or four chamber balancing container
- Easy balancing strategy
- compatible to the most of the HBA3001 & HBA4000 units

Customer benefits:

- Simply retrofit
- Optimization of workpiece quality
- Prolonged operating life of individual machine components (spindle, grinding wheel etc.)
- efficient work



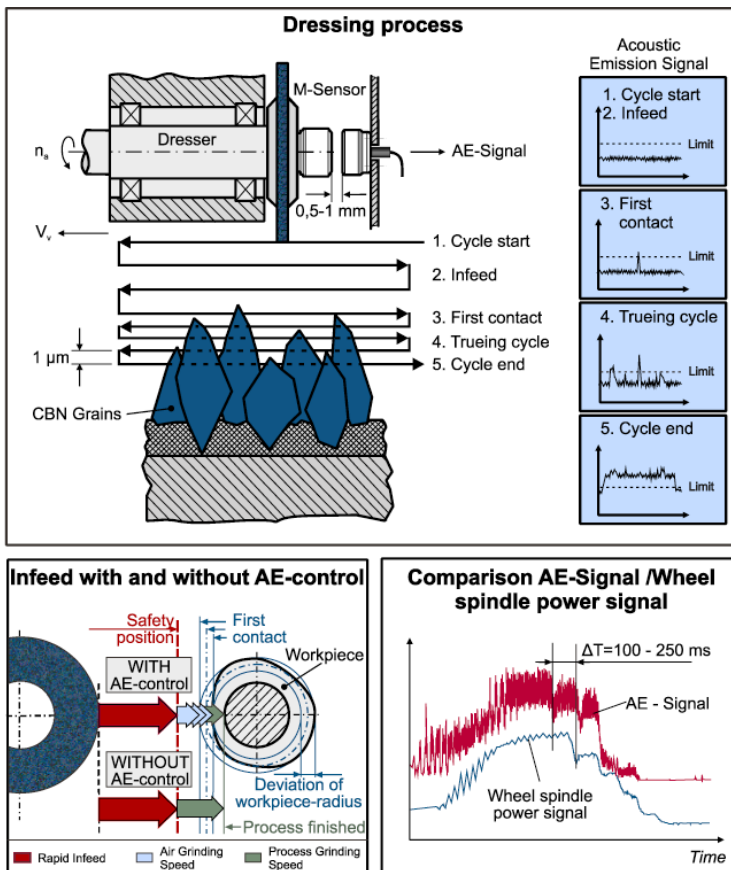
Easy Retrofit with 19-inch rack



Display HBA4000R

Acoustic Emission (AE)

When removing material from workpiece (e.g. during grinding), a noise acoustic emission is generated in the machine elements that are involved in the process – an emission that consists of measurable frequencies mainly in the ultrasonic range. These frequencies are detected by AE sensors and rapidly analyzed, assessed and visualized by the diagnosis and monitoring systems to determine the current state of workpiece quality, tool wear and the machine itself. Whether a machine breaks down or stays in operation depends to a great extent on knowing about the faults that can arise. The sensors used by the system must therefore meet very high standards. We offer a wide variety of highly sensitive static or rotating AE sensors (with non-contact signal transmission) that can detect even the slightest signal deviation, enabling you to tap into the full production technology potential of your machine tools and to systematically reduce process costs. The outstanding signal-to-noise ratio of AE sensors ensures that your processes are as stable as possible.



Potential uses

Collision monitoring (Crash Control)

Tool collision is detected as quickly as possible, helping to avoid or minimize further damage to the machine.

First detection

By evaluating the AE signal, it is possible to detect the tool or workpiece first contact position to the micrometer, thus reducing non-productive “air grinding” time.

Process visualization

When the process is visualized on the display, the process technologists are in a position to make conclusions about the course of the process, to observe it and carry out process and error analyses.

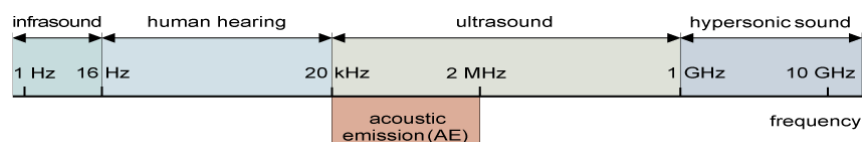
Process optimization

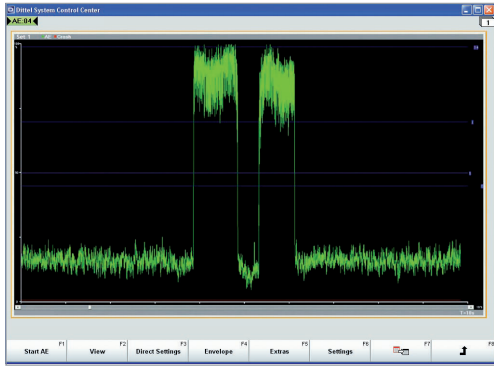
Via powerful software and analyze tools you can optimize your processes and minimize processing time while maintaining the same level of quality.

Acoustic Emission:

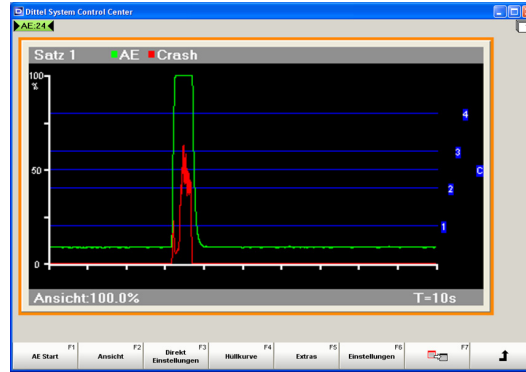
The cutting process also generates vibrations at the point of contact between the tool and the workpiece. These vibrations manifest themselves as sound. The sound waves consist of and transport kinetic energy that changes the stress in the material and, in turn, leads to short-term plastic deformations, shifting and displacements in the nanometer range. The dynamic displacements generate high-frequency vibrations known as acoustic emissions (AE) that can be detected beyond the point of direct contact between tool and workpiece with the aid of the piezo effect, and are measured as changes in electrical potential.

The acoustic emissions (also known as structural noise, depending on the medium in which they are disseminated) are inaudible, ultrasound signals. The electrical signals measured in this way consist of characteristic frequencies and sound amplitudes that are specific to the cutting operations and can therefore be used to monitor the process.



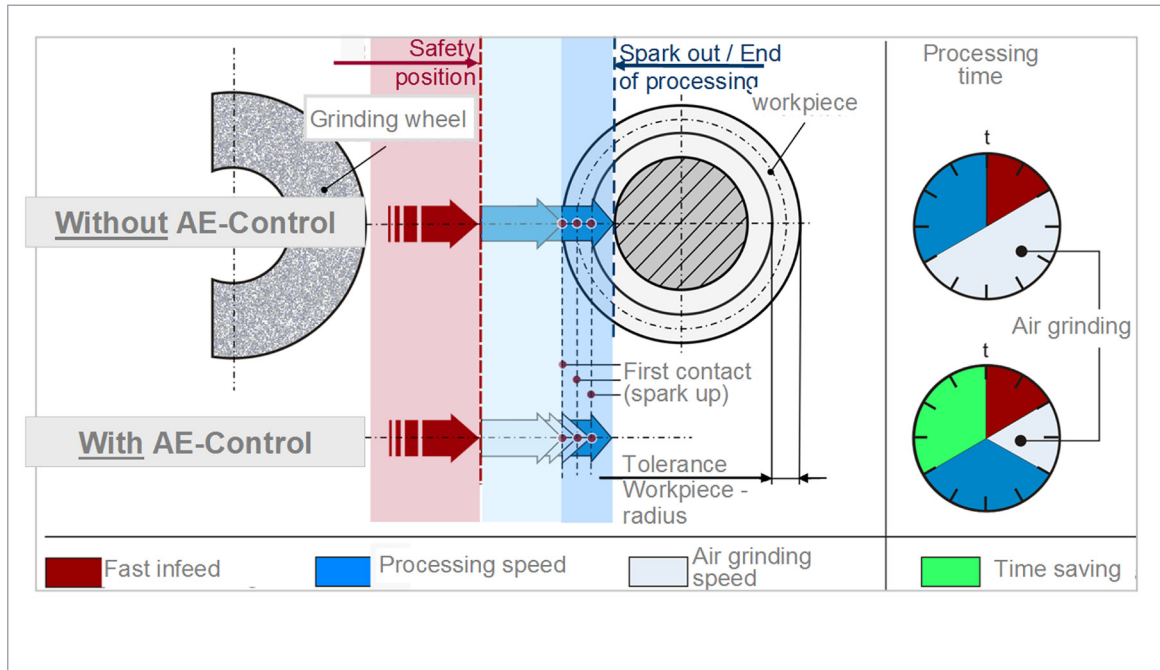


AE signals arising during dressing detected via AE fluid sensor

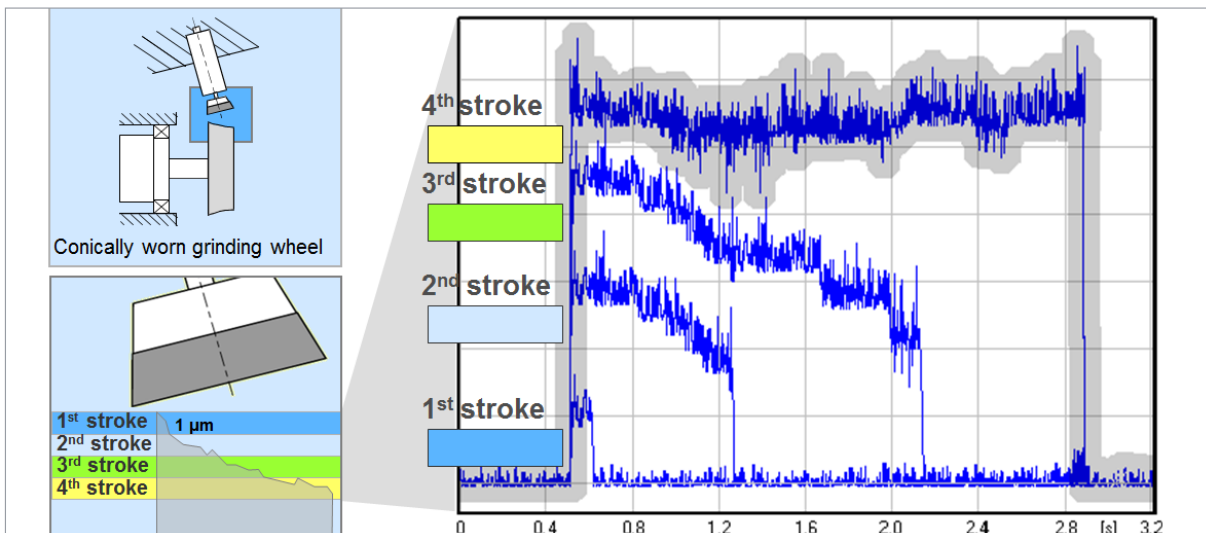


Crash-Signal - control over additional crash limits

First detection / GAP-Reduce



Reduction of the non productive "air grinding" time (GAP-function)



With the envelope function the dressing cycle will be proceed as long as the AE-signal is inside the teached envelope curve

Static AE-Sensor

Types:

- S-Sensor
- Mini-S Sensor
- SF-Sensor
- Magnetic Sensor
- Mini-Magnetic Sensor
- Micro-S Sensor

Applications for example:

- Stationary dressing tools:
- Single point diamond
- Blade type diamond

Appropriate sensor position:

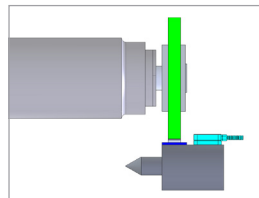
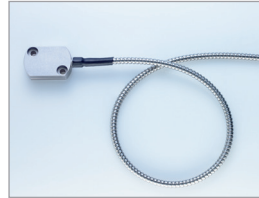
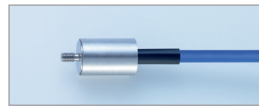
- On the workpiece headstock
- On the tailstock
- On the machine's headstock

Additional functions:

- Monitoring of dressing and grinding processes

Customer benefits:

- Easy to assemble
- High signal quality



AE fluid sensor:

The AE fluid sensor is the latest addition to the company's range of AE sensors for grinding process optimization. The acoustic emission is transmitted in the opposite direction to the flow of liquid from the machine's coolant system (either grinding oil or cooling emulsion). By electrically and acoustically isolating the AE fluid sensor from the machine tool, we have managed to suppress the machine's background noise.

Brief description:

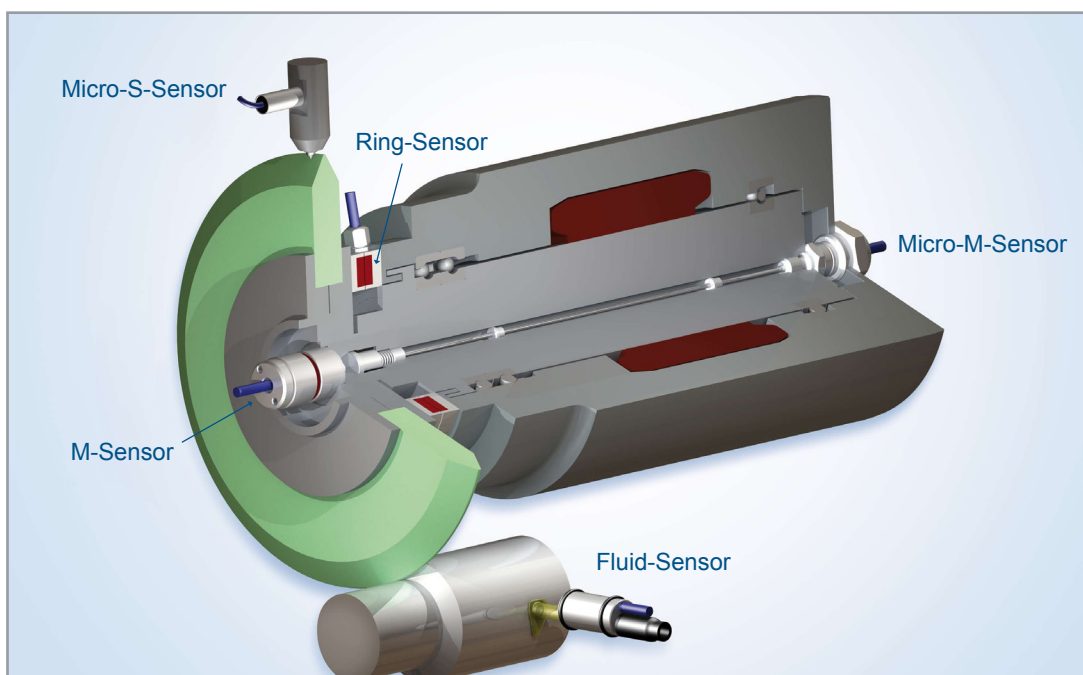
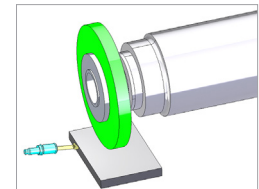
Dressing and process monitoring while grinding rotating and static surfaces.

Signal transmission:

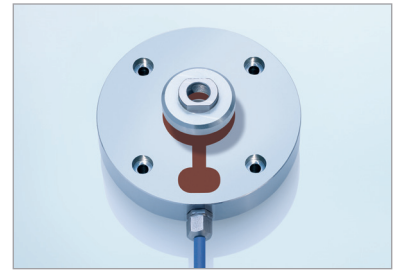
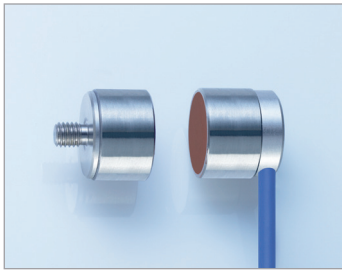
- From the workpiece
- From the tool
- From the workpiece headstock
- From the workpiece holder

Customer benefits:

- Easy to assemble & suitable for retrofitting
- Unsusceptible to the electromagnetic interference generated by the machine itself
- Connects all DITTEL AE evaluation systems without additional preamplifier



Rotating AE-Sensor



M- and Mini-M sensors:

Applications for example:

Dressing rotating dressing tools:

- Form roller
- Profile roller

Sensor position:

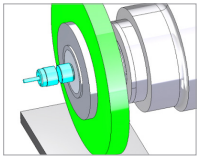
- On the grinding wheel spindle
- On the grinding wheel flange

Additional functions:

- Monitoring of dressing and grinding processes

Customer benefits:

- Simple to assemble
- Measurements on the rotating shaft provide optimal signal to-noise ratio



Micro-M sensors:

Applications for example:

Dressing rotating dressing tools:

- Form roller
- Profile roller

Sensor position:

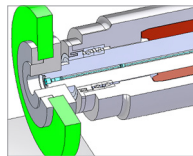
- In the wheel spindle
- In the dresser spindle

Additional functions:

- Monitoring of dressing and grinding processes

Customer benefits:

- Proximity to process and large signal recording area provide high signal quality



Ring sensors:

Applications for example:

Dressing rotating dressing tools:

- Form roller
- Profile roller

Sensor position:

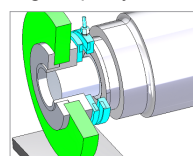
- On the chuck
- On the grinding wheel spindle
- On the grinding wheel flange

Additional functions:

- Monitoring of dressing and grinding processes

Customer benefits:

- Direct contact to dressing or grinding tool ensures highest signal quality



High-speed R sensor:

The high-speed R sensor can detect acoustic emissions in close proximity to the grinding process. In order to better isolate the sensor from sources of interference, e.g. bearings, we have integrated the AE sensors into the fastening nut of the grinding mandrel. The flow of cooling lubricant through the grinding mandrel has hardly any effect on signal quality. The high-speed R sensor, with an external diameter of 30 mm, can be operated at a maximum rotational speed of 100,000 1/min in combination with any evaluation electronics.

Applications for example:

- Internal grinding
- Dressing

Sensor position:

- Integration in the grinding tool coupling nut

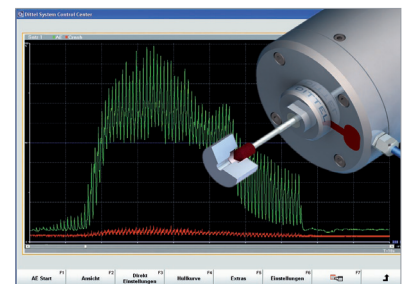
Additional functions:

- Monitoring of dressing and grinding processes
- Grinding tool attachment

Customer benefits:

- Easy to assemble
- Direct contact to dressing or grinding tool ensures highest signal quality
- Easy to retrofit

Types	Dimensions [mm]	Thread/ Fastenings	Non-contact signal transm.	Active preamplification possible
S - Sensor	ø 21 x 24.5	M 6		
Mini-S Sensor	ø 15 x 23	M 4		
Mini-S Sensor MAG	ø 21 x 34.5	magnet		
Micro-S-Sensor	ø 8 x 20	M 3		
SF-Sensor	45 x 30 x 17 D 45 x 30 x 15 M	2 x M 5		
Mini-SF-Sensor	29,5 x 20 x 10			
Magnet Sensor	ø 40 x 40	magnet		
Fluid Sensor	ø 15 x 30	mounting bracket		
Mini-M - Rotor	ø 14 x 9.6	M 4	■	
Mini-M - Stator	ø 20 x 14		■	
M sensor (rotor)	ø 21 x 14.2	M 6	■	
M reciever (stator)	ø 21 x 18		■	
Ringsensor / High-speed-Sensor	customer specific	customer specific	■	■
Micro-M Rotor	customer specific	customer specific	■	■
Micro-M Stator	customer specific	customer specific	■	■



AE signals arising during internal cylindrical grinding detected via high-speed ring sensor

AE6000Basic

Acoustic-Emission System

For the automation of grinding- or dressing sequences it is more and more important to optimize the process and safe workpiece quality. The acoustic emission (AE) signal is an ideal and safe quality of criterion for evaluation. The AE-Signal of the S6000 will be visualizes over optical LED's over the WINDOWS based machine.

Basic functions:

- Passive and Active Sensors possible
- Signal will be displayed on a LED's on the machine control screen
- Profibus and static interface to machine control.
- Could be visualized via RS232 or Ethernet on the machine control

Customer benefits:

- WINDOWS based unit with LED's for shortening the air grinding time, touch dressing control and for the process control

Sensitron 6

AE evaluation electronics

The Sensitron6 is a new type of AE evaluation electronics that can help to monitor and stabilize complex grinding processes. The high performance grinding process monitoring and control electronics are easy to integrate into the machine controls where they evaluate the signals detected by the highly sensitive AE sensors. The Sensitron6 reliably detects the initial contact between the grinding tool and workpiece, detects spark-up and automatically changes the feed rates in order to reduce air grinding time without loss of quality. An integrated crash monitoring function within the working space is a useful security measure that can minimize the costs arising due to collisions. One can select the sensors and operate the evaluation electronics either manually via push buttons or fully automatically via the machine controls. The AE signal is displayed on a LED bar graph (with 30 graduations).

Basic functions:

- Static interface (digital I/O's) to machine control
- Evaluation of the filtered AE signal
- Crash function
- Up to 2 AE sensors can be connected

Customer benefits:

- Optimization of grinding and dressing process, improving workpiece quality and making the grinding machine more cost efficient



Sensitron 6

S6000

Acoustic-Emission System

For the automation of grinding- or dressing sequences it is more and more important to optimize the process and safe workpiece quality. The acoustic emission (AE) signal is an ideal and safe quality of criterion for evaluation.

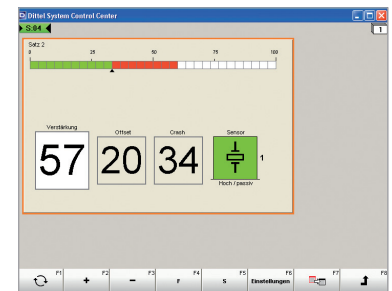
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Basic functions:

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Customer benefits:

- WINDOWS based unit with LED's for shortening the air grinding time, touch dressing control and for the process control



Display S6000

P3SE

Monitoring System

The P3SE is a monitoring system for grinding machines based on the technology of sensors with acoustic emission. The system is able to meet and solve the different needs by including the continuous check of process, check of end of gap elimination, wheel dressing and prevention of crashes.

The P3SE is available as slide solution or with housing. For evaluation it has two physical-channels and four logic-channels.

Basic functions:

- up to 2 AE-Sensor simultaneously
- display (20 elements)
- serial Interface (RS232)
- static Interface for GAP/Crash-Function (15 pole)
- analog output 0-10V
- programmable control thresholds

Specials:

- software package (Windows-Base) for numerical and graphical analysis
- FFT-Analysis (from 0 to 1000 kHz)
- storage of datas
- acoustic signals

Customer benefits:

- Control and minimize air grinding
- Preventive collision monitoring
- Improve the cycle time while dressing, at the same time damage of grinding wheels will be avoided
- Optimal dressing with minimal removal of CBN wheels
- Longer running times of abrasives and dressing tools



P3SE

AE4100

AE process control

The 4100 series is ideal for visualising and monitoring grinding processes on grinding machines where the machine controls are not equipped with their own monitor. The use of acoustic emission systems enables the user to optimize the grinding and dressing process, to reduce air grinding and to monitor for collisions between grinding wheel and workpiece. The entire 4100 series is menu-controlled (in 5 languages) via the displays on an illuminated, monochrome LCD monitor.

The electronics evaluate the data provided by highly sensitive acoustic emission sensors. One can save up to 31 envelopes and their related parameters.

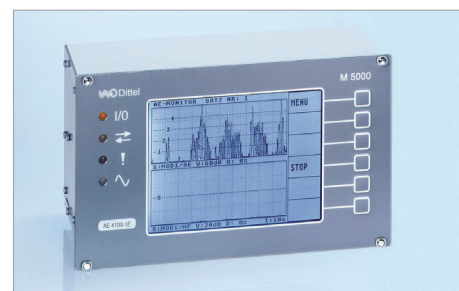
The use of this system helps to optimize grinding and dressing processes and reduce the amount of air grinding. The device is controlled via the menu displayed on an illuminated, monochrome LCD monitor. Dynamic thresholds can be evaluated using the additional envelope monitoring module.

An additional envelope module inside the **AE4100-1E** monitors the process dynamically by taking measurements and evaluating the sensor's output voltage over time. Any value that lies above or below the pre-defined envelope sends an error message to the machine controls.

The combined device **AE4100-1P** combines the functions of pre-balancing / Field balancing and process monitoring with each other. On AE4100-1P, a vibration sensor for monitoring the imbalance and up to four AE sensors can be connected.

The 4000 series includes:

AE4100-1	1 channel AE evaluation
AE4100-1E	1 channel AE evaluation incl. envelope
AE4100-2	2 channel AE evaluation
AE4100-1P	1 channel AE evaluation incl. pre-balancing



AE4100

AE6000

AE process control

Automated grinding or dressing processes must run safely and stably, and produce a consistent level of workpiece quality. Process monitoring on the basis of highly sensitive acoustic emission sensors combined with the AE6000 evaluation unit is the ideal solution to improving process stability. This system can be used to reduce air grinding time, to detect first contact, to detect the first cut during touch dressing, dressing monitoring, grinding process monitoring and wheel damage or collision monitoring.

Basic functions:

- Compatible with previous AE4000/AE4100
- Profibus and static interface to machine controls
- "Passive" and "active" AE sensors and voltage sensors can be connected
- Auto setup function
- Series setup of multiple modules with all parameters
- "Open architecture" i.e. updates, software specific to customer and new functions can be integrated flexibly

Additional functions:

- Envelope function

Customer benefits:

- Optimization of grinding and dressing process, improving workpiece quality and making the grinding machine more cost efficient



AE6000

DM6000

Process control

The DM6000 process monitoring module enables you to evaluate sensor-based and internal control data.

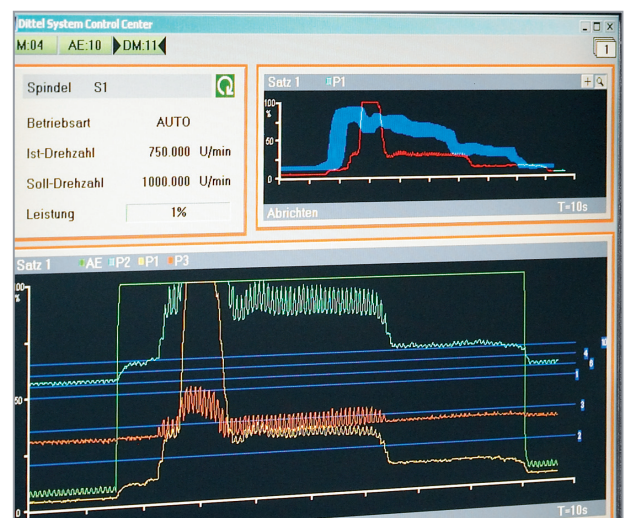
The increased demands placed on the grinding process over the past few years have led to the introduction of new technologies. In order to make full use of a machine's reserves at increasingly high cutting speeds, one must use the appropriate sensors to detect threshold values during the grinding and dressing processes. Should the measured data exceed the tolerances, corrective action can be taken before the process degenerates without intervention on the part of the machine operator.

Internal control data, e.g. torque, is transferred via Profibus to the module where monitoring takes place. The data set for each monitoring strategy can be flexibly allocated to a signal source. AE/Crash, the voltage input and Profibus inputs are treated equally and can be used for envelope monitoring. When using digital drives, even sensorless process monitoring is possible with the aid of internal control data.

Feedback to the controls is made via Profibus or static interface.

Special features:

- Evaluation of user-defined 4-byte signals via Profibus
- Also available in combination with the SINUMERIK Profibus tool and process monitoring
- Unrestricted allocation of 10 limits to signal sources



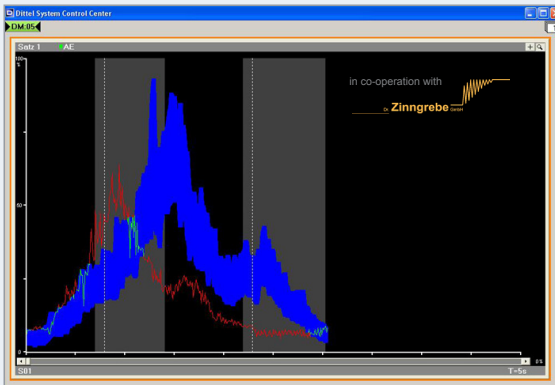
Display DM6000

Software options for AE6000 & DM6000

Envelope curve

Software option for AE6000/DM6000: envelope curve

The envelope function monitor the process either through time controlled acoustic emission signals and/or voltage inputs. Each over or under crossing of the given envelop produces an error message for the machine control unit. The envelop can adapt itself to changing conditions. That can be achieved after each cycle using fixed limits (dynamic envelop) or manually on the screen using a computer mouse (edit function).

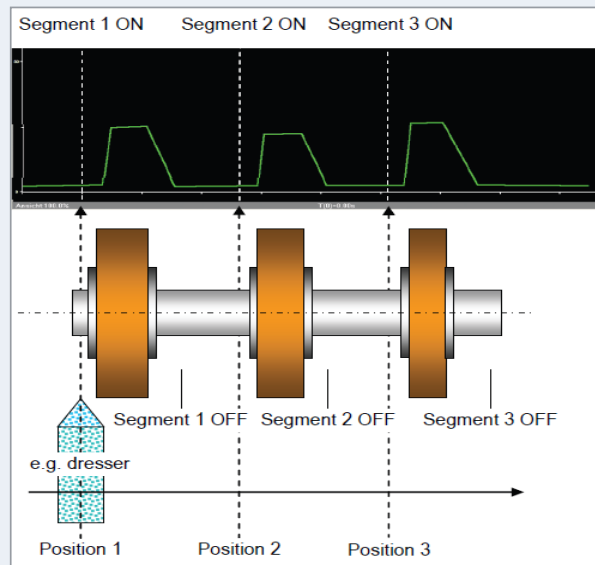


Software option: envelope recording

In addition the sets can be saved on an external storage medium. The automatic upload of the saved data back into the DM6000 is possible given the machine control unit uses the foreseen Active X software elements.

Software option for DM6000: segmented envelope

Important parts of a complete process (segments) can be taught through the machine control unit. The so saved segments can be individually started by the machine control unit. It is also possible to re-synchronize the time axis of the envelope with the actual monitoring by every new segment start. Doing that allows for the correction of an envelope monitoring due to a disturbance caused by the axis displacement or change in axis override.



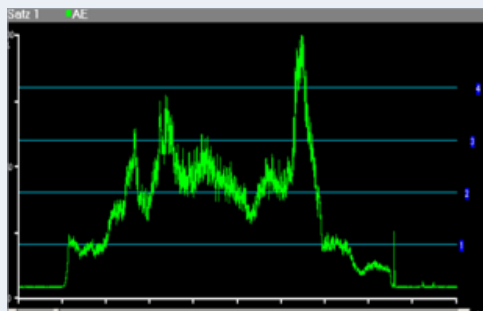
Software option: segmented envelope

Time controlled start of each process monitoring segment

AE-Monitoring

AE6000/DM6000: Acoustic emission monitoring on a time-axis

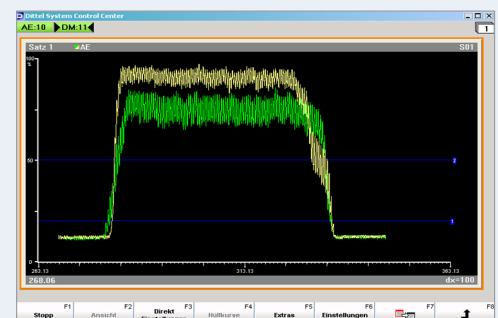
Process monitoring and process safety during grinding or dressing is obtained through the constant monitoring of the acoustic emission signals. The acoustic emission signals are displayed along a time axis. Thanks to a fast communication link, i.e. static interface or profibus, to the machine control unit the given limits are constantly monitored and thus the air gap part of the process and the negative effects of a collisions reduced.



Acoustic emission signal on a time-axis

Software option for DM6000: Acoustic emission monitoring on machine axis

The acoustic emission signals are picked up by the connected sensors and displayed synchronous to a specific machine axis. The axis displacement information are obtained through an OPC server connection. Doing that allows for monitoring different cycles in different moment in time. Without axis displacement the input signals are put on hold and released only together with a change in the axis position. This software option allows for the visualization of the wheel profile during the dressing cycle. The acoustic emission signal is synchronized with the axis position.



Acoustic emission monitoring based on machine axis

M5100MA - Series

Electromechanical balancing

The M5100MA combines the monitoring and control electronics needed for electromechanical balancing and the evaluation of data generated by highly sensitive acoustic emission sensors, in order to optimize grinding and dressing processes. The device is controlled via the menu displayed on an illuminated, monochrome LCD monitor.

Basic functions:

- Fully automatic grinding wheel balancing
- Static interface (digital I/O's) to machine controls
- Field balancing
- Presentation of grinding spindle's frequency spectrum
- Four AE sensors and a voltage sensor can be connected

Additional functions:

- Remote control via RS232 interface with PC software for Windows user interface at machine controls.
- Separate remote control (M5000B)

Customer benefits:

- Prolongs the operating life of individual machine components (spindle, grinding wheel etc.)
- Optimization of grinding and dressing process, improving workpiece quality and making the grinding machine more cost efficient

The 5000 series includes:

M5000B	Remote Control
M5100M	Balancing control
M5100M-2WB	Balancing for 2 spindles
M5100MA	Balancing- and AE Process control
M5100MA-2WB	Balancing- and AE for 2 spindles
M5100ME	Balancing- and AE (incl. Envelope)

DS6000 - Series

Modular System for Balancing and Acoustic Emission

The DS6000 (Dittel-System 6000) represents a completely new generation of process monitoring and balancing electronics equipment, which acts as an interface between the automation systems and the sensors and/or balancing components, incorporating parameter initialisation, signal processing and signal evaluation.

The DS6000 product family has a modular design, which can be added to and combined with each other. This innovative concept is highly flexible in terms of its ability to meet customer requirements, provides the user with an increased range of features and is very easy to operate.

The DSCC Software (DITTEL System Control Center) was developed for Windows-based automation systems like Siemens SINUMERIK, Heidenhain, Fanuc or Bosch-Rexroth and PCs. The communication between modules and automation systems is made via a static interface, PROFIBUS and RS232 or Ethernet. All modules, their controls and the relevant measurement signals can be displayed on the machine monitor, giving the operator a comprehensive overview of all functions and information. All the data needed for time-saving series commissioning can be saved in an XML file and transferred to other machine controls. This also makes it easy to restore the factory settings.

Our systems can also be operated independently of automation systems using the RC6000 or PC6000 remote controls of DITTEL.

The intelligent use of visualisation provides the user with sufficient information to make full use of the available manufacturing potential and, ultimately, to significantly reduce process costs.

The Dittel-System 6000 includes the electronic modules:

M6000	Electromechanical balancing control
P6000	Pre-balancing
H6000	Hydro-balancing control
AE6000 basic	Process Monitoring basic
AE6000	AE process control
DM6000	Process control
S6000	Acoustic-Emission System

Remote Control: RC6000

Remote Control RC6000

The RC6000 remote control is an accessory for the DS6000 series. This external unit is required for systems without e.g. PC based automation systems, where the DS6000 module can not be operated and visualised via the Windows user interface.



Remote Control: PC6000

Remote Control PC6000

The PC6000 external control unit is an additional extra for the DS6000 generation of basic modules. The PC6000 is needed if there are no Windows based controls and interfaces through which to control and visualize the DS6000 module.

The PC6000 can visualize several modules at one time, as well as the pre-balancing, spectrum and envelope functions.



P7 - Series

The ALL-IN-ONE Solution: Balancing, AE-Monitoring and Gauging

P7 electronic system is a unique multifunction process control device capable of managing the complete grinding machine by means of Pre-Process, In-Process, and Post-Process measurement controls, machine vibration monitoring, manual and automatic wheel balancing, optimizing the grinding process and wheel dressing cycles.

Configurable to suit multiple gauge applications, P7 is capable of managing measuring heads, electronic and pneumatic plugs, touch probes, and Marposs – Dittel acoustic emission (AE) sensors.

P7 can be connected to all Marposs – Dittel electro-mechanical balancers to control machine vibrations and dynamically compensate any wheel imbalance to improve the surface finish and geometry of the workpiece, and extend the wheel life.

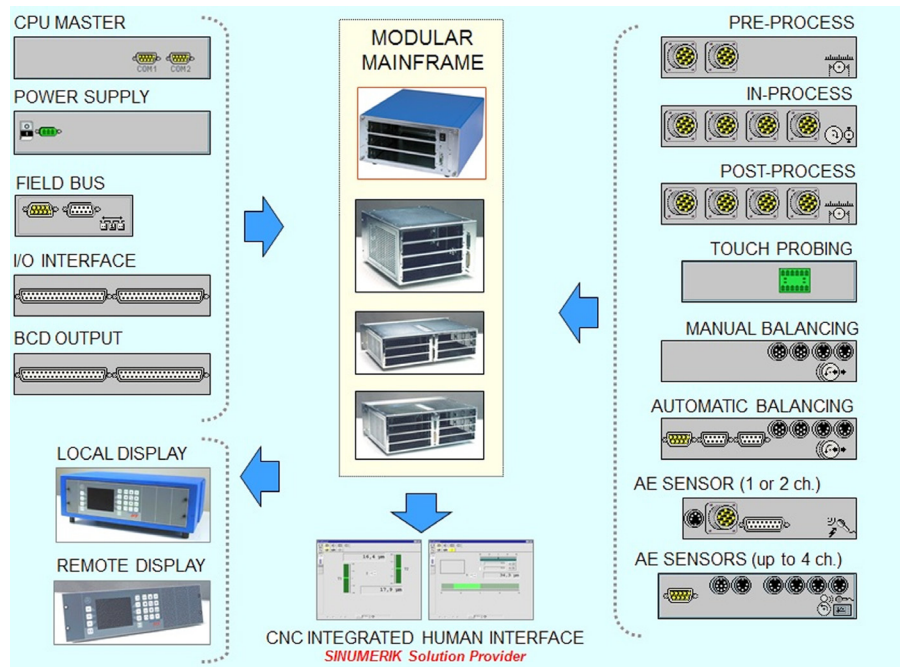
P7 modular platform permits a wide range of HW and SW options to be configured to suit specific applications. The system is available in different enclosure types with local or remote operator panel, provide mounting solutions for all machine types. The system utilizes a series of cards to control inputs from a wide range of measurement, electro-mechanical balancer and sensing devices. Other modules provide logical I/O, field bus support and graphic display control.

Flexible Card-System

The P7 system is most flexible with his card slots for different applications.

Possible to design your P7 with following components:

- Master CPU
- Feldbus
- Display
- Power Supply
- Measuring systems
- AE-Sensor
- Balancing head
- Ethernet



Remote Panel: P7

Remote Panel P7

Color high-definition display, ergonomic membrane keypad, minimal number of keys, simple icon (ISO 700) driven interactive human interface, are the elements that provide rapid and efficient operator use.

Hotkeys can be programmed freely to the most frequently used function or display pages.



Software MHIS <> DSCC



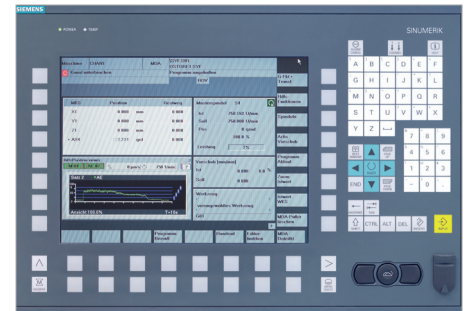
MHIS

Software Interface
Balancing | Process-Control |
In-/ Post-Process Measuring

For the integration of the User Interface of its P7 system Marposs proposes a software called M.H.I.S., for installation in the PC of the machine connected to the P7 via RS232 or Ethernet. The software was developed for the Windows-operating system, is an OCX, and thanks to the presence of a dedicated OPC Server allwos the PC/CNC software to share data with the P7.



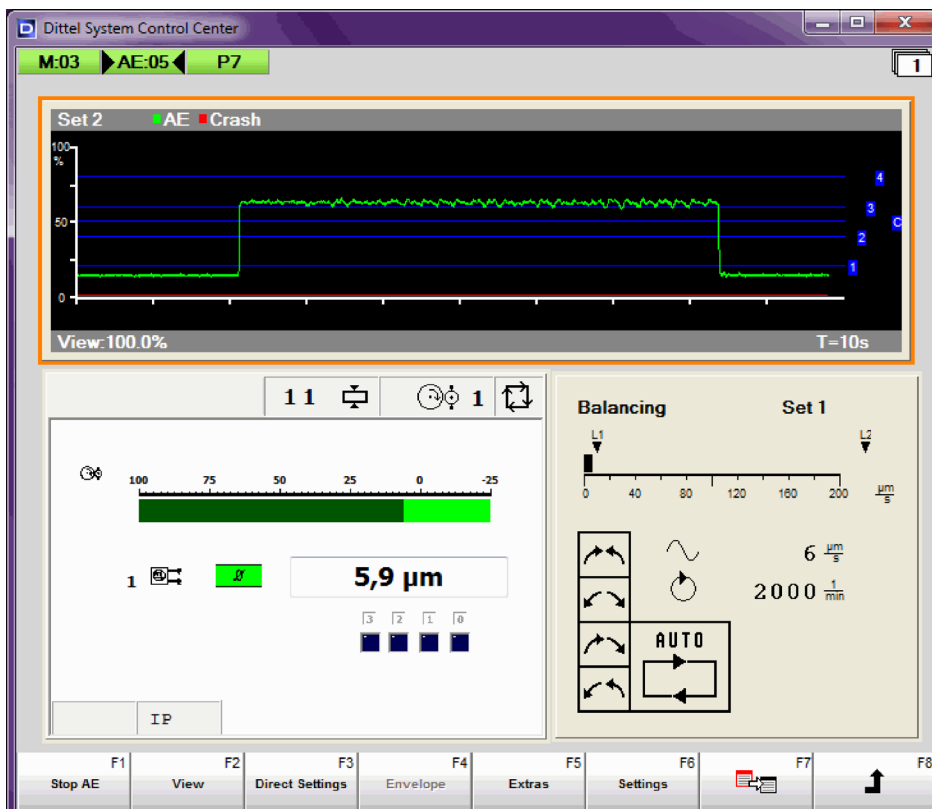
DITTEL
MARPOSS



DSCC

Software Interface
Balancing | Process-Control with AE

The DSCC Software was developed for Windows-based automation systems and easy to integrate. The software is freely programmable on Windows-based user surface and it is possible for applications via programme interface / AxtiveX control elements. Intuitive handlinge, integrate online help and its significant reduction of set-up time are one of the benefits. Following languages are available: German, English, French, Italian, Spanish, Czech



With new combination of MHIS-Software and the DSCC-Software is now available one uniform platform. This solution will be a flexible combination for pre- / in- and post-process measuring as well as operating the balancing- and acoustic-emission systems on the same software surface.

P6001FD

Manual

Single-Plane Balancing

Unbalance is on machine tools the most common source of vibrations. Balancing the grinding wheel, the tool holder and the spindle can be of great help.

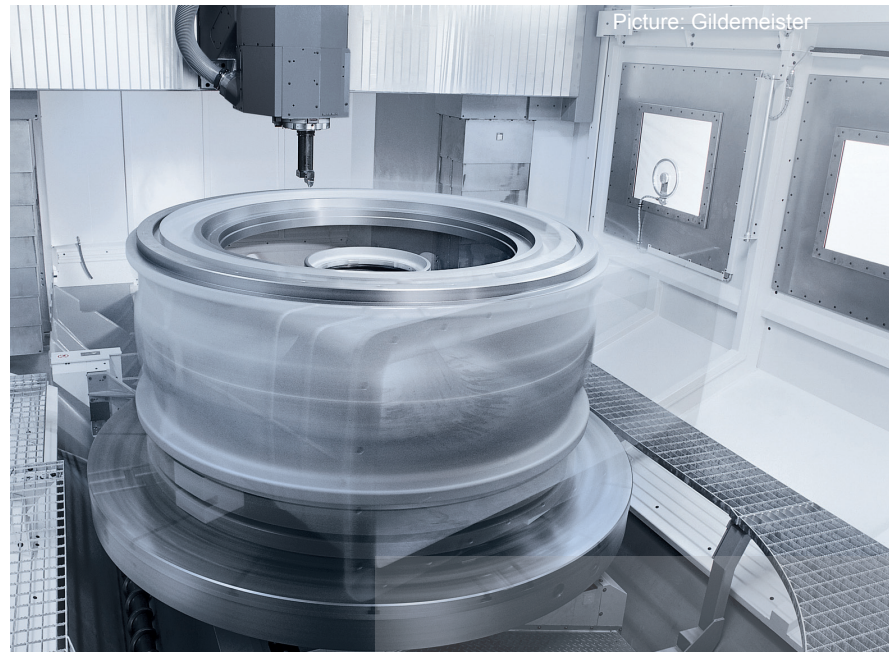
What has become a standard over the last decades on grinding machines, has gained interest also both on combined (milling and turning) and on vertical turning machines especially when asymmetrical workpieces have to be handled. Keeping the vibration as low as possible increases the working life of the bearings as well as of the tools and results in a better workpiece's surface quality.

The P6001FD module is the last addition to the Dittel pre-balancing P6000 family and is purposely designed for the use on machine tools rotating at low RPM.

The workpiece table's unbalance on a pre-defined plane is detected during a pre-balancing cycle and subsequently compensated fixing known balancing weights on calculated position on the rotating table.

The P6001FD suggests the best balancing weight to be used out of a freely programmable weights' table. A fixed positions algorithm is used to determine the best positions out of a maximum of 24 in which to fix two or three weights. The electronics offers also a continuous monitoring function of the vibration level of the rotating table.

The P6001FD can be programmed, used and its functions visualized through the machine control unit or any Windows based PC. The signals can be exchanged to and from the machine via a ProfiBUS or static I/Os connection.



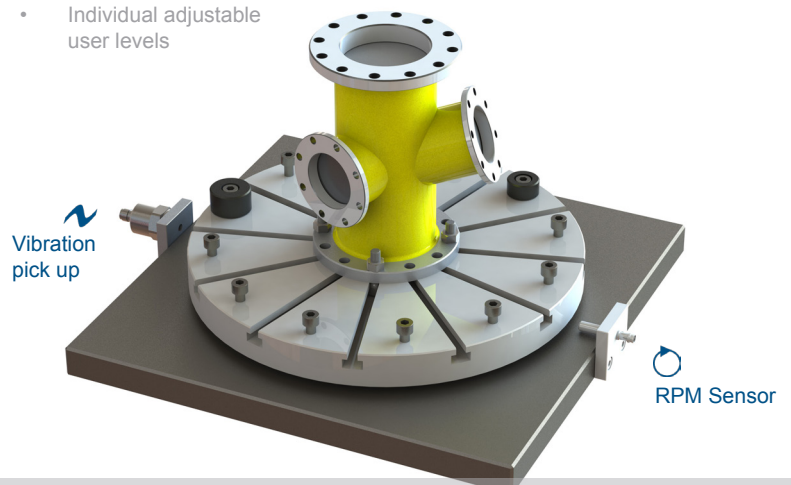
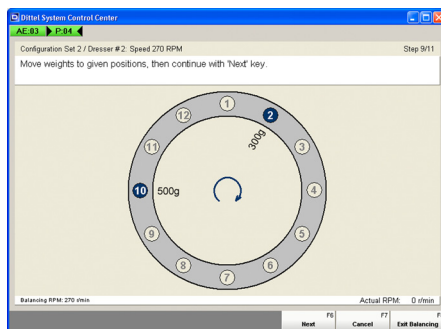
Special features

- Filtered-RPM-Unbalance monitoring for RPM range 80-6000 1/min
- Continuous unbalance monitoring
- Intelligent and customizable graphical user interface
- ProfiBUS and static I/Os communication channels
- Visualization through Ethernet connection
- Simple software integration
- Simple factory reset function in case of servicing (series setup)
- Individual adjustable user levels

Manual

Single-Plane Balancing for

- rotating workpieces' tables
- asymmetrical workpieces
- milling and turning machines
- vertical turning machines
- low RPM range



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Marposs Kabushiki
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TAIWAN

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HONG KONG

MG Asia Limited

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