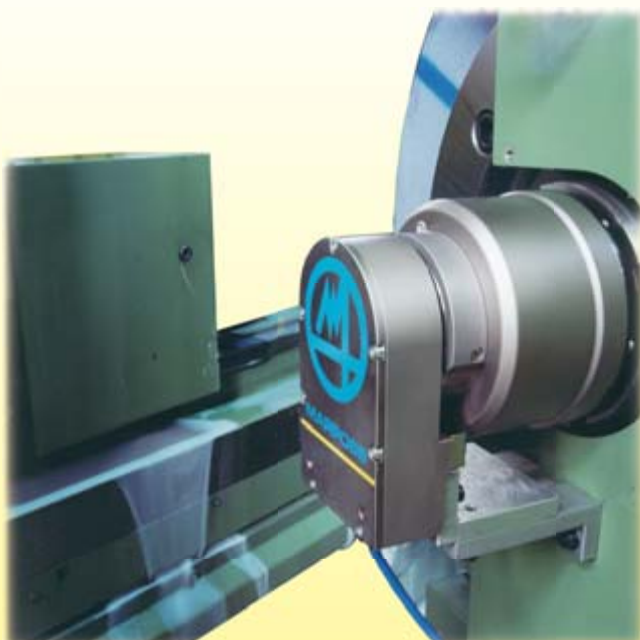


MARPOSS



# BALANCING

## ACTIVE CONTROL OF VIBRATIONS ON GRINDERS



The increase in the speed of rotation of the spindle on grinders has been a constant trend in recent years, just as the machine's capacity to achieve a superior quality part surface finish is increasingly important.

In this context, it is essential to control the vibrations induced in the machine as an effect of the imbalance of mechanical parts and the rotating grinding wheel. A vibration has an amplitude and a frequency. The main source is the spindle, or rather the spindle - grinding wheel assembly; therefore the most damaging vibration in the machine has a frequency corresponding to the speed of rotation of the spindle.

This vibration can be eliminated by an active balancing system which monitors the signals from vibration sensors (accelerometers) and varies the position of the internal weights so as to minimise residual vibration.

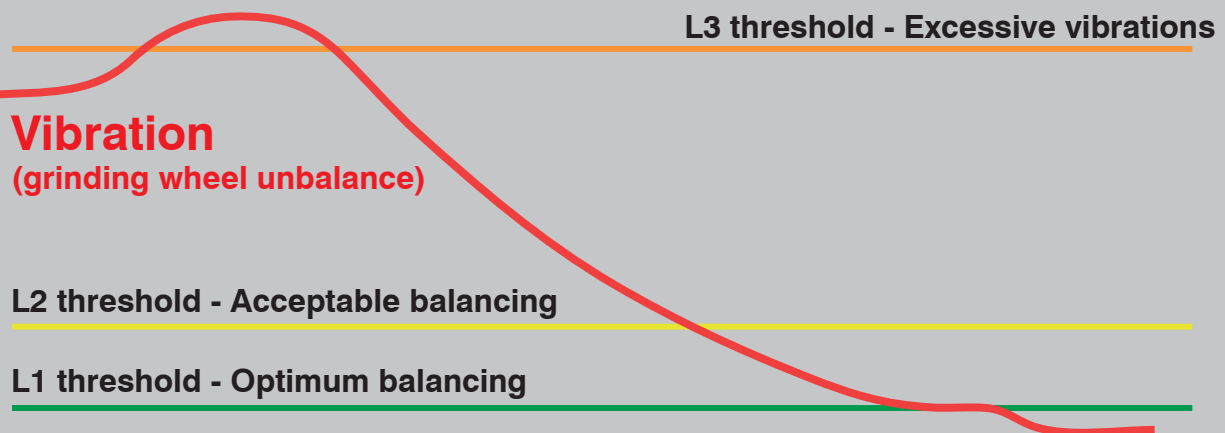
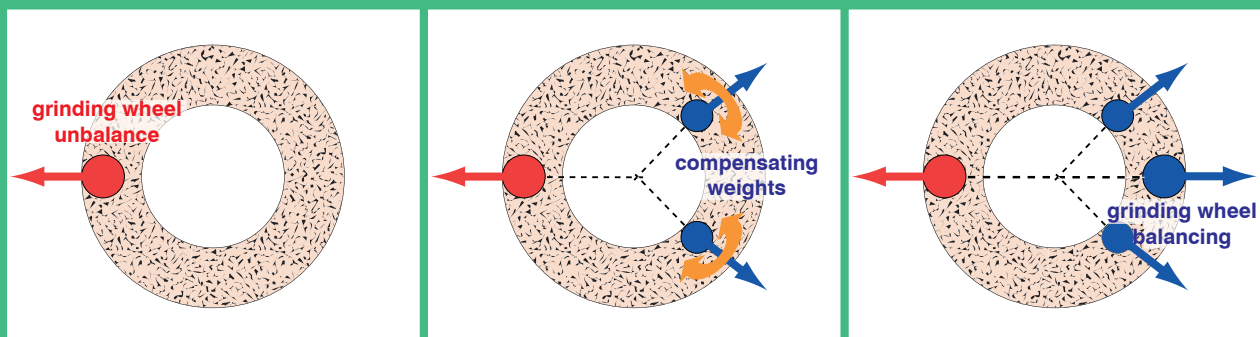
The balancer is a system which controls the intensity of vibrations on the grinding wheel to automatically compensate for imbalance, designed to improve the quality of the parts ground, specifically their surface finish (roughness) and geometry (ovality and trilobate form). Marposs balancing systems are mainly aimed at external, centreless, surface, flexible and special grinders.

In a well maintained grinder the spindle and pulley are normally perfectly balanced and the bearings are in good condition, therefore, the main source of vibration can be attributed to the grinding wheel.

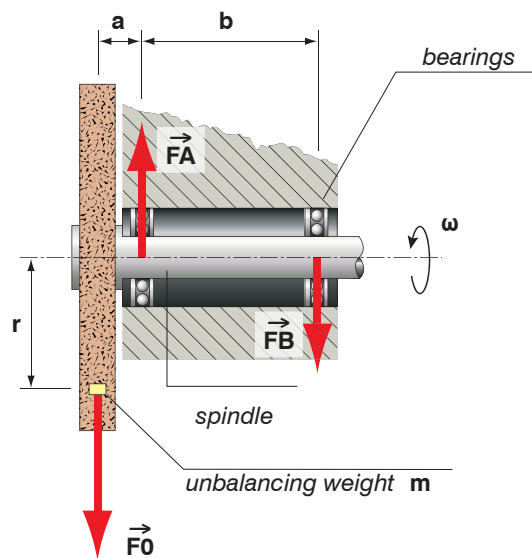
This problem, which as previously indicated can be solved using an active balancing system, is caused by the following phenomena:

1. Uneven distribution of cutting edge and binder in the various parts of the grinding wheel or the and presence of blowholes.
2. Incorrect assembly of grinding wheel and mounting flange, that is to say, the centre of gravity of the grinding wheel is not aligned with the axis of rotation of the grinding wheel - mounting flange assembly.
3. Uneven wear of the grinding wheel.
4. Splintering or fracturing of the grinding wheel and coolant absorption.

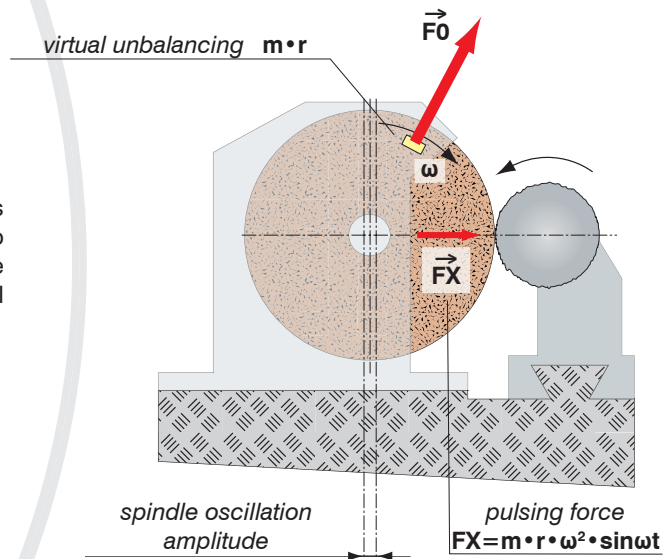
## Balancing principle



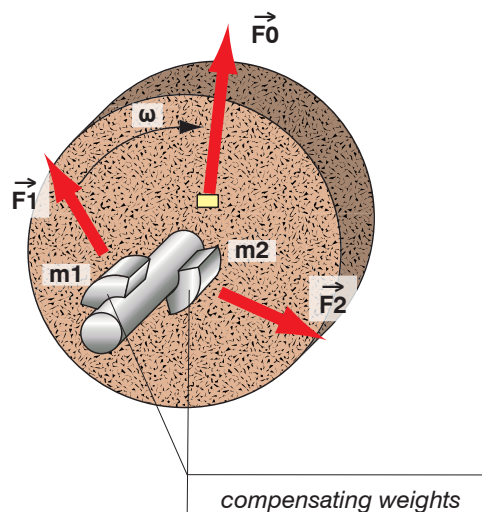
If the grinding wheel operates constantly while imbalanced, vibrations are continuously transmitted to the machine's mechanical parts, particularly the spindle and the bearings, and with time may damage the machine tool and cause a deterioration in its mechanical integrity.



A grinder that has deteriorated and is affected by vibrations due to the spindle and bearings is no longer able to guarantee the production of parts which comply with the quality limits irrespective of the degree of grinding wheel balancing.



The problem has become a structural one and can no longer be simply and economically solved with a grinding wheel balancing system. So it is clear that when high quality and optimum performance are required, any grinding wheel unbalance must be eliminated with suitable balancing.



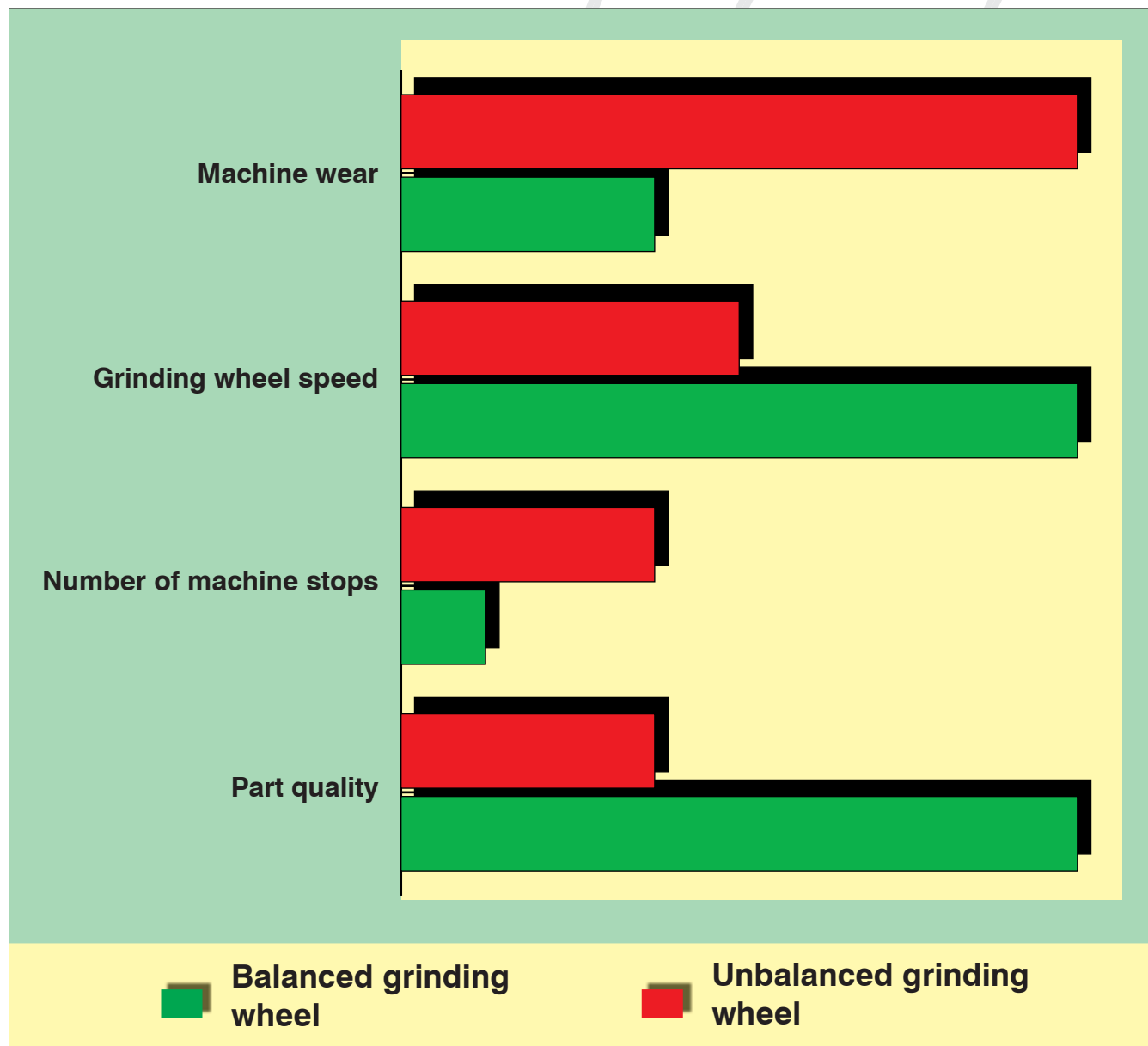
All grinding wheels are normally balanced manually by the operator positioning compensating weights in the appropriate positions on the grinding wheel flange, although this operation requires skilled personnel and lengthy periods of time if it is to be carried out in a correct and effective manner.

Grinding wheels can be more simply and effectively balanced by installing an automatic active balancing system directly on the machine, offering a number of advantages over manual methods, for example:

- More accurate balancing
- Short cycle time (just a few seconds)
- Fully automated balancing cycle
- No need for skilled personnel
- Flexibility thanks to programmable vibration tolerance limits
- Constant control of vibration during the entire life of the grinding wheel.

### Advantages of an automatic balancer

1. Machining cycle times are optimised with consistent in balancer good surface finishing and geometric features with lengthy spark-out times.
2. The balancer eliminates operating conditions with the of vibration to other rotating parts on the machine. The of machine down times and maintenance, providing a
3. The balancing cycle is fully automated and extremely ra from the grinder and weights do not need adding or re
4. The grinding wheel balancer makes grinding intrinsic



## Balancing system for grinding wheels:

ent improvement in machining quality. Normally without a  
atures can be achieved at low grinding wheel speed and

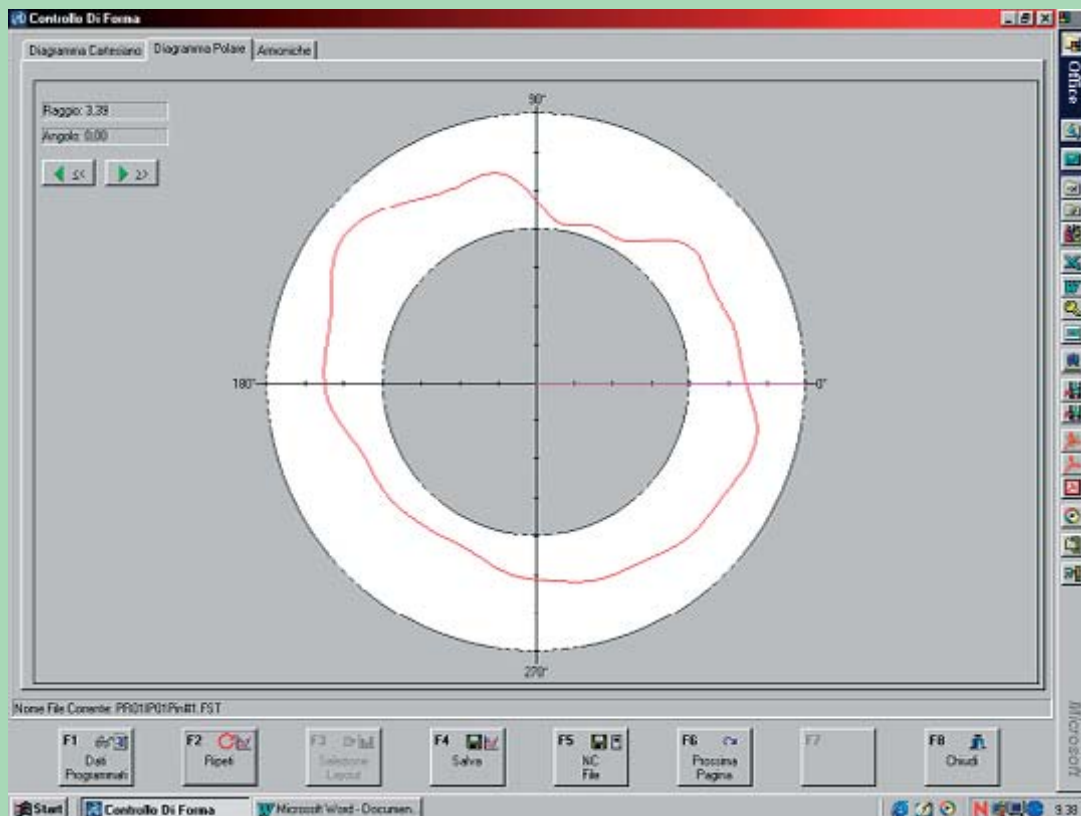
the grinding wheel unbalanced and prevents the spread  
. Therefore, the balancer allows a considerable reduction  
ng a preventive maintenance action.

ely rapid; the grinding wheel does not have to be removed  
or removing to balance the wheel.  
sically safer.

It may be said that the grinding wheel balancer is a system which with a reasonable cost allows the end user to achieve a noticeable improvement in quality without compromising productive machining times.

The experience Marposs has acquired in vibration control and monitoring and in the dynamic balancing of grinding wheels on grinders is consolidated in a complete range of balancing systems, available in various technological solutions, for all types of applications, guaranteeing rapid execution of the balancing cycle and maintenance-free operation.

The balancing system basically consists of a balancing head which can be fitted outside (flange type FT) or inside the spindle (spindle type ST); a vibration sensor and an electronic control unit.



To eliminate risks of:

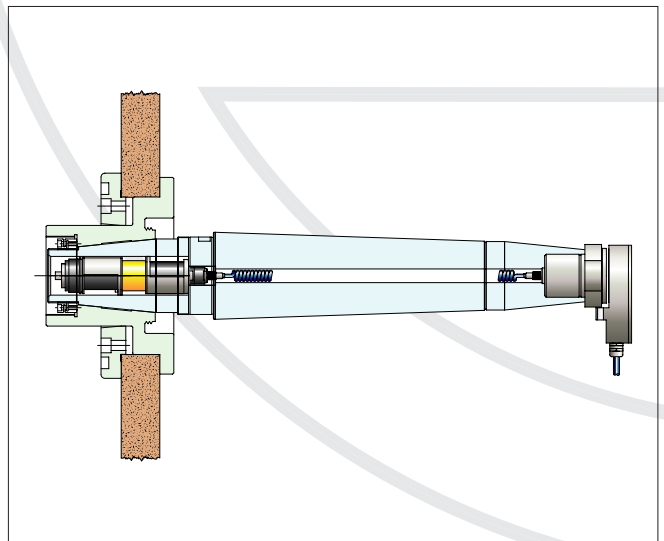
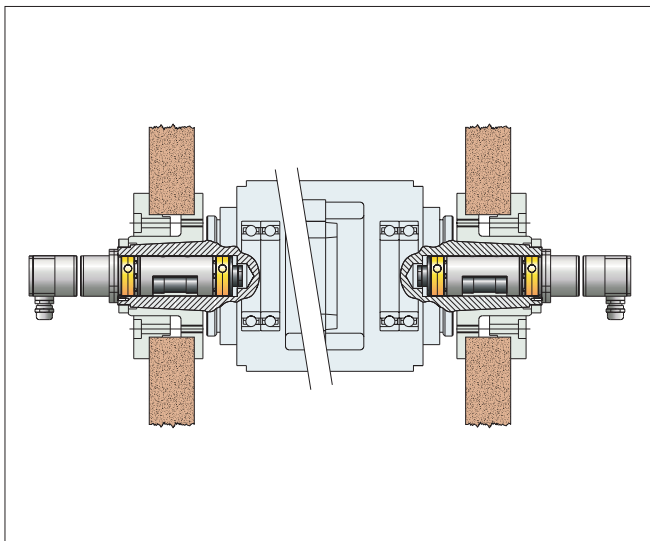
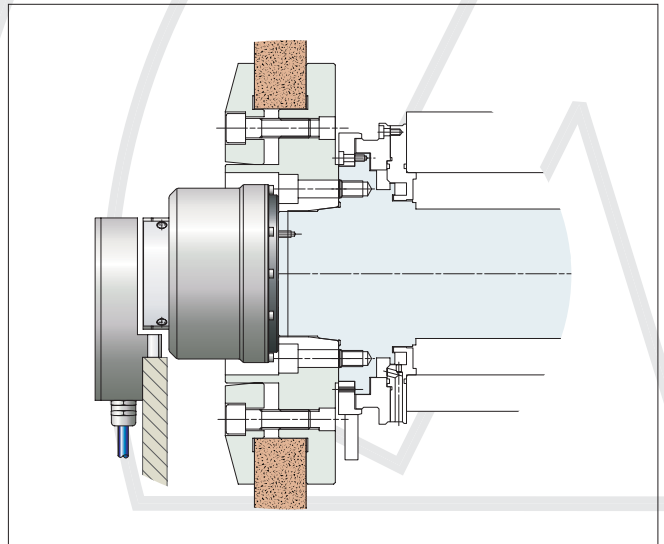
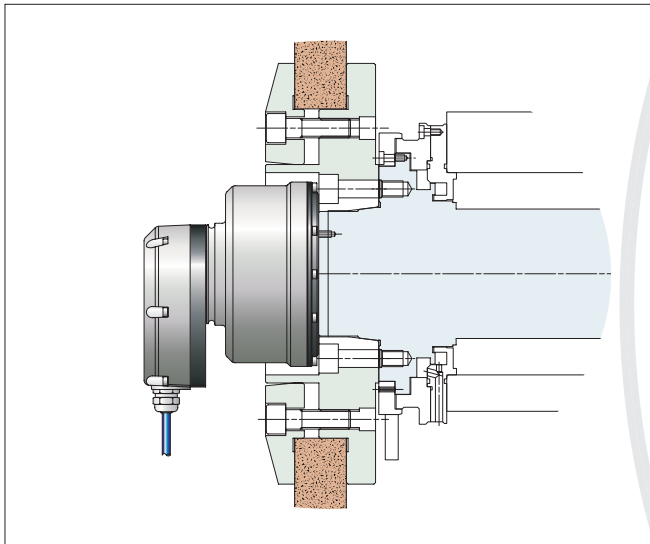
- chatter marks
- roundness errors
- roughness defects

To achieve ideal part roundness and surface quality

## Balancing Head

All Marposs flange type balancing heads (ideal for retrofitting) and spindle type heads (ideal on new machines) are available in the following versions:

- with retractable contacts: the contacts for transmitting power to the balancing head are normally open and are only closed during the balancing cycle, giving them practically unlimited life. Balancing heads with retractable contacts do not require maintenance and are very competitively priced;
- with contactless transmission: power and logic signals for management of the balancing cycle are transmitted across an air gap, guaranteeing an absolute seal and maintenance-free operation. Balancing heads with contactless transmission also have the exclusive zero-setting cycle to neutralise the position of the balancing weights. This function is useful when starting up the machine or after changing the grinding wheel;
- with contactless transmission and an integrated grinding wheel acoustic check sensor: as well as satisfying the need for continuous automatic balancing, these balancing heads have an integrated wideband acoustic sensor, which operates close to the grinding wheel, for maximum sensitivity and the fastest response speed in all applications for air gap, dressing and crash control. All flange type and spindle type balancers can be supplied with the integrated grinding wheel acoustic check sensor.

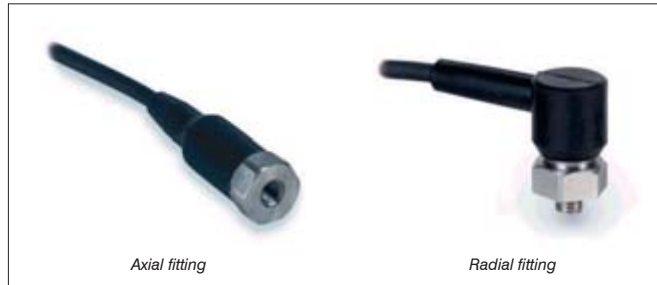






## Vibration sensor

The Marposs vibration sensor is a high performance piezoelectric transducer able to accurately detect even vibrations even at the lowest frequencies. It can be fitted on the machine using a magnetic base or screws. The sensor available for axial or radial fitting is hermetically sealed.



## Electronic control unit

The Marposs P7 electronic control unit is a microprocessor device for complete management of the grinding wheel balancing cycle, air gap, dressing and crash control. All operating parameters for the balancing head and integrated grinding wheel acoustic check sensor are easily programmable using a guided, intuitive menu. The display is specially designed to effectively solve grinding wheel balancing and control problems. All information is shown in a simple, clear way.



This section displays six screenshots of the Marposs P7 control unit's menu system, each with a descriptive caption below it:

- Vibration threshold programming:** Shows a screen with three adjustable vibration threshold levels (0.50 µm, 1.00 µm, 10.00 µm) and a 'Type' dropdown menu.
- Automatic grinding wheel balancing:** Shows a screen with a progress bar and a target value of + 0.20 µm, with a current speed of 10106 rpm.
- Balancing in two planes:** Shows a screen with two balancing planes, each with a target value (0.38 µm and 0.52 µm) and a speed of 1354 rpm.
- Manual grinding wheel balancing:** Shows a screen with a circular diagram representing the grinding wheel and four balancing points, with target values of 0.03 µm, 0.190 g, and 0.200 g.
- Spectral analysis:** Shows a screen with a spectral analysis graph and a speed of 3000 rpm.
- Grinding wheel control with acoustic sensor:** Shows a screen with a graph of the grinding wheel's acoustic control and a speed of 1330 rpm.



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www.marposs.com

For a full list of address locations, please consult the Marposs official website

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