



MEASURE WORLD FOR GRINDERS



In the increasingly competitive world of manufacturing cost control is a must, therefore increasing efficiency is the key to profits. The ideal situation would be having a real time monitoring of the running grinding process. The main parameters monitored to properly produce parts in the quantities and with the quality required are: part size, process trend, tool wear, part shape, feed rate, cycle time.... Monitoring these parameters by means of an automatic real time gauging system a optimal grinding process is performed.

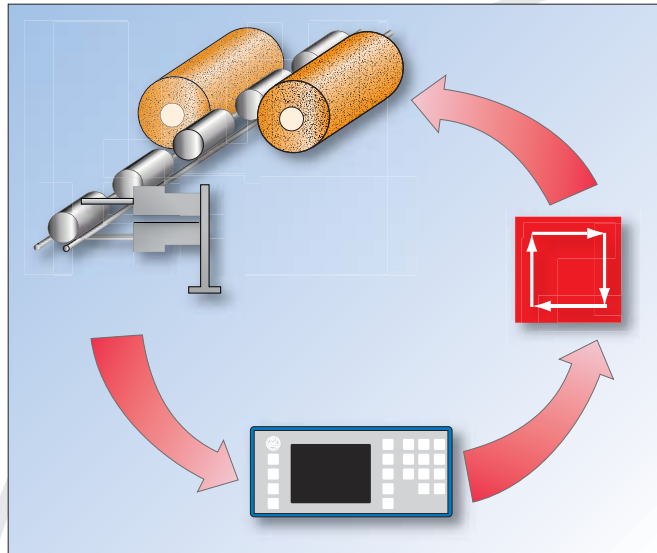
The real time gauging system allows:

- Machine productivity increase thanks to the continuous checking of the machining cycle
- Quality increase of unattended grinding process
- Longer wheel life thanks to the removal speed checking
- Collisions prevention due to extreme stock removal

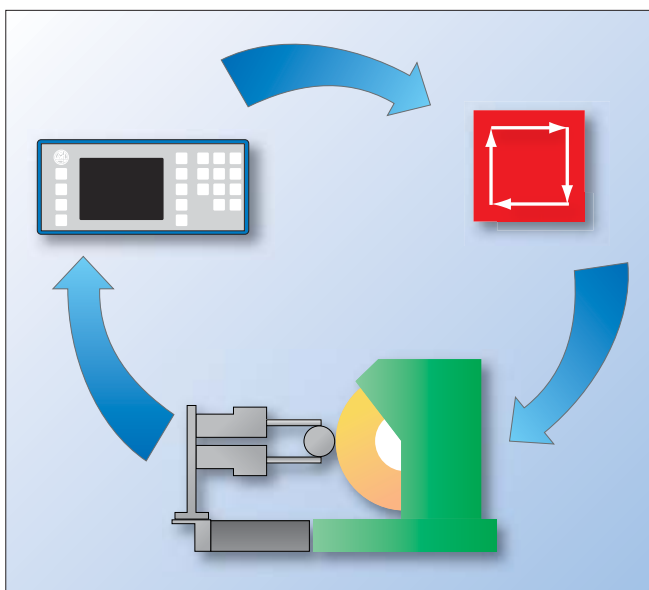
The in process gauges gives the real time information that is obtained directly from the workpiece while grinding is taking place. This allows the operator to see what is happening to the part in real time and adjustments to the machine cycle are made. Information such as measurement values, rate of change and stability are used to make required decisions to produce quality parts.

Measurement values taken during the grinding cycle tell machine when certain actions should take place, such as to reduce feed rates, when to dwell, and of course when to stop the process

Measurement rate of change is an important indication of what is happening during the grinding process. The part size should change at a related rate of wheel infeed. As the part approaches size, the measurement should smooth out and change at the same rate as finishing infeed. Most automatic cycles are determined based on an average rough stock and wheel condition. By monitoring the rate of change the measurement makes, the cycle can be adapted to take advantage of favourable conditions and prevent losses during unfavourable conditions. If the measurement decays at a higher than expected rate, the cycle can be sped up. If the measurement changes at a slower than expected rate, adjustments of the cycle are made being wheel dressing with conventional wheels or feed rate reduction to prevent damage to the tooling or part while still producing a viable product.



Post process gauge check



Gauge on real time process

The measurement values taken at the beginning of the machine cycle can be used to locate the part surface in order to determine where the grinding process will start. Less time is lost grinding air when the position of the surface is known. Initial measurement values can also determine if the incoming stock is within an acceptable amount to produce a quality part.

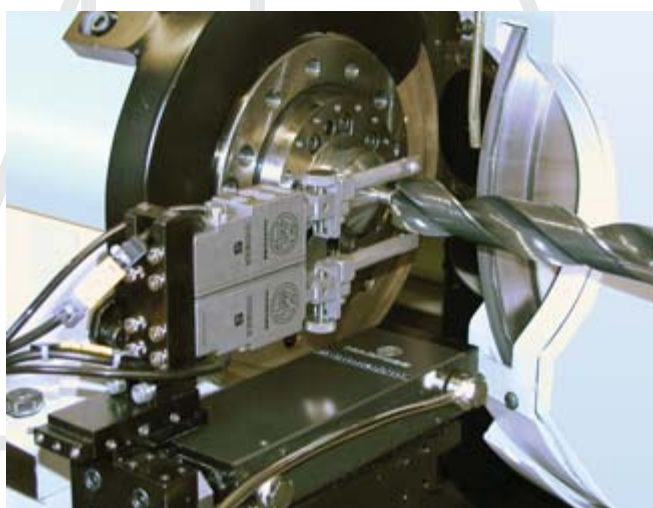
Too much stock can lead to higher than acceptable tool wear. Too little stock can mean the part will be scrap at the end of the cycle so why bother grinding it. A run out measurement at the beginning of the cycle can help to determine if the part will properly clean up so time is not wasted producing scrap.

A gauge checks the part either before or after the grind cycle in order to produce the parts properly. As a pre-process gauge, the external gauge can tell the machine control unit how much stock must be removed from the workpiece. Pre-process inspection also can be used in conjunction with in process gauges to match grind two mating pieces together where a precision fit is require. As a post process device, the gauge verifies that the process is in control and working properly. The post process gauge inspects the size and geometry part calculating the appropriate adjustments to be made to the process.

Marposs, as the worldwide leader of grinding measurement, places its long experience with some dozen of thousands of operating applications at the users' disposal. Marposs experience can be used to solve measuring problems on your grinder and to identify new process aimed at the higher productivity and quality of your process or machines. Hundreds of applications are available according to the type of machine tool, the part shape or the surface to be checked, the machining process or the expected performances.



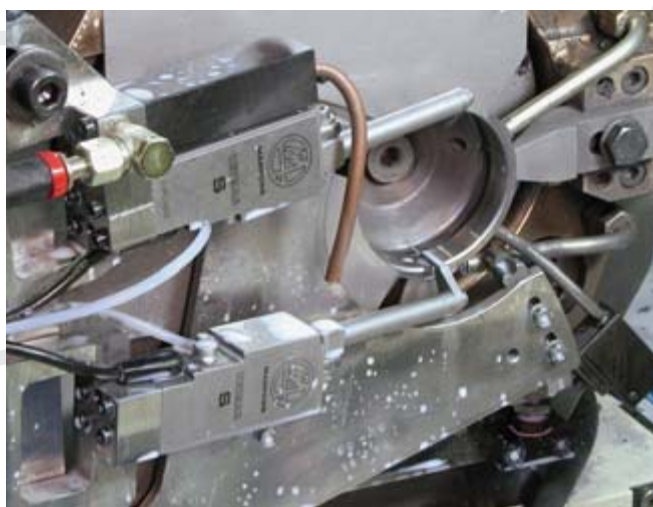
Smooth external diameters application



Interrupted external diameters applications



Orbital grinding of main and pin journals application



Internal smooth diameters application

Marposs products can cover a wide range of applications in order to reduce the gauges operating in your booth.

The use of the single measuring item for various applications such as outside or inside diameter control on smooth or interrupted surfaces, checking of thickness or planes machined on double-disc or traverse grinders allow the spare parts reduction and the consequent quick return of the investment performed.

Beside these multifunction models, specific gauges have been designed for grinders dedicated to special machining operations moving from components of split-phase motor (see example of the crank shaft) to components of the injection or of the mechatronics features by micron dimensional tolerances.

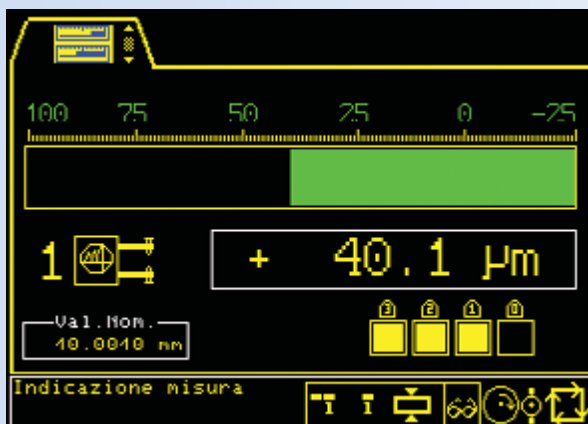
Looking at the measurement value after the grinding cycle is complete reveal that it may be slightly undersized or out of round. Monitoring measurement stability and part form allows the operator to see how the part is reacting with the grinding process taking all automatic countermeasures to feed back the follow cycle. While the in process gauge tells the artificial intelligence what is happening to the parts being gauged, other characteristics may be of interest also. There are even cases where in process gauging may not be possible. In these cases post gauges are used to close the loop.

Measuring electronic units have been designed respecting the ergonomics for the machine operator to whom the process information are presented on a graphic screen. The measuring system sends to the machine controller the controls for the machining cycle management and, in the meantime, the information for each single function are displayed in real time. This guarantees an automatic process in unattended machining environments, but always with the possibility for the operator to intervene on the process with regard to statistic processing.

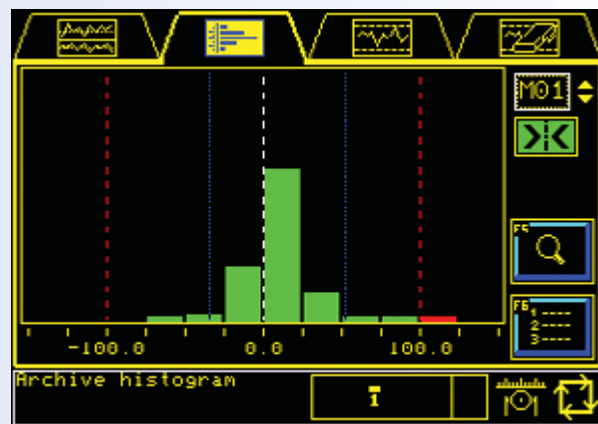
We remind the following points amongst the several display possibilities available for the man/machine interaction (HMI):

- Real time programming of the machining cycle. The operators has programmable controls to optimise the rate change of wheel feed, microfinishing, spark-out, final machining dimension and, eventually, alarms to prevent wheel/machine collisions in case of part absence or too excessive material to remove.
- Real time visualisation of the part dimension during the machining. The information of the feed rate are associated to the measuring value and, as an option, to the value and time of the wheel removal and of the geometric error of the diameter in machining.
- In processes with statistic control the operator has at his disposal the most known method for the calculation of the capacity coefficient of the machine and/or of the process.

The system supplies the process spread on the basis of the detected values and, if the prefixed control limits are exceeded, it processes and sends the tool compensation value in automatic mode.



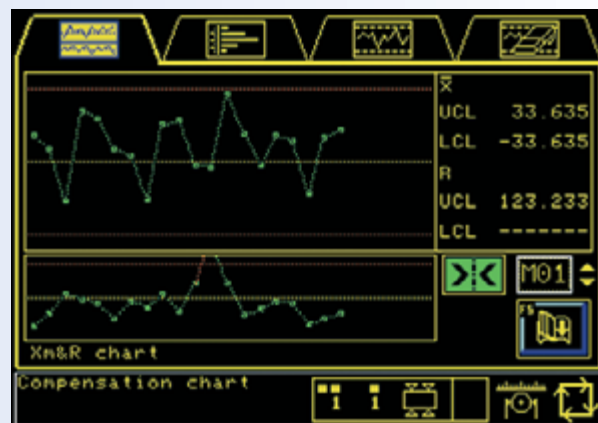
In-process diameter check



Histogram of collected measures



In-process working cycle programming



Control chart in real time for tool compensation



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