



**KELCH**

**KENOVA measure line**

High-precision measuring on the production line.

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# KENOVA measure line made by Kelch.

Measuring workpieces made easy.

BLUeCOMPETENCE

Alliance Member



# Why measure workpieces?

Do you measure your tools?  
Then why not measure your workpieces too?

If you want to increase the quality of your manufacturing processes, the use of tool measuring and setting equipment manufactured by Kelch is the first step before machining the work piece, this way you get off to the right start.

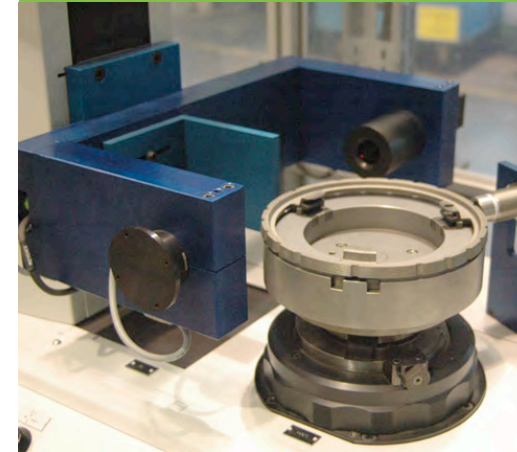
However, even with exactly measured and set tools the logical next step is to measure the work pieces and this is where Kelch can be your perfect partner.

By Carrying out optical measurements of your manufactured parts you can minimize the throughput times compared to the tactile measuring system.

The optical procedure makes it possible to measure geometries that can take far too long or even be unachievable using the tactile measuring system.



## Precision



### FOR THE MEASUREMENT OF:

- Threads
- Cogs
- Roughness measurement
- Bearing locking (roll dimensions)
- Rotationally symmetric components, like cogs and splined shafts, sliding sleeves, cardan shafts, external rings, transmission components (e.g. synchronizer rings).

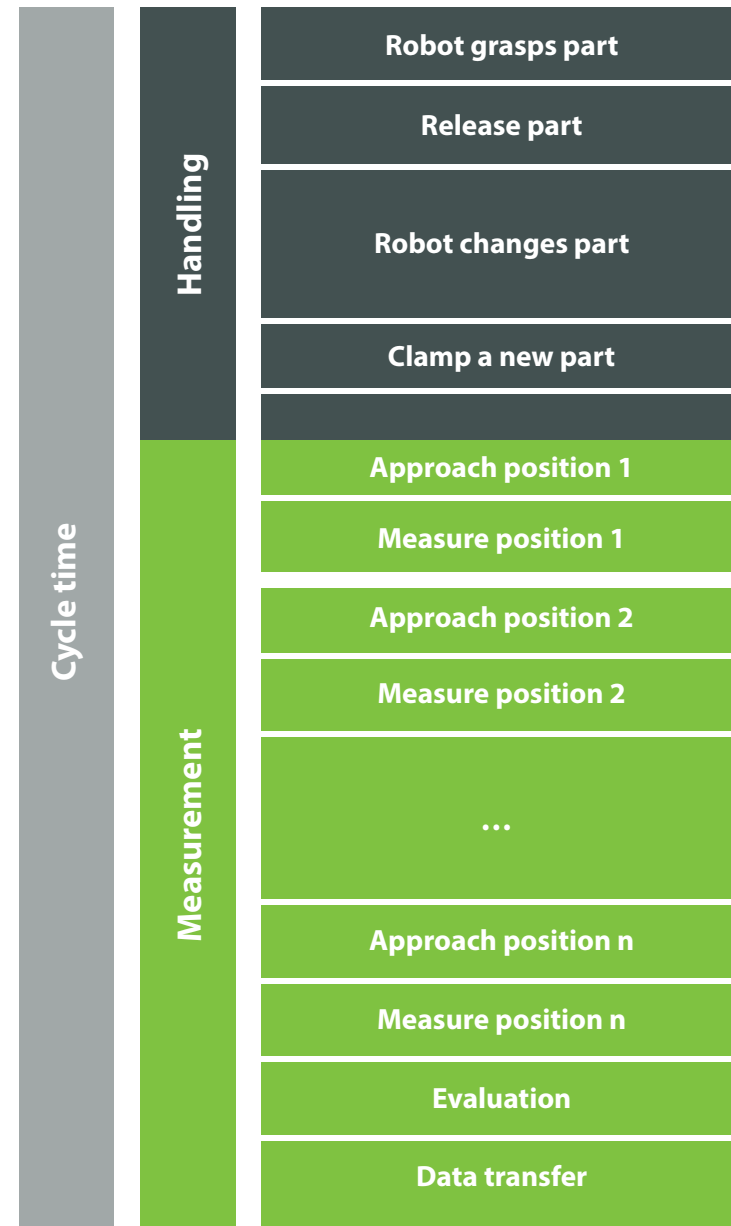
# Measuring Times & Sequences

Measuring times are highly dependent on the measuring function and the required precision as well as the number of measurements. In general, the following applies:

$$\text{Total time} = \sum_{i=1}^n \text{Measuring time}_i$$

Another factor is the differentiation between automatic (full CNC) units, partial CNC (automatic axis of rotation only) or manual units.

The adjacent schematic shows an example of a measuring sequence. In the case of manual operation, the operator removes the workpiece, inserts and clamps it. It is possible to integrate a full CNC solution into the production line such that human intervention is no longer necessary. This increases efficiency even further.



# Applications

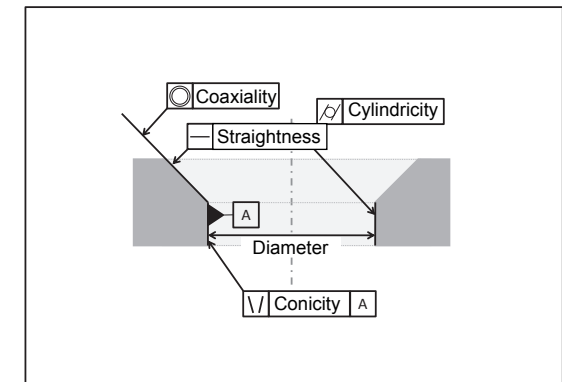
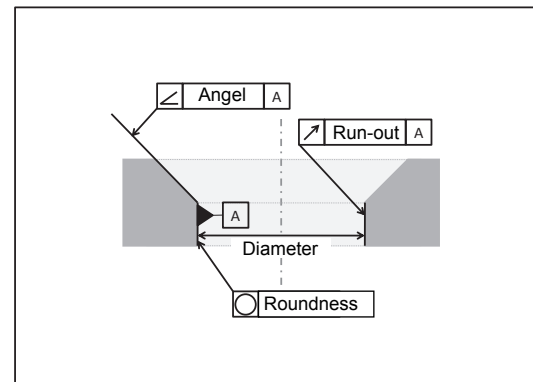
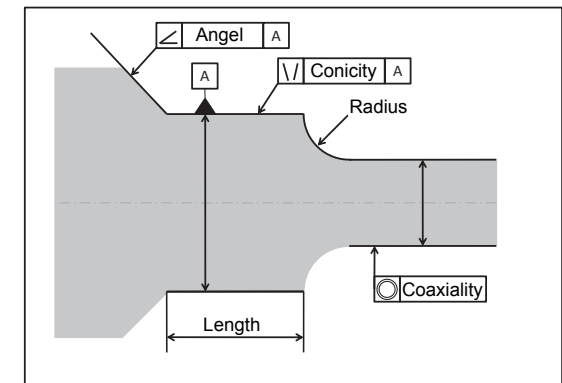
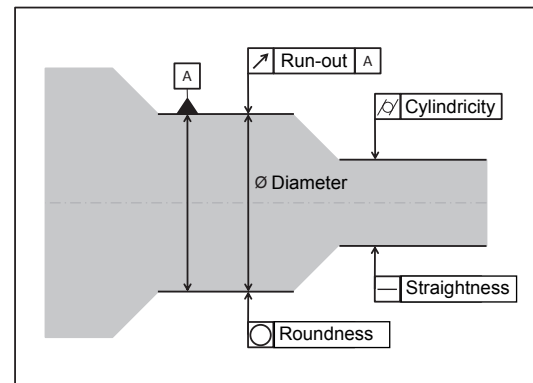
Quality made by KELCH

Measure rotationally symmetric workpieces on your production line.

Feature	Shafts	Miscellaneous	Triangulation
	Camera/outside	Camera/outside	
Diameter	●	●	●
Roundness	●	●	●
Run-out	●	●	●
Length	●	●	
Angle	●	●	●
Coaxiality	●	●	●
Concentricity	●	●	●
Cylindricity	●	●	●
Straightness	●	●	●

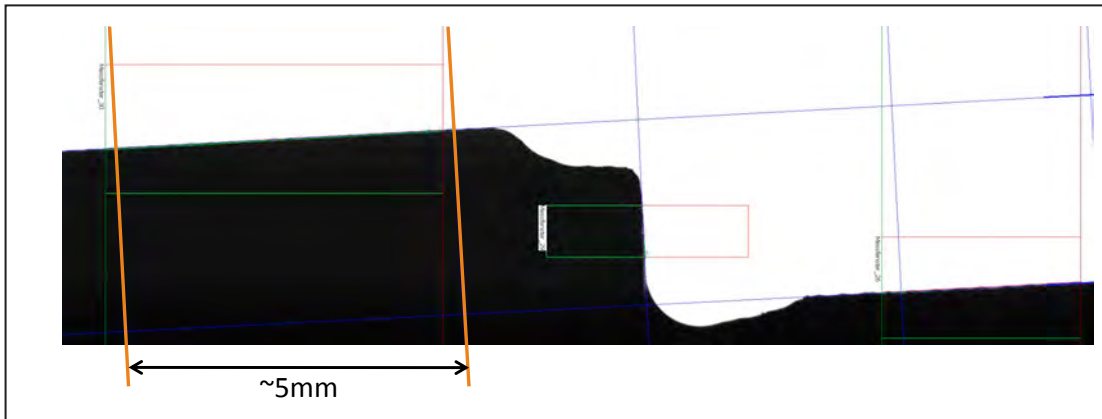
Using our new **KENOVA measure line** range of products means that you can inspect the quality of rotationally symmetric workpieces directly after machining and/or between individual production steps on an automated basis. Since it is possible to integrate the units into production lines, the workpieces do not need to leave the production line. This guarantees the highest levels of efficiency and optimum process monitoring.

You can choose from various measuring tasks that can be customized to your own particular requirements. In this connection, the measuring tasks range from the diameter through the length, roundness, angle to concentricity and even more (See the table on the right). Special solutions are also possible for measuring **threads, gears, roughness measurement or bearing locking (roll dimensions)**. This makes it possible to measure **rotationally symmetric components, like gears and splined shafts, sliding sleeves, cardan shafts, external rings, transmission components (e.g. synchronizer rings)**.

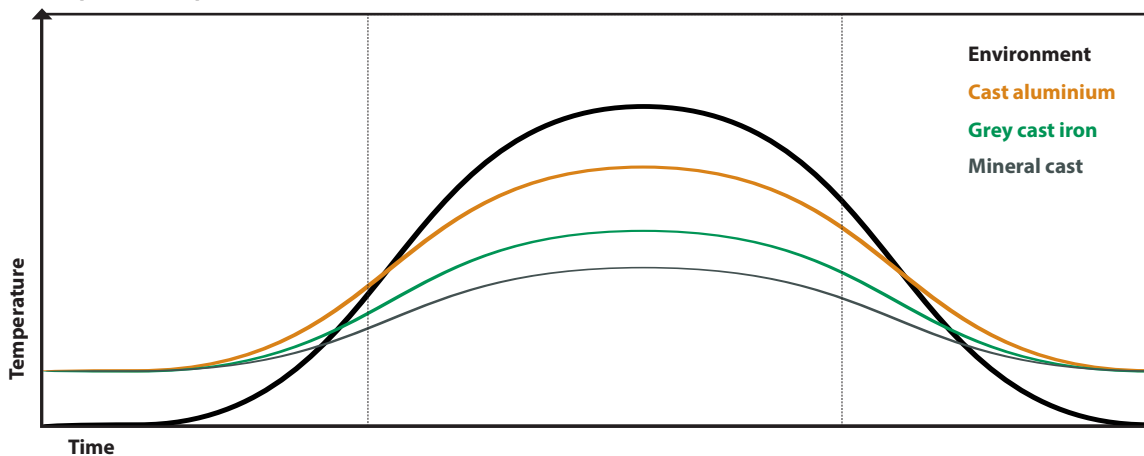


# Just how precise would you like it?

Example of a measurement:



Temperature response of different materials



## Measuring Principles

When measuring workpieces, the same requirements apply as with tools. It is highly dependent on where you carry out measurement and under what conditions. The measuring machine must be as resistant as possible to vibrations, temperature variations and other external influences. In addition, the traversing speeds of the motors must be optimized and all the components must be coordinated on an optimum basis. Equipment produced by Kelch doesn't just provide you with the perfect conditions for measuring your tools but also for measuring your workpieces.

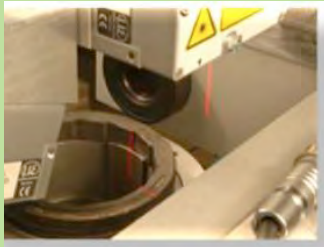
The solid structure of the machine due to the mineral cast plays a decisive role in guaranteeing precise measurements. This helps avoid the risk of changing ambient conditions affecting the measuring result. Many other manufacturers use cheaper cast aluminium, but we firmly believe in mineral cast. This is the foundation for precise measuring in our high-quality mechanical systems.

## Product features of mineral cast:

- Environmentally-friendly manufacture due to cold casting
- Sustainable reuse is possible, e.g. for road building
- Vibration-reducing
- More resistant to temperature fluctuations
- Precise measurement due to robust structure

# Mechanical Systems

## » APPLICATION



» **Measurement determination on transmission external rings with 3D/2D sensor technology.**



» **Position measurement of indexable inserts on crankshaft cutters.**



» **Optical dislocation to determine the imbalance of a wave/shaft.**

## Precision creates sustainable success

The micrometer-precise measurement of transmission components or cutting tools can often be a challenge due to complicated geometries or the large sizes of components. This is even more true when the measurements are carried out directly on the production line. High measurement resolutions and large component dimensions are a contradiction in terms. However, with highly-precise mechanics, selected measuring sensors and intelligent measuring software, measuring systems can be developed which meet the high-quality standards of today's industries.



**KENOVA Measuring Systems** can be fully integrated into your product line. In the measuring process rotationally symmetrical parts are measured with the same precision as in the measuring laboratory.



The measuring machine can be supplied as a manual workstation for production. This design can also combine 2D and 3D sensor technology.

# Sensor technology and software

## Measurement values:

Adjust measurement values during the process



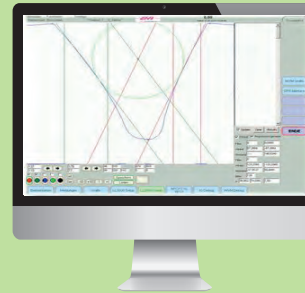
## Imbalance

Imbalance in axial components



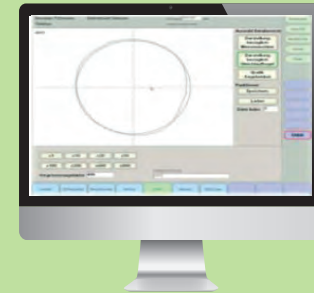
## Optical dislocation:

3D-data for optical dislocation

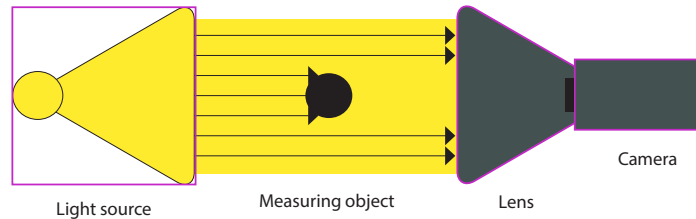


## Roundness:

Determination of the roundness of a component

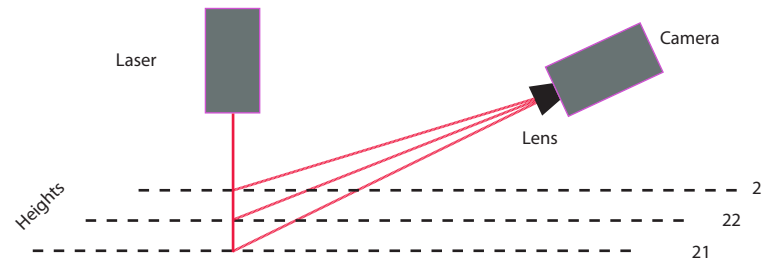


## Backlight measurement:



The benefit of the telecentric construction is that reflecting objects of different heights can also be measured with high-precision.

## Laser measurement:



Triangulation sensors with up to 256,000 measuring points/sec. are used. Measuring precision of up to 1  $\mu\text{m}$  is achieved.



# Hardware & Interfaces

Sensor technology that can be used		Workpieces	
		Shafts Kelch clamping device (workpiece-specific)	Standard HSK/SK50 attachment
Laser Measuring System	2D back light Illumination and optics (telecentric)	X	X
	3D Triangulation		X
	2D Micrometer	X	X
	Distance Point		X
Temperature	Thermal Reading Head	X	X

## Your benefits in overview:

- Customized adaptations and solutions
- Can be integrated into the production line
- Maximum process safety
- Based on the proven, precision mechanical systems from Kelch
- Customized software solution with modular structure
- Global Kelch sales structure
- Already proven in the automotive sector

The **KENOVA measure line** range is based on the proven mechanical systems of the **KENOVA set line V9** range. Data communication and the sensor technology have been specially customized for your application. Depending on the application, you have the option of clamping workpieces in standard adaptors (SK/HSK), or you need a specific clamping device that we can create or adapt specially for your application.

The possible use of sensor technology depends on the workpiece too. In the adjacent table, you can see a combination matrix that shows you exactly which sensor technology is suitable for which particular workpieces.

Long workpieces like shafts, for example, are fixed using a tailstock. This means that as high a precision at run-out as possible is reproduced, since possible wobbling does not occur.



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