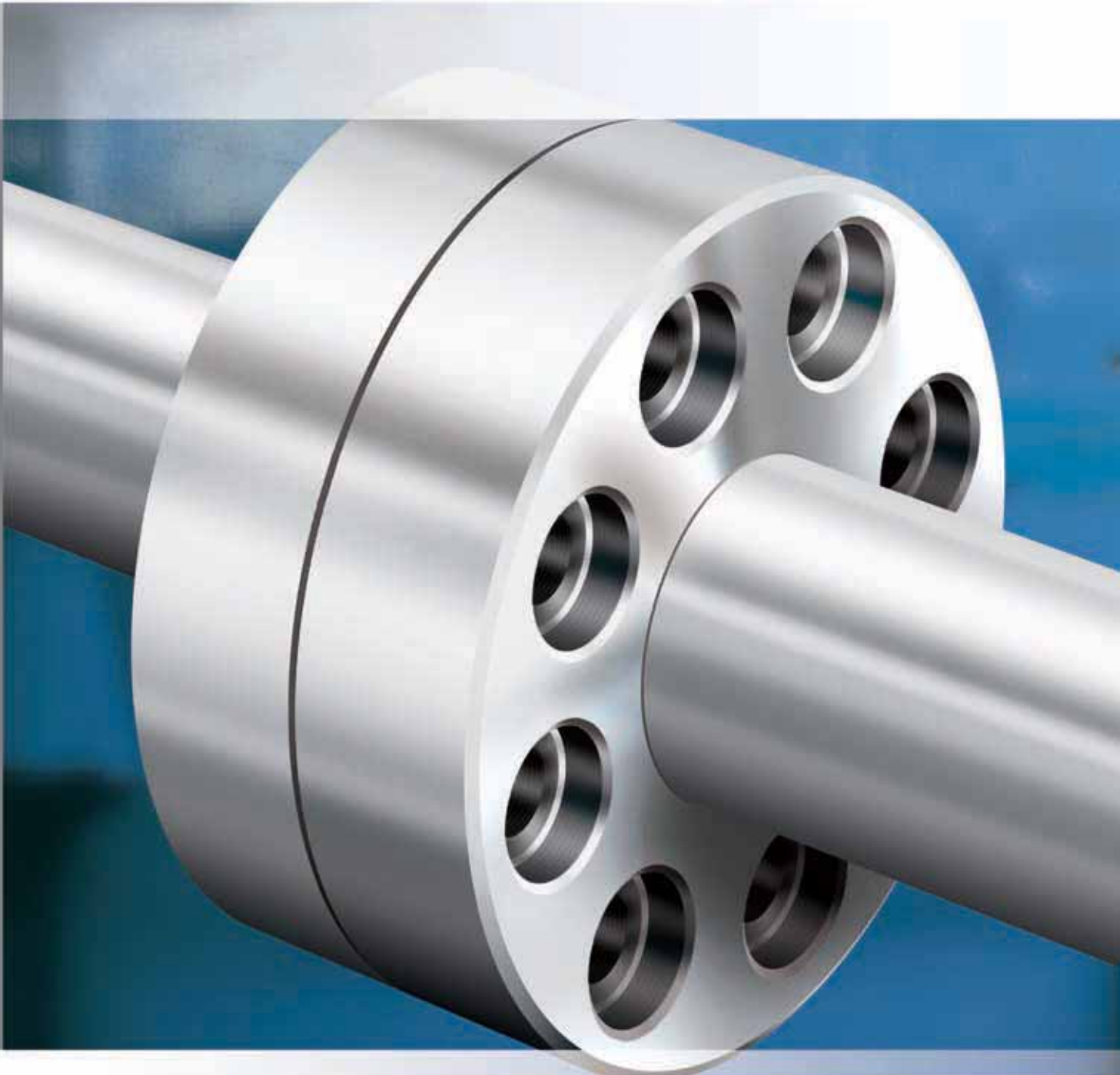




Why Alignment

Reliability starts with precision shaft alignment



Extend machine availability and efficiency

Precision alignment pays back

Rotating machinery is susceptible to misalignment. Machines that are well aligned at the commissioning stage and thereafter regularly maintained, will in the long term reduce both plant operating and maintenance costs.

Laser precision alignment extends machine availability as the Mean Time Between Failure (MTBF) increases. It protects assets and increases product quality, as vibration is reduced to very low levels.

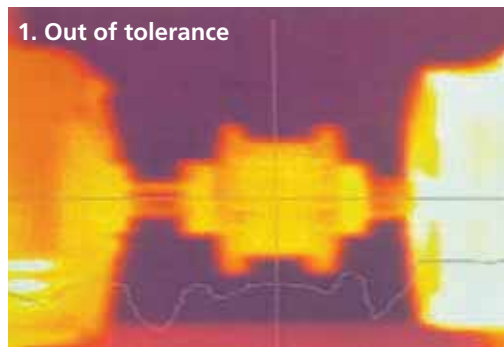
When misaligned, the loading of the shafts dramatically increases due to the reaction forces created within the coupling.

Precision alignment guarantees:

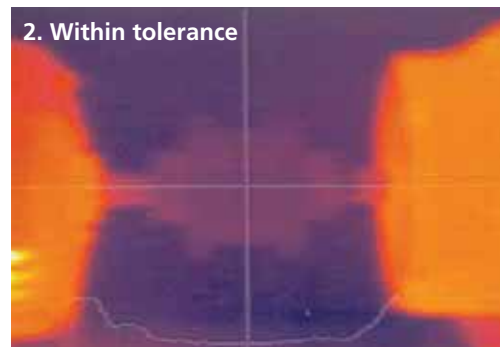
- ▶ Reduced energy consumption
- ▶ Reduction in bearing, seal, shaft and coupling failure
- ▶ Reduced bearing and coupling temperatures
- ▶ Reduced vibration
- ▶ No breaking (or cracking) of shafts
- ▶ Secure foundation bolts

Accurate shaft alignment contributes in more than one way towards great savings and a cleaner environment.

The effect of increased coupling loading due to misalignment can readily be shown using infrared thermography.



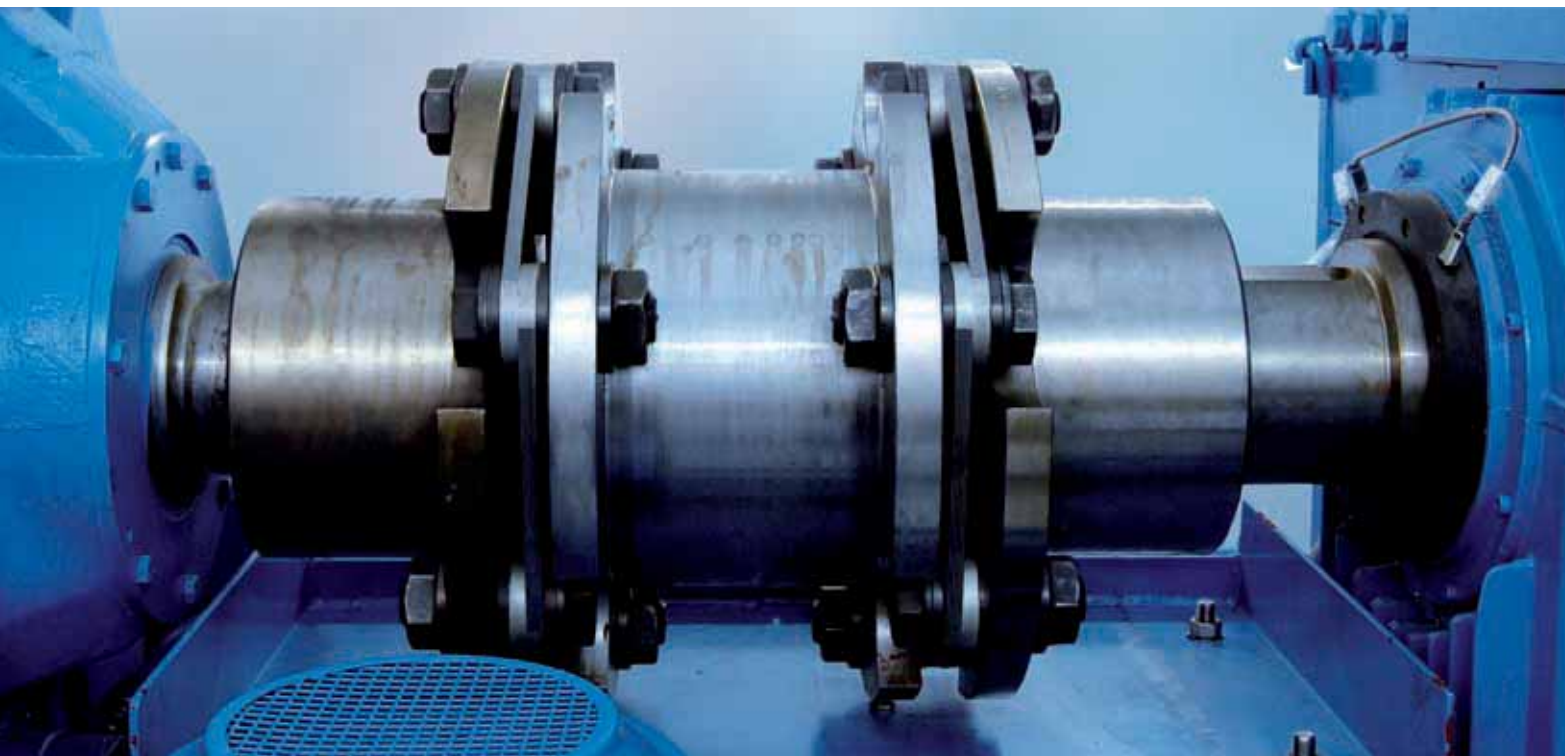
1. Out of tolerance



2. Within tolerance

1. In this case, the flexible coupling element heats up. The machine develops elevated temperatures, particularly around the bearing housings.

2. Precision alignment drastically reduces factors that may cause machinery breakdown.



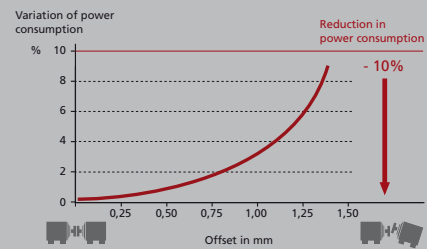
3 benefits of precision alignment

1. Reduced energy consumption

Effects on power consumption

Significant power savings can be made through accurate alignment. Precise alignment eliminates reaction forces and reduces energy consumption by up to 10%.

Courtesy of © ICI PLC

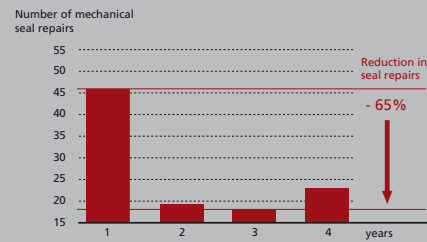


2. Reduced repair incidences

Mechanical seal repairs

Mechanical seal repairs decline by up to 65% when precision alignment is carried out on a regular basis.

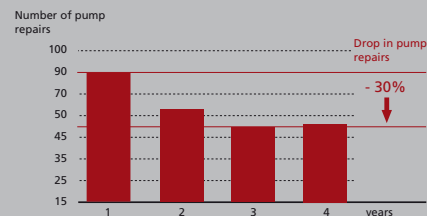
Courtesy of © HOECHST AG Gendorf / Germany



Pump repairs

The rate of repairs declines by up to 30% when precision laser alignment becomes an integral part of the pump repair schedule. Maintenance costs are also reduced through lower parts expense and inventory levels.

Courtesy of © HOECHST AG Gendorf / Germany

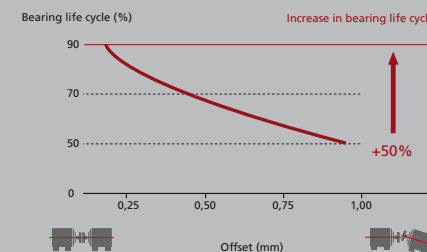


3. Longer machine life

Relation between offset and bearing life cycle

The smaller the offset misalignment, the higher the expected bearing life cycle.

Courtesy of © The University of Tennessee



Align machines to specified tolerance

A survey conducted by one of the world's leading rotating equipment service organizations shows that less than 10% of the 160 machines randomly chosen for measurement were found to be aligned within acceptable limits.



Only 7% of the measured machines fall within the acceptable alignment tolerances.

Offset (mm)	Machines measured (%)	Alignment Status
0.00 – 0.05	7%	acceptable alignment
0.06 – 0.10	10%	
0.11 – 0.20	23%	
0.21 – 0.50	31%	out of tolerance
0.51 – 1.00	18%	
> 1.00	11%	

The above tolerances are for equipment running at 3000 rpm.

Statistics courtesy of a major UK chemical company

Traditional shaft alignment methods

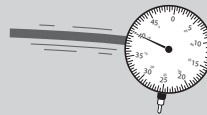
Conventional measurement methods possess a low resolution for the adjustment of modern machinery. The straightedge/feeler gauge methods depend on the limited resolution of the human eye. The resulting resolution of 1/10 mm is for most machinery inadequate.

Dial indicators normally have a resolution of 1/100 mm, but calculations tend to be complicated, requiring highly experienced users, and jobs take longer to accomplish. These methods are prone to human influences when reading dial indicator values or computing the alignment condition.

How accurate are dial indicator readings?

Sagging indicator brackets

Sag should always be measured before actual alignment readings are taken irrespective of how solid the bracket appears.



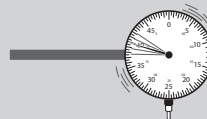
Low resolution

Up to 0.005 mm rounding error may occur with each reading – which easily results in an error of up to 0.04 mm in the calculated results.



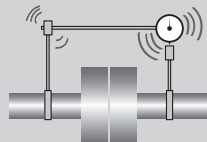
Sticking/jumping dial hands

Sometimes the indicator must be tapped in order for the needle to settle on its final value.



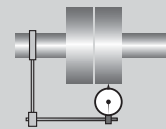
Play in mechanical linkages

Slight amounts of looseness may not be noticed, yet produce large errors in results.



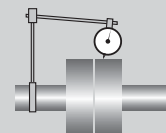
Reading errors

Human errors occur all too often when dials must be read under cramped, poorly-lit conditions and severe time constraints.



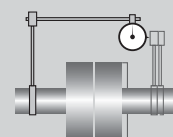
Tilted dial indicator

The indicator may not be mounted perpendicular to the measurement surface so that part of the displacement reading is lost.



Axial shaft play

This can affect face readings taken to measure angularity unless two axially mounted indicators are used.

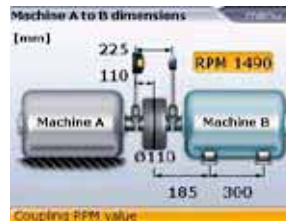


Advantages of laser shaft alignment

Straightforward alignment procedure

Dimensions

- ▶ Systems are user-friendly and intuitive
- ▶ Quick set-up of the fully assembled ready-to-use sag-free brackets
- ▶ Follow the simple on-screen guidance to enter required machine data.
- ▶ Bracket variety for any shaft or coupling



Measure

- ▶ Error-free and accurate measurement with a resolution of 1 micron (0.00004")
- ▶ No human reading errors and bracket sag influences
- ▶ Quick on-screen laser beam adjustment
- ▶ Take readings at any desired position



Results

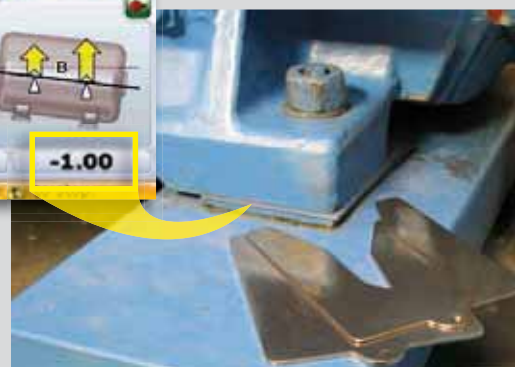
- ▶ Instant display of the coupling & feet values in both horizontal and vertical directions
- ▶ Evaluation of the alignment condition according to coupling tolerance
- ▶ Repeatability of results
- ▶ Reports generated directly from instrument, in conformity with ISO 9001 requirements



Live move

The unique measurement principle offered by PRÜFTECHNIK laser alignment systems allows the machine feet corrections to be monitored during live adjustment. The machine graphics show the direction and the correction value of feet to be moved. A smiley face appears as soon as the alignment condition falls within the set coupling tolerances.

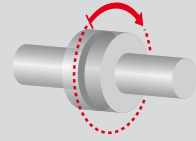
PERMABLOC® precut shims from PRÜFTECHNIK are the quality shims for fast and accurate alignment correction.



Benefits of PRÜFTECHNIK laser alignment systems

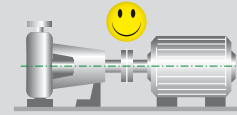
Continuous sweep mode

Measurement data is automatically and continuously collected from any start position as the shafts are rotated capturing a large number of measurement points to accurately determine the alignment condition.



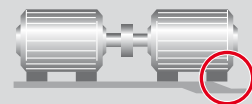
Tolerances (TolChek®)

Avoid unnecessary moves by automatically evaluating alignment condition with respect to tolerances using the "smiley" which is also active during live machine correction.



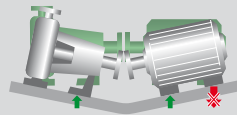
Soft foot

For good alignment, soft foot must be eliminated. The machine feet should rest properly on the foundation. Soft foot is measured, corrected and documented.



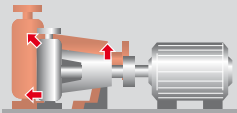
Base-bound or bolt-bound

Problems arising from base-bound or bolt-bound feet are resolved by redefining fixed/movable feet.



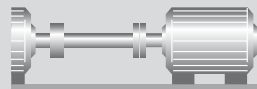
Thermal growth and Target specifications

The specifications can be input to take into account the expected positional change of the machine during operation.



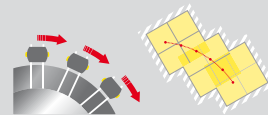
Choose coupling type

Short flex, single plane, cardan or spacer couplings can be selected to apply the correct tolerance and display criteria for your machines.



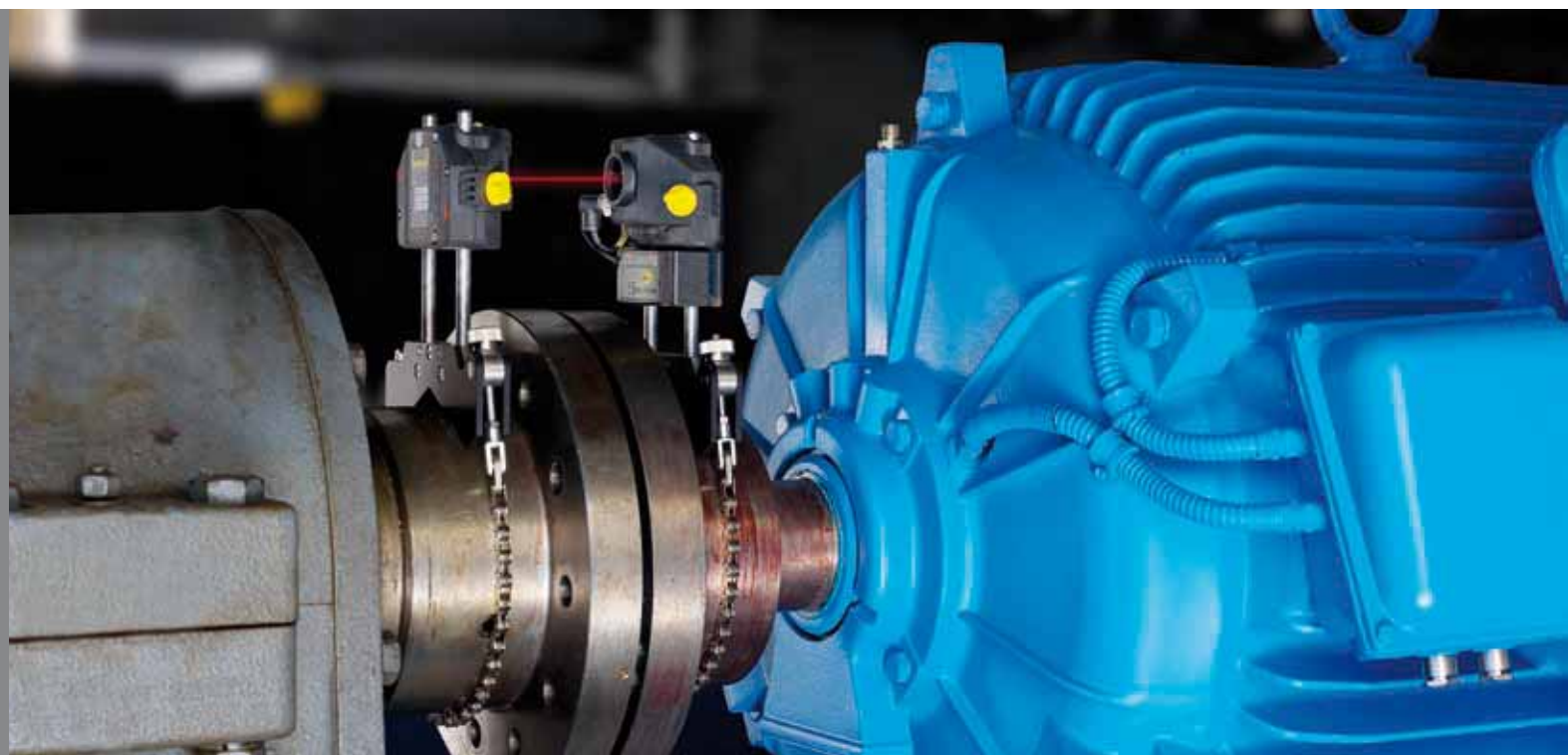
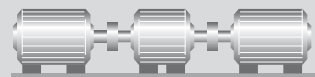
InfiniRange®

The measurement range of the detector can be infinitely extended to accommodate gross misalignment. This is ideal to perform and document initial rough alignment and easily handle long spans across spacer shafts.



Machine train alignment

Measure and display the entire alignment condition of machine train; allowing the user to make the optimal machine adjustment.



Celebrate with us ... 25 years laser shaft alignment

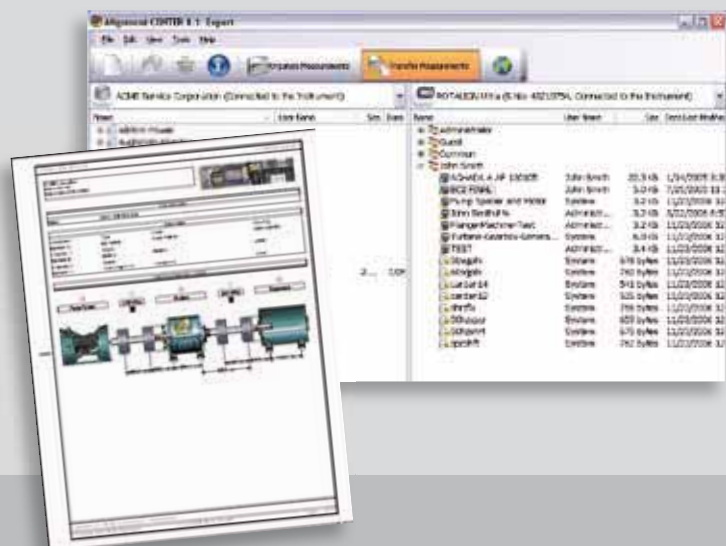
As part of the silver anniversary commemoration of laser shaft alignment, we would like to thank our customers and the many users worldwide for their confidence in our products. Contact your local PRÜFTECHNIK representative today or request further information by emailing to info@pruftechnik.com.



ALIGNMENT CENTER – The software for professionals

ALIGNMENT CENTER is a state-of-the-art PC software database platform for all PRÜFTECHNIK Alignment instruments and applications. It is the perfect solution for preparing, analyzing, organizing and archiving measurements.

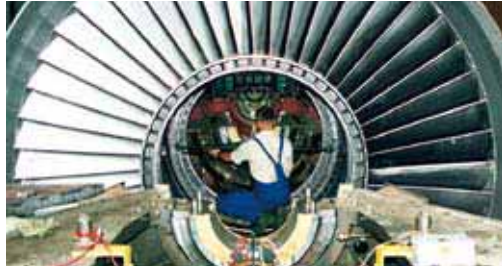
Measurement related data is also saved and the measurement history can also be followed and organized under hierarchies. The software generates professional color reports that include photos, company information and logo.



... shafts and much more

Applications

PRÜFTECHNIK Alignment measurement systems are utilised in a wide range of industrial applications including alignment of rotating machinery, bores, turbines and rolls, monitoring of machine position changes, measurement of machine tools, surface flatness and straightness.



Industries

PRÜFTECHNIK hi-tech instruments are used in top industrial organizations worldwide. Industrial sectors covered include: power, oil, gas, mining, petrochemical, cement, water treatment and sewage, marine and shipping, pulp and paper, chemical and pharmaceuticals, food processing, steel, production and processing, and within OEMs.



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