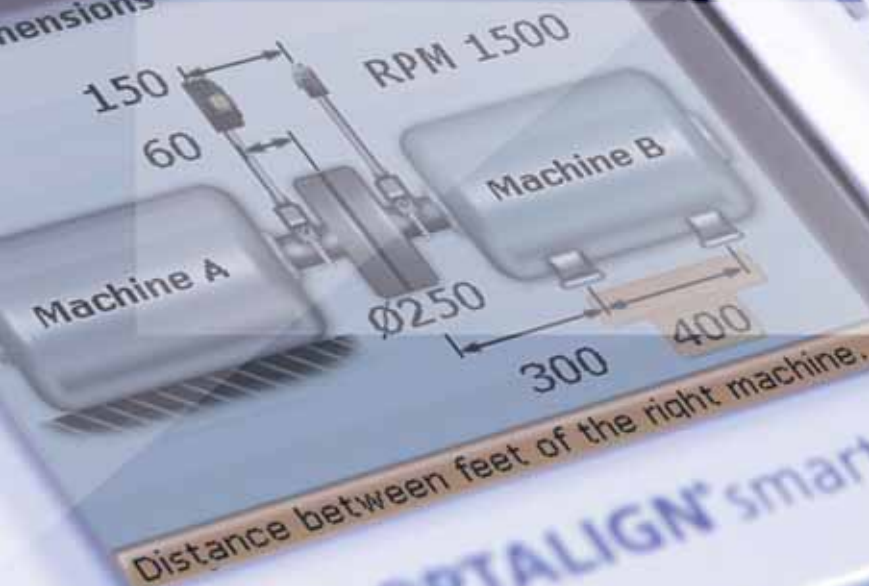


# OPTALIGN<sup>®</sup> smart

Precision laser alignment with a twist. Optalign it!

Number 1 in laser precision alignment

Dimensions



OPTALIGN<sup>®</sup> smart



PRÜFTECHNIK  
Alignment Systems

[www.pruftechnik.com](http://www.pruftechnik.com)



## Expertise in precision laser alignment

For over two decades, PRÜFTECHNIK Alignment Systems has continued to develop undisputed precision laser alignment products. The maintenance departments in the top industrial organizations worldwide employ these highly-developed and user-friendly systems to measure and align machinery used in the power, chemical, water treatment, production and processing industries. From the numerous PRÜFTECHNIK patents, a good number have been incorporat-

ed in OPTALIGN® smart. The high measurement accuracy attained through the automatic and continuous acquisition of measurement data during shaft rotation and its straightforward and intuitive operation, transform OPTALIGN® smart to an incomparable high performance and dynamic precision laser alignment measurement instrument. With OPTALIGN® smart, the alignment of rotating machinery has never been simpler and convenient.

## Value added through patented solutions

### The single laser beam technology UniBeam® ensures rapid precision alignment.

The patented UniBeam® feature guarantees that laser set-up and beam adjustment in all laser units from PRÜFTECHNIK Alignment Systems is quick and straightforward, even for cases affected with extreme angularity. An additional advantage of UniBeam® is the use of a single laser detector and cable. Wireless data transmission is possible via the Bluetooth® RF module.

### InfiniRange® extends the effective measurement range significantly.

Alignment procedures are dependent on the application. The alignment of machines with gross misalignment – in particular angularity – or those that are distant from each other, can be handled using InfiniRange®, a precision alignment capability from PRÜFTECHNIK Alignment Systems. This function extends the detector surface mathematically, making it possible to measure machines with severe misalignment or distant from each other without loss in accuracy of alignment results. Rough alignment is not necessary, and the initial alignment condition is recorded.

OPTALIGN® smart is equipped with powerful features for productive maintenance.

- ▶ **Single laser technology (UniBeam®)**
- ▶ **Intuitive user guidance**  
3-key alignment (define machines, automatic measurement, analyze alignment results)
- ▶ **Continuous sweep measurement mode**  
For automatic and continuous acquisition of data as shafts are rotated
- ▶ **Dynamic tolerance (TolChek®)**  
Automatic and active evaluation of the alignment condition through the smiley and system LEDs
- ▶ **Live Move**  
Live on-screen monitoring of the alignment correction
- ▶ **Soft foot**  
Check, correct and record soft foot in the measurement report
- ▶ **Data protection and printing reports**  
Measurement files are saved and reports printed in both graphic and text formats. In case of power interruption, the current file is saved automatically

Investing in innovative solutions has transformed PRÜFTECHNIK Alignment Systems into the leading global player in the world of precision laser alignment. We are active in the global market, as a large percentage of our hi-tech instruments – developed and produced in Germany – are used in top industrial organizations worldwide.



## Precision laser alignment with a twist. Optalign it!

Thanks to its intuitive operation, ergonomic design and its many beneficial features, OPTALIGN® smart remains a sought-after measurement system in the maintenance of pumps, motors, gearboxes, compressors, and a variety of rotating machinery. If machines are precisely aligned, the load on the shafts reduces dramatically. This results in increased machinery life, extended machine availability and the keeping down of maintenance costs.

The high resolution backlit TFT screen, the low weight and the distinct positioning of the operating keys make it possible to carry out alignment jobs under extreme conditions. The secret behind the intuitive operation lies in the three blue round function keys for the

main alignment steps, the context menu, the status line help text, and the clear depiction of alignment results. Uncomplicated and easy to comprehend.

The default configuration can be enhanced with powerful features as job demands grow, making OPTALIGN® smart an investment for the future that pays off.



reddot design award  
product design 2007

# OPTALIGN® smart

The OPTALIGN® smart **high resolution TFT colour display** is backlit. Due to its good contrast ratio, measurement values can easily be read in low light environments.

OPTALIGN® smart **integrates a Bluetooth® interface**. This allows convenient and flexible wireless data transmission. The connection to a PC and other peripheral devices such as a printer is via a USB interface.

### Express alignment / Quick Check

Fast and rigid mounting of transducer and reflector on the shafts using the pre-assembled brackets. Enter a single dimension and rotate shafts for instant results .

The alignment condition is determined automatically based on the active tolerance table.

### Continuous sweep measurement mode

In this exclusive and patented mode, measurement data is automatically and continuously collected as the shafts are rotated.

A shaft rotation of as little as 60° captures a large number measurement points to accurately determine the alignment condition. Measurement can start at any position and in any direction.



### Live Move

Both horizontal and vertical coupling and foot results are automatically calculated. The machine graphics show the direction and the correction value of feet to be moved. During alignment, OPTALIGN® smart continuously measures the corrections. The monitored changes are displayed live on the screen.





Actual size

The alphanumeric keyboard and the navigation keys ensure comfortable operation of the measurement system. The alignment condition is monitored through the computer LEDs. The batteries allow long operation.

OPTALIGN® smart has been constructed and manufactured for industrial applications, and can be used in **extreme working conditions**. The computer is dustproof and water spray resistant in accordance with IP 65;

the transducer and reflector are both submersible and dustproof in accordance with IP 67.

Optional brackets that extend application capabilities are readily available:

- ▶ The compact magnetic bracket provides quick and rigid mounting of measurement components on coupling flanges.

- ▶ The sliding magnetic bracket is suited for non-rotatable shafts. It glides around the outside of the coupling or shaft end from one measurement position to the next.

## Precision laser alignment in 3 smart steps

### Straightforward and flexible operation



**Enter dimensions**

Define machine by entering the required dimensions. The dimensions to be entered are clearly highlighted on the display.



**Measure**

After the on-screen laser beam adjustment, rotate shafts in their normal direction of rotation. Measurement can start and stop at any position.



**Evaluate results / machine corrections**

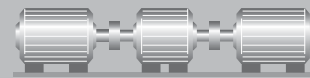
The alignment condition at the coupling and the machine feet corrections are displayed on the screen in both graphical and numerical formats.

The main function keys allow a quick switch between the main functions during alignment.

## Convenient, beneficial and quick precise alignment

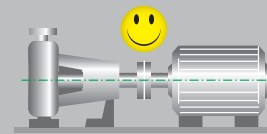
### 3-Machine train alignment

OPTALIGN® smart measures and displays the entire alignment condition of 3-machine trains, allowing the user to make an optimal machine move.



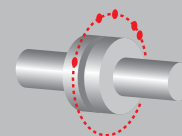
### Tolerances (ToIChek®)

Automatic evaluation of the alignment condition with the assistance of the dynamic tolerance table, the smiley and the system LEDs. This function is also active during live machine correction.



### Multipoint measurement mode

Measurements are carried out at any selected positions. Results obtained from any 3 or more positions over 60° rotation or wider. This mode is suitable for shafts mounted on sleeve bearings.



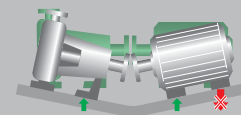
### InfiniRange®

The detector measurement area is extended to allow alignment of grossly misaligned machines. This is ideal for long spans, and eliminates the need for rough alignment, hence the possibility to record the initial alignment status.



### Base-bound or bolt-bound?

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



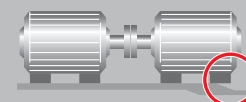
### Choose coupling type

True offsets of the coupling type used are calculated at the actual coupling transmission planes in accordance with the manufacturer's specifications.



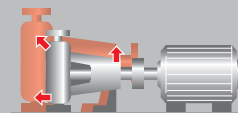
### Soft foot

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



### Thermal growth and Target specifications

Thermal growth at the feet and target specifications at the coupling can be input to take into account any possible positional changes during operation.



## How accurate are dial gauge readings?

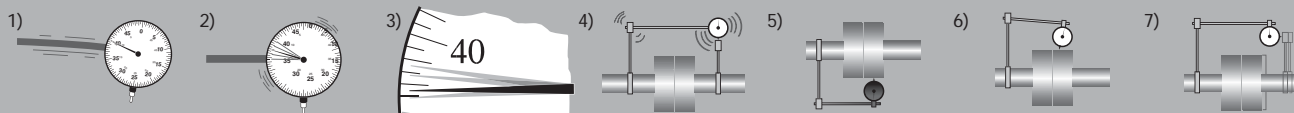
Conventional measurement methods possess a resolution that may be too low for the adjustment of modern machinery. The straightedge/feeler gauge methods depend on the limited resolution of the human eye. The resulting resolution of 1/10 mm is for most machinery inadequate.

Dial gauges have on the other hand a resolution of 1/100 mm, but cumbersome in usage, requiring highly experienced users to obtain

reliable results. Alignment jobs take longer to accomplish.

Sources of error within the system include:

1. Sagging indicator brackets
2. Low resolution
3. Sticking/jumping dial hands
4. Play in mechanical linkages
5. Reading errors
6. Tilted dial indicator
7. Axial shaft play



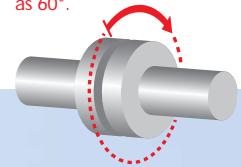
## Continuous sweep measurement mode



The OPTALIGN® smart transducer operates using UniBeam®, the single laser beam technique, and has also a built-in electronic inclinometer to determine the angular position. With the unique sweep measurement mode, both the laser beam coordinates and the angle of rotation are simultaneously and continuously recorded as

the shafts are rotated. Shaft rotation can start and stop at any possible position and in any possible direction. This mode is quicker and the measurement accuracy is much higher than the 3-position method. Modern high performance machines require the accuracy attained using the continuous sweep mode.

OPTALIGN® smart takes sufficient readings to accurately determine the alignment condition with a shaft rotation of as little as 60°.



## Why laser precision is accurate and faster

Laser shaft alignment instruments from PRÜFTECHNIK Alignment Systems utilize UniBeam® and the patented single laser technology, with a resolution of 1 micron. The universal precision brackets have been designed for quick and rigid set-up with no sag. The patented multiple measurement points method makes it possible to measure more than only 3 points. As shafts are rotated, a vast number of readings are continuously taken, or measurements taken by positioning the shaft at any rotational angle. This ensures an unmatched reliability of alignment results even in situations where vibration is prevalent.

In addition to providing high accuracy, laser precision alignment systems have other huge advantages. Coupling values and feet corrections are automatically computed and displayed in graphical format. TolChek® shows whether alignment corrections are needed. Should corrections be necessary, live move of the machines is monitored on the computer display, which also shows the updated values and the direction of correction. A happy “smiley” appears as soon as the optimal machine positions are attained. Retighten the feet bolts and the machine is ready to run.

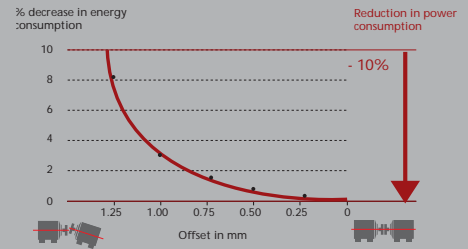
### 3 reasons for precision alignment

#### 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

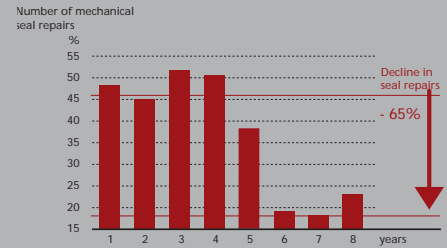


#### 2. Reduced repair incidences

##### Mechanical seal repairs

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

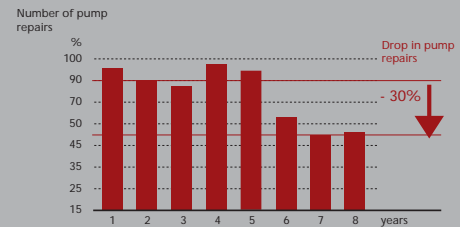
Courtesy of © HOECHST AG Gendorf / Germany



##### Pump repairs

The rate of repairs decline 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

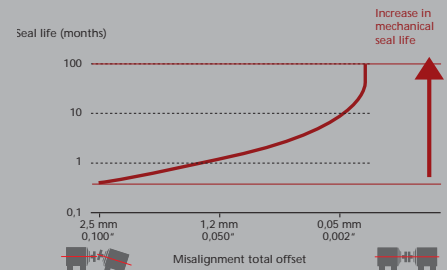


#### 3. Longer machine life

##### Relation between offset and mechanical seal life

The smaller the offset misalignment, the higher mechanical seal life.

Courtesy of © DURAMETALLIC Inc.



## Align machines to within specified tolerances

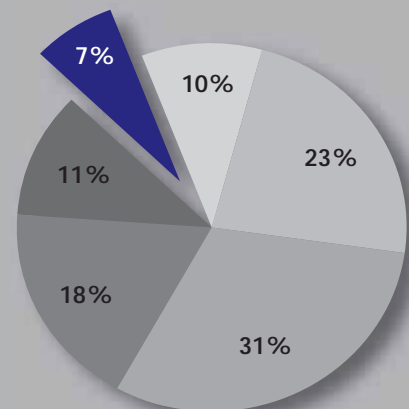
A survey conducted by one of the world's leading rotating equipment service organizations shows that less than 10% of the 160 machines randomly chosen for measurement were found to be aligned within acceptable limits.

| Offset (mm) | Machines measured       |
|-------------|-------------------------|
| 0,00 – 0,05 | 7% acceptable alignment |
| 0,06 – 0,10 | 10% out of tolerance    |
| 0,11 – 0,20 | 23% out of tolerance    |
| 0,21 – 0,50 | 31% out of tolerance    |
| 0,51 – 1,00 | 18% out of tolerance    |
| > 1,00      | 11% out of tolerance    |

The above tolerances are for equipment running at 3000 rpm.

Statistics courtesy of a major UK chemical company

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





## Extend machine availability and efficiency

### Precision alignment pays

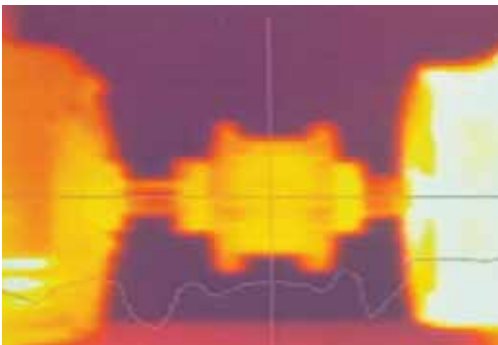
Rotating machinery are susceptible to misalignment. Machines that are well aligned at the commissioning stage and thereafter regularly maintained, will in the long term reduce both plant operating and maintenance costs.

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.

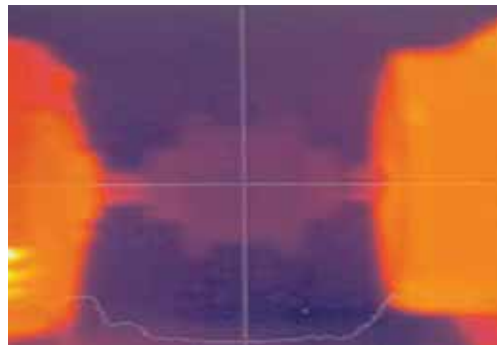
When misaligned, the loading of the shafts dramatically increases due to the reaction forces created within the coupling. Precision laser alignment pays back through:

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

1)



2)

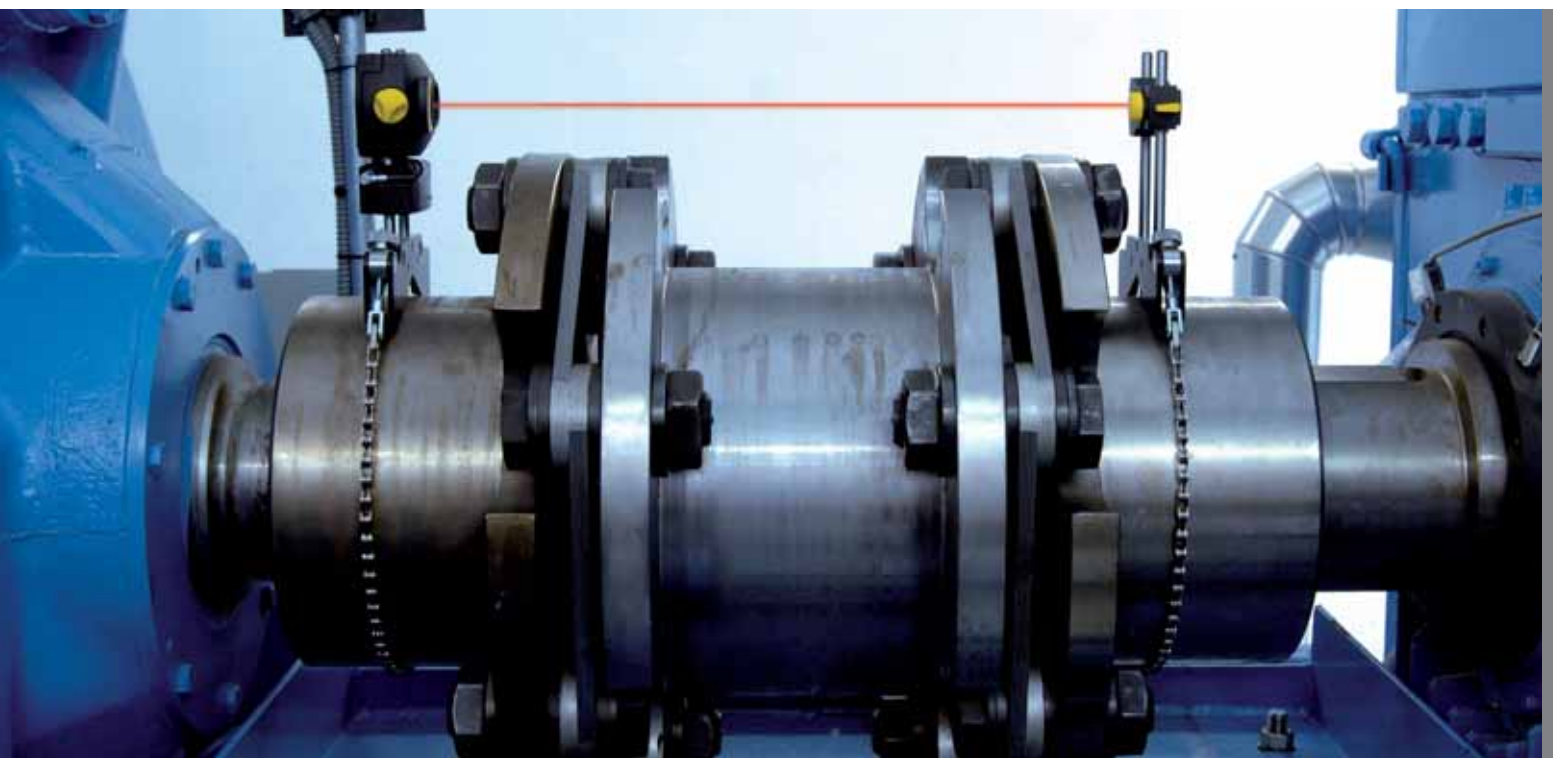


The effect of increased coupling loading due to misalignment can readily be shown using infrared thermography.

1) The flexible coupling element heats up.

The machine develops elevated temperatures, particularly around the bearing housings.

2) Precision laser alignment drastically reduces these problems.



## Standard features and powerful options

Products from PRÜFTECHNIK Alignment Systems are used by top industrial organizations worldwide within the following industries:

- ▶ Oil, Gas, Coal
- ▶ Petrochemical
- ▶ Power
- ▶ Maintenance
- ▶ Cement
- ▶ Pulp and Paper
- ▶ Chemical
- ▶ Food processing
- ▶ Water treatment and Sewage
- ▶ Steel
- ▶ Pharmaceuticals
- ▶ Production and Processing

And also in leading service organizations worldwide.

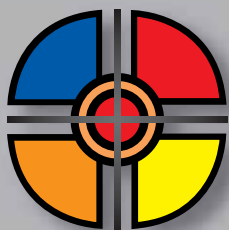
### Standard features

- Bluetooth® wireless communication and USB interface integrated within the computer
- High resolution backlit TFT screen
- UniBeam® for quick adjustment of the single laser beam
- Alignment of coupled and uncoupled shafts
- Alignment of nonrotatable shafts
- Automatic continuous measurement as shafts are rotated – start and stop rotation at any position
- TolCheck® – automatic evaluation of alignment condition
- Static measurement mode – requires any 3 of the 8 available 45° measurement positions
- Live monitoring of horizontal or vertical machine corrections
- Coupling and feet results are displayed in both graphical and numerical formats
- Save up to 50 measurement files
- Data protection – auto save and resume capability
- Alignment of multiple feet machines
- Soft foot check – measure, correct and save results
- Protected against dust, water and grease in compliance with classification IP 65 and IP 67

### Powerful options

- 3-Machine train alignment
- Customer-defined tolerances
- Results table to verify measurement repeatability
- Conversion and inputting of dial gauge readings
- Ability to enter alignment targets and thermal growth values
- Fixed feet selection – resolves base-bound and bolt-bound problems
- InfiniRange® extends detector measurement range to handle any amount of misalignment
- Multipoint mode – measurement at any 3 or more positions over 60° rotation or wider
- Alignment of vertical and flange-mounted machines
- Alignment of cardan and spacer shafts
- Save up to 500 measurement files
- Heavy-duty rechargeable Li-Ion battery
- Bluetooth® RF module for wireless data transmission between computer and transducer

## ALIGNMENT CENTER – The PC partner for alignment professionals



ALIGNMENT CENTER is a PC software used for preparing, analyzing, organizing and archiving measurement files.

ALIGNMENT CENTER is a Windows™ based common PC software platform for current PRÜFTECHNIK alignment instruments and applications.

Use ALIGNMENT CENTER to manage your measurement files and data, and use the two-way communication to transfer files from PC to instrument and vice versa.

ALIGNMENT CENTER simplifies job preparation as all alignment and measurement specifications including thermal growth compensation and tolerances are saved for future use.

Measurement related data is also saved and the measurement history can also be followed. The software generates professional colour reports that include photos, company information and logo. Improve your alignment efficiency and productivity by utilizing this indispensable tool in your everyday alignment tasks.

ALIGNMENT REPORTER is a PRÜFTECHNIK Alignment Systems freeware used for generating measurement reports and backup of measurement files on a PC. Use it generate reports that can be printed on any available printer.

## Technical data OPTALIGN® smart

|   |   |
|---|---|
| <b>Computer</b>   |   |
| CPU   | Intel XScale PXA270 running at 520 MHz  |
| Memory  | 64 MB RAM, 32 MB Flash  |
| Display   | Type: TFT, transfective (sunlight-readable), 65 535 colours, backlit LED<br>Resolution: 320 x 240 Pixel<br>Dimensions: 3.5 inch diagonal<br>Contrast: adjustable<br>Keyboard elements: Navigation cursor cross with up, clear and menu keys; Alphanumeric keyboard with dimensions, measure and results hard keys   |
| LED indicators  | 4 LEDs for laser status and alignment condition<br>2 LEDs for Bluetooth® communication and battery status   |
| Power supply  | Operating time: 18 hours typical use (based upon an operating cycle of 25% measurement, 25% computation and 50% 'sleep' mode)<br>Disposable batteries: 6 x 1.5 V IEC LR6 (* AA*)<br>Lithium-Ion rechargeable battery: 7.2 V / 2.4 Ah (optional)   |
| External interface  | USB host<br>USB slave<br>RS232 (serial) for transducer<br>Integrated wireless communication (Bluetooth®), class 1, transmitting power 100 mW<br>AC adapter/charger socket   |
| Environmental protection  | IP 65 (dustproof and water spray resistant), shockproof<br>Relative humidity 10% to 90%   |
| Temperature range   | Operation: -10°C to 50°C<br>Storage: -20°C to 60°C  |
| Dimensions  | Approx. 214 x 116 x 64 mm   |
| Weight  | 865 g   |
| CE conformity   | EC guidelines for electric devices (2004/108 EWG) are fulfilled   |
| <b>Transducer</b>   |   |
| Particulars   | Measurement principle: Coaxial, reflected laser beam<br>Environmental protection: IP 67 (submersible, dustproof)<br>Ambient light protection: yes<br>Storage temperature: -20°C to 80°C<br>Operating temperature: 0°C to 55°C<br>Dimensions: approx. 107 x 70 x 49 mm<br>Weight: approx. 177 g  |
| Laser   | Type: Ga-Al-As semiconductor laser<br>Wavelength (typical) 675 nm (red, visible)<br>Safety class: Class 2, FDA 21 CFR 1000 and 1040<br>Beam power: < 1 mW<br>Safety precautions: Do not look into laser beam  |
| Detector  | Measurement area: unlimited, dynamically extendible (U.S. Patent 6,040,903)<br>Resolution: 1 µm<br>Accuracy (avg): > 98%  |
| Inclinometer  | Measurement range: 0° to 360°<br>Resolution: <1°  |
| <b>Reflector</b>  |   |
| Particulars   | Type: 90° roof prism<br>Accuracy (avg): > 99%<br>Environmental protection: IP 67 (submersible, dustproof)<br>Storage temperature: -20°C to 80°C<br>Operating temperature: -20°C to 60°C<br>Dimensions: approx. 100 x 41 x 35 mm<br>Weight: approx. 65 g   |
| <b>Carrying case</b>  |   |
| Particulars   | Standard: ABS, drop tested (2 m)<br>Case dimensions: approx. 470 x 400 x 195 mm<br>Weight, including all standard parts: approx. 5.8 kg   |
| <b>Bluetooth® RF module for wireless communication with transducer (optional)</b> |   |
| Particulars   | Bluetooth® class 1 connectivity, transmitting power 100 mW<br>Transmission distance: 10 m<br>LED indicators: 1 LED for Bluetooth® communication, 3 LEDs for battery status<br>Power supply: Batteries 2 x 1.5 V IEC LR6 (* AA*)<br>Operating time: 14 hours typical use (based upon an operating cycle of 50% measurement, 50% standby)<br>Operating temperature: -10°C to 50°C |
| Environmental protection  | IP 65 (dustproof and water spray resistant), shockproof   |
| Dimensions  | Approx. 81 x 41 x 34 mm   |
| Weight  | Approx. 110 g including batteries   |



Machinery Service

### Industrial services from PRÜFTECHNIK Alignment Systems

In addition to offering leading-edge alignment products, PRÜFTECHNIK also provides a wide range of high-end alignment services. Teams of dedicated experts assist you in special alignment situations and geometric measurements.

PRÜFTECHNIK also offers roll alignment service throughout the world.

“ Our technicians confirm that work using measurement systems from PRÜFTECHNIK Alignment Systems, is definitely faster and more precise – the result of the rapid laser set-up and the continuous sweep measurement mode. ”

**Departmental Head, a UK-based international service organization for maintenance and facility management**

“ I am absolutely thrilled with OPTALIGN® smart. That measurement files can be prepared on a PC and the wireless data transmission has made my task convenient and flexible. ”

**Maintenance Technician, an industrial enterprise in Germany**

“ Instruments from PRÜFTECHNIK Alignment Systems are both ergonomic and technically superior. We are more than satisfied with the performance. ”

**Maintenance Manager, world leading US production company**

“ We work under extreme environmental conditions. OPTALIGN® smart from PRÜFTECHNIK Alignment Systems meets our requirements. The instrument has never let us down . ”

**Maintenance Technician, a Dutch petrochemical organization**

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