

## **SHAFT ALIGNMENT**

Professional measurement and alignment system for rotating machines





## A PRECISION CHOICE is also a safe choice!

## **EXTENSIVE EXPERIENCE**

Easy-Laser® measurement systems have been developed from more than twenty five years of experience in solving measurement problems for the industry. We have been around long enough to understand problems we face, and at the same time, our company is young enough to see opportunities and solutions with fresh eyes. Our development department consists of designers who specialize in mechanics, electronics, optics and programming. Taking full control from the initial idea to the finished product and working closely with our users, we are able to create user-friendly measurement systems.

## EXTENDED RELIABILITY

Our philosophy is that the products we develop must not only have extended operating times, but also an extended lifecycle. We design our products to be robust, with as few small parts as possible. The Easy-Laser® measuring systems can therefore withstand rough handling and work with the greatest precision in the most demanding environments, year after year. Easy-Laser® is a dependable and safe choice from every point of view.

## FAST SERVICE AND SUPPORT

Easy-Laser<sup>®</sup> measurement systems are available from local dealers in more than 70 countries, but there are users to be found in many more countries. For them, professional tools and the best possible support are of great importance, and the same is no doubt true for you as well. Service and repair centres can be found all over the world for your convenience. You can be assured that we will provide you with the fastest and best possible support. Our service department usually takes care of servicing or calibration within five working days. As an extra service, we provide a 48-hour express service for when accidents occur and time is of the essence. Contact us for further information about terms and conditions.

## LARGE SAVINGS

Easy-Laser<sup>®</sup> measurement systems are already extremely flexible in their standard form. By using clever accessories, you can adapt the systems for your own needs, now and in the future as your measurement requirements change. It is cost-effective. Your production capacity increases by being able

> ALIGNMENT SOLUTION

YEAR WARRANT

to measure faster and with greater reliability. Easy-Laser® helps you remedy production errors quickly and easily. This can save you large amounts of money, and your investment can even be repaid within a few months.

## A MEASURING SYSTEM FOR ALL STAGES OF MACHINE SET-UP

With Easy-Laser<sup>®</sup> E710 the same system is used to reassure yourself that the machines have optimal conditions for problem-free operation, without risk of unplanned downtime etc. Carry out the following:

- Check the base
- Check vibration level
- Check bearing play
- Check soft foot
- Measure the machine
- Align the machine
- Document the results



- The measurement system for all stages of machine set-up.
- Easy to Learn, Easy to Use.
- 3 year warranty gives assurance.
- Fast service and support. 48-hours Express service if necessary.
- Ergonomic design.
- Low overall costs during the entire lifecycle of the product, for example servicing, accessories, etc.
- Endurio<sup>™</sup> Power management system ensures that you never have to stop in the middle of a measurement because the battery has run out.
- Expandable / Adaptable A range of accessories means that you can adapt the measurement system to your needs, now and in the future.



# SIMPLE AND EFFECTIVE

*Easy to use = Fast and efficient!* 



The barcode reader is used to enter the machine data before measurement is taken. After the first measurement is recorded, the adhesive barcode label is applied to the machine. Next time the machine is checked, the measurements, compensation values and tolerances can be read directly from the barcode. Simple and accurate!



Measurement and alignment should be easy! That is the fundamental philosophy behind our measurement systems. The simple chain link mounting system and straightforward user interface make the Easy-Laser® E710 easy to learn, easy to understand, and easy to use!



Easy-Laser® is used to align generators and gearboxes in wind turbines of a number of sizes and makes. Special brackets are available (accessories) for alignment with locked rotors, which increases the safety for the operator.

Engines, gearboxes and propeller shafts on ships are aligned using Easy-Laser® system. Thanks to flexible brackets you can mount the equipment in the most appropriate place; shaft, coupling or flywheel.

Easy-Laser® is used to align pumps and motors for all types of industries and installations. Correctly set-up and aligned machines are a requirement for achieving optimum service life and minimal energy consumption.

## **SHAFT ALIGNMENT**

## HORIZONTAL MACHINES

Horizontally mounted machines often consist of a pump and a motor, but can also include other types of machines such as gearboxes and compressors. Regardless of the machine type, it is easy to measure and align with Easy-Laser®. The measuring units (M and S) are easily mounted on each side of the coupling and prepared to communicate with the display unit either wirelessly or with cable.



In the Horizontal and Machine train programs, you can chose which machines are to be shown, which side they are on, and specify the number of pairs of feet to correspond with your reality. You can even name the machines individually.







**1.** Enter the distances between measuring units and the machine feet. If you enter the coupling diameter you can also get the result as gap/sag.

**A.** Information field. States what you must do at each stage of the measurement. Also displays Bluetooth® connection, warning symbols etc.

**B.** You can start from a previous measurement and so avoid re-entering the dimensions, the barcode reader is the fastest method.



2. Take the measurement values in three positions with as little as 20° between. It is clearly visible on the display when the laser beam hits the detector.

*C.* The detector surface is shown on the screen and functions as an electronic target for the laser beams.

**D.** 20° marking. The S unit position on the shaft is shown. You can also choose to show the M unit when you align uncoupled machines.



**3.** The live values are used to adjust the machine. For clarity the adjustment is displayed both graphically and numerically. Horizontal and Vertical directions are shown at the same time.

**E.** Shims values for front and rear pairs of feet. Colour coded in order to determine the result more quickly: red=outside tolerance, green=inside tolerance.

F. Horizontal adjustment values. Colour coded.

## SOFT FOOT CHECK

Alignment work begins with a soft foot check. The soft foot check ensures that the machine is resting evenly on all its feet by indicating which foot/feet should be adjusted. This is an important part of securing a reliable alignment. After the soft foot check is complete, you can go directly to the alignment program with all of the machine's distance values saved.



## EASYTURN™ FUNCTION

With the EasyTurn<sup>™</sup> function you can start measurement anywhere on the turn. Turn the shafts with the measuring units to three positions in any direction with as little as 20° between to register the measurement value. Measurement is complete! For advanced applications, such as turbines, there is a Multipoint function where any number of measuring points around the whole or part of the rotation can be registered. 3. Finished!



## THERMAL GROWTH COMPENSATION

Oftentimes, machines expand considerably when moving from a cold to hot operating temperature. The Thermal Growth Compensation function allows the measurement system to calculate the appropriate shims and values needed to make adjustments in such cases. Compensation values for the machines are normally supplied by the manufacturers.







VERTICAL/FLANGE-MOUNTED MACHINES

Alignment of vertical and flangemounted machines. Shows center offset, angular error and shim value at each bolt.



CARDAN/OFFSET-MOUNTED MACHINES Alignment of cardan/offset mounted machines. (Accessory Cardan fixture, Part No. 12-0615 is required.)



## MACHINE TRAINS

-+-\_-+

Regardless of what machines you have and in which order they were assembled, you can build your own

machine train with theoretically as many machines as you like. You can pick the reference machine manually, or let the program choose one that will minimize the need for adjustments.

## **TOLERANCE CHECK**

Measurement results can be checked against pre-defined tolerance tables or values you determine yourself. This allows you to immediately see if the alignment is within the approved parameters, thereby considerably reducing the amount of time spent on alignment.

## LIVE-ANY-ANGLE 360°

This function allows you to adjust machines in real time with the measuring units positioned anywhere on the shaft. It is ideal for situations in which outside objects interfere with normal positioning.

## **REFERENCE FOOT LOCKING**

This function allows you to lock any pair of feet on the machine, giving you more freedom when aligning basebound or bolt-bound machines.

## **MULTIPLE SETS OF FEET**

The software can adjust to machine designs of all types such as those with two pairs of feet, three pairs of feet, and feet in front of the coupling, etc.

### QUALITY ASSESSMENT

Function in Multipoint measurement that helps you achieve the best possible result during alignment.

#### **MEASUREMENT VALUE FILTER**

An advanced electronic filter function can be used to achieve reliable results even under poor measuring conditions. Air turbulence and vibrations from adjacent machines are no match for the Easy-Laser® E530 advanced filter function!

## **SWAP VIEW FUNCTION**

The swap view function allows you to adjust the position of the motor on screen to correspond with the position of the machine in front of you, making it easier to understand adjustment directions.

## **MANY OPTIONS**

## **BELT ALIGNMENT**

The Belt Alignment program allows you to align sheaves and pulleys with digital precision. Adjustment values are displayed in real time on the screen and include readings for angle and axial displacement in both vertical and horizontal positions, as well as an adjustment value for the feet. The result can be documented as usual. (Requires the E170 BTA accessory.)



## VIBRATION MEASUREMENT AND BEARING CONDITION

The Vibration Measurement program allows you to measure vibration levels (in/s, mm/s) and bearing condition (g-value). The program guides the user through the vertical, horizontal and axial points to measure on the machine. The result can be documented. (Requires the E285 Vibrometer probe accessory.)





## STRAIGHTNESS MEASUREMENT

With our program for measuring straightness, you can easily measure long shafts, rolls, bearings, bases, machine structures etc. All you have to do is define a number of measuring points, in advance or while measuring. You will be able to get the result for both the horizontal and vertical alignment, graphically as well as digitally. To get even more out of your system, add the D22 swiveling laser.



## TWIST AND FLATNESS MEASUREMENT

The twist measurement program allows you to check the flatness or twist of the machine foundation using only the measuring units in the system. A flatness program is also included, for checking larger surfaces.





## **CHECKING BEARING PLAY**

All our measurement systems come with the extremely useful Values program. The program can be used e.g. when one wants to measure as with dial gauges and to check bearing play. With the standard equipment and completely normal set up on the machine!



## **OFFSET AND ANGLE**

This program shows centre offset and angular error between two shafts, for example. The values are displayed for both horizontal and vertical direction simultaneously. Can also be used for dynamic measurements.

## DOCUMENTATION





## **CREATE A PDF REPORT DIRECTLY**

When measurement is complete it is possible to generate a PDF report containing graphs and measurement data directly in the measurement system's display unit. All the information about the measurement object is documented, and you can add your company's logo and address details if you so wish.

## SAVING IN THE BUILT-IN MEMORY

Save all measurements in the display unit's internal memory.

## SAVE TO USB MEMORY

Save desired measurements on your USB memory. This enables you to take it to your computer to print reports whilst leaving the measurement system in place.



## **CONNECT TO YOUR COMPUTER**

The display unit is connected to the computer via the USB port. It then appears on the desktop as a USB Mass Storage Device which you can easily transfer files to and from.

## **EASYLINK™ PC SOFTWARE**

With the EasyLink<sup>™</sup> database program you can save and organise all your measurements in one place, produce reports with both data and images and export to your maintenance systems. You can customise what your Excel reports should look like and what data should be visible and where it should be positioned. The program has a clear folder structure, where you drag and drop files from the display unit to the database. Create your own structure with folders for manufacturer, department or machine type for example. The database can also be located on a common server and shared with other users. For extra safety you can use EasyLink<sup>™</sup> to make backups of what you have saved in the display unit.

## **MAJOR BENEFITS OF ALIGNMENT**

You have much to gain in both time and money through having your machines aligned to the correct tolerances. An investment in a laser based alignment system such as Easy-Laser<sup>®</sup> rapidly pays for itself through lower costs for replacement parts, less downtime and smaller electricity bills. Correctly aligned machines reduce the risk of expensive breakdowns and downtime. The benefits of alignment are many:

- Increased availability and productivity of the machine = assured production
- Increased life of bearings and seals = less use of replacement parts
- Complete seals = less leakage and better working environment
- Optimally utilised lubricant = less risk of overheating and secondary damage
- Less lubricant leakage = *less lubricant consumption*
- Reduced friction = *lower energy consumption*
- Less vibration = reduced noise level
- Less risk of serious breakdowns = *safer working environment*



Maintenance costs and operation
per annum

Saving after alignment per annum\*

*Cost of investing in Easy-Laser®* 

## **ADVANTAGES OF LASERS**

There are many advantages to aligning using lasers compared to more traditional methods such as using dial gauges:

- Easy to learn and to use
- Stable brackets without play and slack
- Much faster to mount
- Automatically calculated shims/adjustment values
- Simple tolerance check
- Simple compensation for thermal expansion
- No risk of read off errors
- Possible to document the result

Other old methods such as rulers and feeler gauges are not sufficiently accurate for today's modern machines. With a laser based alignment system checks are easy and fast to carry out. If you choose Easy-Laser<sup>®</sup> you also have a measurement system that has many more uses in the workplace than merely aligning shafts.

## **SYSTEM PARTS**



- A. Two Enter buttons, for left and righthanded users
- B. Large, easy to read 5.7" colour display
- C. Proper buttons for clear feedback



- D. Thin profile gives a perfect grip for your hands E. The integrated battery compartment design
- gives the correct angle on the display screen F. Battery compartment
- G. Mounting for shoulder strap



- H. Connection for charger
- I. Network connection
- J. Expansion port
- K. USB A
- L. USB B
- M. Easy-Laser® measurement equipment



- N. Dust and splash guards for sockets that are not used when measuring
- O. Robust, rubber coated design

### **DISPLAY UNIT**

The new display unit for the E-series enables you to work more efficiently and for longer than ever before thanks to several innovative solutions. It is also ergonomically designed with easy-to-grip rubber cladding and robust construction.

#### NEVER LOSE POWER!

Easy-Laser<sup>®</sup> E710 is equipped with our Endurio<sup>™</sup> Power management system. This ensures that you never have to stop in the

middle of a measurement because the battery has run out. If

the internal battery's charge level starts to



drop, simply insert the batteries into the integrated battery compartment and continue measuring.

#### ERGONOMIC DESIGN

The display unit has a thin, easy-to-grip rubber coated exterior for secure handling. Enter buttons on each side make the system suitable for both right and left-handed users. The large well-spaced panel buttons correspond to clear graphics that guide you through the measurement process with ease.

#### PERSONAL SETTINGS

You can create a user profile where you can save your personal settings. You can also have different settings for different types of measurements. It makes work faster!



Calculator

#### CALCULATOR

We have integrated a calculator and conversion tool for length units in the display unit.

#### LANGUAGE SELECTION

You can choose the language that you want to appear on screen. You can choose the language that you want to appear on screen. English, Spanish, French, Portuguese, German, Swedish, Finnish, Russian, Polish, Dutch, Italian, Japanese, Korean and Chinese are available. More languages to follow.

#### UPGRADING

If you wish to expand functionality, the display unit software can be upgraded via the internet or with a USB memory stick containing the new software. The upgrade feature also provides access to any new measurement programs we develop in the future.



A. The rods have a height of 2.4"–7.1" [60–180 mm]. If necessary they can be extended "infinitely" with additional rods. Made of stainless steel.

- B. Well protected connectors
- C. PSD (2 axis)
- D. Laser aperture
- E. Stable aluminum design
- F. Threaded holes for multiple mounting options

## **MEASURING UNITS**

The measuring units have large 0.78" sq [20 mm] detector surfaces (PSD for the greatest accuracy) which allows the possibility of measuring at a distance of up to 66 feet [20 metres]. The substantial and rigid design of aluminum and stainless steel guarantees stable measurement values and reliable alignment with the greatest precision in even the toughest of environments. The measuring units are also water and dust proof to classes IP66 and IP67. Connect to the display unit via cable or wirelessly. Both cable and wireless units are connected quickly using Push/Pull connections.

### INCLINOMETERS IN BOTH UNITS

With electronic inclinometers in both measuring units the system knows exactly how they are positioned. This also makes it very easy to align uncoupled shafts.

### ELECTRONIC TARGETS

Thanks to the two axis detectors you have access to electronic targets, that is you can see on the screen where the laser beams hit.

### FLEXIBLE MOUNTING OPTIONS

The thinking behind the rigid and compact design, is that it will simplify positioning and provide varying installation methods. You can measure all types of rotating machine, large and small, equally well, regardless of shaft diameter. The units also have extra space for additional mounting options.

### TWO LASERS, TWO PSD

The reversed measurement method with two laser beams and two PSD makes it possible to also measure very incorrectly set machines. This is particularly good for new installations, where the machines are not yet in the correct position.



## WIRELESS COMMUNICATION

The unit for wireless communication is easily inserted into one of the connectors on the measuring unit. Wireless connection to the display unit enables you to work more freely. Dust and water proof to IP66 and IP67.



## STANDARD BRACKETS INCLUDED IN THE SYSTEM



SHAFT BRACKET WITH CHAIN For attachment around shaft or coupling. Suitable for diameters of 0.8"–17.7" [20–450 mm] with standard chains.



MAGNET BASE For direct attachment to shaft or coupling. Very strong and stable. Three magnetic sides give flexible positioning possibilities.



OFFSET BRACKET Allow axial displacement between measuring units in order to be able to rotate past projecting machine parts and connectors.

# **ACCESSORIES AND EXPANDABILITY**



## A FUTURE-BUILT CHOICE

Easy-Laser<sup>®</sup> measurement systems are already extremely flexible in their standard form. By using accessories, you can adapt the systems for your own needs, now and in the future as your measurement requirements change. It is cost-effective.

We have standardized measurements between places for connection in different parts to easily facilitate mounting on the machine. Experience tells us that this is very much appreciated. A further advantage is that you can use one of the measuring units separately as a detector with, for example, our geometric laser D22. This expands the areas of application of the measurement system. Easy-Laser<sup>®</sup> is a system that is complete in its full meaning!

## MAGNETIC BRACKET



Bracket for axial mounting on flange or shaft end. With four super magnets. Part No. 12-0413

## THIN SHAFT BRACKET



This is used, for example, when there is limited space between the coupling and machine. Thin chain and lock tools included. Width: 0.47" [12 mm]. Part No. 12-0412

## SLIDING BRACKET



Used when the shafts cannot be rotated. The spherical feet give a stable position against the shaft. Mounted with standard chains. Part No. 12-0039

## **CARDAN BRACKET**



For alignment of Cardan/offset mounted machines. Part No. 12-0615

## **EXTENSION RODS**



Screwed together. Extendable theoretically "unlimited".

Length 2.36" [60 mm], (4 x) Part No. 12-0059 Length 4.72" [120 mm], (8 x) Part No. 12-0324 Length 9.44" [240 mm], (4 x) Part No. 12-0060

## **EXTENSION CHAINS**



Makes it possible to align very large shafts. Length: 35.4" [900 mm], (2 x) Part No. 12-0128



## ADDITIONAL POWER SUPPLY



Chargeable battery pack which gives extra operating time. With or without built-in Bluetooth<sup>®</sup> unit. Part No. 12-0618 or 12-0617

## CHARGER 12-36 V



To charge the display unit via 12–36 V socket, for example in a car. Part No. 12-0585

## EXTENSION CABLES



Length 16.4' [5 m], Part No. 12-0108 Length 32.8' [10 m], Part No. 12-0180

## **PROTECTIVE COVER**



Protective case for display unit. With shoulder strap. Part No. 01-1379

## **BARCODE READER**



Barcode reader for registration of machine data. Connected in the USB port. Part No. 12-0619

## VGA KIT



Makes it possible to show display unit screen image with a projector, for example in a training context. Must be factory installed on order. Part No. 12-0573

## TARGET



Simplifies the rough alignment at very long distance and large alignment fault. Part No. 12-0588

## SUN PROTECTION FOR PSD



To screen against extremely strong ambient light. Part No. 12-0587

## LASER TRANSMITTER WITH SWEEP FUNCTION



Laser transmitter D22 can be used to measure flatness, straightness, squareness and parallelism. The laser beam can sweep 360° (1) with a measurement distance of up to 130' [40 metres] in radius. The laser beam can be angled 90° to the sweep (2), within 0.5 mils/thou [0.01mm/m]. Part No. 12-0022.

## **BELT ALIGNMENT**



E180 BTA. Laser transmitter and Bluetooth® wireless detector for belt transmission alignment. With built-in display. Use it as a separate tool or connect it to the E710 for extended functionality. Part No. 12-0796

## VIBRATION MEASUREMENT



E285 Vibrometer probe. For measuring vibration and bearing condition. For connection to display unit, one of the red cables of system E710 is used. Part No. 12-0656

## EASY-LASER®

## www.easy-laser.com

## TECHNICAL DATA

10-95%

22 lbs [10 kg]

#### System

**Relative humidity** Weight (complete system) Carrving case

#### Measuring units M / S

Type of detector Resolution Measuring errors Measurement range Type of lase Laser wavelength Laser class Laser output Electronic inclinometer Thermal sensors Environmental protection Temperature range Internal battery Housing material Dimensions Weight

2 axis PSD 0.78" sq [20x20 mm] 0.05 mils [0.001 mm] ±1% +1 digit Up to 66 feet [20 m] **Diode laser** 635–670 nm Safety class II <1 mW 0.1° resolution ± 1° C accuracy IP class 66 and 67 -10-50 °C Li Po Anodized aluminum WxHxD: 2.36"x2.36"x1.65" [60x60x42 mm] 7.1 oz [202 g]

WxHxD: 19.7"x15.7"x7.9" [500x400x200 mm]

Drop tested (10 feet/3 m). Dust and water proof.

#### **Display unit**

Type of display/size Displayed resolution Power management Internal battery (fixed) Battery compartment **Operating time** Temperature range Connections Wireless communication Internal memory Help functions **Environmental protection** Housing material Dimensions Weight (without batteries)

#### 4 x C Battery Approx. 30 hours (at typical user cycle) -10-50 °C USB A, USB B, External, Easy-Laser® units, Network Class I Bluetooth® wireless technology >100 000 measurements can be saved Calculator, Unit converter IP class 65 ABS / PC / TPE WxHxD: 9.8"x6.9"x2.5" [250x175x63 mm] 2.4 lbs [1080 g]

**Bluetooth® wireless units** Wireless communication

Temperature range **Environmental protection** Housing material Dimensions Weight

Class I Bluetooth® wireless technology -10-50 °C IP class 66 and 67 ABS 2.1"x1.2"x0.9" [53x32x24 mm] 0.9 oz [25 g]

Length 70.8" [1.8 m]

VGA 5.7" color screen, backlit LED

Heavy duty Li lon chargeable

Endurio<sup>™</sup> system for unbroken power supply

0.05 thou / 0.001 mm

#### Cables

System cables USB cable

Brackets etc.

Shaft brackets

Magnet bases Offset brackets Rods

Type: V-fixture for chain, width 0.7" [18 mm]. Shaft diameters: 0.8"-17.7" [20-450 mm] Material: anodized aluminum Holding strength: 800 N Displacement: 1.2" or 0.6" [32 or 16 mm] Length: 4.72", 2.36" [120 mm, 60 mm] (extendable) Material: Stainless steel

Length 78.7" [2 m], with Push/pull connectors.

### EasyLink<sup>™</sup> Data base software

System requirements

Windows® XP. Vista, 7, 8, For the export functions, Excel 2003 or newer must be installed on the PC.

05-0477 Rev6

Easy-Laser® is manufactured by Damalini AB, Alfagatan 6, 431 49 Mölndal, Sweden, Phone +46 31 708 63 00, Fax +46 31 708 63 50, email: info@damalini.se, www.damalini.com @ 2014 Damalini AB. We reserve the right to make modifications without prior notification. Easy-Laser® is a registered trademark of Damalini AB. Other trademarks belong to the relevant copyright holder. This product complies with: EN60825-1, 21 CFR 1040.10 and 1040.11 This device contains FCC ID: PVH0925, IC: 5325A-0925.





A complete system contains	
1	Measuring unit M
1	Measuring unit S
1	Display unit
2	Bluetooth® units
2	Cables 2 m
2	Shaft brackets with chains
2	Extension chains
2	Magnet bases
2	Offset brackets
4	Rods 4.72" [120 mm]
4	Rods 2.36" [60 mm]
1	Manual
1	Quick reference manual
1	Measuring tape 9.8' [3 m]
1	USB memory with EasyLink <sup>™</sup> PC software
1	USB cable
1	Charger (100–240 V AC)
1	Tool box
1	Shoulder strap for display unit
1	Ontical cleaning cloth

- CD with documentation
- 1 Carrying case

System Easy-Laser® E710 Shaft, Part No. 12-0440





Extend the warranty from 2 to 3 years by registering your system on the Internet: www.easy-laser.com



#### Cascade MVS 1705 Gill Rd Dickinson, TX 77539 Tel: 281-482-2727 Fax: 832-201-0346 E-mail: easy-laser@cascademvs.com

please visit www.cascademvs.com

To find your local representative,