presents…

The Total Solution Package
for Machinery Installation and Maintenance

What's included in the Total Solution Package?

✓ The **Easy-Laser® E710 Shaft Alignment system** which can measure:

- ✓ The twist/distortion of a machine base
- ✓ Coupling run out and bearing play
- ✓ Softfoot
- ✓ Static and Dynamic Pipe Strain
- ✓ Shaft to Shaft Alignment
  - ✓Horizontal, Vertical, and Cardan-mounted machines

✓ The **Easy-Laser® Belt & Chain Alignment system** digitally measures the parallel and angular values of your belt, sheave, pulley, etc.

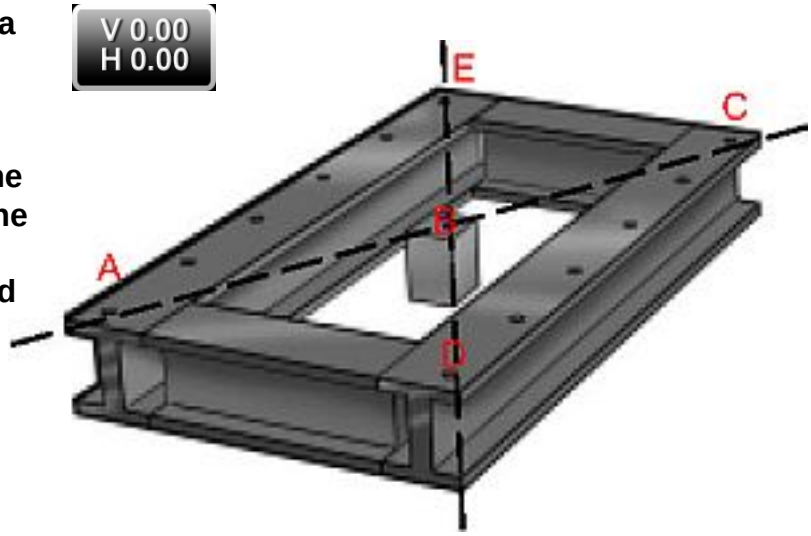
✓ The **Easy-Laser® E285 Vibrometer Probe** so you can measure overall vibration and take a bearing condition reading.

✓ The **Easy-Laser® Barcode Reader** for quick machine measurement specifications and the **VGA Kit** so you can view your display unit on a large screen for presentations or training (optional).

Want more? Keep reading for more information…

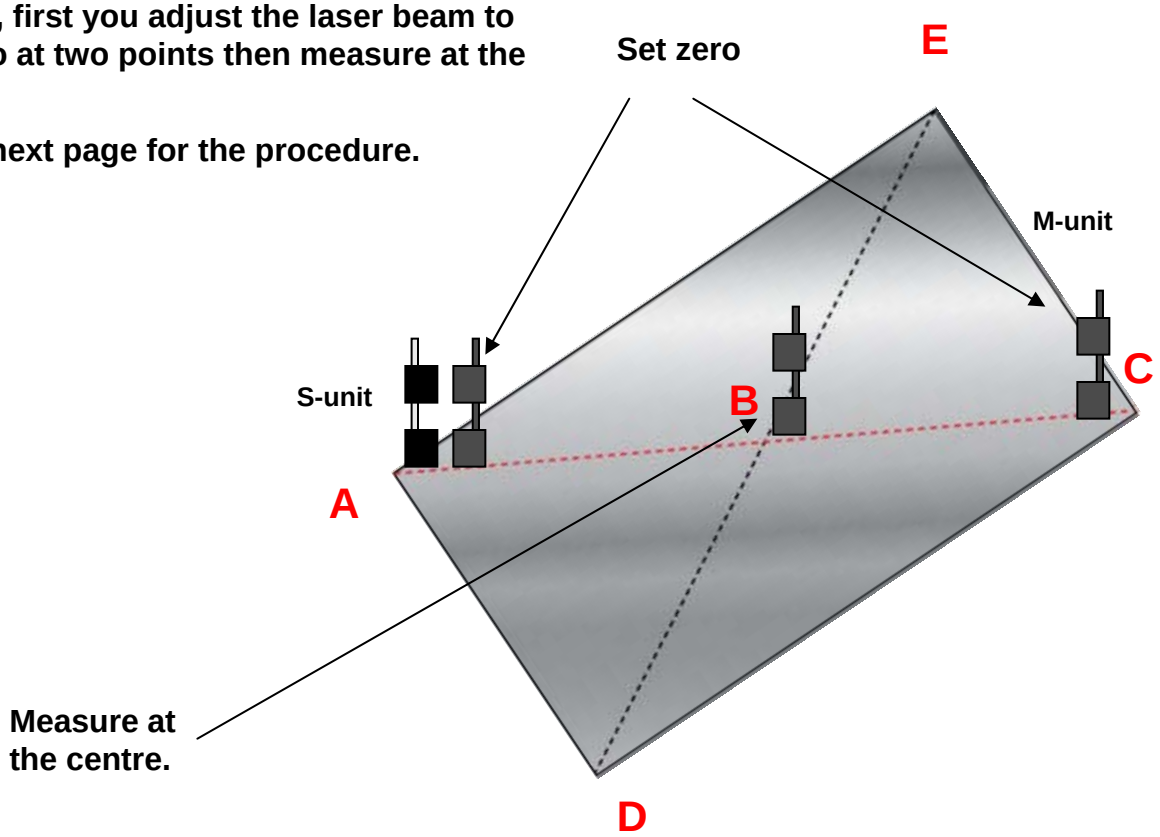
Machine Base Flatness:
Measuring the base for twist or distortion

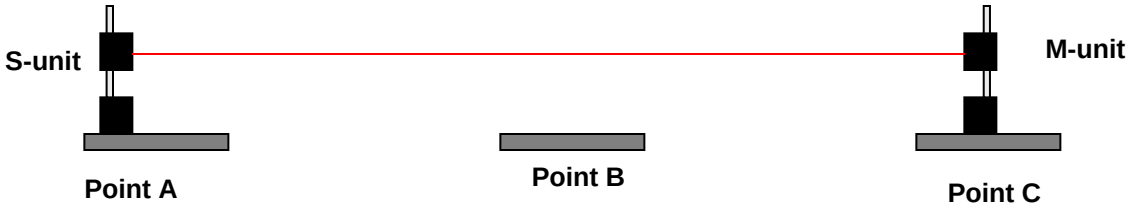
To measure the base twist with a E710 shaft system you can use the Values program. What you need is a common centre point B. Using values program with the measuring heads mounted on the magnetic blocks the S unit is used as the laser transmitter and the M unit is used to take the measurements.



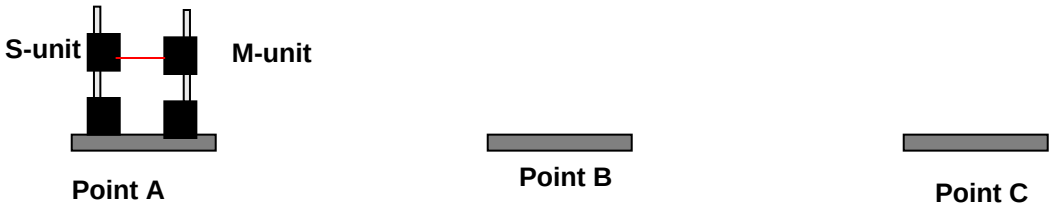
It's Easy, first you adjust the laser beam to read zero at two points then measure at the center.

See the next page for the procedure.

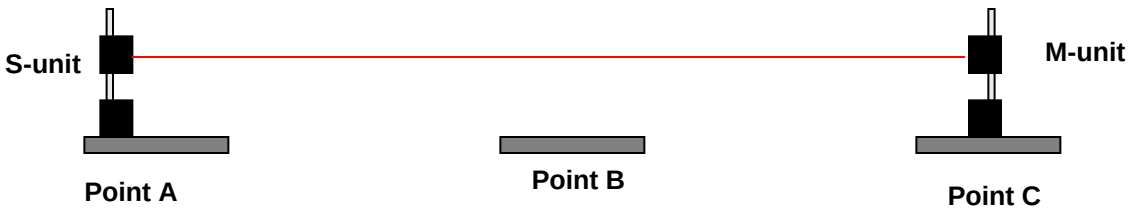




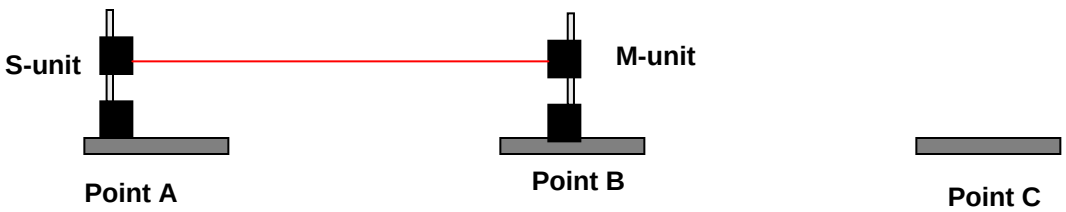
Mount the S unit on point A and mount M unit on point C. With the target window closed adjust the vertical beam to the centre of the target.



Now move the M-unit to point A close to the S unit and open the target door. Slide the M Unit on the rods until the value on the display reads close to zero than lock it on the rods. Now press the button 0 to zero the result.



Move the M unit to point C and adjust the beam until it reads zero. Repeat this until you have zero at both points

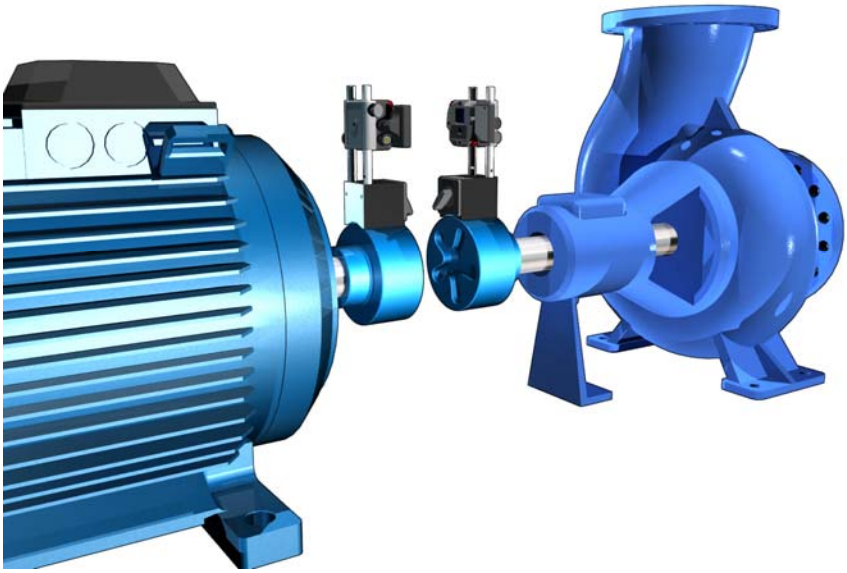


Now measure and record the value at Point B.

Repeat this procedure for points D to E.
If the results are -20 and -20 your base is good! If it's -5 and -20 you have a twisted base.

Measuring Coupling Run Out and Bearing Play

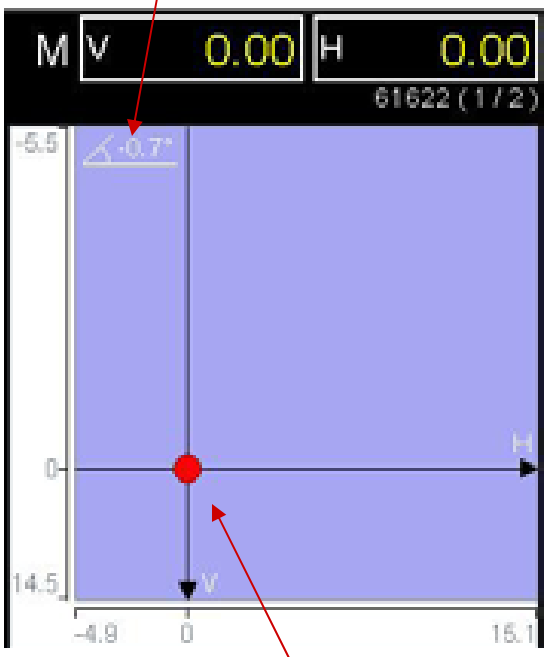
Run-out is measured on the couplings or the shafts. Run-out occurs when couplings are bored eccentrically, shafts are bent, or when couplings are “out of round”. Correcting excessive run-out requires replacing the defective coupling or shaft. To use a shaft laser system to measure run out, it is best to use magnetic mounting blocks. (Supplied with D505/525 E710 etc. or as an accessory)



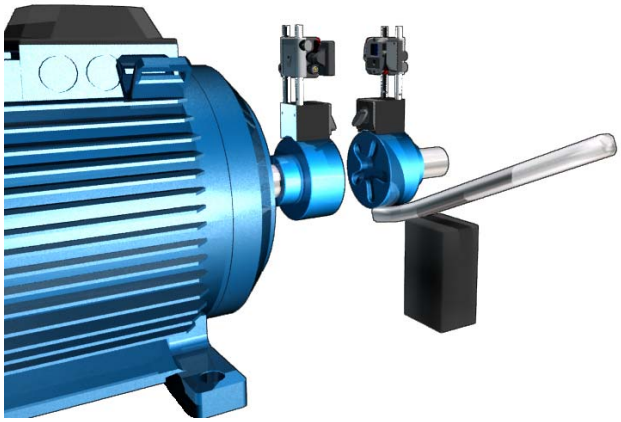
Mount the laser transmitter/detector units onto the mounting blocks and clamp them at the twelve o’clock position of both shafts. Use the digital inclinometer to maintain the twelve o’clock position. Each shaft has to be able to rotate independently so open (remove insert) or remove the coupling. Start program 17, Values, and adjust the beams into the centre of the target.

Now open the target door and zero the value by pressing the zero button. The display should read M which stands for Moveable and the value in both planes should be zero.

Digital inclinometer reading.



Zero set.



Check for bearing play.

At this point you would be wise to check for bearing play. It is a simple test done by lifting the shaft up in the vertical direction. The display is set to zero so any movement will be the result of a worn out bearing. If it is a small machine you can lift the shaft up as long as it stays in the twelve o'clock plane. If it is a large machine you can use a pry bar but do not use too much force; you only want to measure the lift, not flex the shaft.

Back to Run Out

Keep the S (stationary) unit in a fixed position at twelve. Un-clamp the M (moveable) unit and rotate the shaft a quarter turn (90 degrees). Re-clamp the M unit at twelve o'clock and read any error on the display. Again, un-clamp the M unit, rotate the shaft a quarter turn going in the same direction as before and re-clamp at the twelve o'clock position. Read and record any error. Repeat this procedure for two more quarter turns and review all four results.
Note: the fixed S unit must be maintained at the twelve o'clock position using the digital inclinometer. Also, the M unit must be set at twelve after each turn using the inclinometer. If there is any doubt, re-measure.
To measure the other shaft, change the display to now read S for Stationary and zero the value in both planes by pushing the zero button. The M unit now has to be maintained at twelve and you repeat the same procedure of taking four readings at a quarter turn or 90 degrees apart.
Re-view the results. In theory, they should all be zero or very close. Use the chart below and decide if more work is needed.

General coupling tolerances for shaft run out.

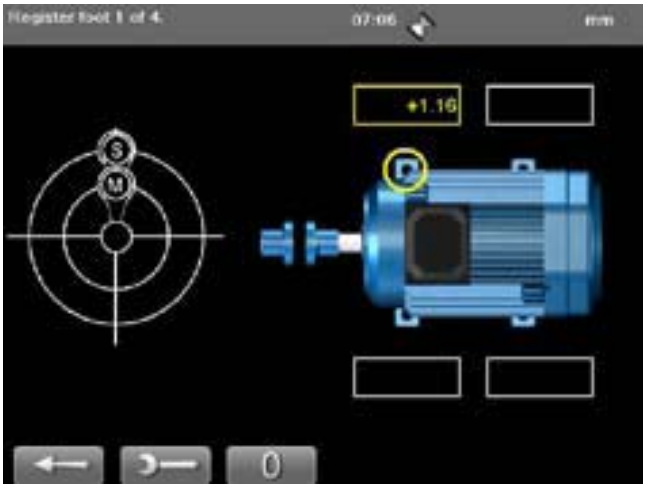
Machine RPM	Runout
0-1800	5 mils (0.13mm)
1800-3600	2 mils (0.05mm)
3600 and up	1.5 mils (0.03mm)

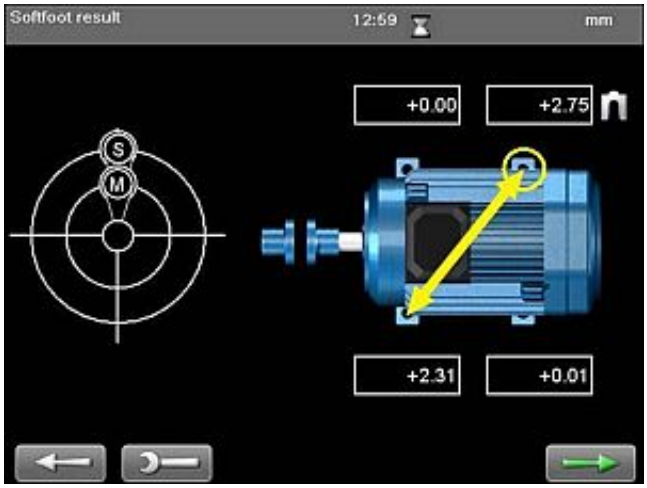
Soft foot

Now is the time to do a soft foot check before the pipe is connected and the coupling is still open. The screen prompts you through the process and tells you where the soft foot has to be corrected. With the heads in the twelve o'clock position loosen the foot hold down bolt that is highlighted on the screen. The result will be calculated and saved when you push the enter button and move to the next position.

When removing soft foot, start with the worst foot first. Often, correcting one soft foot will remove the soft foot at other locations on the machine. Therefore, once the initial soft foot correction is made, a second set of readings should be taken to determine the proper shim change for the next foot being checked.

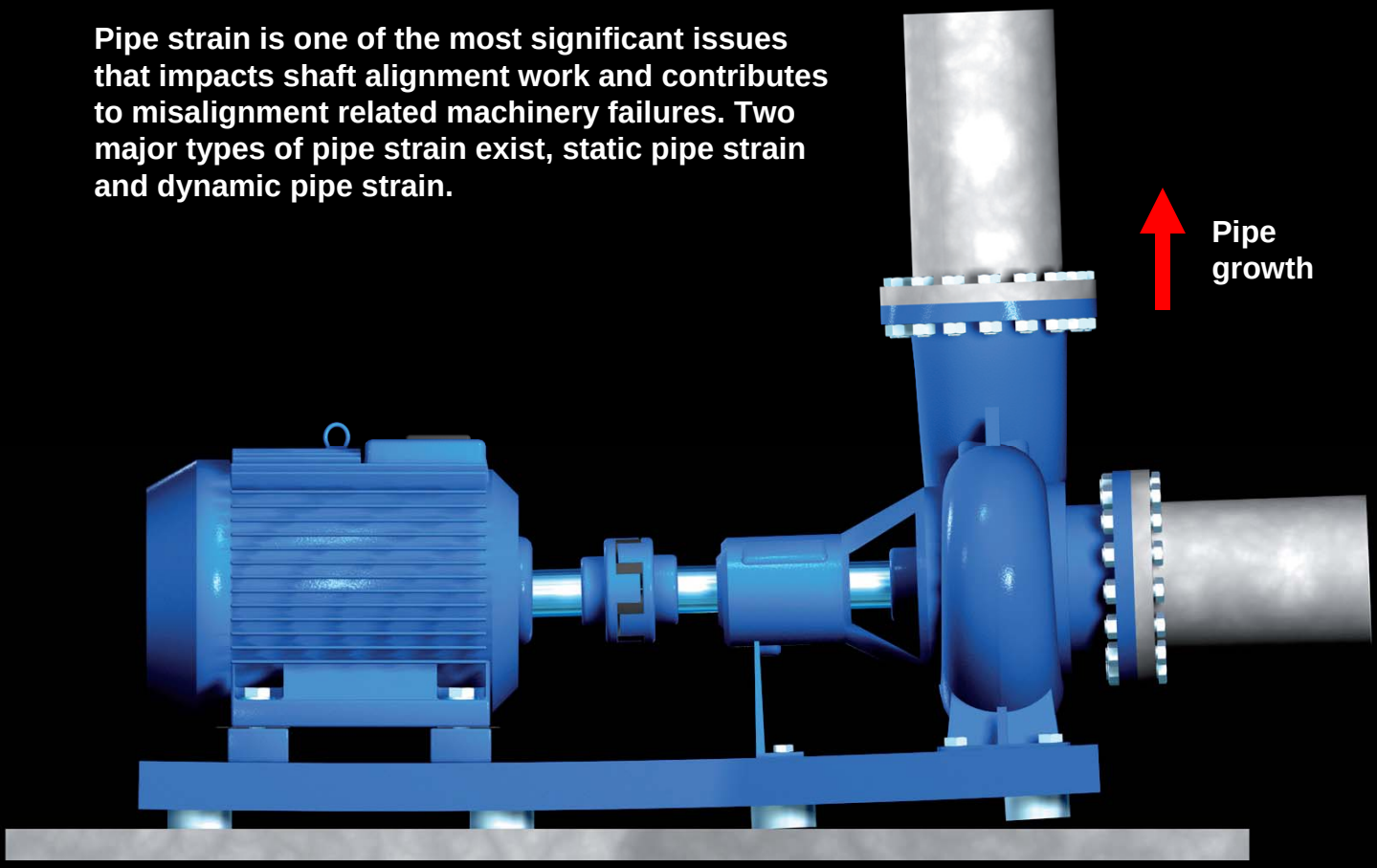
Soft foot correction is a must if you ever have issues doing shaft alignment, redo this step. You should try to get it down to about 0.002" or less.





Measuring Static and Dynamic Pipe Strain

Pipe strain is one of the most significant issues that impacts shaft alignment work and contributes to misalignment related machinery failures. Two major types of pipe strain exist, static pipe strain and dynamic pipe strain.



Static Pipe Strain

Static pipe strain exists when the machines are not even operating. Static pipe strain and its effects are relatively simple to measure. One method is to disconnect the pipe flanges and measure the piping misalignment. The average sized person should be able to hold the pipe in to position so that the bolts go freely through the holes without the use of pry bars or even a come-a-long to align the pipe flanges.

One simple way of measuring pipe strain with an E710 shaft system is to mount the system in the normal manner when performing shaft alignment. Position the measuring units at twelve o'clock and using the values program set both units to zero. Rotate the shaft to the three o'clock position and note the value if it is not zero. Rotate the shafts back to twelve and confirm the zero setting. Now connect or disconnect the piping.

Any changes to the values read at the twelve or three o'clock positions is the result of pipe strain and should be corrected. What you are seeing is movement transmitted through the casing to bearing and shaft. Any movement at the shaft should generally be considered excessive because it means that you pre-loaded the bearing.

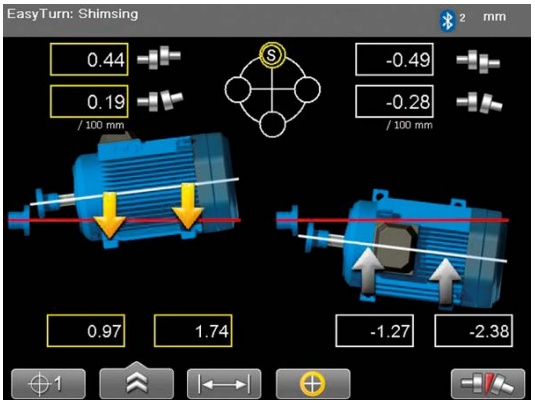
Dynamic Pipe Strain

Dynamic pipe strain is much more difficult to check since it is present only after the machine and piping are at operating conditions. Much of this type of pipe strain is due to thermal expansion of the piping, the weight of system fluid, combined with inadequate piping and piping support design.

You can use the values program in the Easy Laser systems to check this. To do this you would mount one laser transmitter/detector on the machines piping. The other you would mount on a fixed position. This could be a tripod, steel block or even the other machine. The laser beam is set to zero and is reading live time. You now bring the pump on line and to full operating temperature. Recording the movement of the pipe.

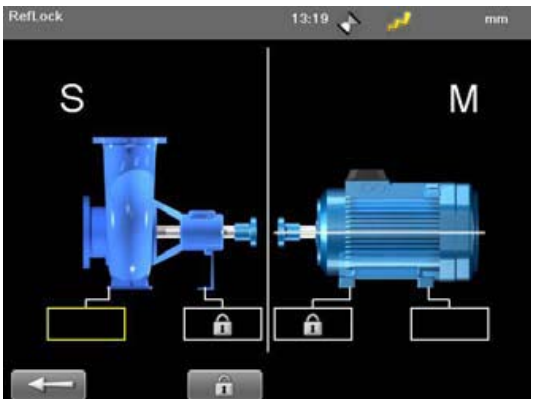
Shaft to Shaft Alignment

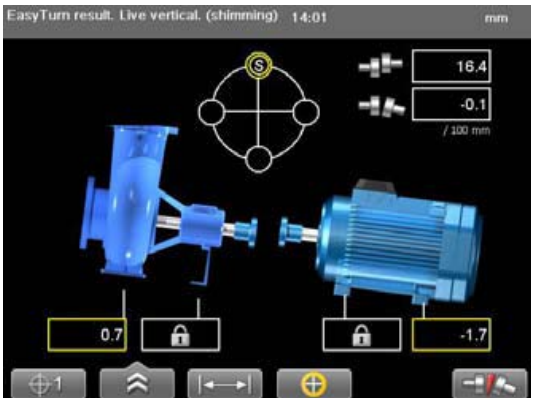
Now move onto the shaft alignment and again the screen prompts you. Using the E710, you only have to move the heads a total of 40 degrees to get the results. You can start anywhere and record the readings. To go live time on the display simply move the heads to 12 or 6 position for the vertical or 3 or 9 for the horizontal then make the correction and you are done. Take your time when taking measurements.



Some laser systems like you to take measurements as you rotate the shaft this is because they are more susceptible to back lash in the coupling. Other laser systems focus on speed. This is not an advantage for you the end user because if you think about it, it's not a race. The goal is accuracy not speed. And ask yourself if you have a better chance at hitting a moving target or a stationary one?

Accuracy and repeatability are the goals.





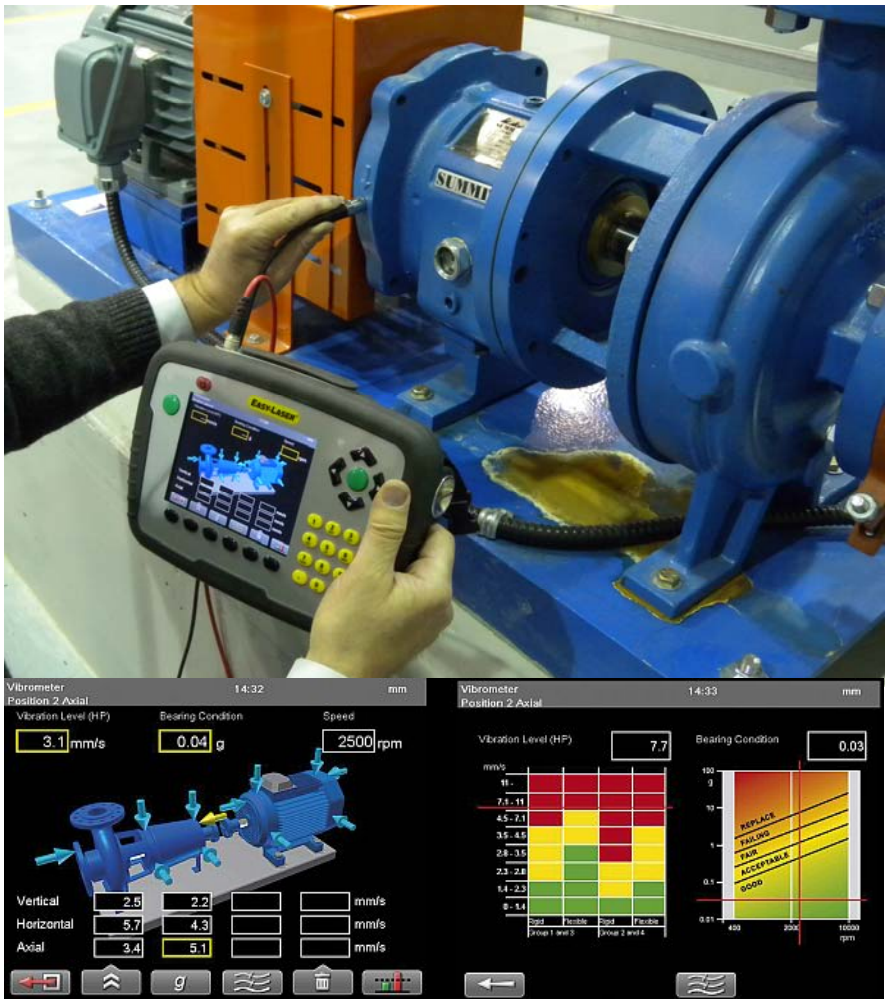
Bolt bound and base bound issues

It can be frustrating when your alignment result tell you that you have to lower the motor only to find that there is no shim to remove. Many tradesmen add shim under the pump but this can be a problem if they don't adjust the pipe support. You don't want the pump holding the weight of the pipe.
One of the functions such as RefLock can help with this. In the E series RefLock is in the Horizontal program. RefLock gives you the ability to lock any two feet and use them as reference points. In the E series screen picture on the left the two inboard feet are locked. The system calculates the new correction as seen left. Be careful when using this function you do not want to create pipe strain by making too large a correction. However you will be surprised at how a small amount of angular correction can improve your alignment results.

Vibration Measurement: Resonance Checks

One special feature that we like about our lasers is their ability to take vibration readings with the E285 Vibrometer Probe. After the alignment is done you can start up the unit and take an immediate set of vibration readings. Then wait until the unit gets to full operating temperature and re-measure the vibration. Compare the results to see if there is a thermal growth issue.

These initial vibration or bearing condition readings can be saved as part of the machines history. They can be used to verify that the machine is within tolerance using a supplied basic tolerance chart (Right picture)



Another great use for vibration and bearing condition measurement is a Running Soft Foot or Foot Resonance Test. The procedure is simple; you find the highest vibration reading then while measuring you loosen off each hold down bolt in turn checking the results.

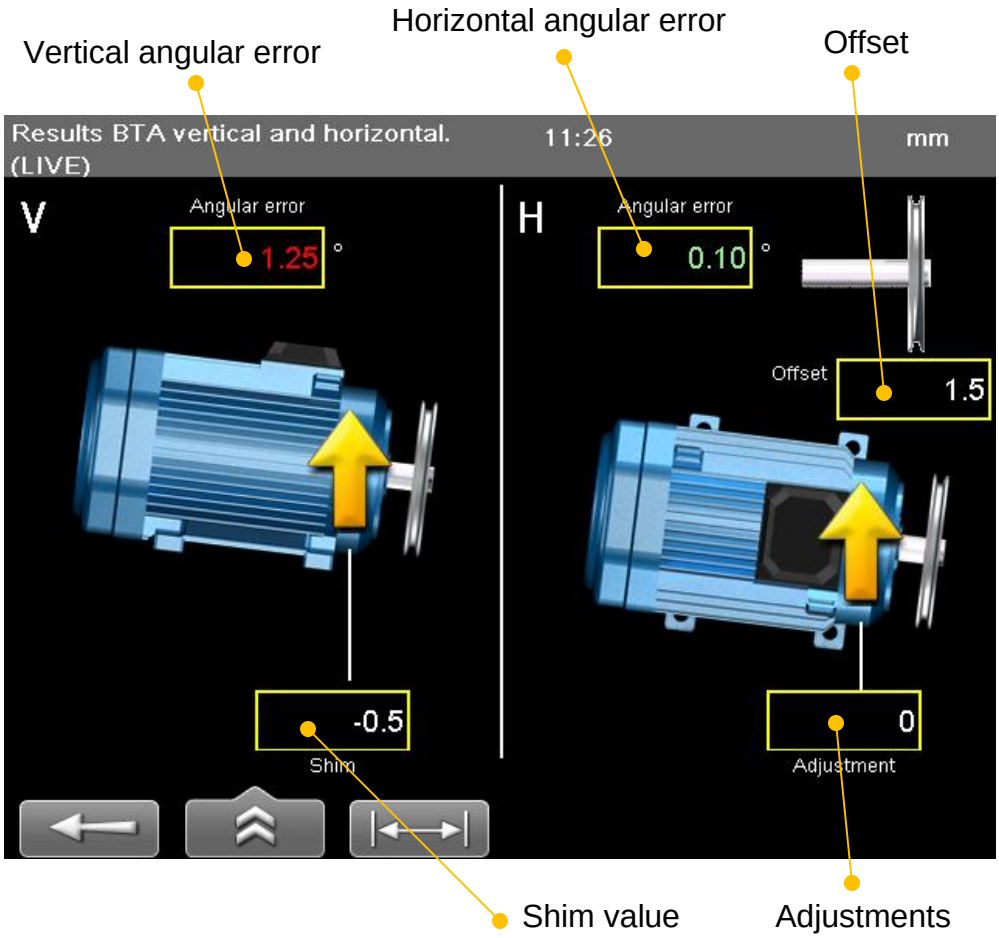
You may be surprised at what you see. Sometimes the reading will go down. This is because you have taken the strain off the motor, in other words the motor is distorted and you are easing the strain.

There is more that you can do with a simple vibration reading and we have written out the procedure for this so e-mail a request if you want it.

We know that to control a process we have to measure it. Well this measure allows you to control your machinery installation process.

Belt & Chain Alignment

The E170 belt alignment system is the most advanced system in the world. It really is state of the art modern technology. It can show you live movement in both the Horizontal and Vertical planes. It will also show the amount of angular error and the offset. It will even tell you how much shim to put under the motors feet.



So that's what we call a…

Total Solution Package

For Machinery Installation and Maintenance

Of course, it still features all of the hallmarks of an Easy-Laser® system, including our 2 Year Warranty, intuitive programs , unmatched durability, and FREE software for documentation! The Total Solution Package not only outmatches the competition in performance, it also beats everything else in price.

Bluetooth®

POWERED by ENDURIO™

2 YEAR WARRANTY

Benchmark PdM

info@benchmarkpdm.com (905)509-6522 1(800)598-1117