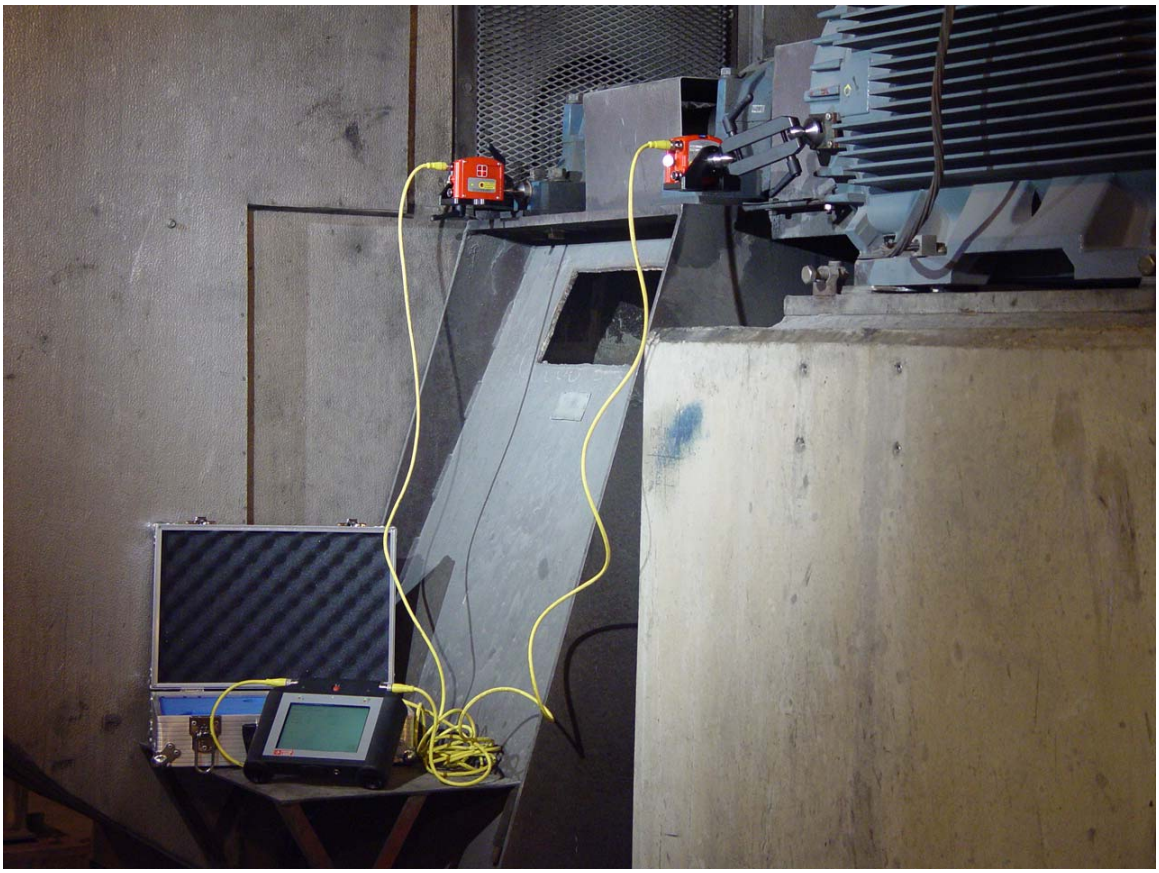
OL2R

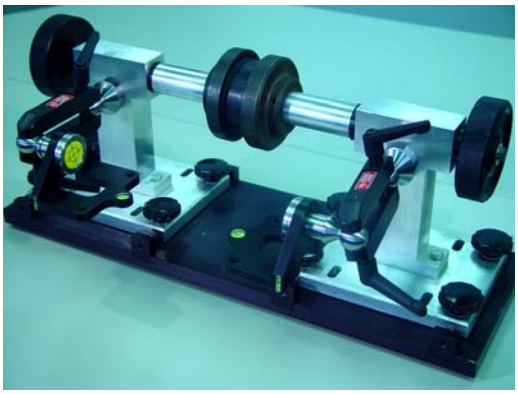
A practical and easy solution for measuring dynamic movement



OL2R Measurement Instructions

It is important to understand that the OL2R Fixtures are designed to measure Dynamic Movement of rotating machinery, not just thermal growth.

To understand how the OL2R Fixtures work also requires some knowledge of basic geometry. Put simply, OL2R Fixtures create a virtual centerline that corresponds with the machine position at both the cold (off-line) and hot (running) position. Any changes in the machine alignment (both vertical and horizontal) will be duplicated by changes in the OL2R Fixture alignment.



1. Before proceeding, inspect the machines and decide on locations where the OL2r Fixtures can be installed such that the TD units can be "aligned" with each other. Prior to any measurement, it is necessary to first prepare the machine. It will be necessary to affix the OL2R tooling balls in such a fashion that the TD units will "span the coupling". The optimum locations are on or close to the bearings (but DO NOT drill into the race area of bearings).

2. Holes need to be drilled and tapped at least ½" deep, ¼" x 20 UNC threads – use the pilot bit and tap supplied with the OL2R Fixtures. The tooling balls are installed using a 3/16" Allen head wrench (not included).

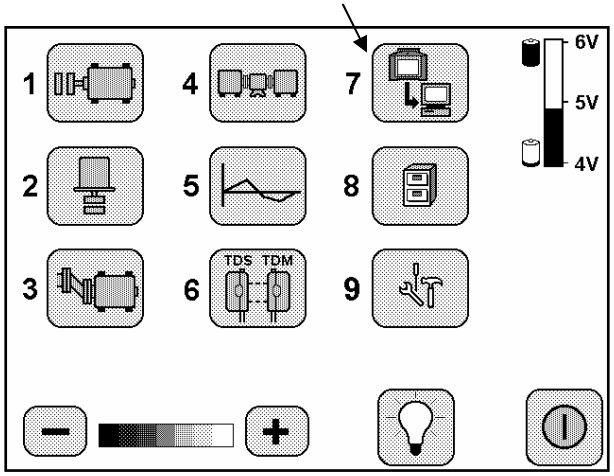
3. While holding one of the OL2R Fixtures in one hand, mount the tooling ball on the first machine. Repeat for the other machine. Tighten the tooling balls very securely. Remember that the OL2R Fixtures must not loosen or move during the process.

4. Once the brackets are put on the machine, use the stationary side bracket and set close to level using the circular target level vial as the guide. It may be easiest to create 90^{o} angles (but not mandatory) with the bracket. Once the stationary side is set, DO NOT MOVE IT AGAIN. Make sure it is locked down. These must be securely locked down, so you must use a fair amount of force. Note that the tightening arms are spring loaded and can be rotated freely by lifting slightly then turning in either direction; this is especially useful to get the best leverage when tightening the OL2R Fixtures.

5. Set up the moveable side OL2R Fixture trying to aim it as parallel as possible – again, it will be easiest to create 90º angles (i.e., get the clamps parallel to each other and perpendicular to their respective TD bracket).

6. Connect both TD's to the DU, using a cable from each TD going back to the DU. DO NOT use an interconnecting cable between each TD; this length of cable may pose a safety risk when the machine is placed in operation.

7. Turn on the Fixturlaser Shaft system and select the Real Time Data Transfer program (program "7" on a Shaft 200). The lasers on the TD's should now be on constantly. This will help you during the next step. (Note: program "7" is only available on the Shaft 200; if you have a Shaft 100, simply go into program 1 and enter a value for dimension A.)



You will now use a technique called "coning" to roughly align the OL2R Fixtures to each other, ensuring that the lasers will stay within the detectors throughout the measurement process.

Coning Procedure

a) Place the TD-M on its OL2R Fixture; the TD-S is removed.
b) Rotate the TD-M to the 9 o'clock position
c) Loosen the movable OL2R clamps slightly so the TD-M laser can be pointed at the center of the crosshairs on the stationary target.
d) Rotate the TD-M 180º to the 3 o'clock position.
e) Take note of where the laser beam has traveled to. Using the blue thumbwheels on the TD-M, move the laser dot ½ the distance back toward the crosshairs on the stationary target. Now loosen the movable OL2R clamps slightly and adjust until the laser beam is again at the center of the stationary target, keeping the TD-M at the 3 o'clock position.
f) Snug up the clamps again.
g) Rotate the TD-M to the 9 o'clock position.
h) Take note of where the laser beam has traveled to. Using the blue thumbwheels on the TD-M, move the laser dot ½ the distance back toward the crosshairs on the stationary target. Now loosen the movable OL2R clamps slightly and adjust until the laser beam is again at the center of the stationary target, keeping the TD-M at the 9 o'clock position.
i) Snug up the clamps again.
j) Repeat this procedure (b – i) until the beam stays roughly at the center of the stationary target when the TD-M is rotated.
k) Remove the TD-M, and place the TD-S on its OL2R Fixture.
l) Repeat the above steps (b - i) until the laser from the TD-S stays at the center of the movable target when the TD-S is rotated.
m) Place the TD-M on its OL2R Fixture; rotate and check to ensure that laser is still at the center of the stationary target. If not, repeat steps b - i. Remove the TD-M

n) Place the TD-S on its OL2R Fixture; rotate and check to ensure that laser is still at the center of the movable target. If not, repeat steps b - i.

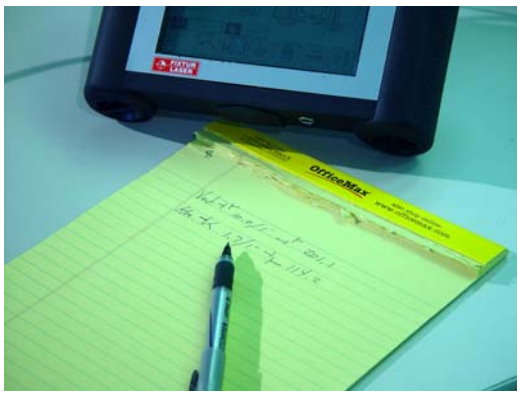
8. Place both TD units on their respective OL2R fixtures. Rotate both to the 12 o'clock position. Use the blue thumbwheels to aim the lasers to the center of the opposing TD targets.

9. Once the OL2R brackets are aligned, the cold (off-line) measurement is ready to be taken. We prefer that the clock method for measuring be utilized. If the limited rotation method is used, it is important that the heads be rotated measuring at 9, 12 and 3 o'clock positions – NOT in a limited rotation of less than 180^{o}. This is why the small leveling vials are located on the OL2R brackets. Exit program 7 and enter program 1. Set any other toolbox options (resolution, sampling time, screen filter, etc.) as needed. Note that the sampling time can be changed between alignments, but should probably not be changed between measurements.

10. Now perform a standard shaft alignment measurement with the OL2R Fixtures. It is important that the "A" and "D" dimensions be measured carefully and inputted correctly. Note that it is not necessary to enter the "B" and "C" dimensions.

11. Perform the shaft alignment procedure. Use the bubble levels on the OL2R Fixtures as guides when positioning the fixtures at 9-3-12. After the measurement has been performed, store the data in the File Cabinet.

12. Write down the vertical and horizontal values of the cold (off-line) alignment, including a representation of the icons. Enter the Toolbox. Enter the Thermal Target program. At this point you must choose what value set to use (choose coupling angularity and offset, which are recommended for this method). Use the data set collected at the cold position (just previously written down) and input that data as the targets. Return to the shaft alignment. All values should now show Zero and the Thermal Target icon will be visible in the top right hand corner of the screen. If incorrect values were entered the angularity and offset will NOT show zero. If opposite values were entered, the angularity and offset will show twice the previous readings. Re-enter the toolbox and correct the targets if necessary.



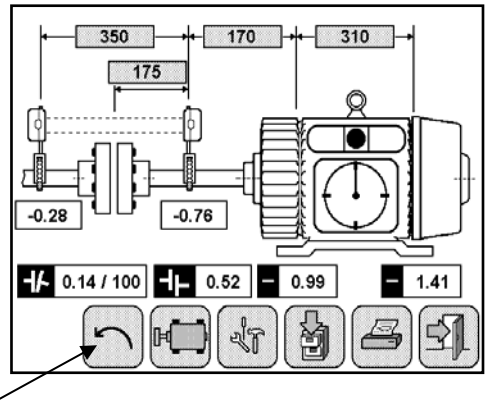
13. It is important to check both the vertical and horizontal values. Rotate to the 12:00 position and ensure that the representation of the motor is correct for the vertical. Check to see if the offset & angularity values are zero. Now rotate to the 3:00

position, and ensure that the representation of the motor is correct for the horizontal. Check to see if the offset & angularity values are zero.

14. At this point you have set the Off-line (cold) data set to zeroes. Leave the display unit on, but remove the TD-S and TD-M.

15. Operate the machine and bring it to normal operating temperatures and conditions.

16. Re-install the TD-S and TD-M on the OL2R brackets. Do not move the brackets. Do NOT exit the horizontal shaft alignment program; if the DU has entered the "sleep mode", awake the DU and return directly to the shaft alignment. Touch the "re-measure" icon and take a new set of alignment readings with the OL2R Fixtures. The results on the screen are the dynamic movement of the machines. You should save the data into the File Cabinet.



This method provides the dynamic movement values directly with no other calculation, but the values measured are the opposite of the targets. Therefore, the data must be reversed when used as targets for the standard shaft alignment. The stored data is the absolute value of the dynamic movement – where the machine moved from it's Off-Line 2 Running condition.

<u>To perform the alignment of the machines incorporating the dynamic movement</u>

1. Set up the shaft brackets (or optional magnetic brackets).
2. Mount the TD units
3. Measure and enter the machine dimensions (dimensions A, B, C, and D).
4. Go into the Toolbox and select the thermal target icon
5. Select the coupling value input and put the <u>negative</u> of the measured dynamic movement values into the program. For example, if the offset misalignment was measured as +20 mils, you must input –20 mils.
6. A standard shaft alignment is now performed at a cold position, positioning machine feet toward a zero position. (Note: shaft alignment should not be performed utilizing the OL2R brackets).

Tips:

a) Take note of the location of the laser at the plane of the targets when beginning the coning process. It might be helpful (or necessary) to place a piece of paper or cardboard onto which the laser beam will be projected. You might use a felt tip marker to mark the laser starting/ending positions on this makeshift target.

b) It is possible to reverse the order of measurement with this method without reversing the data set (hot to cold). However, the machine has to be prepared with the tooling balls already existing or drilled and tapped while running.

c) Note that the original target values mean absolutely nothing – they are the values for the zero position of the brackets for this installation. These values will change next time the fixtures are installed. However, the dynamic movement values are real and would be the same over repeated measurements, of course presuming identical operating conditions.