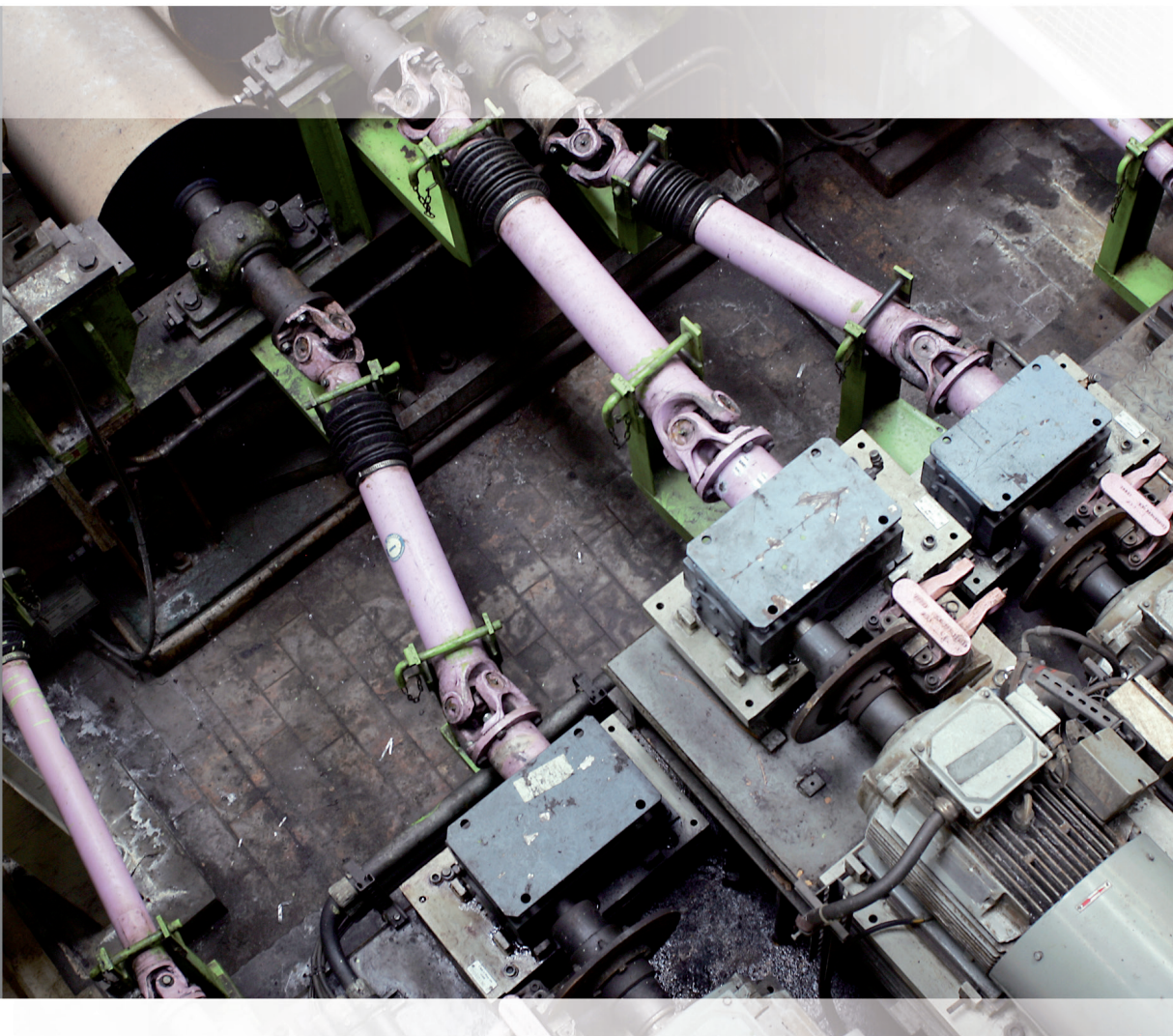


Cardan shaft alignment

Getting started



Cardan shaft alignment – Getting started

Dear Customer,

Welcome to the world of cardan shaft alignment using specialized PRÜFTECHNIK bracketing and measuring systems.

This guide highlights the four main cardan shaft alignment bracketing systems. The actual measurement procedure using ROTALIGN Ultra iS Shaft with any of the four bracketing systems is covered fully in this guide. Measurement procedures for other PRÜFTECHNIK shaft alignment measuring systems can be found within their respective system operating handbooks. This guide must be used in conjunction with the corresponding measuring system handbook.

PRÜFTECHNIK Condition Monitoring GmbH

Oskar-Messter-Str. 19 – 21

85737 Ismaning

Germany

Tel +49.89.99616-0

Fax +49.89.99616-300

Email info@pruftechnik.com

Edition September 2015

Part number DOC 99.201.en

sensALIGN® and ROTALIGN® are registered trademarks of PRÜFTECHNIK Dieter Busch AG. PRÜFTECHNIK products are the subject of patents granted and pending throughout the world. Contents subject to change without further notice, particularly in the interest of further technical development. Reproduction, in any form whatsoever, only upon express written consent of PRÜFTECHNIK Condition Monitoring GmbH.

© Copyright 2015 by PRÜFTECHNIK Condition Monitoring GmbH



Contents

Safety and care	3
Safety notes and symbols	3
Handling precautions	3
Introducing cardan drives	4
Cardan shaft alignment using the rotating arm bracket set ALI 2.450	5
1. Cardan rotating arm bracket set ALI 2.450	5
2. Mounting sensALIGN laser and sensor	5
3. Mounting the brackets on the shafts	6
4. Set the rotating arm measurement procedure	6
5. Setting up sensALIGN laser and sensor	7
6. Taking measurement	9
7. Evaluation and alignment	12
Cardan shaft alignment using the bracket set ALI 2.460	13
1. Large chain type bracket set ALI 2.460	13
2. Mounting sensALIGN laser and sensor	13
3. Mounting the brackets on the shafts	14
4. Setting up sensALIGN laser and sensor	14
5. Set-up and measurement using the 180° rotation procedure	16
6. Evaluation and alignment	20
Cardan shaft alignment using ALI 2.893 SETIS	20
1. Cardan shaft bracket set ALI 2.893 SETIS	20
2. Mounting bracket	20
3. Mounting the laser holder assembly on to the rail	22
4. Mounting and adjusting the laser	22
5. Adjusting the laser beam to machine's rotational axis	24
6. Positioning laser and mounting sensor for measurement	26
7. Set-up and measurement using ROTALIGN Ultra iS with sensALIGN laser and sensor	27
8. Evaluation and alignment	30
Cardan shaft alignment using ALI 2.874 SETIS	31
1. Cardan shaft bracket Lite set ALI 2.874 SETIS	31
2. Mounting the faceplate to the rail	31
3. Mounting the laser holder assembly on to the rail	32
4. Mounting and adjusting the laser	33
5. Adjusting the laser beam to machine's rotational axis	35
6. Positioning laser and mounting sensor for measurement	35
7. Set-up and measurement	36
Cardan shaft brackets' measurement matrix	37
An overview	37
Index	38

Safety and care

Safety notes and symbols

PRÜFTECHNIK cardan shaft alignment bracketing systems are to be used in industrial environments to carry out cardan shaft alignment measurements. Although the related system computers, sensors and lasers are all shockproof, care must be taken to ensure they are not subjected to mechanical knocks. The bracketing systems must be operated only by properly trained personnel. No liability will be assumed when components or operating procedures as described in this guide are altered without permission of the manufacturer.

The following symbols are used in this manual in order to draw the reader's attention to especially important text, such as that regarding possible sources of danger or useful operating tips.

This symbol denotes general information and tips regarding operation of the bracketing and related measurement system.

This symbol denotes information which must be followed in order to avoid damage to equipment.

This symbol denotes information which must be followed in order to avoid personal injury.

PRÜFTECHNIK Condition Monitoring assumes no liability when components or operating procedures as described in this guide are altered without permission of the manufacturer.



Note



CAUTION



WARNING



CAUTION

Handling precautions

Use the supplied cases to transport the bracketing systems. If not in use, the brackets must be stored in dry locations.

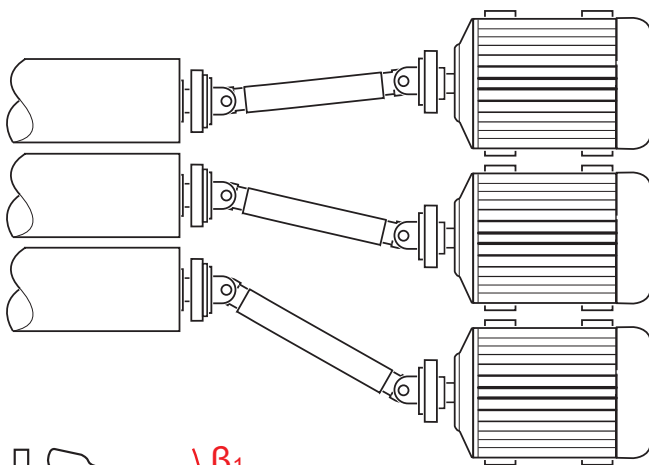
Any scrap metal from the bracketing systems is to be recycled or disposed of according to applicable safety and environmental regulations.

None of the cardan shaft alignment brackets is magnetic. If however transporting any PRÜFTECHNIK magnetic brackets, refer to the relevant safety data sheet, which is available for download and reference on the PRÜFTECHNIK website at www.pruftechnik.com.

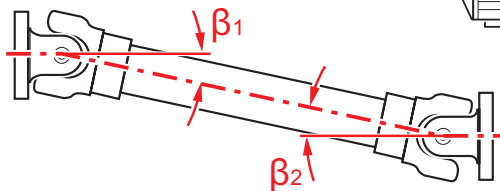
Introducing cardan drives

Cardan drives are installed and operated with a large offset between the driver and the driven shaft. Depending on the type of cardan shaft in place, a minimum deflection angle of the universal joints may be necessary in order to ensure sufficient lubricant circulation, which in turn prevents the universal joints from seizing. A large difference in the deflection angles β_1 and β_2 [refer to image below] leads to rapid fluctuation of the driven shaft RPM during operation, which can lead to grave consequences for electronically-controlled synchronous and asynchronous AC drive motors.

For smooth operation the machines should be aligned such that the driving and driven machine shaft centerlines are parallel. Precise alignment reduces the rotational irregularities of the cardan shaft to a minimum, so that the uneven bearing loading during cardan shaft rotation is also minimized, the service life of the components is extended and the chance of unexpected machine failure is reduced.



Positioning of machines
in an area with limited
space.



For optimal running
condition, the deflection
angles β_1 and β_2 should
be equal

The cardan shaft alignment procedures described in this manual for ROTALIGN Ultra iS computer are based on the Shaft Alignment firmware version 3.03 or higher.



Note

Cardan shaft alignment using the rotating arm bracket set ALI 2.450

This section describes the aligning of cardan shafts using the cardan rotating arm bracket set ALI 2.450. This bracket set and the related measurement principle are used only in conjunction with sensALIGN sensor and laser, and ROTALIGN Ultra iS Shaft firmware version 3.03 or higher.

The measurement procedure described in this section allows precise measurement of machines joined by cardan shafts without having to remove the cardan shaft, which however, must be rotated to take measurements.

1. Cardan rotating arm bracket set ALI 2.450

This bracket set comprises:

Cardan rotating arm bracket	ALI 2.451
Large chain type bracket	ALI 2.461
400 mm support post	ALI 2.178 (6 pcs.)
495 mm support post	ALI 2.179 (6 pcs.)
2.5 mm Allen key	0 0739 1055 (2 pcs.)
External inclinometer	ALI 5.020 (2 pcs.)
Carrying case	ALI 2.480
Getting started	DOC 99.201.en

Based upon experience, it is suggested that both sensALIGN laser and sensor should first be mounted on their respective brackets together with the anti-torsion bridges, then the bracket assemblies with the components mounted on the respective machine shafts.

It must be ensured that the surface where the cardan rotating arm bracket ALI 2.451 is to be mounted is clean, smooth, cylindrical, even and provides the necessary surface contact. Should the surface be painted, ensure that paint is stripped off the four areas with contact to the bracket frame.



Note

5

2. Mounting sensALIGN laser and sensor

1. With the laser OFF, carry out a pre-adjustment to ensure that the laser beam will be emitted perpendicular to the laser housing. Use the two yellow beam position thumbwheels to center the 'bulls-eye' as accurately as possible, then mount it on the support posts of the large chain type bracket ALI 2.461.
2. Mount an anti-torsion bridge on the laser support posts to provide the necessary rigidity to the long support posts.

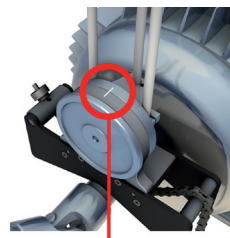


'bulls-eye'

3. Mount the sensor on the support posts of the cardan rotating arm bracket ALI 2.451, then mount an anti-torsion bridge on the sensor support posts to provide the necessary rigidity to the long support posts.

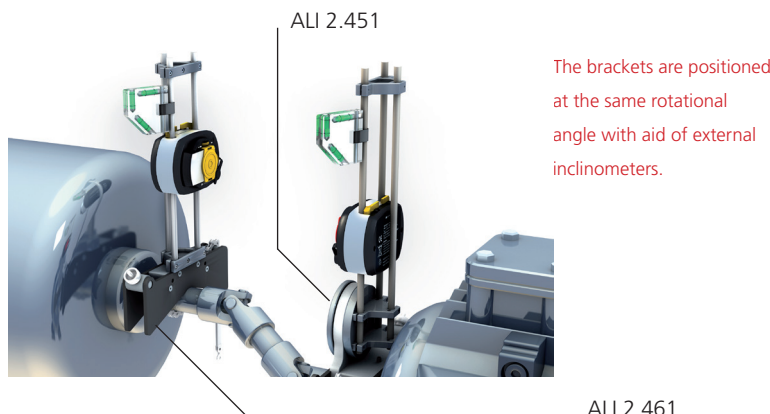
3. Mounting the brackets on the shafts

Mount the large chain type bracket ALI 2.461 holding the laser on the shaft of the left machine (usually reference machine), and the cardan rotating arm bracket ALI 2.451 holding the sensor on the shaft of the right machine (usually moveable machine) – as viewed from normal working position. Ensure that both markings on the rotating arm are in line. Use the external inclinometers to position both brackets at the same rotational angle. (Details on the bracket mounting procedure may be found in section 4.4 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en.) Remove the external inclinometers, then switch the laser on.




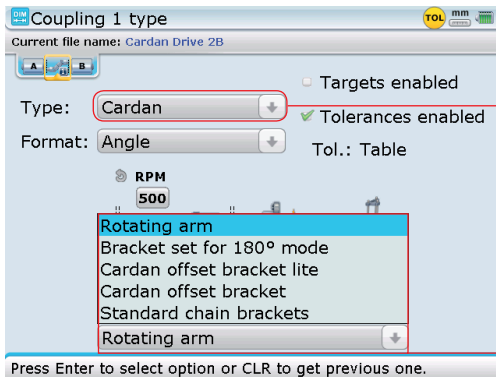
Markings on the rotating arm bracket

Do not stare into the laser beam.



4. Set the rotating arm measurement procedure

1. Switch sensALIGN sensor and ROTALIGN Ultra iS computer on, then proceed to set up the machines (refer to sections 4.6 – 4.9 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en). From the machine set-up screen, highlight the coupling, then press  to access the "Coupling type" screen.
2. Select the coupling type 'Cardan' then navigate to the bottom box to select type of bracket to be used from the drop down menu that opens.



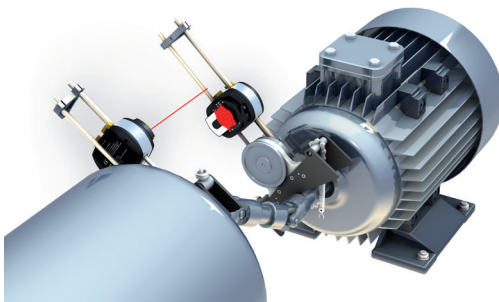
ROTALIGN Ultra iS Shaft provides five bracketing options with which cardan shafts may be measured. The system also determines the corresponding measurement mode for each bracket option and type of sensor used.

3. Use / and highlight 'Rotating arm'. This is the option for the rotating arm bracket set ALI 2.450.
4. Press or to confirm selection.

5. Setting up sensALIGN laser and sensor

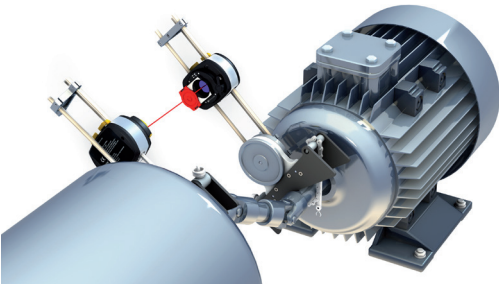
In a crowded plant, it is necessary to determine the optimal position to start measurement. The objective is to ensure that the line of sight between sensALIGN sensor and laser is maintained through as wide a rotational angle as possible when the cardan shaft is rotated in its normal direction of machine rotation.

1. Rotate the cardan shaft in the normal direction of machine rotation while observing the laser beam position at the opposite end. By loosening the rotating arm wheel, the frame with the support posts may be rotated until the laser beam strikes the middle sensor support post. When the laser beam strikes this support post, retighten the rotating arm wheel. A red cardboard or paper placed behind the three sensALIGN sensor support posts may be used to help locate the laser beam.

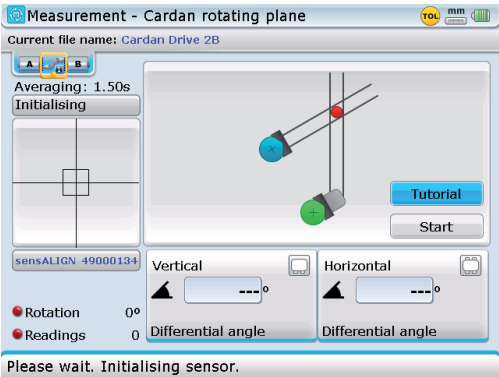


Laser beam strikes the middle sensor support post.

- 2. Loosen the sensor by pushing the yellow sensor clamping levers to the open position, then slide the sensor up and down the support posts to ensure that the laser beam strikes the center of the red sliding dust cap. Fasten the sensor at this position by locking the yellow clamping levers, then slide the dust cap so that the laser beam strikes the sensor aperture.




The sensor and laser set-up, and measurement procedure for the cardan rotating arm bracket is shown in a video tutorial within the application. The tutorial is accessed via the measurement screen. It is recommended to go through the short tutorial before beginning actual measurement.

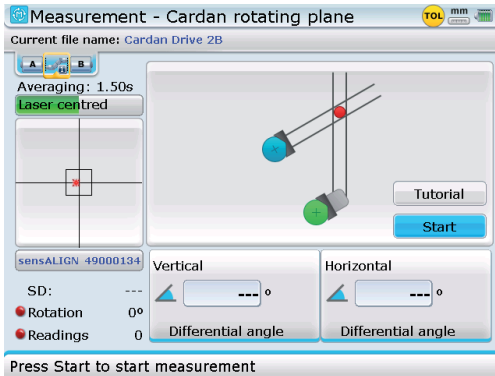


With bracket type set to 'Rotating arm', accessing the measurement screen by pressing opens the shown measurement screen. Use the navigation keys and highlight the 'Tutorial' button. Confirming selection by pressing starts the video tutorial.

To pause the video, press . To exit the tutorial, press .

6. Taking measurement


1. Press  to start measurement in ROTALIGN Ultra iS computer. The laser beam location should be apparent in the adjustment screen.





Note: This screen appears only when a new measurement is to be started.

If desired, the tutorial video may be viewed again from this screen before starting actual measurement.

Note that measurement may also be started via the "Measurement" screen context menu item 'Start'.

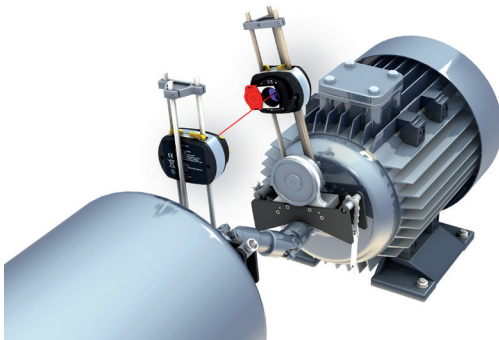
2. Press  to start measurement.

If the measurement option 'Multipoint measurement' is set to 'Take point automatically', automatic collection of measurement points, based on stability filter parameters, takes place when the laser beam strikes the sensor. The measurement option may be set via the "Measurement options" screen. From the "Measurement" screen press  then select 'Mode/Options -> 'Measurement options', then confirm selection by pressing .



Note

3. Slide the red sensor dust cap to cover the sensor aperture, then rotate the cardan shaft ca 10° - 20° to the next measurement point. Determine this position depending on the accessible angle of rotation, and the minimum requirement of five measurement points through a rotational angle greater than 60° .
4. Due to the cardan shaft offset in the horizontal plane, the laser beam strikes neither the sensor dust cap center nor the middle sensor support post. Loosen the rotating arm wheel, then rotate the frame with the support posts until the laser beam strikes the middle sensor support post. Retighten the rotating arm wheel, then unfasten the sensor and slide it along the support posts until the laser beam strikes the center of the sensor dust cap. Fasten the sensor then slide the sensor dust cap to expose the sensor aperture.



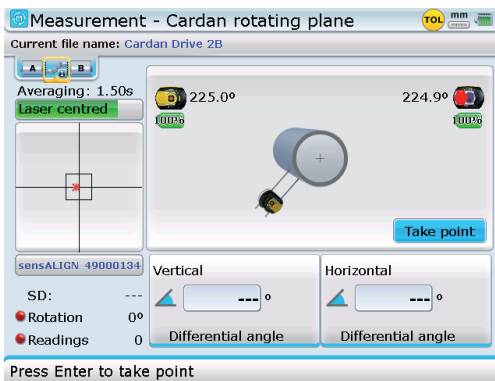
While rotating the cardan shaft, the position of the laser beam may be tracked by placing a red cardboard or paper behind the three sensALIGN sensor support posts.

Note: DO NOT stare into the laser beam.




WARNING

- When the laser beam strikes the detector, the 'Take point' button appears again on the measurement screen.



The 'Take point' button appears only when the laser beam strikes the sensor within the detector range, and the value stabilization time is attained.

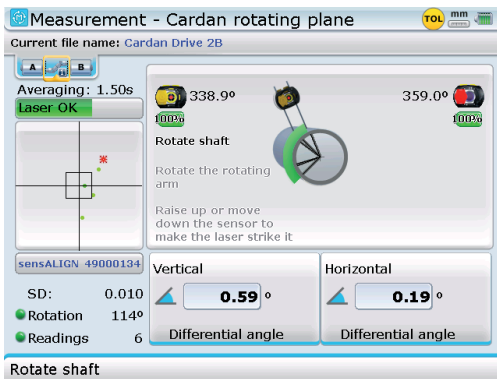
10

- Press  to take the first measurement point.
- Repeat the measurement procedure (steps 3 to 6) taking as many points as possible, through as wide a shaft rotational angle as possible. A minimum requirement of five measurement points through a shaft rotational angle greater than 60° is necessary.

Taking measurements at points evenly distributed along the rotational arc has a positive influence in the quality of the measurement attained.

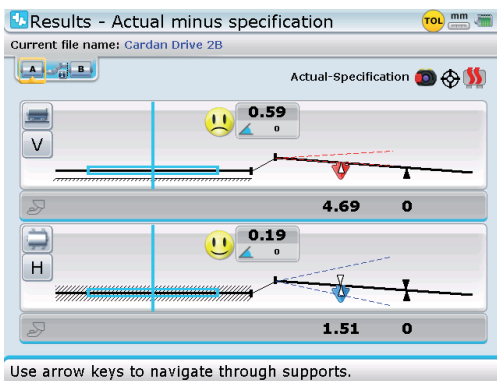


Note



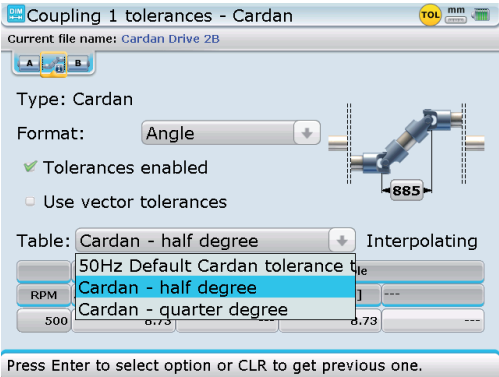
Measurement may be finished by using the "Measurement" screen context menu item 'Stop'.

8. Press (RES) to view cardan alignment results.




7. Evaluation and alignment

A PRÜFTECHNIK cardan shaft tolerance table for 1/2° and 1/4° limits is available within the ROTALIGN Ultra iS computer. The tolerance table is accessed via 'Coupling properties' (refer to section 5.4.7 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).



The tolerances table may also be accessed as described in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en section 5.4.7.

1. Out of tolerance machines may be repositioned with the help of the MOVE function (refer to section 4.13 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).
2. Remeasure to determine the new alignment condition, by pressing , then repeating the measurement procedure (steps 3 to 7 in section 5 previously).

Cardan shaft alignment using the bracket set ALI 2.460

This section describes the aligning of cardan shafts using the large chain type bracket set ALI 2.460. This bracket set and the related measurement principle are used only in conjunction with sensALIGN sensor and laser, and ROTALIGN Ultra iS Shaft firmware version 3.03 or higher..

The measurement procedure described in this section allows precise measurement of machines joined by cardan shafts without having to remove the cardan shaft, which however, must be rotated to take measurements.

1. Large chain type bracket set ALI 2.460

This bracket set comprises:

Large chain type bracket	ALI 2.461 (2 pcs.)
400 mm support post	ALI 2.178 (6 pcs.)
495 mm support post	ALI 2.179 (6 pcs.)
2.5 mm allen key	0 0739 1055 (2 pcs.)
External inclinometer	ALI 5.020 (2 pcs.)
Carrying case	ALI 2.480
Getting started	DOC 99.201.en

Based upon experience, it is suggested that both sensALIGN laser and sensor should first be mounted on the large chain type brackets together with the anti-torsion bridges, then the bracket assemblies with the components mounted on the respective machine shafts.

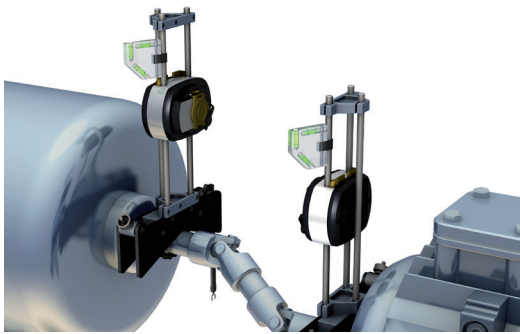
2. Mounting sensALIGN laser and sensor

1. With the laser OFF, carry out a preadjustment to ensure that the laser beam will be emitted perpendicular to the laser housing. Use the two yellow beam position thumbwheels to center the 'bulls-eye' as accurately as possible, then mount it on the support posts of the large chain type bracket ALI 2.461.
2. Mount an anti-torsion bridge on the laser support posts to provide the necessary rigidity to the long support posts.
3. Mount the sensor on the support posts of the large chain type bracket ALI 2.461, then mount an anti-torsion bridge on the sensor support posts to provide the necessary rigidity to the long support posts.



3. Mounting the brackets on the shafts

Mount the large chain type bracket ALI 2.461 holding the laser on the shaft of the left machine (usually reference machine), and the large chain type bracket holding the sensor on the shaft of the right machine (usually moveable machine) – as viewed from normal working position. Use the external inclinometers to position both brackets at the same rotational angle. (Details on the bracket mounting procedure may be found in section 4.4 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en.)



The brackets are positioned at the same rotational angle with aid of external inclinometers.

4. Setting up sensALIGN laser and sensor

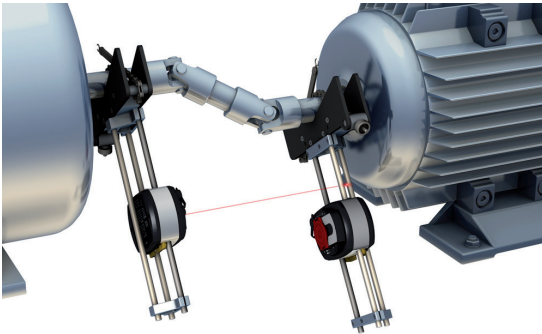
You will now be required to determine the optimal rotational position to start measurement.

1. Rotate the shaft in the normal direction of machine rotation while observing the position of the laser beam at the opposite support posts. This action may be aided by placing a red cardboard or paper behind the three sensALIGN sensor support posts.

Do not stare into the laser beam.

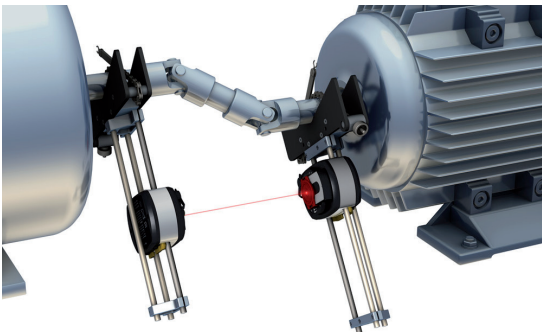
2. Carefully rotate the cardan shaft until the laser beam strikes the middle sensALIGN sensor support post or the center of the sensALIGN sensor sliding dust cap..






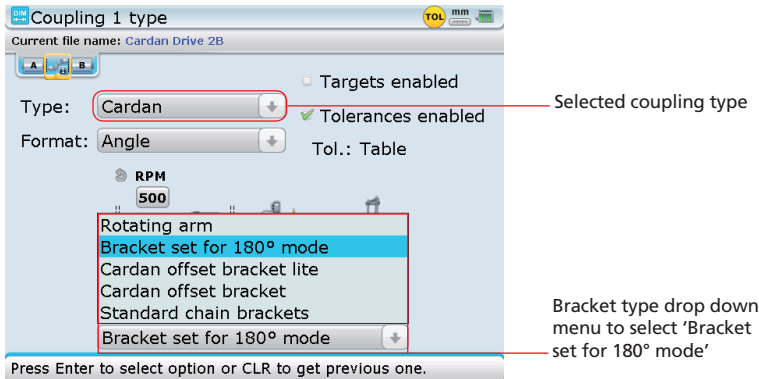
When the cardan shaft is at a position where the laser beam strikes the middle support post, then the brackets are on the cardan plane and the direction of the offset.

3. Slide both the laser and sensor up and down the support posts to ensure that the laser beam strikes the center of the sliding dust cap.








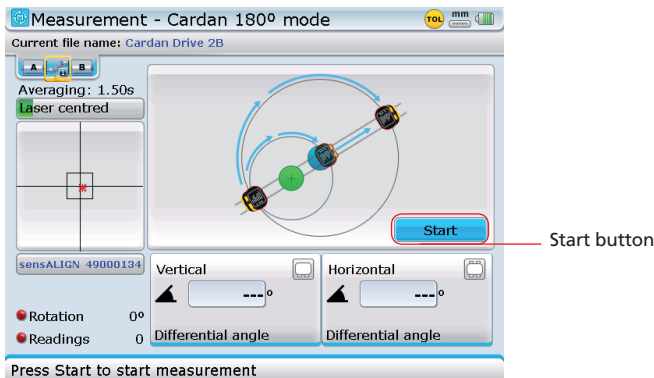
5. Set-up and measurement using the 180° rotation procedure

1. Switch sensALIGN sensor and ROTALIGN Ultra iS computer on, then proceed to set up the machines (refer to sections 4.6 – 4.9 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en). From the machine set-up screen, highlight the coupling, then press  to access the “Coupling type” screen.
2. Select the coupling type ‘Cardan’ then navigate to the bottom box to select type of bracket to be used from the drop down menu that opens.



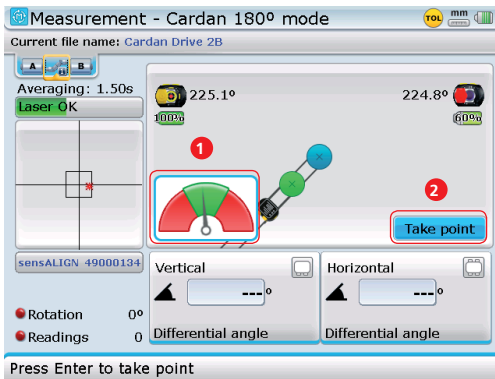
ROTAGLIGN Ultra iS provides five bracketing options with which cardan shafts may be measured. The system also determines the corresponding measurement mode for each bracket option and type of sensor used.

3. Use  /  and highlight ‘Bracket set for 180° mode’. This is the option for the 180° mode using the large chain type bracket set ALI 2.460.
4. Press  or  to confirm selection.
5. Slide the sensALIGN sensor dust cap to expose sensor aperture, then press . The laser beam location should be apparent in the “Measurement” screen, and the ‘Start’ button is automatically highlighted.



Note that measurement may also be started via the “Measurement” screen context menu item ‘Start’.


6. With the ‘Start’ button highlighted, press  to begin the measuring procedure.



1 – On-screen needle indicator

2 – 'Take point' button

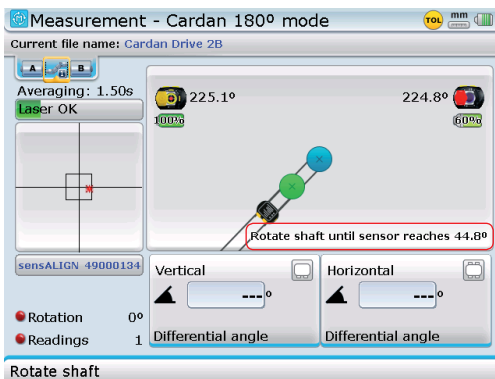
The 'Take point' button appears only when the laser beam strikes the sensor within the detector range and the value stabilization time is attained. The on-screen needle indicator provides additional aid when rotating the cardan shaft.

- With the laser beam centered, and the needle exactly at the center of the green sector, press  to take measurement at the first point.

The first measurement must be made when the needle is at the exact center of the green sector. This assists in keeping the laser beam within the range of sensor even for large cardan offsets.



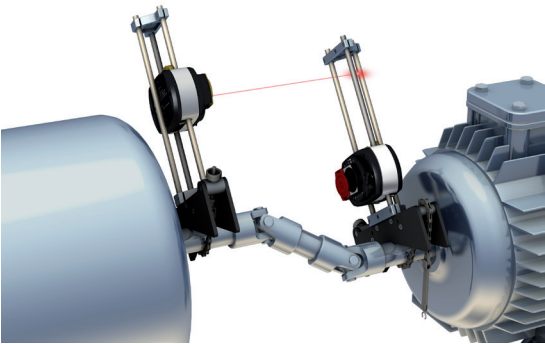
Note



After taking first measurement point, a hint requiring the shaft be rotated through 180° appears on the screen. In this example, the shaft is to be rotated until the sensor indicates 44.8°.

- Rotate the cardan shaft through 180° until the laser beam strikes the middle sensor support post. The needle will be in the middle blue sector.

Cardan shaft alignment getting started



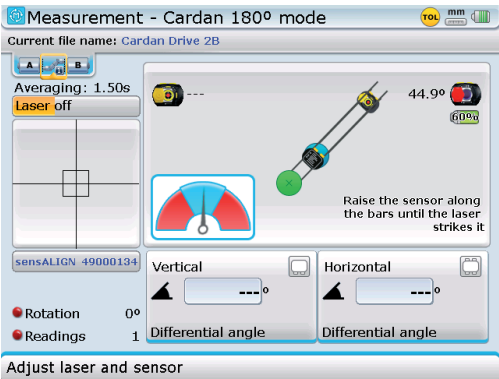
While rotating the cardan shaft, the position of the laser beam may be tracked by placing a red cardboard or paper behind the three sensALIGN sensor support posts.

Note: DO NOT stare into the laser beam.



WARNING

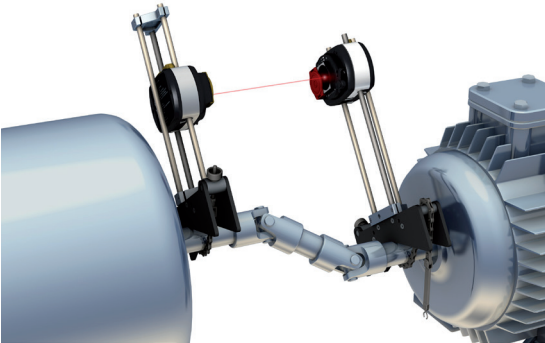
9. When the laser beam strikes the middle support post, a hint to raise or lower the sensor appears on the ROTALIGN Ultra iS computer display.



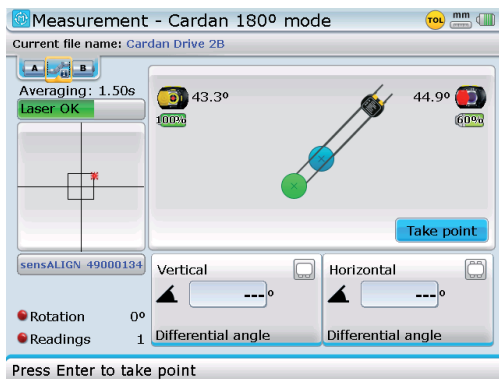
The on-screen needle indicator provides additional aid when rotating the cardan shaft. The needle will be in the middle blue sector when the laser beam strikes the middle sensALIGN sensor support post.

18


10. Slide the sensor along the support posts in the direction of sensALIGN laser and position it where the laser beam strikes the sensor aperture.

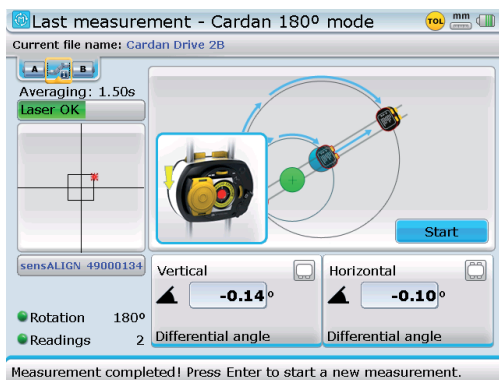


11. Once the laser beam is detected, the 'Take point' button appears on the display.



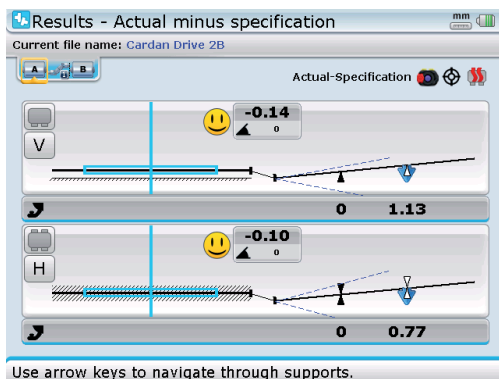
Note: While rotating the cardan shaft, the position of the laser beam may be tracked by placing a red cardboard or paper behind the three sensALIGN sensor support posts.

12. Press  to take measurement at the second point.



Note: Another set of measurements may be taken to check and confirm the repeatability

13. Press  to view alignment results.




In results, the cardan angle is given in degrees. An alternative measurement unit, milliradian (mrad) may be set under 'Configuration' -> 'Unit'.

6. Evaluation and alignment

A PRÜFTECHNIK cardan shaft tolerance table for 1/2° and 1/4° limits is available within the ROTALIGN Ultra iS computer. The tolerance table is accessed via 'Coupling properties' (refer to section 5.4.7 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).



- 1. Out of tolerance machines may be repositioned with the help of the MOVE function (refer to sections 4.13 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).
- 2. Remeasure to determine the new alignment condition, by pressing , then repeating steps 6-13 in section 4 previously.

Cardan shaft alignment using ALI 2.893 SETIS

This section describes the aligning of cardan shafts using the cardan shaft bracket ALI 2.893 SETIS. This bracket is used in conjunction with any of these alignment systems: ROTALIGN smart EX, OPTALIGN smart RS and ROTALIGN Ultra iS. The measurement procedure described in this section allows precise measurement of machines joined by cardan shafts over distances of up to 10 m (33 ft) and shaft offsets of up to 1000 mm (39 3/8 in.).

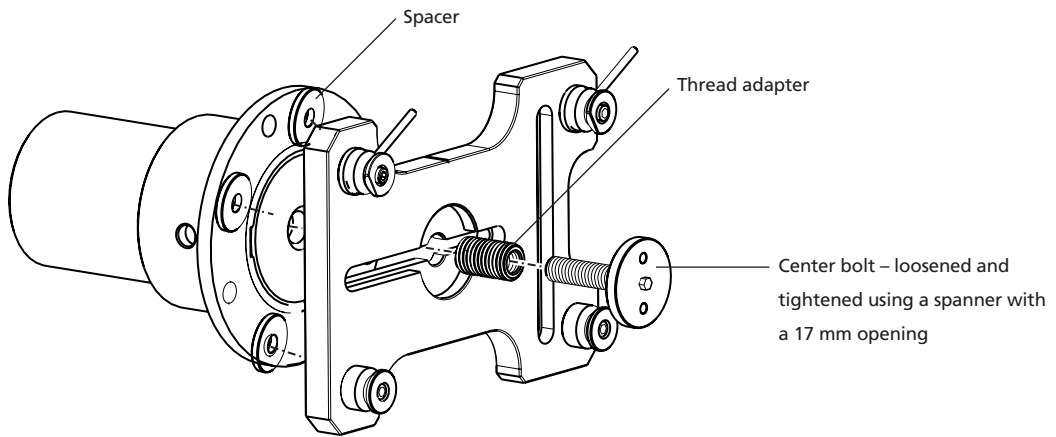
1. Cardan shaft bracket set ALI 2.893 SETIS

This bracket set comprises:

Laser cardan shaft brackets	ALI 2.894
Case for laser cardan shaft	ALI 2.896
Getting started	DOC 99.201.en
Open end spanner (wrench)	
Distance sleeves and plate	
Allen key (3 no.)	

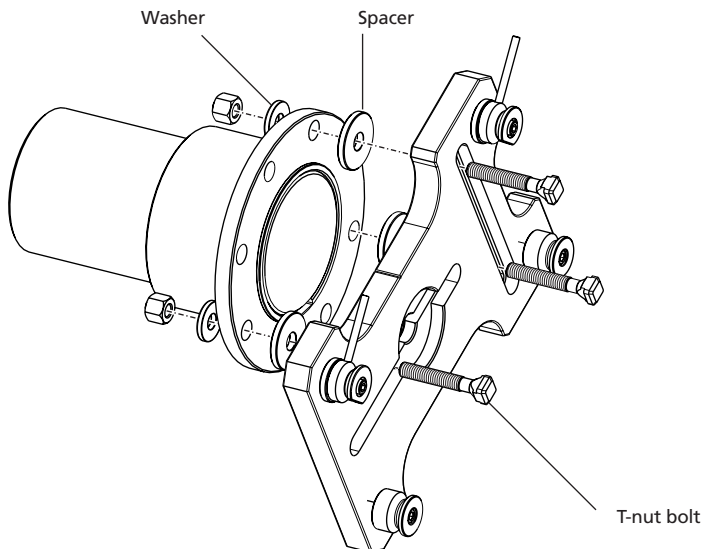
2. Mounting bracket

- 1. Mount the faceplate on the face of the coupling using the bolts supplied. The bracket is usually mounted on the coupling face of the non-rotatable shaft, for example, the roll in a paper mill.
Two different mounting arrangements are available:
 - › If the shaft end or coupling face has a threaded hole in its center, the easiest and most rigid mounting method is to use the large center bolt as shown below. A thread adapter may be used as shown to fit the center bolt to larger bores.



- › The faceplate may also be attached to the coupling face using the three T-nut bolts, forming a three-point mounting.

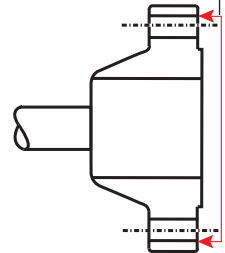
If the coupling has a raised face, the precision machined spacers are used as shown in order to separate the faceplate from the raised inner section of the coupling face while connecting the faceplate to the coupling face which is the reference surface.



Reference
surface



Note



21

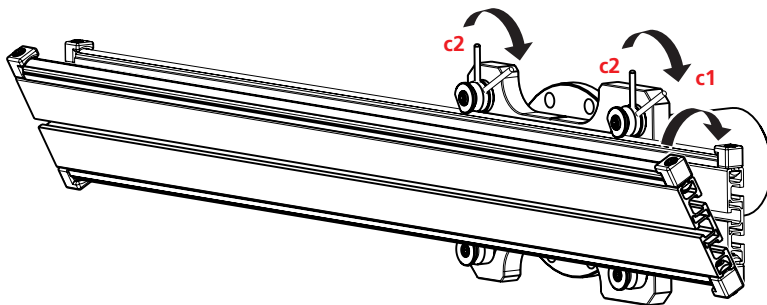
The coupling shown above has a raised face flange. The provided spacers are used to create a three-point plane to ensure that the faceplate and the coupling surface are joined together.

Do not bolt down the faceplate as the laser is still to be adjusted.



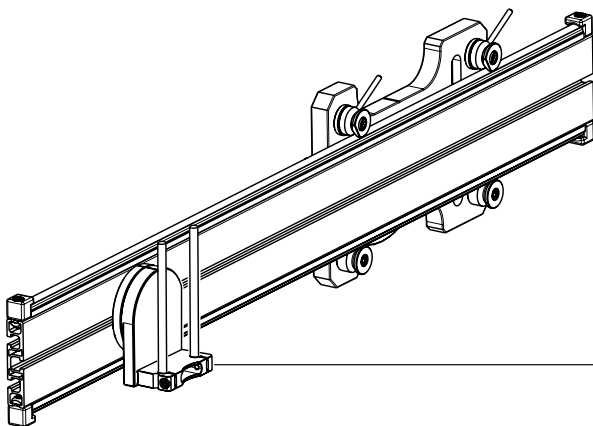
Note

2. Place the rail in the faceplate as shown below (c1), then use the two top levers (c2) to tighten the slide into place. Ensure that the center groove on the rail faces outwards.



3. Mounting the laser holder assembly on to the rail

Loosen the handwheel slightly, then slide the laser holder assembly down the center groove of the rail.

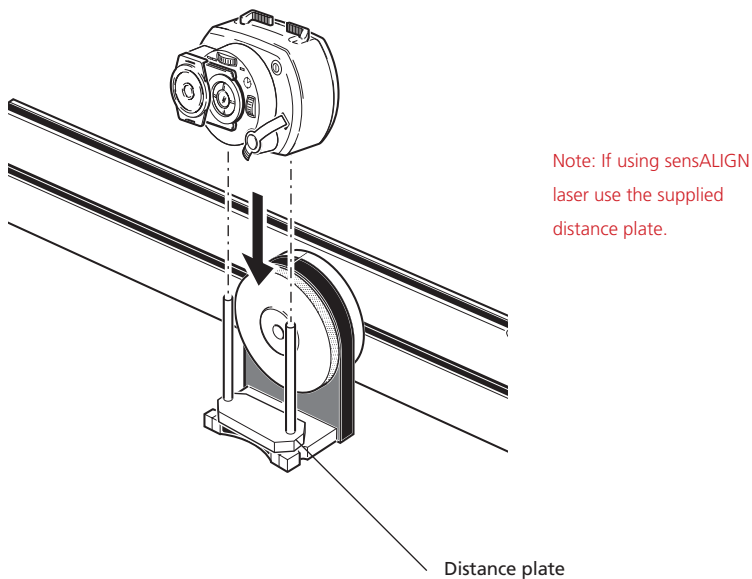
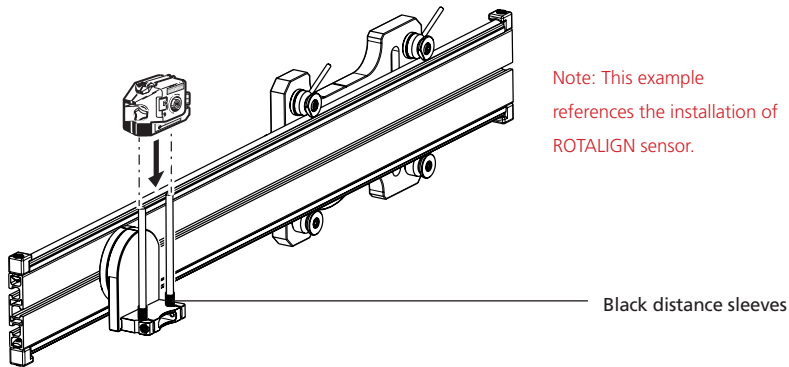


Laser holder

4 Mounting and adjusting the laser

In this step, the laser beam is adjusted such that it is roughly colinear to the rotational axis of the laser holder assembly.

1. Slide the two black distance sleeves (or distance plate if using sensALIGN laser) down the support posts.
2. Slide the laser onto the posts until it rests on the distance sleeves (or distance plate) – (refer to following figures).



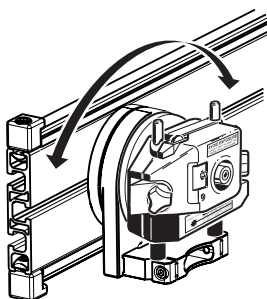
3. Mark a set of target crosshairs on the shaft rotation centerline of the other machine coupling (if the flange has a center hole, a temporary target surface such as a dust cap may be affixed to the hole).
4. Switch on the laser and adjust the beam to strike the center of the target on the opposite coupling:
 - › The objective is to adjust the laser beam such that it is colinear to the rotational axis of the laser holder assembly; making it possible to shift the laser assembly holder rotational axis.

The distance sleeves (black or white) and the distance plate influence the offset by positioning the laser beam on the same axis as the rotational axis of the laser holder assembly.



- › The two yellow beam position thumbwheels are used to adjust the angular position of the laser beam. By rotating the laser assembly holder, the laser beam traces an 'approximate' circle. If the 'approximate' circle is a single dot at the center of the target, then the laser beam has been adjusted correctly. If that is not the case, repeat the laser beam adjustment process until the 'approximate' circle corresponds to a 'single dot' position.

To achieve a 'single dot' position, rotate the laser 180 degrees and note the difference in the beam's position top to bottom. Rotate back to the start position and using the vertical adjustment thumbwheel adjust the laser beam by half the distance it travelled up or down. Repeat this for the side to side adjustment. Repeat this process until you can rotate the laser a full 360 degrees and the beam never moves on target, i.e., it describes a dot.



Note: This example references the installation of ROTALIGN sensor.

As soon as a single dot position has been achieved, do not touch the laser thumbwheels.



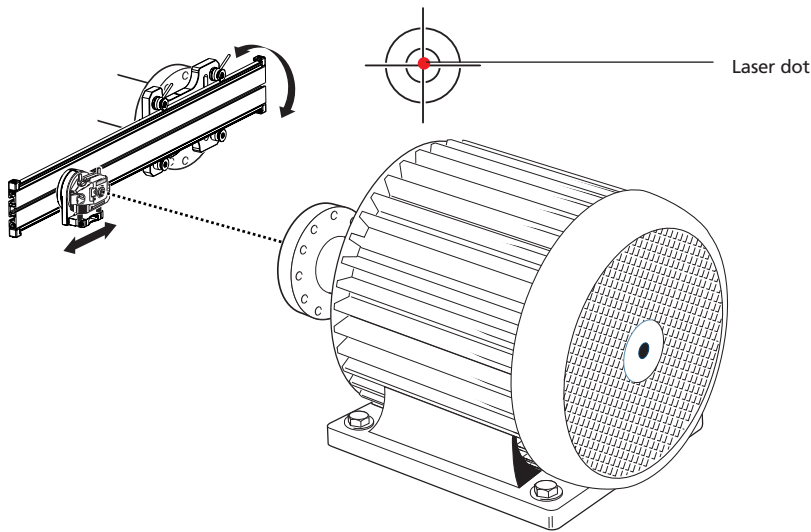
5. Adjusting the laser beam to machine's rotational axis

In this step, the laser holder assembly is adjusted on the bracket such that the laser holder rotational axis is roughly colinear with the rotational axis of machine to be aligned (which could be a motor or a gearbox).

During this procedure, DO NOT touch the yellow laser beam position thumbwheels.

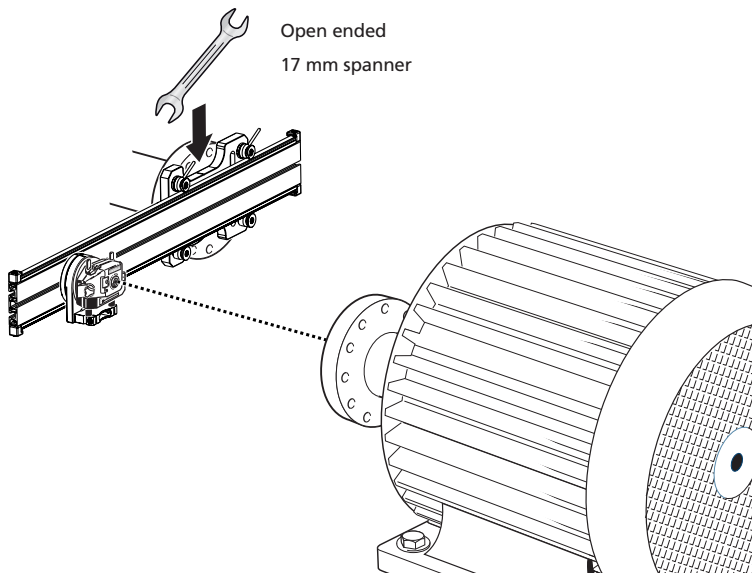


1. Carry out the vertical and horizontal adjustment of the laser holder assembly by sliding it horizontally through the center groove on the rail and positioning it vertically by rotating the rail.
2. Repeat the above procedure until the laser beam strikes the center of the target placed on the rotational axis of machine to be aligned.



Note: This example references the installation of ROTALIGN sensor.

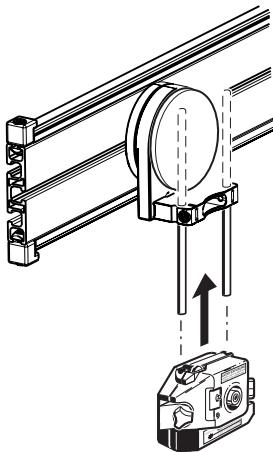
3. Once the laser beam has been centered on the target, tighten the faceplate on the coupling face.
 - › If using the center bolt, tighten this using the provided 17 mm open end spanner (wrench).
 - › If using the T-nut bolt, tighten them as appropriate.



6. Positioning laser and mounting sensor for measurement

In this step, the laser is remounted on the underside of the laser holder while the sensor is mounted on the shaft of the machine to be aligned.

1. Switch off the laser and remove it from its holder.
2. Using the provided M4 Allen key, loosen the support posts then slide them through the laser holder base so that they protrude from the other side.
3. Retighten the M4 Allen screws to secure the support posts, then remount the laser onto the support posts.



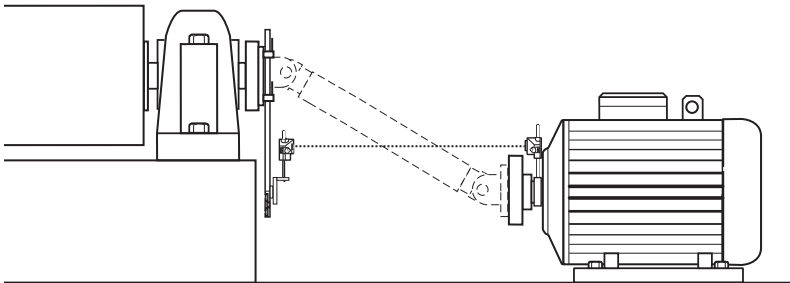
Note: This example
references the installation
of ROTALIGN sensor.

- Use the chain-type bracket or appropriate magnetic brackets to mount the sensor on the shaft of the machine to be moved (such as the motor or gearbox). The sensor is aligned to the laser by pushing or sliding the bracket supporting the sensor.

DO NOT touch the laser or its laser position thumbwheels.



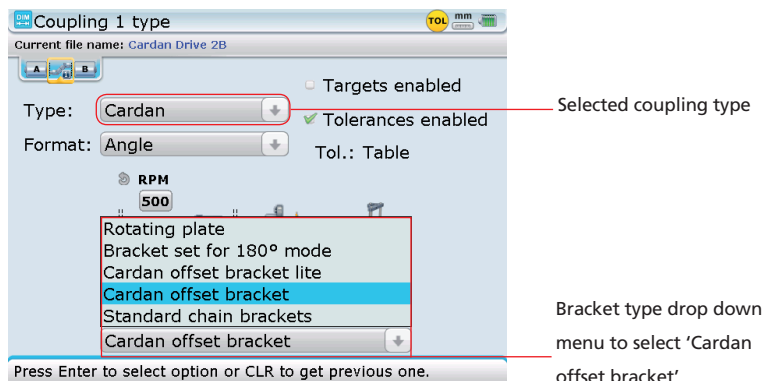
Note



7. Set-up and measurement using ROTALIGN Ultra iS with sensALIGN laser and sensor


- With sensALIGN laser, sensor and ROTALIGN Ultra iS computer switched on, proceed to set up the machines (refer to sections 4.6 – 4.9 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en). From the machine set-up screen, highlight the coupling, then press to access the “Coupling type” screen.
- Select the coupling type ‘Cardan’ then navigate to the bottom box to select type of bracket to be used from the drop down menu that opens.

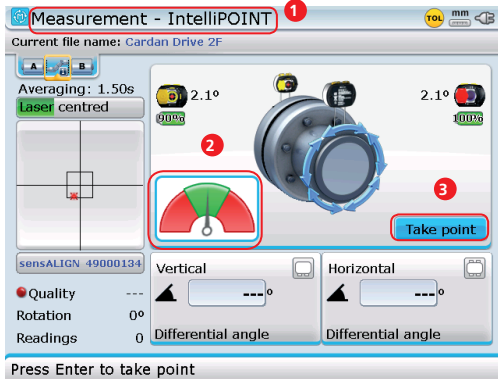
Note: The measurement procedure described in this section relates to ROTALIGN Ultra iS Shaft Advanced version. If using the Standard version, the designated measurement mode is Multipoint.



ROTAGLIGN Ultra iS provides five bracketing options with which cardan shafts may be measured. The system also determines the corresponding measurement mode for each bracket option and type of sensor used.


- Use / and highlight ‘Cardan offset bracket’. This is the option for the cardan shaft alignment bracket ALI 2.893 SETIS.
- Press or to confirm selection.

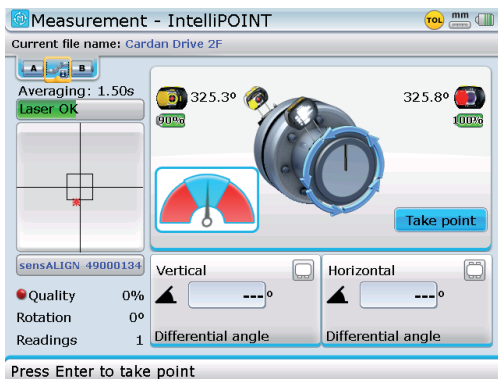
- Slide the sensALIGN sensor dust cap to expose sensor lens then press . The laser beam location should be apparent in the "Measurement" screen, and the 'Take point' button is automatically highlighted.




In this example where the cardan shaft alignment bracket ALI 2.893 SETIS is being used, the system selects the IntelliPOINT measurement mode. To center the needle, both laser and sensor must be at the same rotational angle.

- 1 – Designated measurement mode for the cardan bracket set ALI 2.893 SETIS with ROTALIGN Ultra iS Shaft Advanced
- 2 – On-screen needle indicator
- 3 – 'Take point' button'

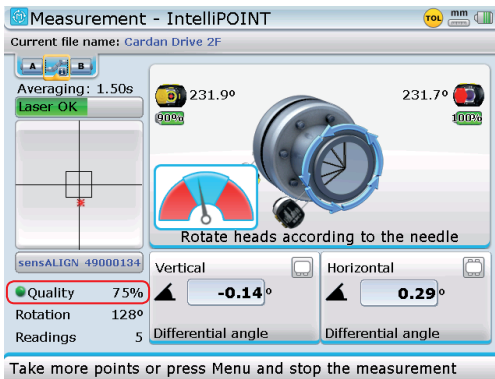
- With the laser beam centered, and the needle exactly at the center of the green sector, press  to take the first measurement.
- Rotate sensALIGN sensor to the next measurement position.
- Turn the laser-side shaft and observe the on-screen needle indicator. The 'Take point' button only appears when the needle is in the blue sector.



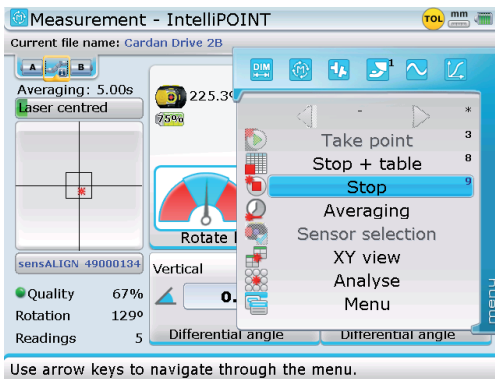
The 'Take point' button appears only when the laser beam strikes the sensor within the detector range, and the value stabilization time is attained.




- Press  to take the next measurement.
- Repeat steps 7–9 above, to take measurements in as many positions over as wide an angle as possible, ensuring that the measurement quality is acceptable.

For details on measurement quality refer to the ROTALIGN Ultra iS Shaft operating handbook DOC 40.200.en.



11. When a good enough measurement quality has been attained, stop measurement using the “Measurement” screen context menu item ‘Stop’.

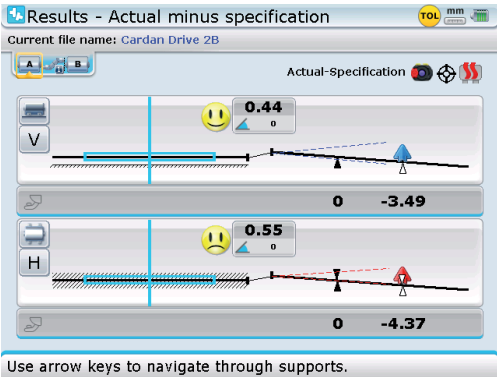


Stop measurement by using   to highlight 'Stop' then pressing  to confirm selection.

8. Evaluation and alignment

Offset has no real influence in the alignment condition but any angularity at the rotational axes must be corrected.

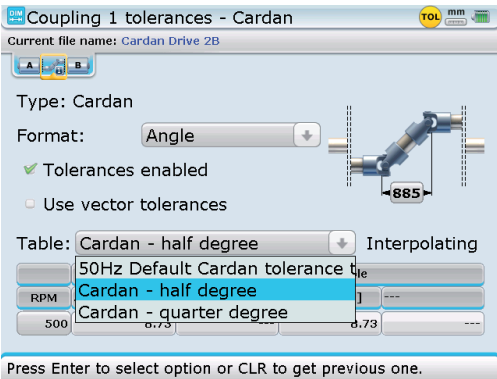
- 1. Press (RES) to view alignment results.



As only angularity must be corrected in cardan shaft alignment, results displayed show only foot values for one pair of feet.

Angularity may be presented in mrad or degrees. Cardan shaft units are set under 'Configuration' (refer to section 8.1.3 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).

A PRÜFTECHNIK cardan shaft tolerance table is available for 1/2° and 1/4° limits. The tolerance table is accessed via 'Coupling properties' (refer to section 5.4.7 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).



The tolerances table may also be accessed as described in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en section 5.4.7.

- 2. Out of tolerance machines may be repositioned with the help of the MOVE function (refer to section 4.13 in the ROTALIGN Ultra iS Shaft handbook DOC 40.200.en).
- 3. Remeasure to determine the new alignment condition by pressing (M), then repeating steps 9-11 in section 7 previously.

The measurement procedure described above may also be used with the cardan shaft bracket Lite ALI 2.874 SETIS.



Cardan shaft alignment using ALI 2.874 SETIS

This section describes the aligning of cardan shafts using the cardan shaft bracket Lite ALI 2.874 SETIS. This bracket is used in conjunction with any of these alignment systems: SHAFTALIGN, OPTALIGN smart EX, ROTALIGN smart EX, OPTALIGN smart RS, ROTALIGN Ultra iS.

The measurement procedure described in this section allows precise measurement of machines joined by cardan shafts over distances of up to 3 m (10 ft) and shaft offsets of up to 400 mm (15 3/4 in.).

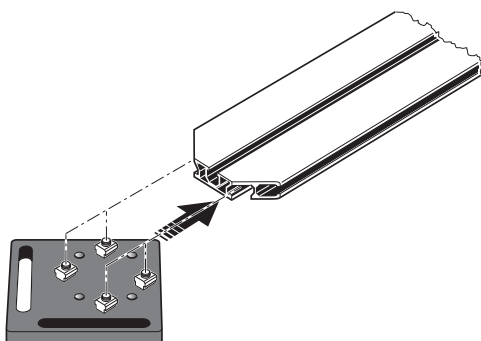
1. Cardan shaft bracket Lite set ALI 2.874 SETIS

This bracket set comprises:

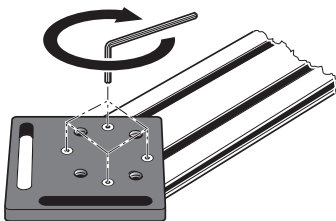
Extension arm for cardan shaft Lite bracket	ALI 2.875
Case for cardan shaft Lite bracket	ALI 2.876
ROTAGLIGN sensor adjustment cap	ALI 3.606 UN
OPTALIGN sensor type adjustment cap	ALI 5.115 UN
Getting started	DOC 99.201.en
Distance sleeves and plate; Allen key (3 no.)	

2. Mounting the faceplate to the rail

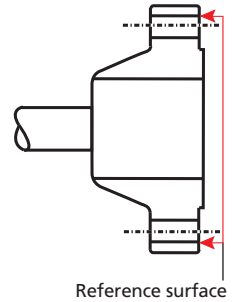
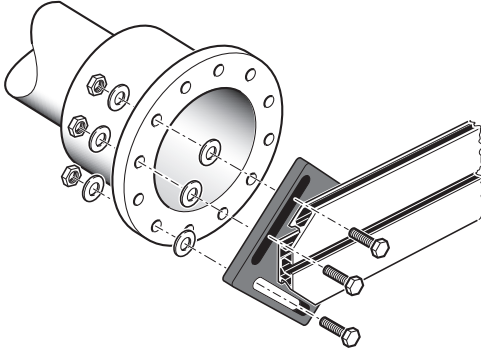
1. Slide the faceplate down the rail as shown in the figure below. The four T-nuts should sit in the grooves.



2. After positioning the faceplate on the rail, tighten the four socket head screws using the provided M5 allen key (see figure below).



3. Mount the bracket assembly to the coupling face of the non-rotatable shaft. If the coupling has a raised face, the precision machined spacers are used as shown in order to separate the faceplate from the raised inner section of the coupling face (see figure below).



The coupling shown above has a raised face flange. The provided spacers are used to create a three-point plane to ensure that the faceplate and the coupling face, which is the reference surface are joined together.

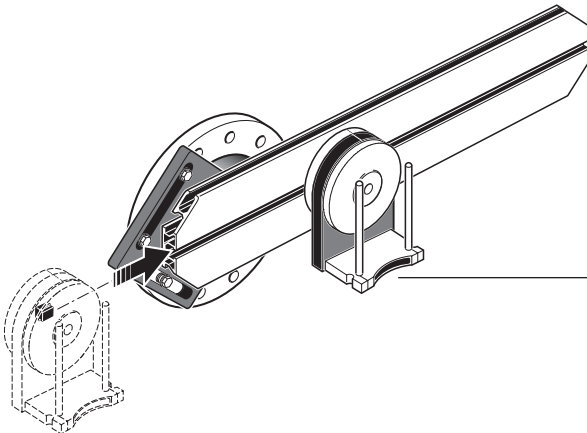
The center part of the coupling face must not be used as a reference surface.



Note

3. Mounting the laser holder assembly on to the rail

Loosen the handwheel slightly, then slide the laser holder assembly down the center groove of the rail, with the T-nut acting as a guide (see figure below).

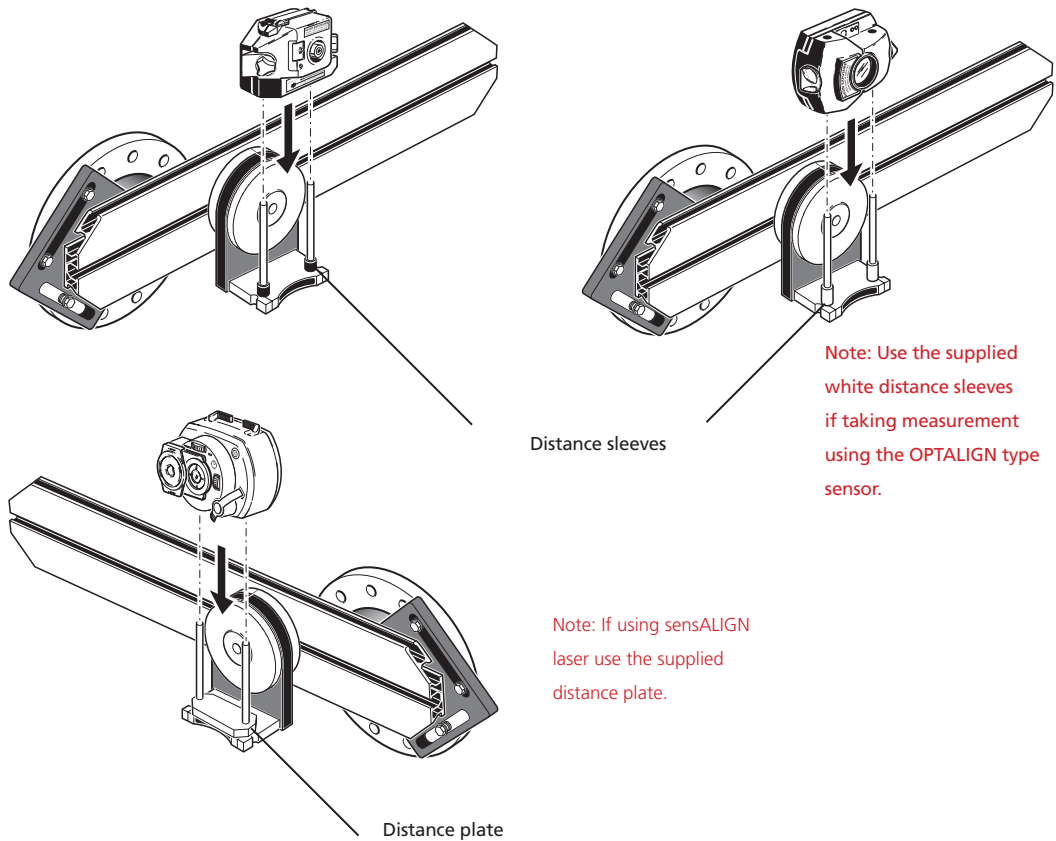


Laser holder

4. Mounting and adjusting the laser

In this step, the laser beam is adjusted such that it is roughly colinear to the rotational axis of the laser holder assembly.

1. Depending on the laser type being used, slide either the black, or the white distance sleeves or the distance plate down the support posts. (Refer to figures below for corresponding sleeves or plate to use.)
2. Slide the laser onto the posts until it rests on the distance sleeves or distance plate (refer to figures below).



3. Mark a set of target crosshairs on the shaft rotation centerline of the other machine coupling (if the coupling flange or shaft has a center hole, a temporary target surface such as a dust cap may be affixed to the hole).

4. Switch on the laser and adjust the beam to strike the center of the target on the opposite coupling:
 - › The objective is to adjust the laser beam such that it is roughly colinear to the rotational axis of the laser holder assembly; this will make it possible to make fine adjustments to the laser holder assembly's position afterwards, without having to realign the laser beam itself.

The distance sleeves (black or white) and the distance plate influence the offset by positioning the laser beam on the same axis as the rotational axis of the laser holder assembly.

- › The two yellow beam position thumbwheels are used to adjust the angular position of the laser beam. By rotating the laser assembly holder, the laser beam traces an 'approximate' circle. If the 'approximate' circle is a single dot at the center of the target, then the laser beam has been adjusted correctly. If that is not the case, repeat the laser beam adjustment process until the 'approximate' circle corresponds to a single dot position.

Laser adjustment tip:

If the beam describes a circle rather than a dot at the target when rotating the laser holder assembly, then note how big the circle is and use the yellow adjustment thumbwheels to move the laser beam back by half the distance it has moved when rotating the laser holder assembly 180° from its start position. Do this both vertically and horizontally. When correctly adjusted, you should be able to rotate the laser holder assembly a full 360° without the laser dot moving from the target center.

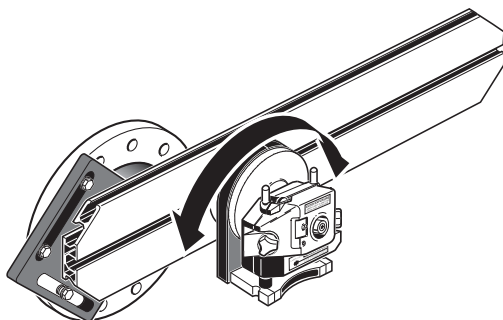
Note: The laser beam from the OPTALIGN type sensor **CANNOT** be adjusted and therefore it **MUST** be physically placed as accurately as possible.



Note



Note



Note: This example references the installation of ROTALIGN sensor.

As soon as a single dot position has been achieved, do not touch the laser position thumbwheels.

5. Adjusting the laser beam to machine's rotational axis

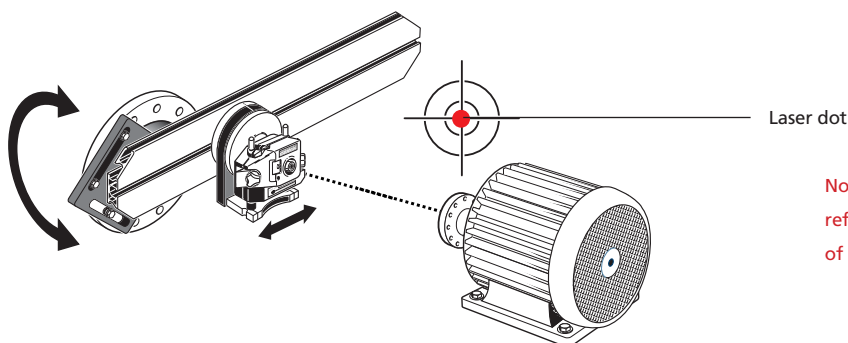
In this step, the laser holder assembly is adjusted on the bracket such that the laser holder rotational axis is colinear with the rotational axis of machine to be aligned (which could be a motor or a gearbox).

During this procedure, DO NOT touch the yellow laser beam position thumb-wheels.



Note

1. Carry out the vertical and horizontal adjustment of the laser holder assembly by sliding it horizontally through the bracket rails and positioning it vertically by rotating the bracket.



Note: This example references the installation of ROTALIGN sensor.

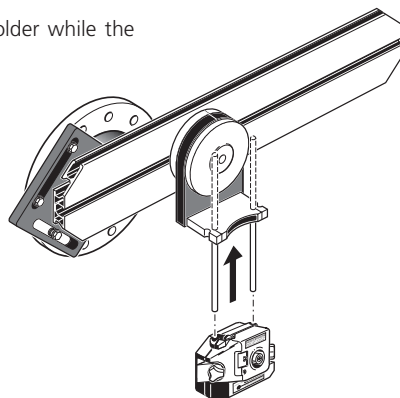
2. Repeat the above procedure until the laser beam strikes the center of the target placed on the rotational axis of machine to be aligned.
3. Once the laser beam has been centered on the target, tighten the faceplate on the coupling face using the provided hexagon socket head screws.

35

6. Positioning laser and mounting sensor for measurement

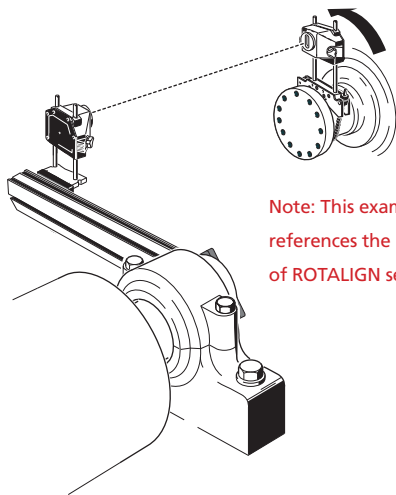
In this step, the laser is remounted on the underside of the laser holder while the sensor is mounted on the shaft of the machine to be aligned.

1. Switch off the laser and remove it from its holder.
2. Using the provided M4 Allen key, loosen the support posts then slide them through the laser holder base so that they protrude from the other side.
3. Retighten the M4 Allen screws to secure the support posts, then remount the laser onto the support posts.

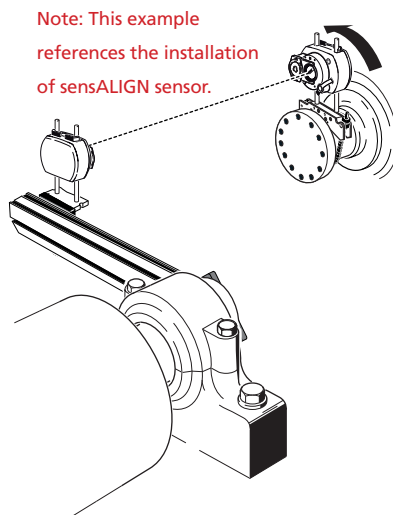


4. Use the chain-type bracket or appropriate magnetic brackets to mount the sensor on the shaft of the machine to be moved (for instance the motor or gearbox). The sensor is aligned to the laser by pushing or sliding the bracket supporting the sensor.

Do not touch the laser or its laser position thumbwheels.



Note: This example references the installation of ROTALIGN sensor.



Note: This example references the installation of sensALIGN sensor.

7. Set-up and measurement

1. Switch the respective measurement system on, then proceed to establish communication and carry out measurement as described in the corresponding system operating handbook.
 - › If using SHAFTALIGN system, refer to DOC 21.200.en ('Cardan drive machines').
 - › If using OPTALIGN smart EX system, refer to ALI 9.123.G ('Cardan drive machines').
 - › If using ROTALIGN smart EX system, refer to DOC 12.200.en ('Cardan drive machines' in chapter 8).
 - › If using OPTALIGN smart RS system, refer to DOC 12.201.en (section 7.2 'Cardan drive machines').
 - › If using ROTALIGN Ultra iS Shaft system, refer to the measurement procedure described in this guide for the cardan shaft alignment bracket ALI 2.893 SETIS on page 27.

Cardan shaft brackets' measurement matrix

An overview

Feature	Provided bracketing systems			
	ALI 2.450	ALI 2.460	ALI 2.893 SETIS	ALI 2.874 SETIS
sensALIGN sensor	✓	✓	✓	✓
ROTALIGN type sensor	✗	✗	✓ with Multipoint	✓ with Multipoint
OPTALIGN type sensor	✗	✗	✓ with Multipoint	✓ with Multipoint
ROTALIGN Ultra Shaft firmware version 3.03 or higher	✓	✓	✓	✓
ROTALIGN Ultra iS Shaft Advanced/Expert levels	✓	✓	✓ with intelliPOINT	✓ with intelliPOINT
ROTALIGN Ultra iS Shaft Standard level	✓	✓	✓ only Multipoint	✓ only Multipoint

Legend:

✓ [The corresponding bracketing system and the feature are compatible]

✗ [The corresponding bracketing system and the feature are NOT compatible]

Index

Symbol

180° rotation procedure 16

A

Advanced version
 ROTALIGN Ultra iS Shaft 27
 ALI 2.451 6
 ALI 2.461 6
 ALI 3.606 UN
 ROTALIGN sensor
 adjustment cap 31
 ALI 5.115 UN
 OPTALIGN sensor type
 adjustment cap 31
 ALI 9.123.G
 OPTALIGN smart EX
 handbook 36
 Allen key
 M4 26

B

Beam position thumbwheels
 yellow 24
 Bracketing options 7, 16
 Bracketing systems
 transport 3
 Bulls-eye 5, 13

C

Cardan angle
 degrees 19
 Cardan shaft
 alignment bracket
 ALI 2.893 SETIS 27
 units 30
 Cardan shaft bracket
 ALI 2.893 SETIS 20
 Cardan shaft bracket Lite
 ALI 2.874 SETIS 30
 Cardan shaft bracket Lite set
 ALI 2.874 SETIS 31
 Coupling face
 raised 21, 32

D

Deflection angle
 universal joint 4
 Distance plate 22, 23, 33
 Distance sleeves 22, 23, 33
 DOC 12.200.en
 ROTALIGN smart EX
 handbook 36
 DOC 12.201.en
 OPTALIGN smart RS
 handbook 36
 DOC 21.200.en
 SHAFTALIGN handbook 36

E

External inclinometers 6

F

Faceplate 20, 32
 Firmware version 3.03
 ROTALIGN Ultra iS Shaft 13

I

intelliPOINT
 measurement mode 28

L

Large chain type bracket
 ALI 2.461 6, 14
 Large chain type bracket set
 ALI 2.460 13
 Laser adjustment 34
 Laser dot 25
 Laser holder 22, 32
 Lubrication
 cardan shafts 4

M

Measurement
 matrix 37
 Middle support post 7
 Moveable machine 6, 14

O

On-screen needle indicator 17
OPTALIGN type sensor
 laser adjustment 34
Optimal running condition
 cardan shafts 4

R

Reference machine 6, 14
Reference surface 21, 32
Rotating arm bracket
 ALI 2.451 6
 markings 6
Rotating arm bracket set
 ALI 2.450 5
Rotational axis
 machine 24

S

Safety data sheet
 magnetic brackets 3
Safety notes 3
Safety symbols 3
Single dot 24
Sliding dust cap 8
Spanner 25
Standard version
 ROTALIGN Ultra iS Shaft 27

T

Tolerance table
 cardan shaft 12, 30
Tutorial video 8, 9

U

Universal joints 4

Page intentionally left blank

Visit our Internet home page for
information on new products,
accessories and technical applications.

www.pruftechnik.com

sensALIGN® and ROTALIGN® are a registered trademarks of PRÜFTECHNIK Dieter Busch AG. No copying or reproduction of this information, in any form whatsoever, may be undertaken without express written permission of PRÜFTECHNIK Condition Monitoring GmbH. The information contained in this manual is subject to change without further notice due to the PRÜFTECHNIK policy of continuous product development. PRÜFTECHNIK products are subject to patents granted or pending throughout the world.



PRÜFTECHNIK
Condition Monitoring GmbH
Oskar-Messter-Str. 19 – 21
85737 Ismaning
Germany
Tel +49 89 99616-0
Fax +49 89 99616-300
info@pruftechnik.com
www.pruftechnik.com

A member of the PRÜFTECHNIK Group