CENTRALIGN®

Large Bore Bracket

Operating Instructions

Dear Customer,

If you have any suggestions for improvement or corrections (not just for this manual, but also for software or hardware), please give us a call or drop us a line! We would be glad to make improvements wherever possible. We look forward to hearing from you!

PRÜFTECHNIK AG
Documentation Department
Fax (+49) 89- 99616-200

CE

EDITION March 1998
Order Number ALI 9.580G

Foreword

Congratulations and thank you for your decision to use the CENTRALIGN Large Bore bracket for centerline alignment. This unique bracket design provides the quick and rigid mounting required for accurate measurement. Moreover, its versatile design lets you surmount centerline measurement tasks in a wide variety of situations. The few minutes it takes to familiarize yourself with the various parts and their functions will surely be time well spent.

Despite its simple appearance, the bracket you see before you is actually the final product of a rather extensive design process to ensure optimum performance in terms of both accuracy and stability. As a matter of fact, many subtle factors come into play to determine measurement results, and so it must be emphasized that under no circumstances may the bracket or its components be modified from their condition as originally delivered. Doing so would not only void all warranty coverage, but worse yet, may easily jeopardize measurement accuracy and repeatability!

This is not to say, however, that unusual situations cannot be mastered with the bracket: please inform your PRÜFTECHNIK sales or service partner or contact PRÜFTECHNIK directly to discuss your special requirements and benefit from our combination of expertise and experience. At the same time, you will be contributing to the design requirements for the next generation of alignment equipment. Indeed, CENTRALIGN owes much of its very existence to this system of continuous product development based on customer feedback!

We wish you much success with the use of your CENTRALIGN Large Bore bracket!

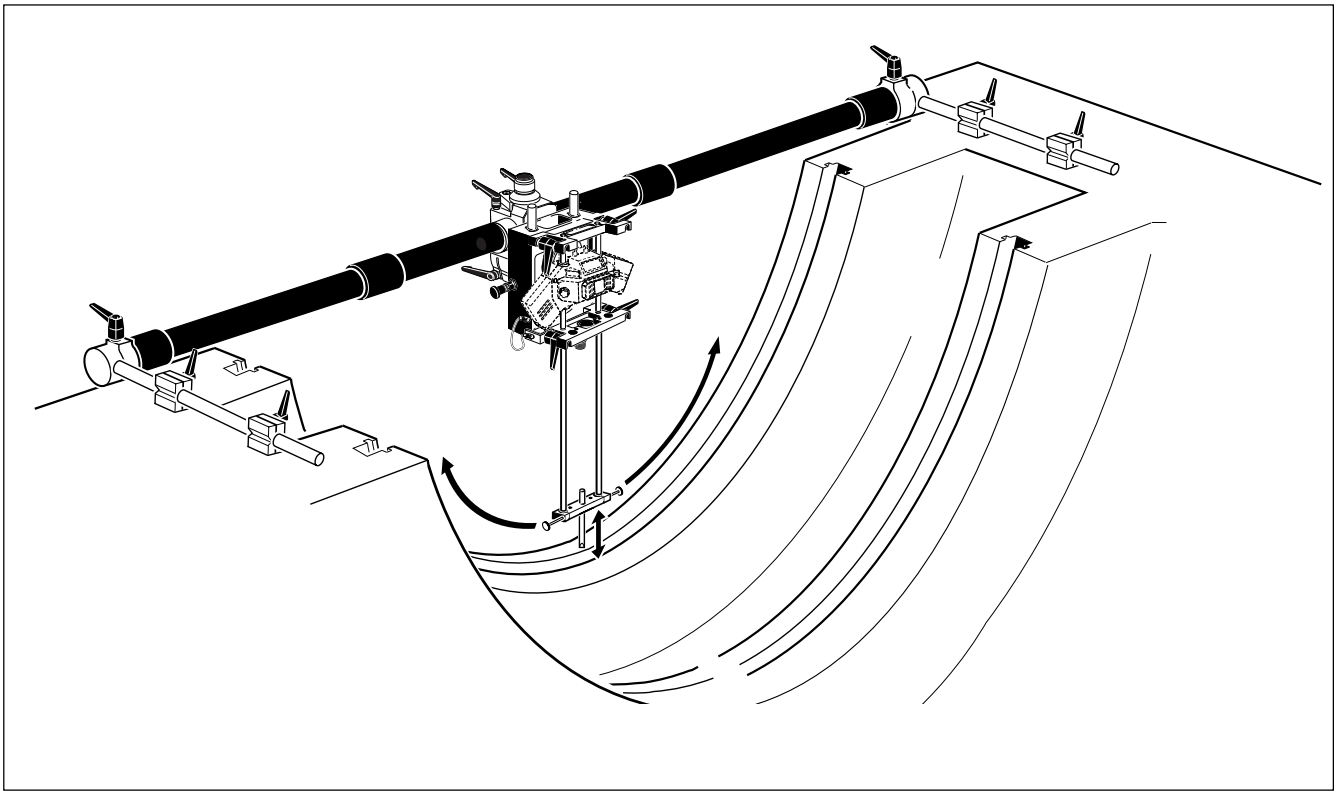
March 1998 Ismaning, Germany

Contents

How the large bore bracket works

The telescopic arms support the laser detector at the approximate centerline. The probe is rotated to different angular positions and lowered to contact the curved measurement surface at each different position. In so doing, it moves the sensor mounting assembly along with it so that the detector undergoes slight radial displacements according to the centerline misalignment. The precision mechanics of the bracket provide extremely high accuracy and repeatability of measurement results.

For open machines ('tops-off'):
Standard support



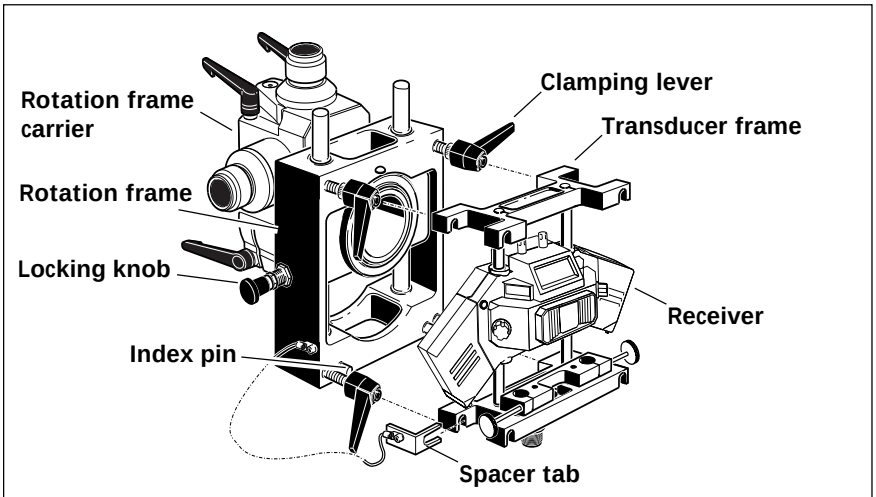
When the upper portion of the machine is removed for measurement, the standard support arrangement shown above allows great flexbility in axial positioning.

(See pages 25 and 27 for other bracket configurations.)

Mounting procedure

The transducer is installed into a separate frame which mounts onto the rotation frame. Two index pins on the lower portion of the rotation frame fit into the transducer frame for consistently accurate transducer mounting relative to the rotation bearing.

1. Remove the transducer frame by releasing its four black clamping levers, then removing the spacer tabs from beneath the lower levers. This allows you to pull the lower portion of the frame outwards and off the index pins. The entire transducer frame then slides upwards and off the four threaded rods on the rotation frame. Additional clearance may be gained if necessary by further loosening the clamping levers (see note at bottom of page).



2. Remove the upper portion of the transducer mounting frame, then slide the transducer all the way down so that it rests firmly upon the black sleeves of its support posts. The transducer must be oriented such that the distance marking on the top of its housing is located precisely above the tip of the surface probe.

A note regarding clamping levers

The clamping levers used to fasten the sensor mounting frame and the rotation frame allow you to mount, adjust and tighten these parts by hand with no need for tools. The handles have a 'pull up and rotate' adjustment feature: pulling up on the handle disengages it while its spindle remains stationary, allowing you to adjust the handle to the desired position. Releasing the handle reengages it for tightening or loosening. (This step can be repeated as necessary.)

Mounting procedure

3. Tighten the yellow clamping knobs on the front of the transducer. Reassemble the frame so that the upper portion is flush with the tops of the posts.

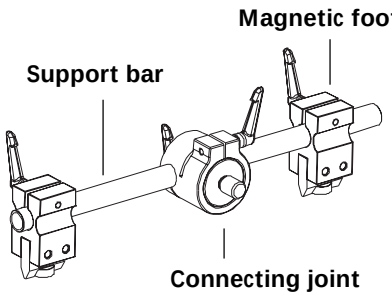
4. Mount the transducer frame onto the rotation frame such that the sensor housing marking faces upwards and the sensor does not obstruct the guide holes of the surface probe assembly.

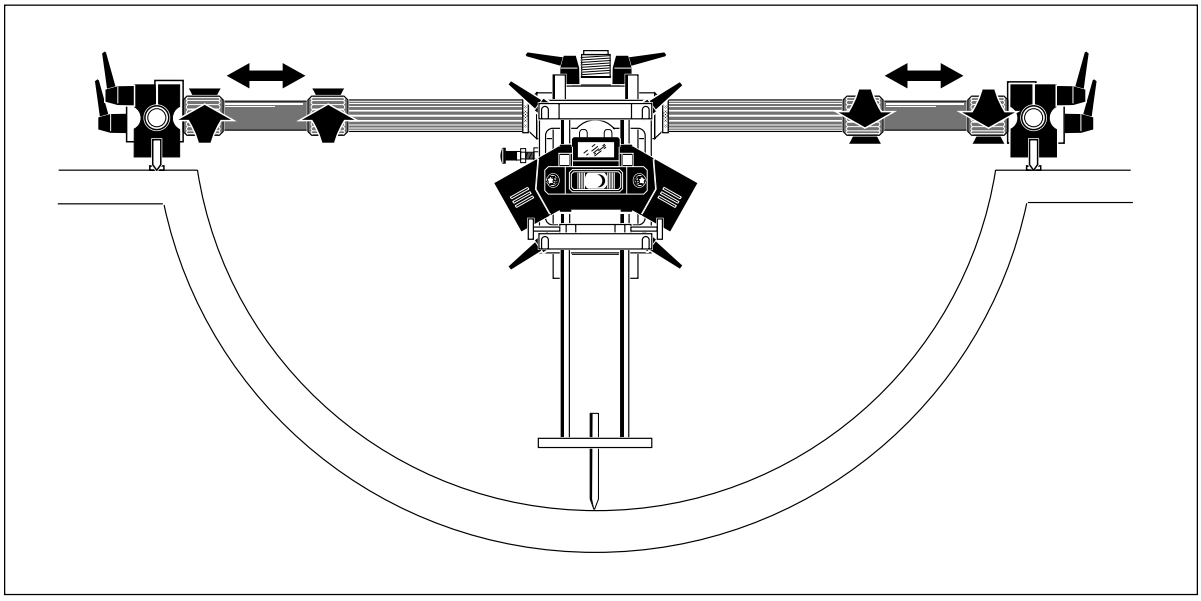
5. Select the proper surface probe tip for your application:
a) For flat surfaces (e.g. for sleeve bearing journals), use the ball-shaped probe tip.
b) For a grooved measurement surface (e.g. of a turbine steam gland), use the knife-edge probe tip mounted with its long edge perpendicular to the groove.
c) For large measurement radii (in excess of 500 mm / 19 5/8"), use the telescopic surface probe (ALI 3.297, page 31) with the appropriate tip described above, instead of the standard probe assembly.

6. Ensure that the threads on all the mounting surfaces are appropriately greased.

7. The bracket straddles the machine to be measured as shown below. Adjust the bracket arms telescopically to fit onto the mounting surface. (To loosen them, turn the locking ring counter-clockwise as viewed toward the bracket center.) Make sure that the magnetic feet stand firmly and perpendicular to the mounting surface. If possible, adjust the spacing of the feet so that they fit into a split line on the machine frame.

ALI 3.290 Lateral bracket support

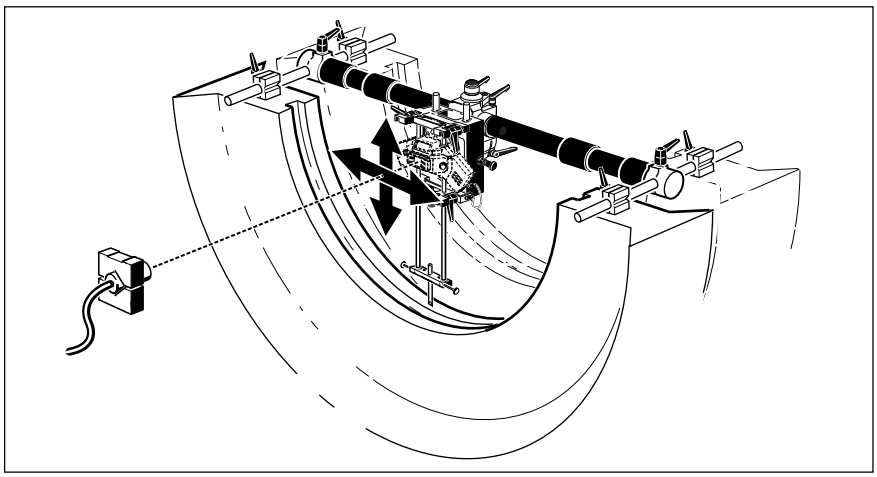




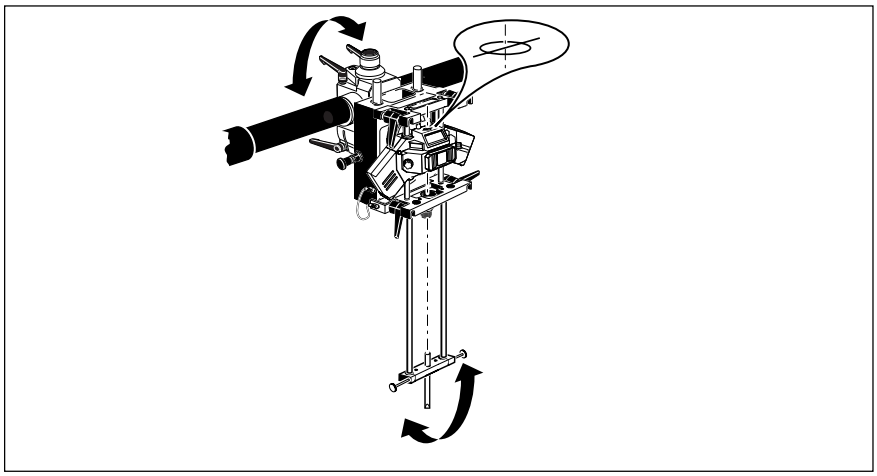
Magnetic feet (ALI 3.295): The swivel design of the foot frame allows mounting even on angled surfaces on the face of the machine as shown on page 29. The mounting surface should be smooth for maximum mounting rigidity.

Position adjustment

Once the bracket assembly is mounted on the machine to be measured, the receiver must be positioned so that it is approximately centered onto the laser beam.



In addition, the entire rotation frame must be perfectly level so that the measurement probe tip is located precisely beneath the sensor measurement plane.



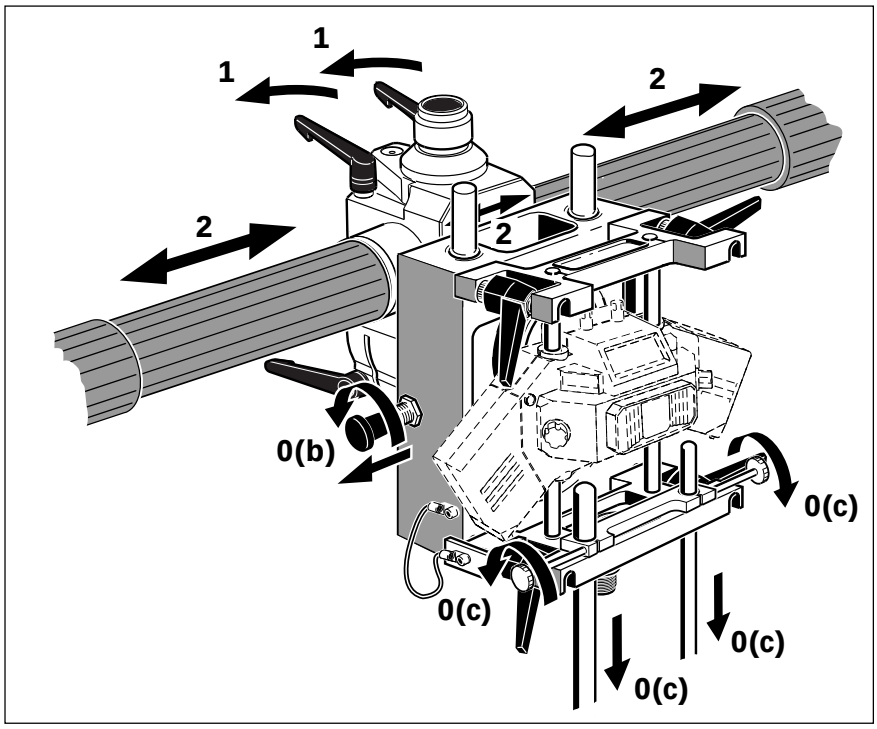
These two requirements may be met through the procedure outlined on the following pages.

0) Activate the laser beam to facilitate centering adjustment.

a) Place the dust cap with target marking onto the receiver lens.

b) Use the knob on the side of the rotation frame to lock the rotation frame at its center detent position (not the top detent position, see the following page), then

c) extend the measurement probe assembly as shown on the following page (or the telescopic surface probe) so that the probe tip is within 2 cm / 1 inch of the measurement surface.

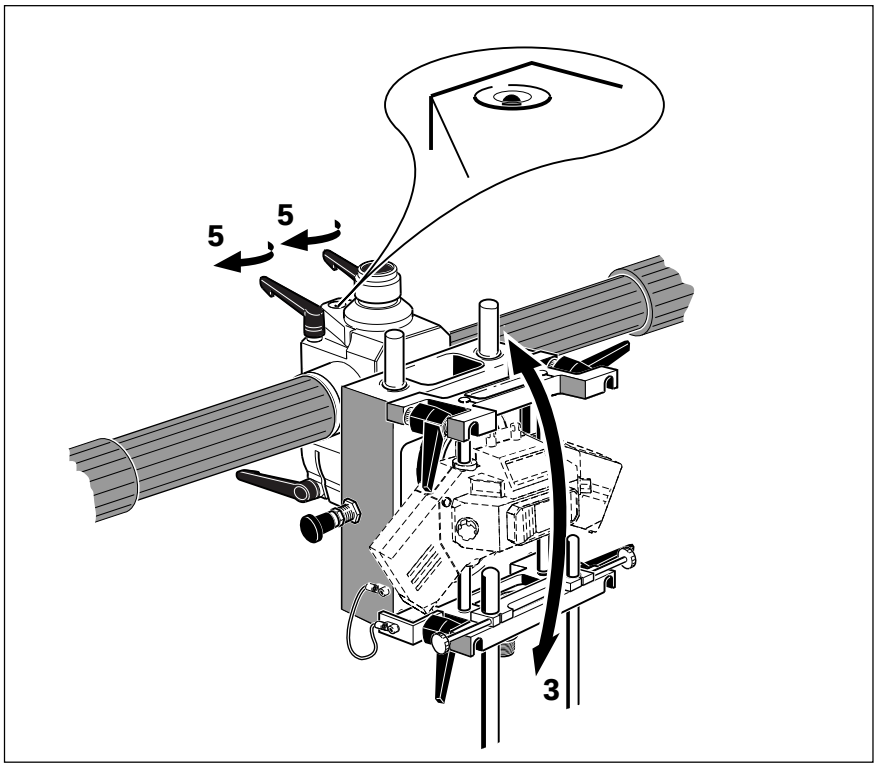


Coarse adjustment

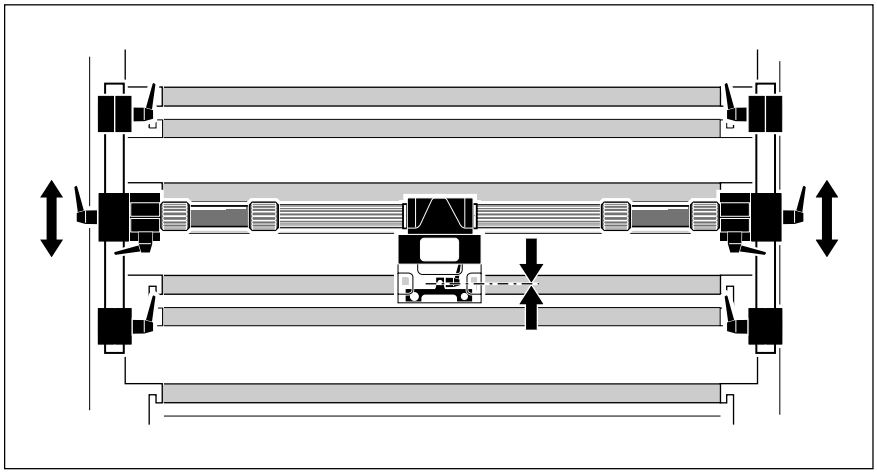
1) Loosen the black clamping levers on the top of the rotation frame until the frame can be slid along its support tube for adjustment.

2) Slide the rotation frame and extend or retract the telescopic bracket arms such that the laser beam strikes the center of the target on the receiver dust cap. Take care to keep the beam centered throughout the remaining adjustment steps.

3) Carefully swivel the entire rotation frame on its support tube until the spirit level on top of the frame is centered, so that the measurement probe tip lies directly beneath the sensor housing marking.



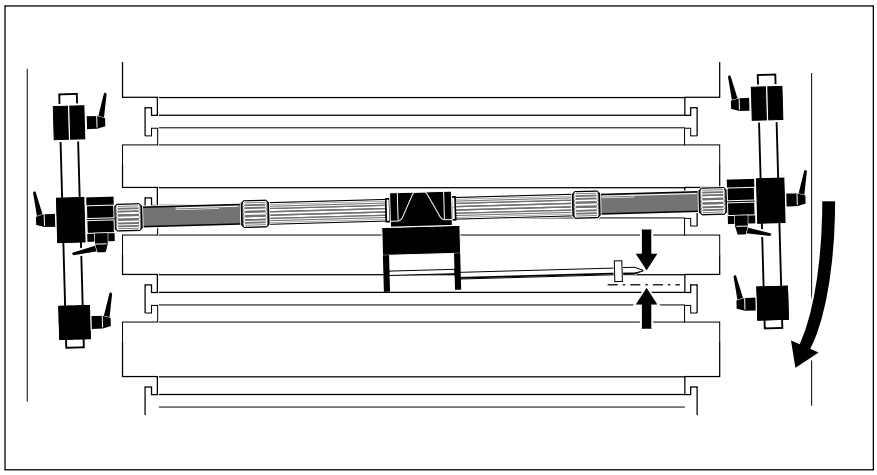
4) Axial position adjustment: the measurement tip must be located precisely in the measurement plane. Adjust its position as shown below by opening the clamps on the joints at the ends of the telescopic arms and sliding the assembly along the lateral support tubes (or sliding the ALI 3.295 magnetic feet).



5) Retighten the rotation frame clamping levers and the telescopic arms.

Fine adjustment

6) Extend the measurement probe tip until it nearly touches the diaphragm, then swing the measurement arm up to one side horizontally, then the other to check that the tip remains precisely in the measurement plane during rotation. The tip should not travel axially by more than 3 mm / 1/8" during this rotation. If it does not, then adjust the foot assembly by repositioning the lateral support
.



7) Return the measurement arm to vertical position. The sensor must still rest firmly upon the black sleeves of its support posts.
Remove the receiver dust cap. The sensor reading should now be within +/- 2 mm / 0.075" (or better). Otherwise, use a third telescopic arm with support foot (page 21) to eliminate sag.

8) In vertical position, loosen the probe tip holder or the telescopic surface probe and gently lower the probe tip until it touches the diaphragm. Retighten all adjusments.

Take rotational measurements

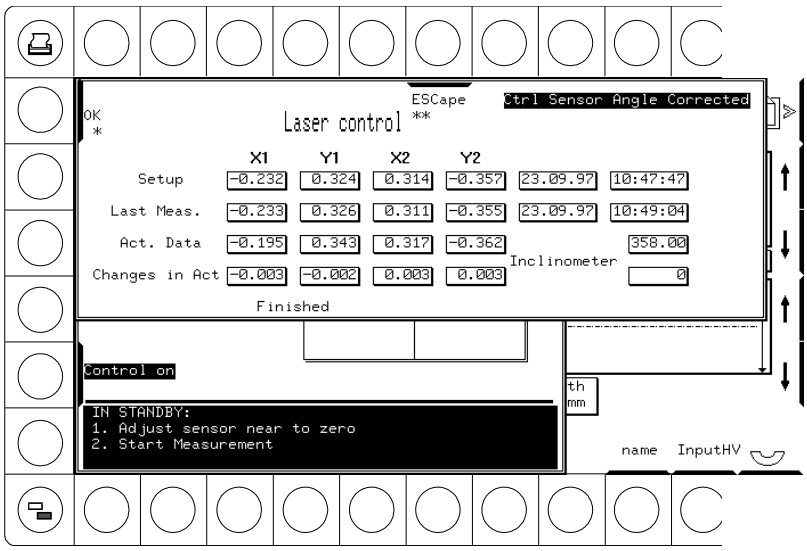
This bracket is intended for use only in the CENTRALIGN 'multi-point' measurement mode. The 'sweep' mode should not be used with this bracket!

ATTENTION

If necessary, consult the CENTRALIGN operating instructions for complete details on the general measurement procedure.

With the surface probe adjusted to just above the bottom measurement surface, take the first CENTRALIGN alignment reading using this as the first measurement position:

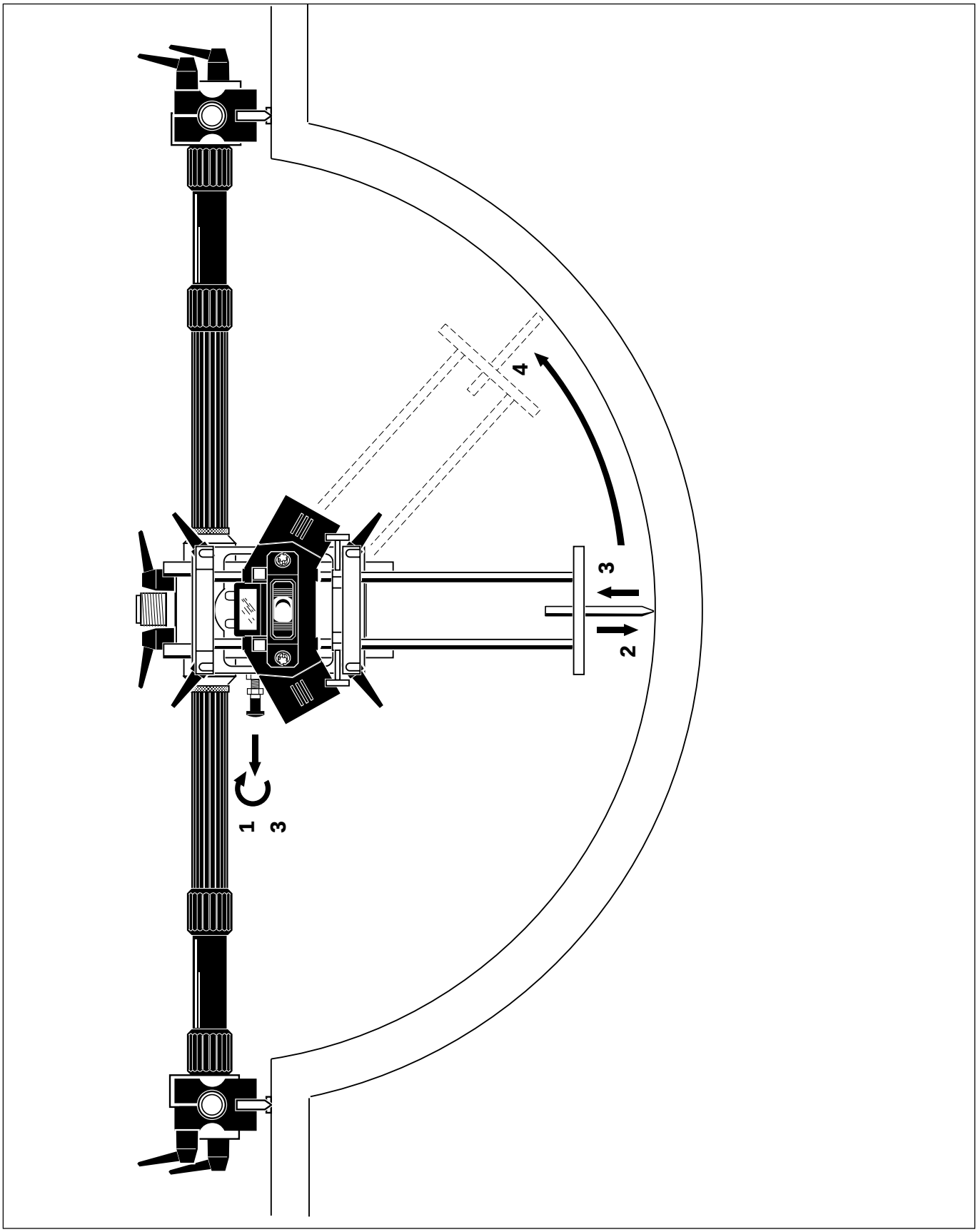
0. Take a set of control sensor readings: support the surface probe assembly while pulling the rotation frame locking knob outward to release it. Raise the frame to its upper position, then release the knob to lock the frame in place. Loosen the yellow clamping knobs on the measurement sensor and raise it all the way on its posts to allow the beam to strike the control sensor, then tighten the knobs. On the SYSTEM 2 computer, press the keys marked 'Measure', 'Multipoint' and 'OK' to take control sensor readings.



The readings on the 'Act. Data' line should not deviate by more than 0.03 mm (as indicated by the 'Changes in Act.' line). Loosen the clamping knobs on the measurement sensor again, then lower it all the way back down onto its posts and retighten the knobs.

12

Take rotational measurements



1. Supporting the surface probe assembly in raised position, carefully release the rotation frame locking knob, turn it 90° and release it to unlock the probe assembly. The rotation frame is now free to extend and retract as necessary for measurement.

2. Gently lower the frame until the surface probe tip firmly contacts the measurement surface. Press the 'Get data' softkey on the SYSTEM 2 computer to register this first measurement with the CENTRALIGN program. Once the reading appears in the computer display, press 'Get data' again to take a second set of readings in the same position for maximum accuracy.

3. Now lift the sensor-probe assembly up from the measurement surface and re-engage the rotation frame locking knob (i.e. by pulling it outward, rotating it by a quarter-turn, then releasing it into its detent). Note: the sensor-probe assembly may be locked into the center position or the fully-raised position.

Be sure to raise the sensor probe from the measurement surface and to re-engage the rotation frame locking knob before the assembly is rotated!

ATTENTION

4. Rotate to the next measurement position (normally where the rotation frame clicks into the next detent). Intermediate positions may be measured if the sensor-probe assembly is held by hand between detent locations. Again, however, please note that any unauthorized attempt to adjust the detents may jeopardize measurement accuracy!

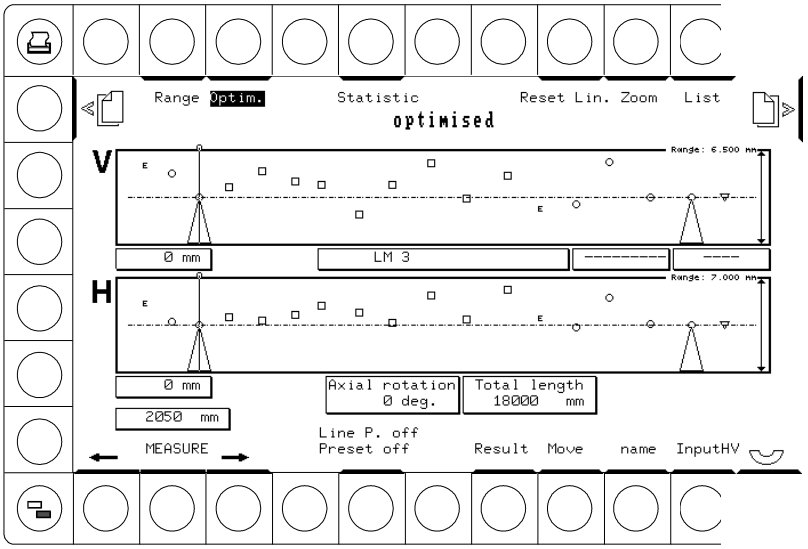
5. Release the rotation frame locking knob once more, then extend the sensor-probe assembly to make firm contact with the measurement surface in this new angular position. You may now take the next CENTRALIGN reading by pressing the 'Get data' softkey. Once the computer has registered this reading, take a second reading for maximum accuracy by pressing the 'Get data' softkey again.

6. Repeat steps 3, 4 and 5 to take subsequent readings. Following the last reading, press the 'Calculate' softkey to obtain results.

7. Repeat step 0 to ensure that the laser beam itself has not moved during measurement due to drift or fixture displacement, then return the sensor to measurement position.

Determining corrections

1. Use the left- and right-arrow softkeys to select the reference planes upon which corrections for all other planes will be based: use the arrow keys to select the left-end reference plane, then confirm this selection by pressing the 'Fix' softkey. Select and confirm the right-end refence plane likewise.



2. Corrections are now displayed for each measurement plane (with the reference plane corrections equal to zero, of course). Several option keys are available for adapting these corrections to special circumstances (see CENTRALIGN operating instructions for complete details and further options):

'Presets on' can be pressed to enter offset values at any number of desired locations along the shaft - for example, in order to consider catenary (shaft bending) in calculations.

'Line preset' can be selected to enter absolute offsets for two reference planes, for example, to compensate for thermal growth amounts known at the 'hot' and 'cold' ends of a turbine.

Press the left- and right-arrow keys to proceed from one measurement location to the next and to view the centerline deviation at each. Press the 'list' key to display deviation amounts at all locations in tabular form.

Setting up the laser beam and sensors

Before the measurement sensor is mounted and adjusted and actual measurement can begin, the laser beam must first be adjusted to the approximate centerline determined by the front and rear bearing housings or diaphragms. This is necessary in order to remain within the sensor measurement range over the entire measurement series; otherwise, the laser beam would fall outside the sensor rather quickly as the sensor is moved further away for additional measurements. Then the control sensor must be mounted at the far end of the measurement path to allow periodic checking for laser drift over time or inadvertent fixture displacement.

Proceed as follows:

Laser mounting and adjustment

1. Mount the laser support frame onto the machine, taking care that the mouting surfaces are clean and the mounting bolts are fastened tight.

2. Mount the ALI 3.230set laser bracket onto the support frame. Make sure that the mounting surfaces are clean; tighten down the M3 hex screws but leave the M8 screws loose for now.

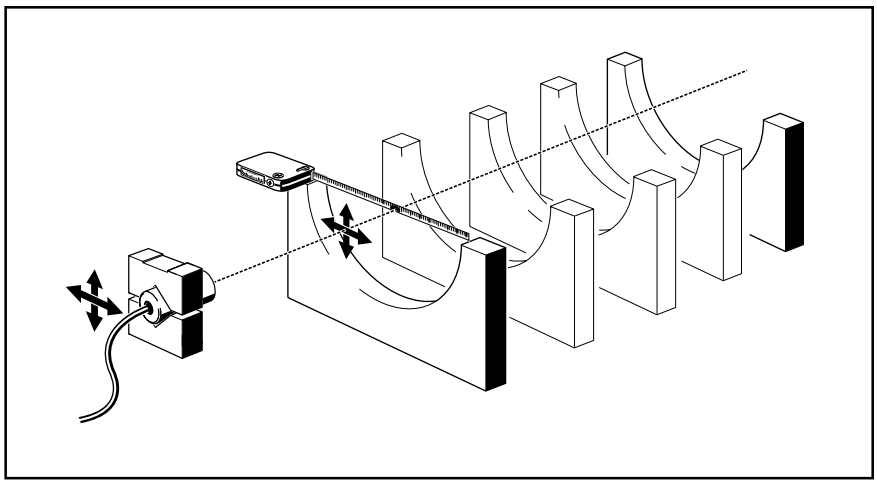
3. Mount the ALI 4.330 laser into the bracket chocks with its triangle marking facing upwards and its housing centered in the chocks.

4. Use a tape measure to measure the diameter of the first bearing pocket or diaphragm to be measured. Divide this diameter by two to find the center location. Put the tape measure on its side so that it can be read from the end of the machine where the laser emitter is located.

5. Connect the ALI 4.606 power supply (fully charged), then switch it on to power the laser. The laser beam is emitted in its bright mode for the first 100 seconds of operation to make adjustment easier.

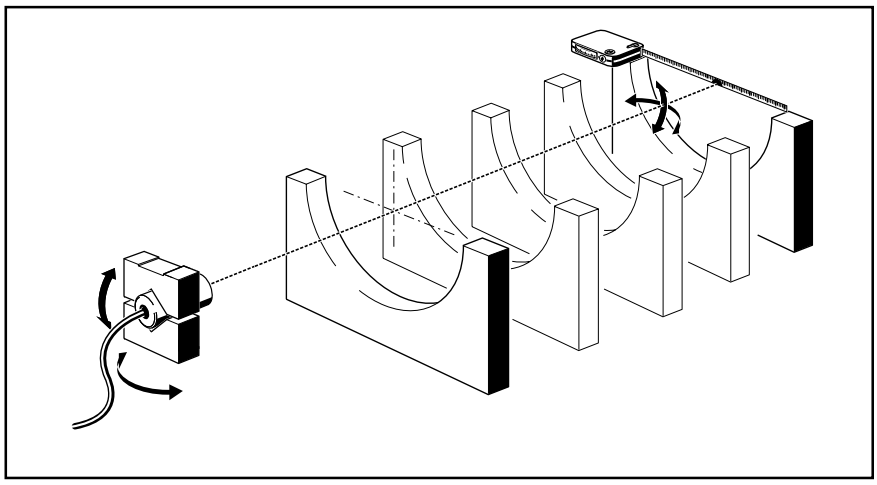
6. Physically adjust the vertical and lateral position of the CENTRALIGN laser so that the beam strikes the tape at the center location (to within 1 mm / 1/32"; only the upper half of the laser spot should actually strike the tape).

Measure the total diameter of the first bearing pocket, diaphragm or cam holder to be measured. Divide this amount by two, then center the laser beam at that position.



7. Now move the tape measure to the last bearing pocket or diaphragm. Measure the diameter and divide by two to locate the center. Put the tape on its side just as before.

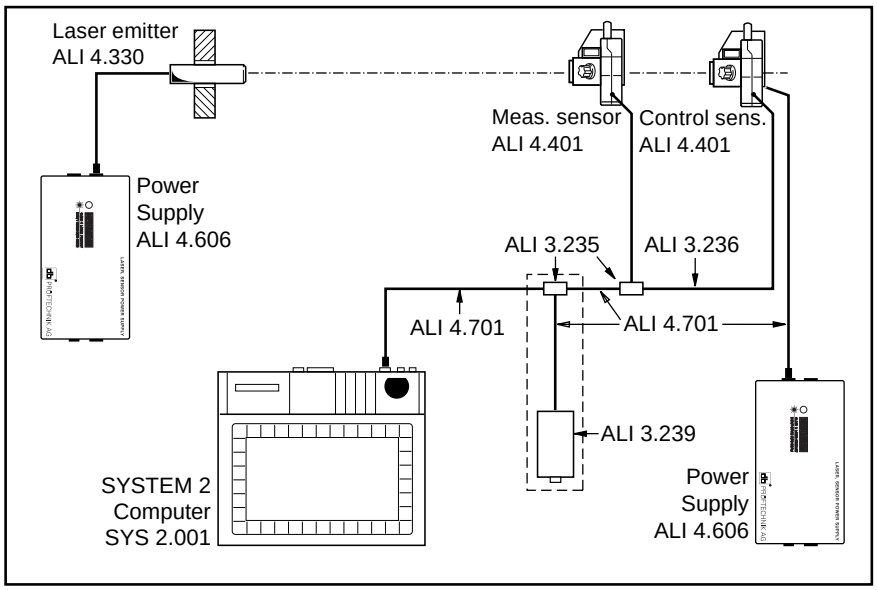
8. Rotate the beam onto the center location, using only angular adjustment of the laser emitter to bring the beam spot into position.



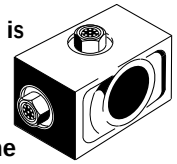
9. Repeat steps 4 to 6 as necessary to center the laser spot to within 1 millimeter / 1/32" at both front and rear bearing housings. Then tighten the M8 clamping screws on the laser bracket.

Control sensor mounting and adjustment

1. Use the ALI 4.501 magnetic bracket to mount the control sensor ALI 4.401 on the rear bearing housing (or beyond that at some fixed external location) so that the laser beam strikes the center of the sensor lens cap. (Do not readjust the laser beam!) The sensor should be oriented vertically as nearly as possible.
2. Connect the sensors to a second ALI 4.606 power supply (fully charged) and the SYSTEM 2 computer as shown in the diagram below:



T-adapter ALI 3.235 is available to attach both the remote control and the control sensor to the SYSTEM 2 computer.

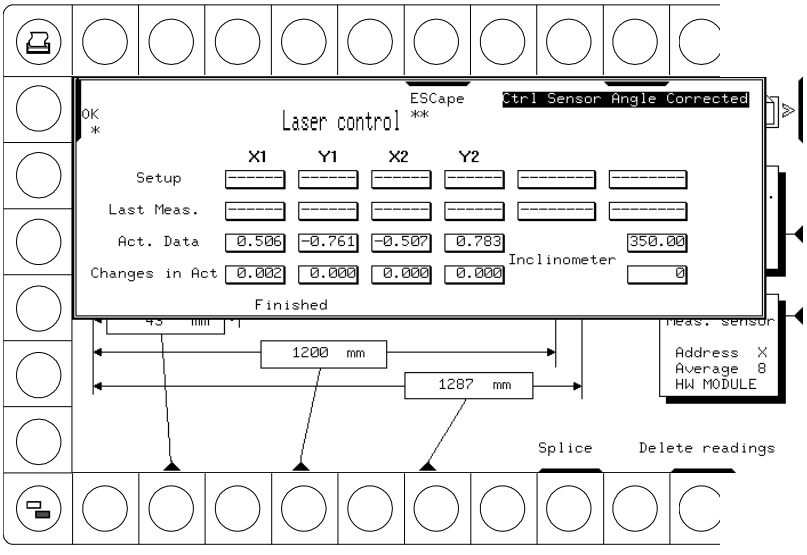


Use of the ALI 3.239 remote measurement trigger is optional. Other configurations are also possible; see the complete CENTRALIGN operating instructions (SYS 9.509G) for complete details. The configuration illustrated above, however, ensures the greatest reliability of data transfer and power supply over the longest operating duration.

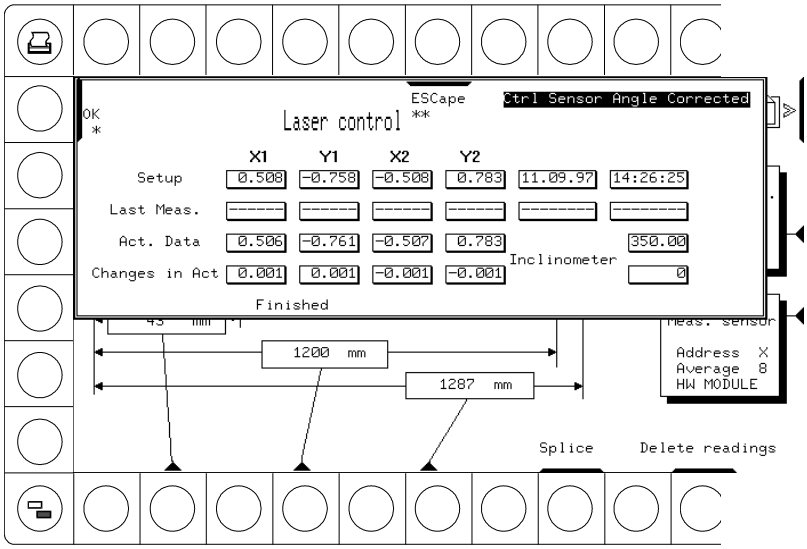
3. Switch on the control sensor. Following the initial test display of '-8.8.8.8', the sensor address '2' should appear. If not, press the on/off button repeatedly during address display to set this value to '2'.

4. Several seconds later, the sensor should display the X and Y coordinates of the laser beam in its LCD. If not, adjust the position of the control sensor:
   a) vertically, by sliding it up or down its support posts and
   b) horizontally, by moving the magnetic bracket laterally along its mounting surface.
   Adjust the sensor position (not the beam itself!) until the beam is centered to display coordinates within 0.5 mm of 0.0 0.0

5. Switch on the SYSTEM 2 computer, select the CENTRALIGN program, then proceed to the next screen ('page right' key). Press the key marked 'Control off' so that it changes to read 'Control on', then select 'Laser control'. Check that 'Changes in Act.' (fluctuation of successive X and Y coordinate readings) does not exceed 0.03 mm / 0.001"; if it does, then ambient vibration or thermal gradients between laser and sensor could be the cause and should be eliminated for the duration of measurement.
   Note the inclinometer reading in the 'Act. data' line: if the sensor has been mounted vertically as directed in step 1, this reading should be very nearly 0 (or 360) degrees. If not, adjust the sensor position as necessary, then repeat X/Y coordinate adjustment (step 4 above). If the sensor cannot be adjusted to 0 degrees inclination, then press the key marked 'Ctrl sensor vertical' so that it reads 'Ctrl Sensor Angle Corrected'. (Note that this key is available only during this initial setup.)



When the 'Act. data' remain steady and the sensor angle is adjusted (or corrected), press the 'OK' key to register the initial control sensor readings in the line marked 'Setup' of the Laser Control display.



6. Allow the system to operate for approx. 1 - 2 hours before proceeding with fine adjustment and measurement in order to ensure long-term thermal stability. (As noted earlier, the batteries used to power the laser and control sensor should be fully charged beforehand so that the entire adjustment and measurement procedure can continue without interruption. The SYSTEM 2 computer, however, may be switched off during this warmup period with no loss of data.) When the 'Laser Control' display is then checked again, the 'Act. data' readings should not have changed from the registered 'Setup' values by more than 0.10 mm / 0.004". If they do, then check for looseness in mounting fixtures, thermal radiation or air convection currents between laser and receiver.

This tolerance can be set in the 'Laserdrift' menu for automatic warning during actual measurement.

7. Before proceeding with measurement, reset the sensor 'Set-up' readings by pressing the 'Delete readings' key in the Dimensions screen, then re-entering the Laser Control screen to take updated 'Act. data' readings and confirming them with 'OK'.

8. See page 5 for instructions on proceeding with measurement sensor mounting using the large bore bracket.

Application-based configurations

The individual parts of the Large Bore Bracket are available in two different configurations which consist of the following different subsets:

Version A: Package I & Package II
Version B: Package I & Package III

Note:
Packages III and IV are delivered in the ALI 4.834 case.
See page 33 for details.

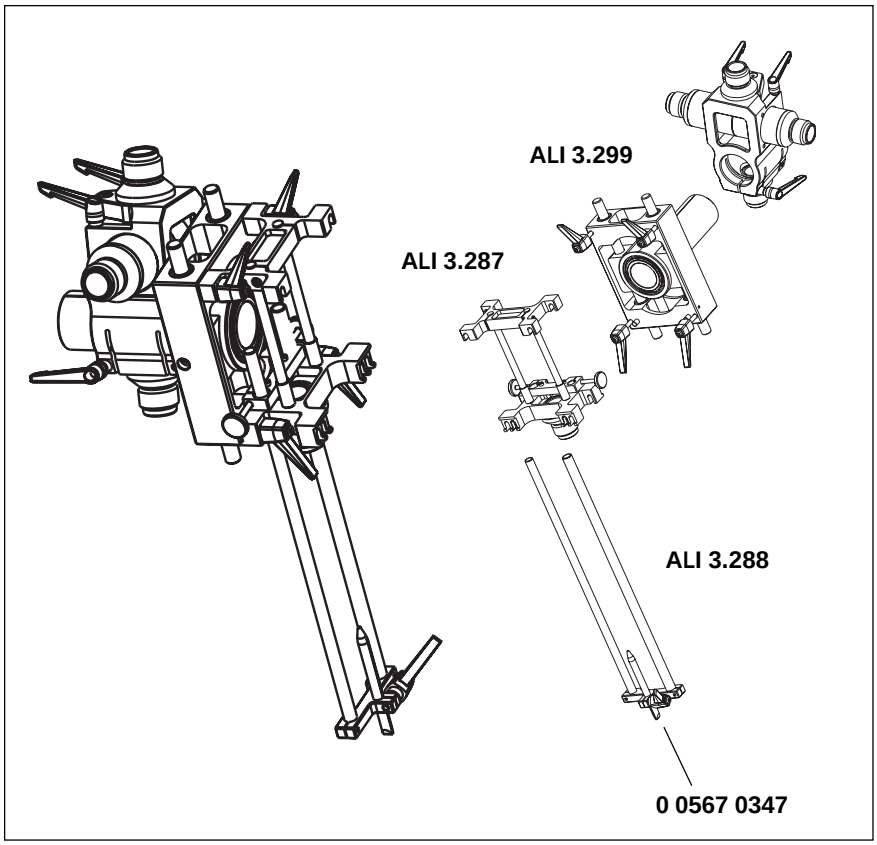
Each version can be further supplemented if necessary to include all three packages and/or the ALI 3.113 extension set (Package IV).

Overview

Order no.	Quantity	Description	Page
ALI 3.110		Package I 'Sensor rotation frame'	21
ALI 3.287	1	Sensor rotation frame	
ALI 3.288	1	Measurement surface probe assembly	
ALI 3.299	1	Rotation frame carrier	
0 0567 0347	2	Combination probe	
ALI 4.833	1	Case with contoured insert	
ALI 3.111		Package II 'Standard support package'	22
ALI 3.285	3	Telescopic arm, 311 - 645 mm (12 1/4" - 25 3/8")	
ALI 3.290	2	Lateral support, magnetic	
ALI 3.291	1	Support foot	
ALI 3.112		Package III 'T-support package'	24
ALI 3.284	3	Telescopic arm, 160 - 237 mm (6 3/8" - 9 1/4")	
ALI 3.293	3	Extension arm, 100 mm (3 7/8")	
ALI 3.295	3	Magnetic foot ('tops-on')	
ALI 3.113		Package IV 'Extension package'	26
ALI 3.286	3	Telescopic arm 539 - 1307 mm (21 1/4" - 51 3/8")	
ALI 3.292	3	Extension arm, 500 mm (19 5/8")	
ALI 3.297		Telescopic surface probe	31
ALI 3.286	1	Telescopic arm, 539 - 1307 mm (21 1/4" - 51 3/8")	
ALI 3.289	1	Measurement tip set	
ALI 3.296		Contact probe set	31
0567 0347	2	Combination probe	
0620 0014	2	Ball contact threaded tip	
3014 0101	2	Knife edge threaded tip	

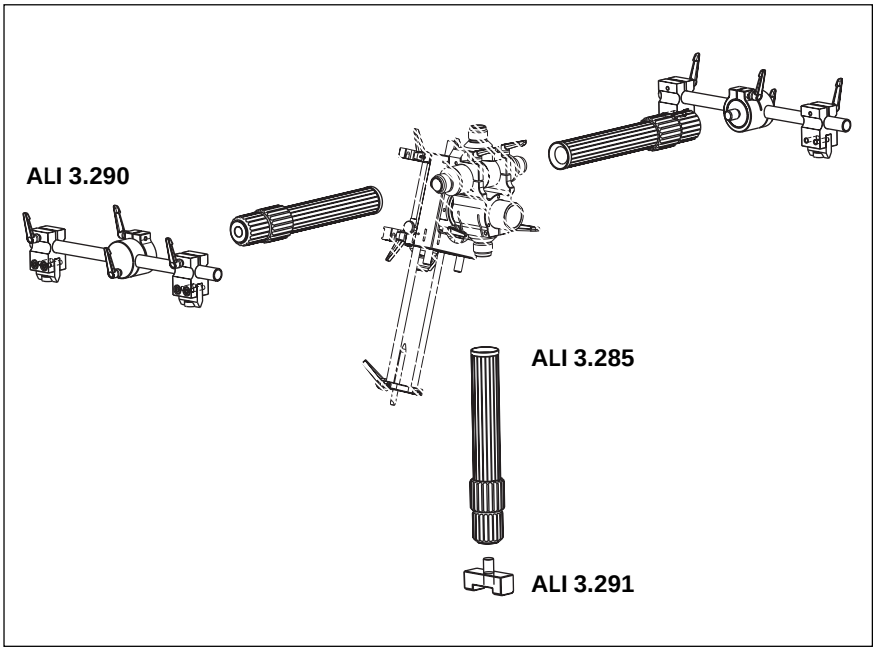
Required for all bracket configurations:

1. Sensor rotation frame package, with case ALI 3.110



ALI 3.287	Sensor rotation frame	1 pc.
ALI 3.288	Measurement surface probe assembly (250 mm / 9 3/4" and 500 mm / 19 5/8", 1 each)	1 set
ALI 3.299	Rotation frame carrier	1 pc.
0 0567 0347	Combination probe	2 pcs.
ALI 4.833	Case with contoured insert (also holds one additional package)	1 pc.

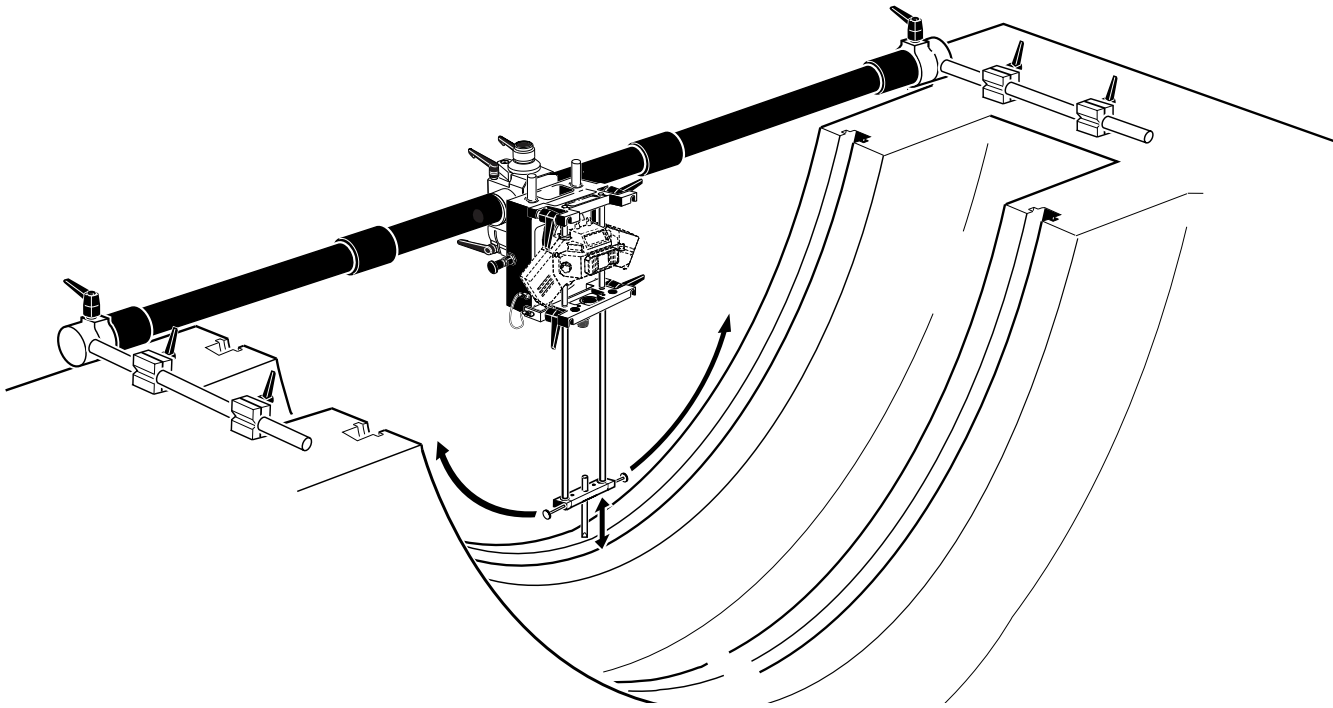
II. Application for open machines: 'tops-off'
Standard support package ALI 3.111



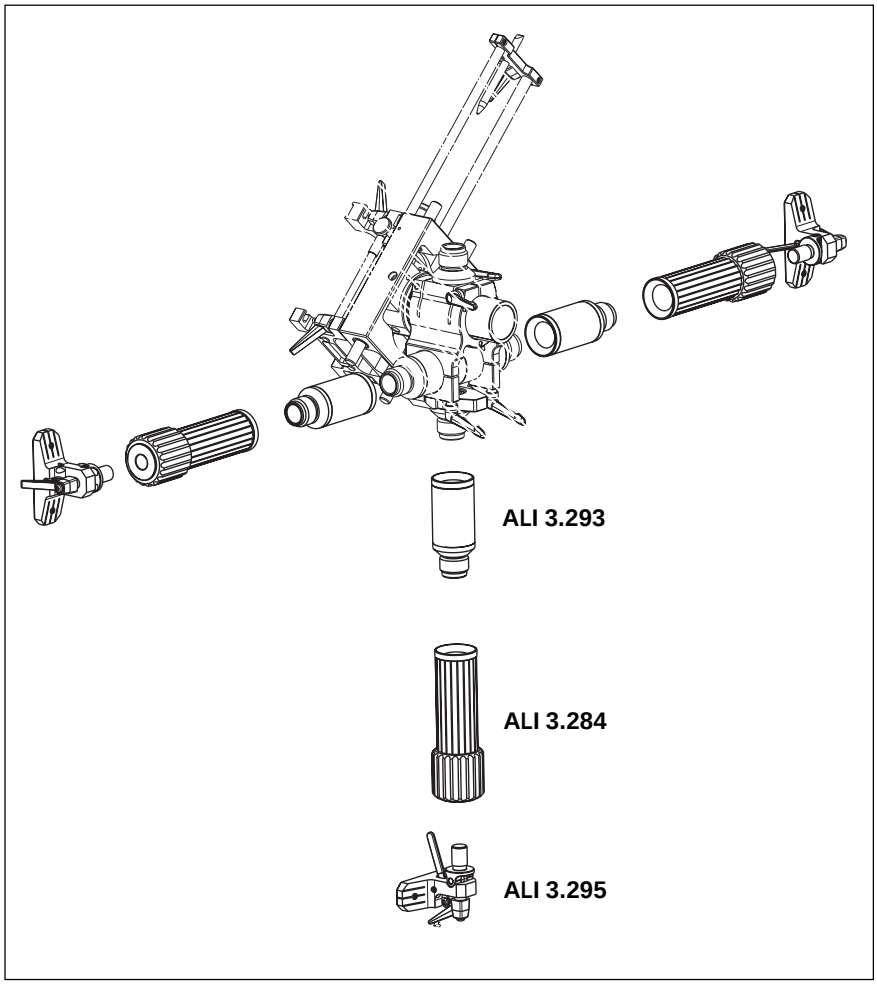
When the upper portion of the machine is removed for measurement, the standard support arrangement shown above allows great flexibility in axial positioning (see diagram opposite). The standard support spans bore diameters of approx. 953 mm to 1821 mm (37 1/2" to 71 5/8").

ALI 3.285	Telescopic arm, 311 - 645 mm (12 1/4" - 25 3/8")	3 pcs.
ALI 3.290	Lateral support, magnetic	2 pcs.
ALI 3.291	Support foot	1 pc.

Tops-off application



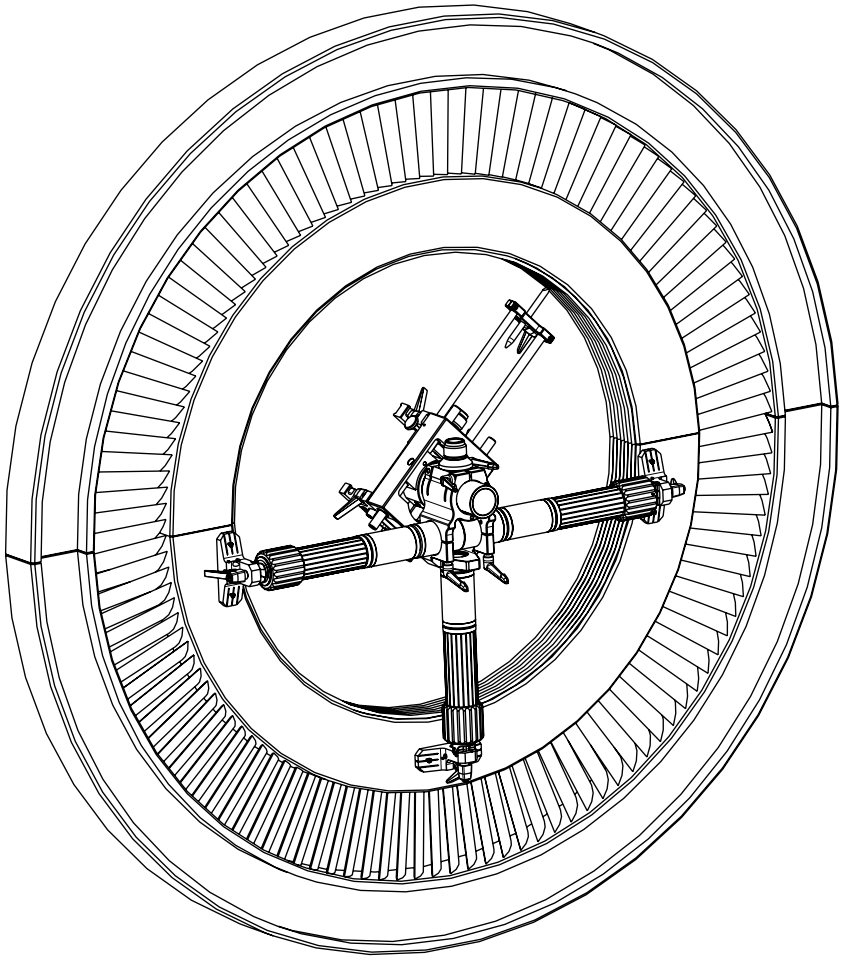
III. Application for closed machines ('tops-on'):
T-support package ALI 3.112



Magnetic feet may be used to mount the T-support on the face of the lower machine half, so that the assembly can be left in place for measurement with the upper half left on or taken off.
This configuration spans bore diameters of approx. 677 mm to 833 mm (26 3/4" to 32 1/2").

ALI 3.284	Telescopic arm, 160 - 237 mm (6 3/8" - 9 1/4")	3 pcs.
ALI 3.293	Extension arm, 100 mm (3 7/8")	3 pcs.
ALI 3.295	Magnetic foot ('tops-on')	3 pcs.

T-support/magnetic feet application:
'tops-off' or 'tops-on'

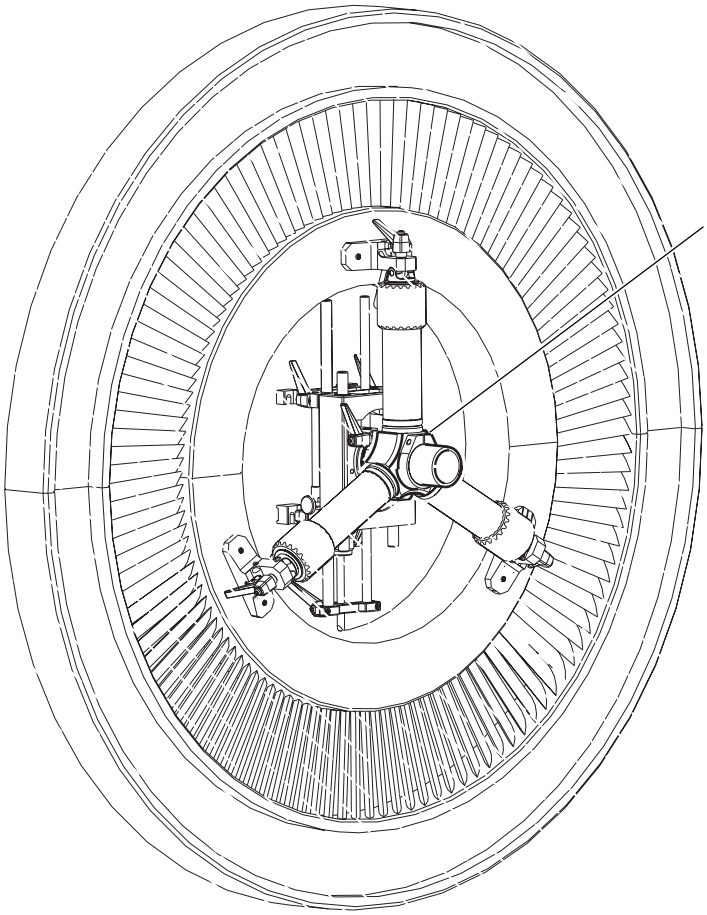


IV. For large diameters ('tops-off' and 'tops-on'):
Extension package **ALI 3.113**

Enables the bracket to span large bore diameters of approximately 2309 mm to 3845 mm (90 7/8" to 151 3/8"). This large-diameter kit also includes its own separate carrying case.

ALI 3.286	Telescopic arm, 539 - 1307 mm (21 1/4" - 51 3/8")	3 pcs.
ALI 3.292	Extension arm, 500 mm (19 5/8")	3 pcs.

Also available optionally:
3-point carrier **ALI 3.298**



For radial mounting of telescopic support arms using magnetic feet when the upper portion of the machine is left in place for 'tops-on' measurement.

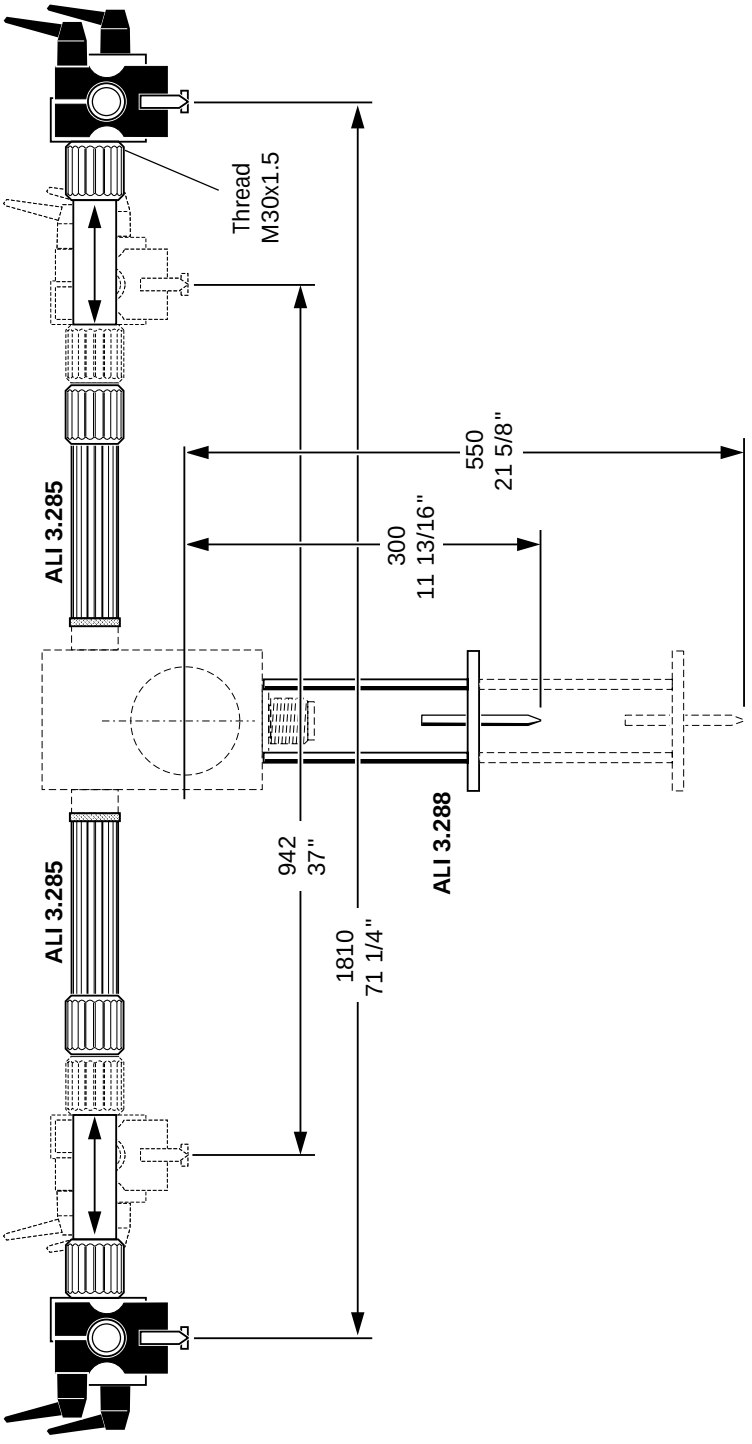
ALI 3.298 includes only the 3-point carrier component. The following components must be ordered additionally for use with the 3-point carrier as pictured above:

Sensor rotation frame	ALI 3.287
Measurement surface probe assembly	ALI 3.288
or, for radii > 500 mm / > 19 5/8":	
Telescopic surface probe	ALI 3.297
Telescopic arm 160/237 mm / 6 3/8" - 9 1/4" (3 pcs. required; other lengths may be used as necessary)	ALI 3.284
Magnetic foot (3 pcs. required)	ALI 3.295

Configuration dimensions

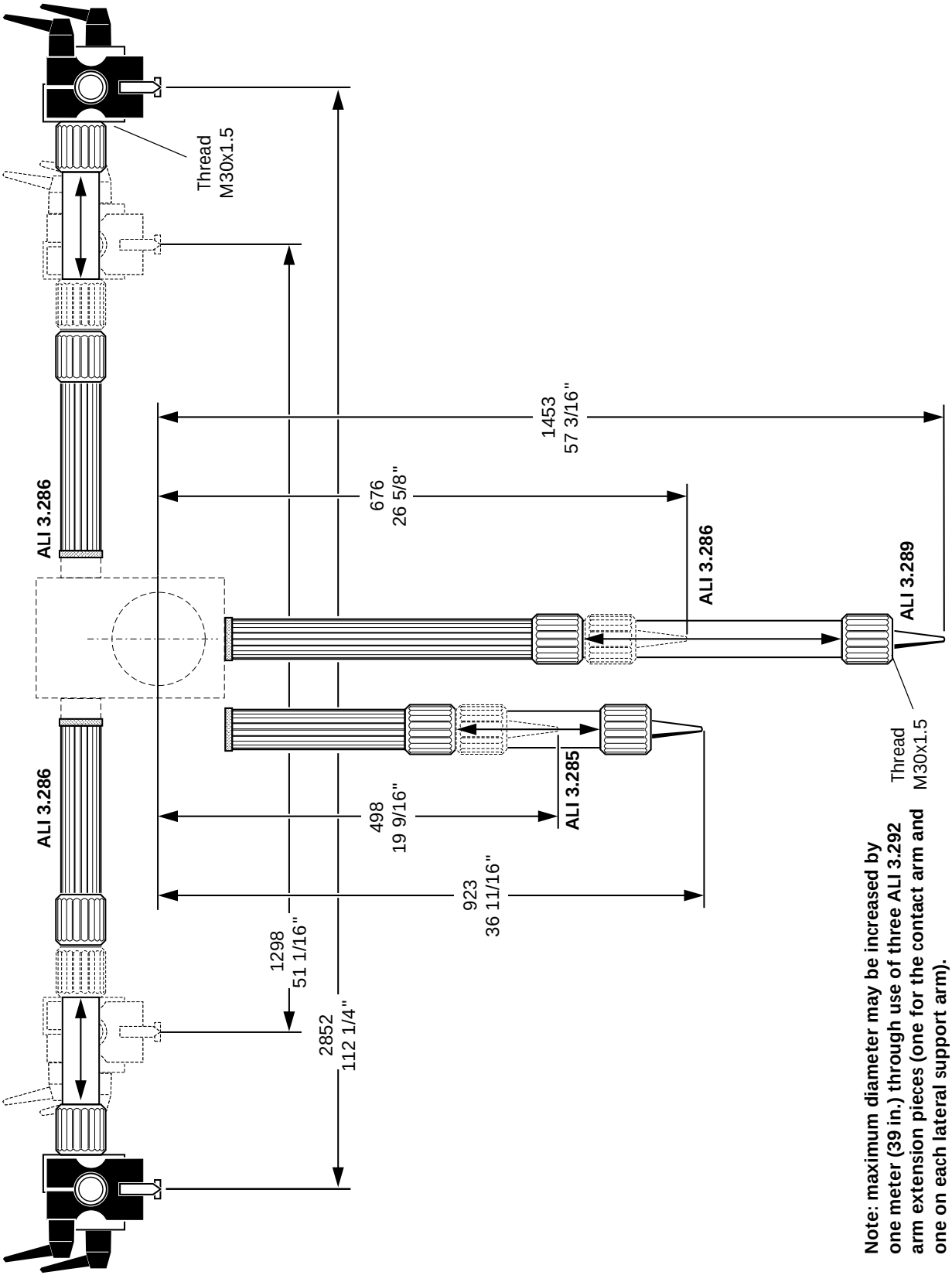
These diagrams show minimum and maximum dimensions for the various configurations of the CENTRALIGN Large Bore bracket.

ALI 3.285 short telescopic arms, 'tops-off'



A) ALI 3.285 short telescopic arms, 'tops-off'

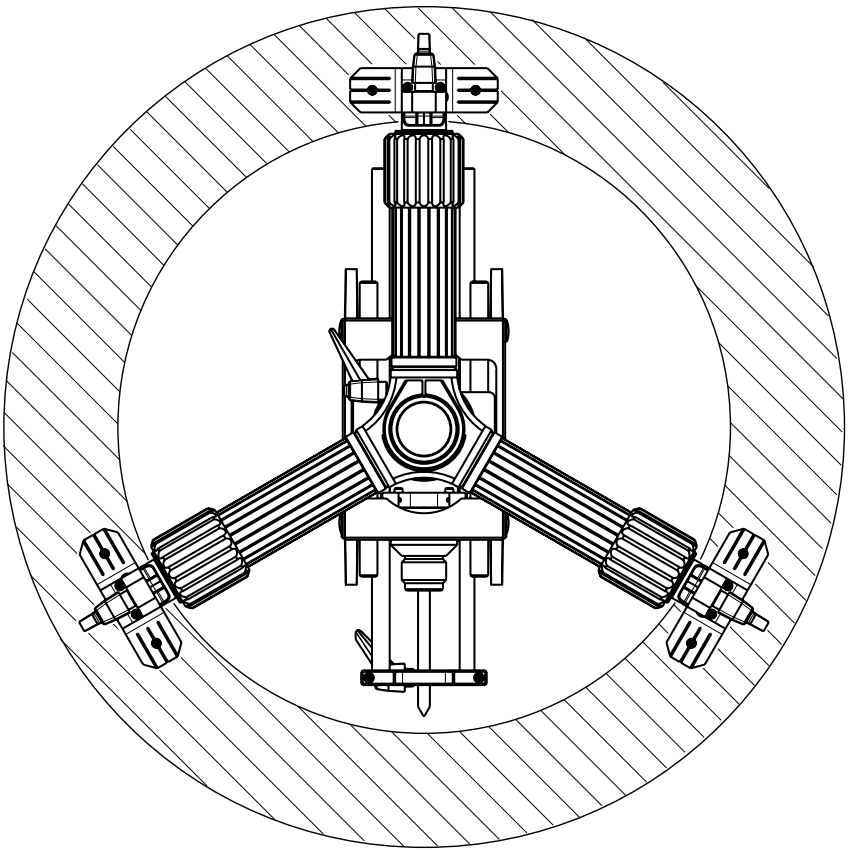
ALI 3.286 long telescopic arms, 'tops-off'



B) ALI 3.286 long telescopic arms, 'tops-off'

Note: maximum diameter may be increased by one meter (39 in.) through use of three ALI 3.292 arm extension pieces (one for the contact arm and one on each lateral support arm).

3-point carrier configuration, 'tops-on'

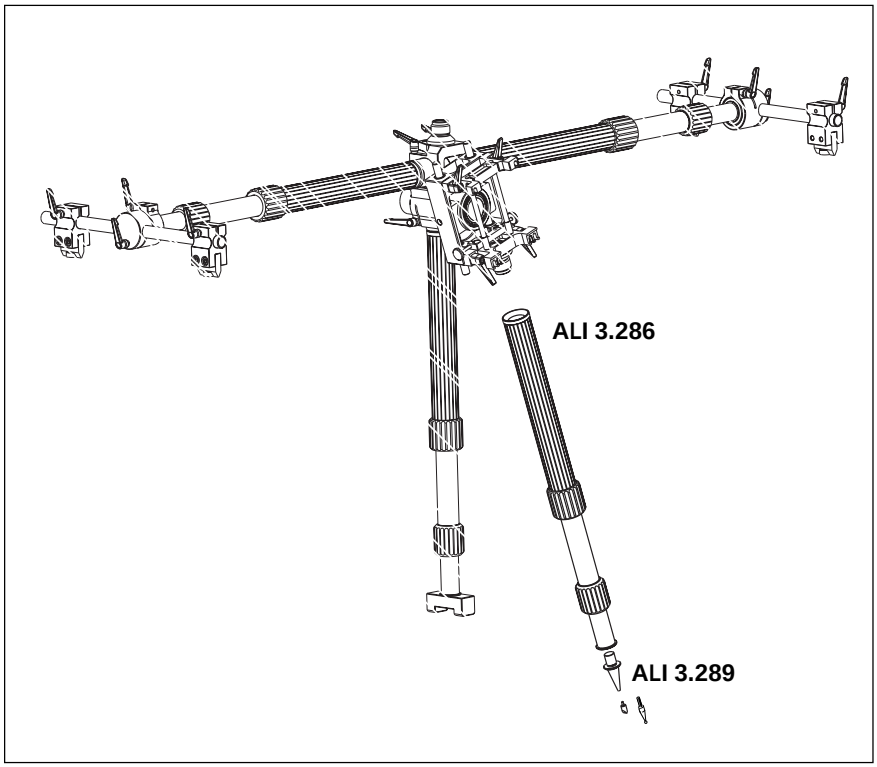


Diameter range with

ALI 3.284	Short telescopic arms	427	to	583	mm
		16 7/8	to	23	in.
ALI 3.286	Long telescopic arms	1181	to	2725	mm
		49 1/2	to	107	in.

Optional accessories

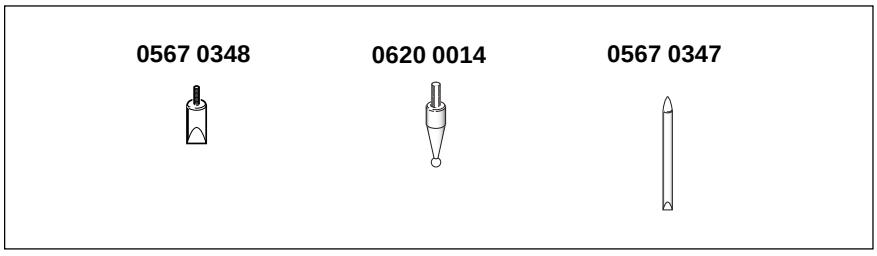
Telescopic surface probe **ALI 3.297**



For 'tops-off' or 'tops-on' measurement at radii that exceed the span of the 500 mm measurement surface probe assembly.

ALI 3.286 Telescopic arm, 1 pc.
539 - 1307 mm / 21 1/4" - 51 3/8"

Contact probe set **ALI 3.296**



0567 0348 Knife edge threaded tip 2 pcs.
For grooved measurement surfaces (e.g. turbine steam glands)

0620 0014 Ball contact threaded tip 2 pcs.
For flat surfaces (e.g. sleeve bearing journals)

0567 0347 Combination probe 2 pcs.
Knife edge on one end, pointed tip on the other, this probe can be mounted in the measurement surface probe assembly either way around, depending upon the surface to be measured.

Storage and transport cases

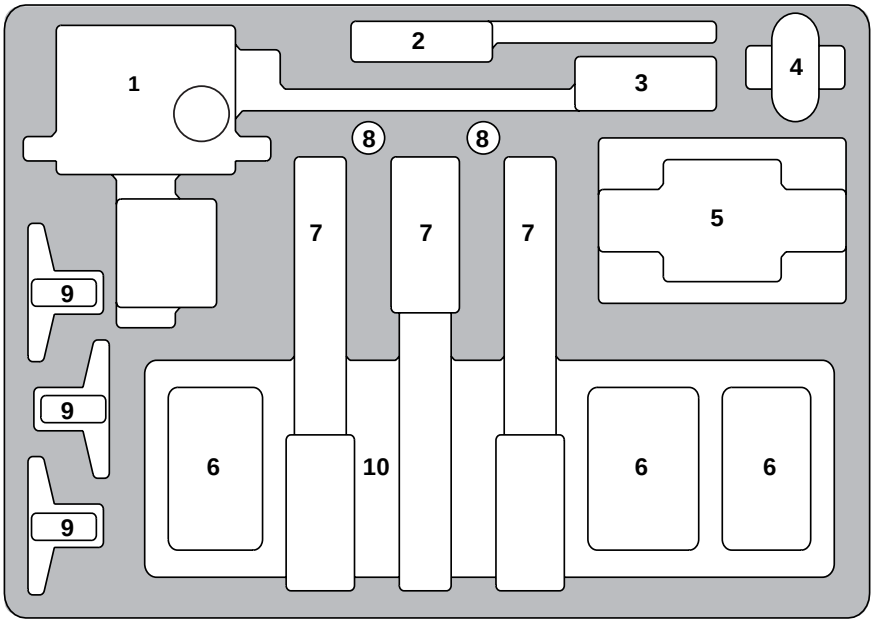
Two different cases are available for orderly storage and secure transport of all CENTRALIGN large bore bracket parts. The ALI 4.833 case included with the basic sensor rotation frame package (ALI 3.110) can hold the basic package contents as well as those of any one additional package (see page 20 for an overview of available packages).

The ALI 4.834 case provides sufficient storage space for any two additional packages. Its foam liner contains contoured spaces that can hold a wide range of accessory components securely.

Both cases are extremely robust, with built-in wheels for easy handling. Airtight (with pressure release valve) and waterproof, they are ideally suited to air transport with no additional protection required.

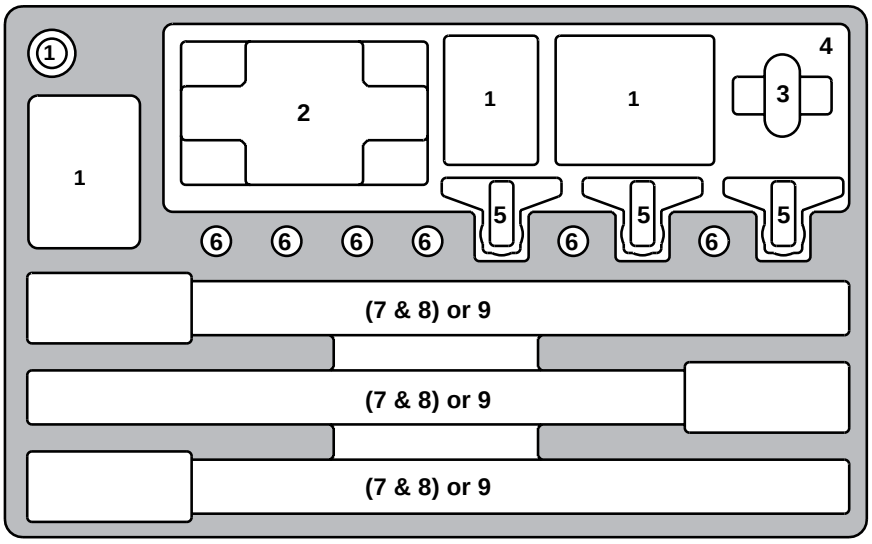
Dimensions (H x W x D)	530 x 815 x 280 mm / 21" x 32" x 11"
Weight (empty)	12.5 kg / 27.5 lb.

Placement of parts in ALI 4.833 case



1	Sensor rotation frame	ALI 3.287
2	Measurement surface probe assembly, 250 mm (9 3/4")	ALI 3.288
3	Measurement surface probe assembly, 500 mm (19 5/8")	ALI 3.288
4	Support foot	ALI 3.291
5	Knife edge threaded tip (beneath)	3014 0101
	Rotation frame carrier or 3-point carrier (on top)	ALI 3.299 or ALI 3.298
6	Measurement tip set / Contact probe set	ALI 3.289 / ALI 3.296
7	Telescopic arm 311 to 645 mm (12 1/4" to 25 3/8") - beneath	ALI 3.285
	Telescopic arm 160 to 237 mm (6 3/8" to 9 1/4") - in between	ALI 3.284
	Extension arm, 100 mm (3 7/8") - on top	ALI 3.293
8	Combination probe	0567 0347
9	Magnetic foot	ALI 3.295
10	Contoured insert for magnetic lateral support	ALI 3.290

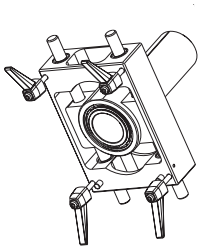
Placement of parts in ALI 4.834 case



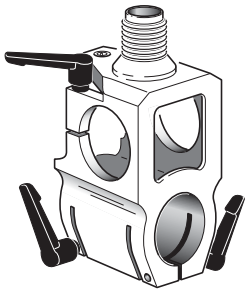
1	Measurement tip set / Contact probe set	ALI 3.289 / ALI 3.296
2	Rotation frame carrier or 3-point carrier (on top)	ALI 3.299 or ALI 3.298
3	Support foot	ALI 3.291
4	Contoured insert for magnetic lateral support	ALI 3.290
5	Magnetic foot	ALI 3.295
6	Combination probe	0567 0347
7	Telescopic arm 539 to 1307 mm (21 1/4" to 51 3/8")	ALI 3.286
8	Extension arm, 500 mm (19 5/8")	ALI 3.292
9	Telescopic arm 311 to 645 mm (12 1/4" to 25 3/8") - beneath	ALI 3.285
	Telescopic arm 160 to 237 mm (6 3/8" to 9 1/4") - in between	ALI 3.284
	Extension arm, 100 mm (3 7/8") - on top	ALI 3.293

Overview of bracket parts

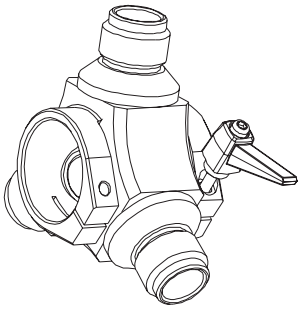
ALI 3.287
Sensor rotation frame



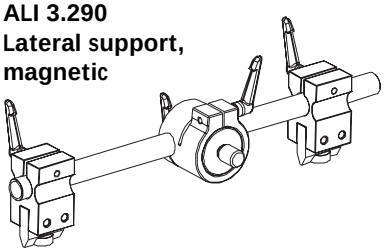
ALI 3.299
Rotation frame carrier



ALI 3.298
3-point carrier



ALI 3.290
Lateral support, magnetic



ALI 3.285
Telescopic arm
311 to 645 mm
12 1/4" to 25 3/8"

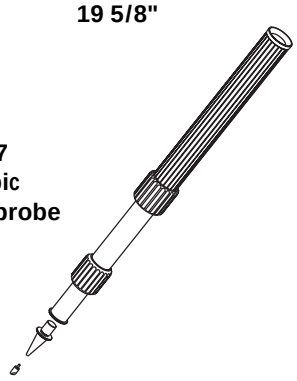
ALI 3.286
Telescopic arm 539 to 1307 mm
21 1/4" to 51 3/8"

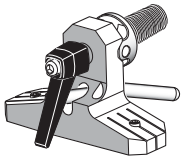
ALI 3.284
Telescopic arm
160 to 237 mm
6 3/8" to 9 1/4"

ALI 3.293
Extension arm, 100 mm
3 7/8"

ALI 3.292
Extension arm, 500 mm
19 5/8"

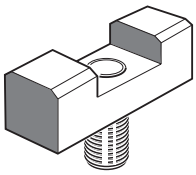
ALI 3.297
Telescopic surface probe



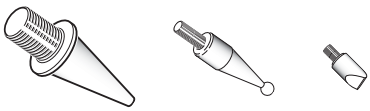


ALI 3.295
Magnetic foot
(tops-on measurement)

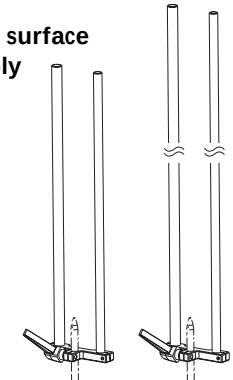
ALI 3.291
Support foot



ALI 3.289
Measurement tip set



ALI 3.288
Measurement surface probe assembly



250 mm **500 mm**
9 3/4" **19 5/8 "**

0 0567 0347
Combination probe

0 0620 0014
Ball contact threaded tip

0 0567 0348
Knife edge threaded tip

Table of order numbers

PRÜFTECHNIK AG
P.O. Box 12 63
D-85730 Ismaning, Germany
www.pruftechnik.com
Tel. (+49) 89-99616-0
Fax (+49) 89-99616-100

Printed in Germany ALI 9.580.11.97.0G

PRÜFTECHNIK

Productive maintenance technology