

VTube-LASER Quick Start Guide for FARO QUANTUM from a Traditional Tube Print





This guide shows how to setup VTube-LASER

from a tube print and then measure and qualify demo tube 4 using a FARO ScanArm. A copy of the following tube print is included on the last page of this guide.



The steps in this workflow are from version 2.9.11 with the FARO v6 driver used for the Quantum model arms.



 Press the **Clear Project** button in the tool bar on the top of the VTube-LASER window.



 About LINEAR UNITS - Before you start entering data, look at the "linear units" button in the TOP TOOLBAR. It will say "I" or "M" depending on whatever default linear units your system is currently using. The VTube-LASER print uses millimeters, so switch the I to M if necessary. (Mixing up the linear units during entry would create some problems for us down the road.)



Fortunately, changing the linear units is easy in VTube-LASER. Just press the I or the M, and the units will toggle.

Use this feature to your advantage. For example, if you need to enter 0.125" somewhere in the system for a metric part (because that's the way you think), then just switch the units to INCHES, enter 0.125, then press the Linear Units button to switch back to MILLIMETERS. VTube-LASER will convert it for you. (It's 3.2).

Or how about "25.4 mm" as another example? That's a one-digit value in inches (a 1). So just press the Linear Unit button and enter "1" and Enter, then press the Linear Unit button again.



 When cleared, VTube-LASER automatically switches to the **Part**

> Setup menu on the left. Start at the top and enter Part Number in row one and press the Enter key.

Pressing the Enter key puts the new value into memory. This is how you enter and save data inside any menu that is based on a grid like Part Setup.

 Either press Enter or the down arrow, or use the mouse to find and click on the Diameter value in row

> 16. Enter the **Diameter** from the print. (Be sure you are in the correct Linear Units!)

- Displayed in UI: VT-4D 4 Part Setup Rev Master Variable Name Value 1 Part Number VT-4D Part Setup 2 Part Name 3 Comment 1 Master Tube 4 Comment 2 5 Customer Measure Setup 6 Supplier 7 Measure Process Revision 8 Material Spec Measured Tube 9 Author 10 Organization Inspection Data 11 Bender Type 12 Job Number Bender Setup 13 Work Order 14 Date/Time 4/11/2018 10:09:33 Reports PM 15 Diameter Profile Cylinder Setup Data Handling 16 Diameter 9.5 17 A-End 9.5 millimeters Diameter 18 B-End 9.5 millimeters Diameter 19 Wall 0.8 20 Rec Width 1 25.4 millimeters 21 Rec Width 2 12.7 millimeters 22 Active:1 Rec Wall 1.5 millimeters 23 Rec Fillet Radius 3.2 millimeters 24 Rec Angle 0.0 millimeters 25 Cut Length 0.0 millimeters 26 Default Radius 25.4 27 millimeters A-End Length 0.0 DCP Auto = 4.8
- 5. Move down to row 19. Enter the **Wall** thickness.
- 6. Move down to row 26. Enter the **Default Radius** which is the radius used most on the print.



7. The Navigation Pane

is the panel with buttons stacked just to the right of the left menu. Click on the

Master Tube button in the Navigation Pane.

8. Increase the **Point**

Count value to the number of centerline points on the print. You can enter the value or press the up or down arrow keys to come to the value. You can then press Enter or the Set button.

Note that VTube automatically fills in the default radius cells with the Default Radius value from row 26 in the Part Setup menu. This saves you time.

9. Click on the first X cell and enter the X value. Press Enter when you are finished with the number. If the number is already correct, then just press Enter. For this Quick Start, you can use the coordinates from the coordinate block in the sample print:

VTube will always forward you to the next cell down. When you complete data in the last row, VTube will automatically select the cell in the next column on the top.



TUBE CENTERLINE COORDINATES

Pnt	Х	Y	Z
1	0.0	0.0	0.0
2	38.8	-15.9	-47.5
3	78.9	-64.9	1.5
4	158.2	-64.9	1.5
5	197.9	3.8	1.5
6	259.8	13.9	50.1
7	285.0	-52.7	105.2
8	334.0	-81.0	48.6
9	395.2	-60.3	45.5



When you've got all the data entered, it should like this:

	М	aster T	ube Da	ta	Rev Master
Main	Setup Exp	ort Radius	Translate	Reverse 💌	
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		Clear A	All Data		Master Tube
				[]	Measure Setup
Maste	er Centerline	XYZ Data	7	Lock Grids	Measure Process
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2	38.8	-15.9	-47.5	25.4	
3	78.9	-64.9	1.5	25.4	Inspection Data
4	158.2	-64.9	1.5	25.4	Dandan Catur
6	259.8	13.9	50.1	25.4	Bender Setup
7	285.0	-52.7	105.2	25.4	Reports
8	334.0	-81.0	48.6	25.4	
9	395.2	-60.3	45.5		Data Handling
9	395.2	-60.3	45.5		Data Handling

10. On the far right side of the screen, find the Model Control menu. Uncheck every model type except for MASTER. Be sure that MASTER is checked like this:

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Number Name Number Process Number Pro	Master Co	sterline XYZ Da	2	Lock Grids	Measure Setup					F7 - VPort: Zoom Win Set Orientation
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11. To refresh the graphics, press F2. To Zoom All, press F3. (Get used to this combination – because you will use it a lot in the future.)

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2	38.8	-15.9	-47.5	25.4							
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7	285.0	-52.7	105.2	25.4	Reports						Labels
8 9	334.0 395.2	-81.0	48.6	25.4	Data Handling						F10 - Show True View Orbit Control
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1	38.0	0.0	89.9	25.4							Model: MEASURED
2	40.1	-135.0	59.9	25.4	Active:1						Model: ALIGNED
3	50.0	45.0	60.0	25.4							Model: MASTER
4	50.0	135.0	60.0	25.4	\sim						Model: ENVELOPE
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Pressing these two keys will cause the MASTER image of the tube to appear in the window. The orientation that you see may be different – but it will be the same tube.

12. At the top of Viewport, you will find the **View Mode** value. The modes vary depending on how you want the Viewport to act. The

	View Mode: SELECT, Proje	ection: PARALLEL, Wire	Frame: OFF, Auto Zoom: OFF
¢= r	Measuring Device: FARO Arm		Scanner Algorithm: Automatic - Normal

default mode is **SELECT**. In Select mode, you can click on objects to select them or drag a window to select multiple objects.

Here are some other things to know about SELECT mode:

- a. You can always get back to SELECT mode by RIGHT CLICKING the mouse.
- b. When in SELECT mode, right clicking on the mouse will cause a popup menu to display. No other mode will allow the popup menu.



13. Probably the most-used View Mode is **ORBIT** that allows you to orbit the part in the Viewport. Enter ORBIT mode by press F5 or pressing on the mouse well as a button.



Pressing on the mouse wheel the first time will switch VTube into ORBIT view mode. Pressing the mouse wheel a second time will switch VTube into PAN view mode. Press the mouse wheel again, and VTube will toggle back to ORBIT mode.

Try dragging the mouse (by holding the left mouse button down) in both modes.

14. The MASTER data is completely entered. At this point, we need to save the save the current VTube state to a VTube project file (VTP file). The VTube project file will store everything for reuse in the future.

Look just below the VTube-LASER logo. You will see a white

project filename box

that will show the current path and filename of the project if it is has been saved previously. There is nothing currently in the box – so the project has not yet been saved.





In this state (with nothing I the project filename box), you can press either

Save As... Project or

Save Project, and VTube-



LASER will perform "Save As" Displayed in UI: because it does not have a filename to overwrite with the "Save Project" yet.

15. Press Save As...Project. The Path Manager will display like this.

VTube-LASER



The Action tells you what the current reason the Path Manager is opening. In this case, it is to SAVE a PROJECT FILE.

The Path Manager is a list of paths to where files are. You can add to these paths any time.

Double click on one of the paths in the list, or press the Continue with no

selection button to just display the File Save Dialog.

16. After the project file save is complete, the project filename box will show the current path and filename like this:





Measuring and Qualifying the Tube Shape

Follow these steps to setup to measure the tube:

1. If the arm is not connected to VTube-LASER, then **click on the black LED** in the upper right corner.



Close

VTube

Choose Select, Orbit, Pan, or change modes

Im

When the connection to the arm is active, the LED turns green, you will hear a connection sound, and the transparent DRO (Digital Readout) window will appear.

2. Pull the arm aware from its resting position and watch the values in the DRO (Digital Readout) move.

If the laser scanner is on, then you can point the scanner about 6 to 8 inches from any object, and you will see XYZ data change in the DRO.

This is the DRO (Digital Readout):



000

time:1

Digital Readout

Last Calculated Diameter

If the laser is not on, then you will see the XYZ data changing whenever you move the arm. In this mode, the data will represent the **center of the ball probe**.



3. If you are using a scanner (rather than the ball probe), then click on the FARO

Scanner Control button. The FARO Laser Line Probe Control window will load.

4. We recommend that you set this scanner with these values:



(1)	3.839,	-8.182, 30	.820	Digital Readout			1
About VTube		0.000	Last Ca	Iculated Diameter		Switch Screens	Close VTube
L, Wire Fra	me: ON, Auto Zoc Re	orm: OFF roentage of Points Below the	Cut Planes 0 (Choo chan	se Select, pe modes
	Scanner Alg	gorithm:Fixed Exposure	Density:1/16	Rate:1/1 Exposure	Scanner Con	trol C	RO

Probe Mana	gement mm				
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-		Algorithms	Automatic	- Normal	•
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		Movement Filter			
		Reflection Filter			
Information <u></u>		Scan Rates	1/1		•
Serial Number	20526	Scan Density	1/16		•
Model	LLP HD	Reset		Add New Remove	Save as New
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Average Width		Show Visible Ligh	+ 	High Accuracy Mor	
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Reset			4		ancel Save

If you are scanning a highly reflective part in a very bright environment (like bright halogen lights), then you might also try the HDR (High Dynamic Range) algorithm.

5. Save the changes (see arrow 4 in the image above) and then press the close button in the upper right corner, or press the "Edit Probe" text on the upper left to close the menu.



6. Setup CUT PLANES if you are measuring the part on a table surface. Cut Planes will remove any laser points beyond the measured plane.

Click on the **Cut Plane icon** at the bottom of the navigate pane.



7. Press the **Measure a New Cut Plane** button in the NEW tab.

Cut Plane Setup Control Cut Planes On/Redraw F3 - Zoom All Standard Diameter Window New On/Off Delete List Edit File Measure a New Cut Plane Cut Plane List Row Currently Selected: Num Name Color Offset Active	×
Cut Planes On/Redraw F3 - Zoom All Standard Diameter Window New On/Off Delete List Edit File Measure a New Cut Plane Cut Plane List Row Currently Selected: Num Name Color Offset Active	Cut Plane Setup Control
Standard Diameter Window New On/Off Delete List Edit File Measure a New Cut Plane Cut Plane List Row Currently Selected: Num Name Color Offset Active	Cut Planes On/Redraw F3 - Zoom All
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Cut Plane List Row Currently Selected: Num Name Color Offset Active	New On/Off Delete List Edit File
Num Name Color Offset Active Image: A state of the	Measure a New Cut Plane
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8. Press the GREEN button for all four points.



Take the first three points <u>on the plane of</u> <u>the table</u> surface using the GREEN button.

Take the last point is at least 1 millimeter above the table also with the GREEN button.

(Again - do not push the red button in this operation.)









9. The Active label in the Cut Planes icon will now show "1".

10. Enter an offset for the new cut plane of up to half of the diameter of the tube.

An offset is important, or the scanner may pickup surface outliers. The greater the offset, the less chance of outliers.

For most tables, we recommend 0.125" or 3 mm as a starting point. Some surfaces will require a larger value.

Enter the offset, then press the **Enter button** to allow the value to be entered into memory.







11. Important Things About Cut Planes

- Cut Planes are always stored until you delete or change them – even if you shut VTube-LASER down.
- b. Cut Planes are only used for laser scans. They are
 IGNORED when using the ball probe.
- c. Make changes to the Cut Plane at any time during any other measurement.
- d. You can add as many cut planes as you want.
- e. You can activate or deactivate the cut planes any time. Each cut plane has its own active switch and offset value.
- f. If you move the arm relative to the table, then you will need to remeasure the cut planes – or the cut plane will be in the wrong place relative to the table.







12. Next, let's cover the

DCP - Diameter Cut Plane

It is powerful – and yet it is easy to understand and use.

The DCP feature will find the top diameter and remove all other objects behind the first diameter (closest to the probe) that it finds. Because it does this, DCP can not only remove unwanted objects from the scanner, it can also remove outliers or flyers that enter the data.

When in AUTO MODE, DCP relies on the nominal diameter to know how big the Cloud Radius should be – so it is important to have the diameter set to the actual value before you measure using the DCP command.

If you turn DCP on, and also enable the **Automatic Maximum Cloud Radius** feature, then be careful to enter the actual nominal DIAMETER, and the Cloud Radius FACTOR in row 5 should be anywhere from 0.75 to 1.0 in normal situations.

With this setup, VTube will find the first (nearest)

surface point it encounters, then keep any surface point within a distance of 0.281" from that first point.





Here are two Important notes about DCP:

- a. DCP only works when the scanner is active **not the ball probe** because it requires multiple points per scanned line to work.
- b. DCP only applies to cylinder scans and bend profile scans. It does not have any effect on END scans.



13. Go to the Navigation Pane and press

MEASURE PROCESS

menu and find the Tube - Cylinder panel at the top of the choices on the left side

of the screen. Press the UniScan.



UNISCAN versus MULTISCAN Note: We are going to use the **UNISCAN** method to measure tubes. The UNISCAN motion feels like spray-painting the tube with laser stripes. When you press the green button, then VTube takes in the laser stripes. You can release the green button to pause scanning to move over obstacles. During scanning, when you release the green button, new scanned points will draw on the screen.

There is another method called **MULTISCAN** that is ideal for for situations where the straights are bowed or curved. In MULTISCAN, you aim near the first tangent, then hold the arm still, then press and hold the green button until you hear the scan complete sound. Then you do the same at the other end of the straight.

For most measurements, we recommend UNISCAN, because this mode takes in much more data and is able to give operators better assurance that the scan is good. For example, using DCF – Dual Cylinder Fit, UNISCAN can reduce uncertainty significantly because it takes many more surface points than MULTISCAN, then uses this to your advantage.

14. Press

Set to MASTER Count









16. Measure the part following the instructions in the guide box like the one shown here. The yellow box tells you the current step.

If VTube is setup to measure the ends with the ball probe, the red laser box will turn black. If you want to measure the end with the laser, then just press the **Toggle LASER** button.

At this point, the trainer will show you the exact technique to use for scanning the ends and the staights. If you are learning without the help of a trainer, then it's important to see at least one of these two videos in the knowledgebase first:

Video 37: "Measuring Demo Part 3 with the HD

Scanner in a Tube Clamp" or

Video 38: "Measuring Demo Part 3 with the HD Scanner on a Table Surface"

Knowledgbase Videos for VTube-LASER are in this web page: http://www.advancedtubular.wiki/index.pp/VTube-LASER_Videos

17. After measuring End B, press the **Finish and Apply** button.







- Change the alignment type to #3 and then press the Alignment button with the triangles.
- 19. Press **Inspection Results** in the navigation pane.
- 20. VTube will align the measured part to the master part. It will show a progress bar as it is doing the alignment.

	Measurement Complete
	Please choose the next step:
	Alignment Choices
	Store new MEASURED, and then ALIGN using:
	Best Fit Alignment 3
2	Perform Alignment Selected Above Now
	Build a new MEASURED tube only
	Do Nothing and Close
Alignment engine will stop if precision level	is: 0.010 inches
	Stop

For the demo tube, don't be surprised if you see a lot RED cells in the Inspection Data menu. This tutorial is designed to show you how to determine if a part is out of profile deviation – and then how to correct that situation. (The out of tolerance condition is expected.)

21. You will see **Inspection Data** menu display on the left with color-coded deviations. End length and tangent point deviations are always shown here.

The **Tangents** deviation grid qualifies the profile of the straights as a virtual gauge. Tangents are where the straights meet the bends. For example, the **T2 dev, row 1** cell shows the deviation where the first straight meets the first bend on the centerline.

Note that **T1-1** and **T2-8** cells in this grid are really <u>trimmed</u> end points (not tangent points).

The end lengths are qualified at the top of the menu. The default profile tolerance can be set at the very top.

		Ins	pect	ioi	า	Da	ata				
	Recalcula	te Best Fit	: - Auton	natic	End	l We	ight /	Adjus	stme	nt 2	
Main Se	etup End	Lengths	General	Setu	ıp	Alig	nmer	nt E	nvel	ope	
Default	Toleranc	e 🗌 0	.039 📄	inch	es			9	Set		
Trim A	+Tol A	-Tol A	Trim B	+To	В	-To	B	Ang	le A	Tol A	An
0.012	0.039	0.039	0.006	0.03	9	0.0	39	0.57	93	1.0000	1.:
•			III								÷.
Tanger	nts Inters	section A	ligned N	1odel	0	ut-o	f-rou	nd	1.14/5	- d	
		Lnange Gr	ia Setup)			Ехра	indea		naow	
	T1 dev	T1 tol	MP dev	/ M	P to	bl	T2 d	lev	T2	tol	
1	0.043	0.039	0.035	0.	039)	0.02	8	0.0	39	
2	0.016	0.039	0.003	0.	039)	0.01	2	0.0	39	
3	0.039	0.039	0.038	0.	039)	0.03	8	0.0	39	
4	0.031	0.039	0.015	0.	039)	0.00	7	0.0	39	
5	0.014	0.039	0.013	0.	039)	0.01	3	0.0	39	
6	0.009	0.039	0.009	0.	039)	0.02	6	0.0	39	
7	0.041	0.039	0.039	0.	039)	0.04	2	0.0	39	
8	0.039	0.039	0.022	0.	039)	0.01	7	0.0	39	



CORRECTING BENDERs with COMMUNICATIONS

This next section works through how to communicate with the bender. This is only an example correction communication. It simulates the Benderlink feature to teach the principles of communications to benders.

To make communications work (and not just simulate), the Benderlink feature must be setup by an experienced technician. The Benderlink setup steps are not covered in this document because it's too complex to be covered here.

1. Press **Bender Setup** to show the Bender Setup screen (for communicating

with the bender).

- 2. Press (1) Setup This Window on the right side.
- Press (2) COPY Master LRA to Setup LRA. (Press the Continue in the Confirmation dialog if it appears.)



4. If the cut length is zero, then press
 (3) Set Cut Length From MASTER Calculation.

This will fill the starting values into the bender setup like this:

	Be Se	nder tup	Bender Nu LightSpeed	mber: 1 1 Protocol: Sa	: pravision Network									I	Dir to LASER
e values are v	what are stored a	t the BENDER.	BENDER data	is often different	than the MASTER a	and MEASUR	ED data.						-	Setup this Wir	ndow
Dart 1	tumber VTube-	ASER Demo 3									Copy the MAS into	TER Part Setup Values these fields			
	incoder	0.375	22								-		COF	Y Master LRA to	Setup LRA
04	Walt	0 inche	5								Set Cut Len	igth From MASTER alculation	RECA	LL Bender XYZ to	Master XYZ
A	Automat	c Springback Da	mping	Automatic Corr	ection Damping	Previou	s Adjusment De	sta					REVERS	E Calc Setup LRA	to Master XYZ
Am	Compensate for objuitment veha	bend springback wh i is at least:	सन देख	✓ Longth Adjustine ✓ Rotation Adjustre ✓ Bend Adjustreen	rits wrto a	15 f	NOT PRESENT						COPY Last Be	VTube Adjustmer nder Setup Adjus	nt Values into tment Values
sder Data RECALI	3.00 LED: [Watang far fir	degrees	Bender Data Si	Reduce direction di BIT: (Waiting far find	snga er to 37% 🔹					Ree	CRECALL Time	Asset 5010 Time	CLEAR the	Adjustment Grid	
ler Adjustmen	e l												CLEAR the	Extended Addisor	Mckee MarkIV
Length	Adjust	SE Adjust	MENTLAN	Retation	Adjust	inert	NEW Rut	Angle	Agust	SE Adjust	NEX Are	Fadur			Gata
1.525	0.001	0.0000	t.525	0.0	0.0		0.0	89.9	-0.1	0.0000	89.9	1,000			
1.601	-0.025	0,0000	1.509	-134.6	-0.5		-134.9	59.9	-0.1	0.0000	59.8	1.000			
2.197	-0.008	0.0000	2.193	44.7	0.7	8	45.0	59.7	-0.1	0.0000	59.6	1.000			
2.217	-0.009	0.0000	2.213	134.6	0.6	0	134.9	59.9	-0.3	0.0000	59.B	1.000			
2.219	-0.071	0.0000	2.183	0.2	0.4		0.4	59.9	0.0	0.0000	59.9	1.000			
2.117	-0.012	0.0000	2.111	90.3	0.6		90.6	89.5	0.9	0.0000	90.0	1.000			
1.634	-0.053	0.0000	1.607	89.6	0.5		89.9	60.0	0.1	0.0000	60.0	1.000			
2.866	-0.019	0.0000	2.857		-				()						
														Setup the Be	nder
													1		



The BLUE columns represent bender data before correction. The ORANGE columns represent corrected data to be sent to the bender. The columns in between the BLUE and ORANGE columns are ADJUSTMENT columns.

This BLUE and the GREY cells can be manually adjusted for total control by the operator over the corrections being sent to the bender.

- 5. Press (1) Setup the Bender button.
- 6. Press (2) AUTO SEND the MASTER... button.

If VTube-LASER was connected to a bender, then **this would have transferred new setup data** to the bender.



 Press the (1) Bidirectional Communication button on the right bottom side.

> This sequence of button presses is how VTube can RECALL and SEND data for corrections loops to benders. VTube can communicate with up to 100 benders.

8. Press **Exit to LASER** on the top right corner of this window.





CORRECTIONS REPORT EXAMPLE

You may not have a connection to the bender. That's ok, because you can still get to the correction data using printed reports.

Click on **Reports** in the navigation pane.

Double-click on the Bender Corrections Only

template cell in row 4.

If the tube image is not the same as the image in the main screen, then press **Refresh Image** at the top of the screen.

You can also tell VTube to always automatically refresh the image by putting a check in the **Automatic Image Refresh** switch at the top.

This is the end of the Quick Start Guide.





Bender Adjustments

Bend	Length	Rotation	Angle	
1	-0.018	0.0	0.5	
2	-0.029	-0.9	0.5	
3	-0.231	0.5	0.7	
4	-0.266	-0.2	0.3	
5	-0.267	0.1	0.6	
6	-0.140	-0.8	1.1	
7	-0.081	0.7	0.6	





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XX	APPROVED		

TUBE SPEC: 9.5 OD X 0.8 WALL RADIUS: 25.4 TYPICAL

ENTERLINE COORDINATES

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	3	7	0,		+	8			×
395.2	334.0	285.0	259.8	197.9	158.2	78.9	38.8	0.0	
									Y
-60.3	-81.0	-52.7	13.9	3.8	-64.9	-64.9	-15.9	0.0	
									Ζ
45.5	48.6	105.2	50.1	1.5	1.5	1.5	-47.5	0.0	



TUBE BENDING SOLIDWORKS File Name: VTube-LASER Demo Tube 4.slddrw