MIPS Rear Sensor Installation Guide

Introduction

This guide will give you mounting suggestions for your MIPS rear sensor. Your bike was not designed to incorporate a position sensor by the shock so your job may be easy or challenging depending on your bike. There are a few main linkage designs we've worked with so we will call those out and let you know what was successful.

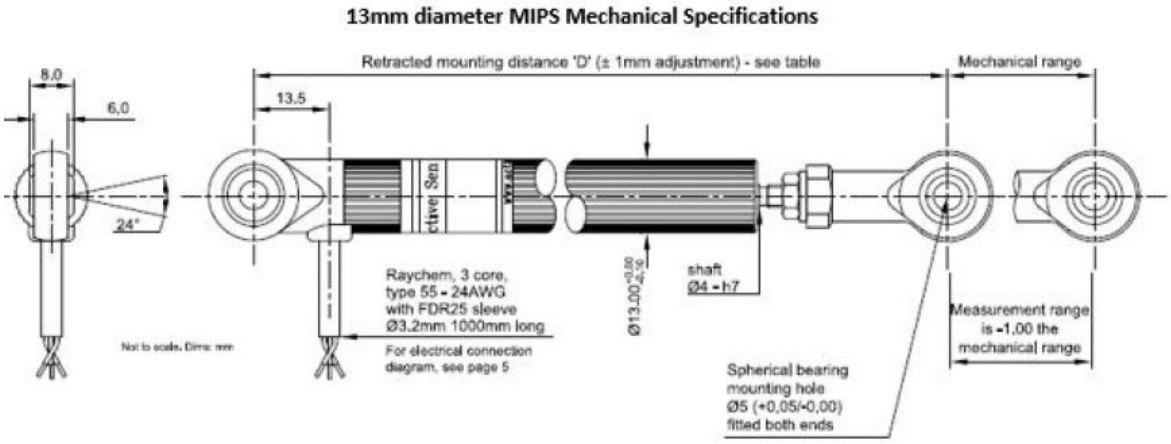
After studying these bikes for years, there is no simple one size fits all solution. Even the most difficult bike can be set up, but it will involve some work with us to make that happen. If you have one of those bikes, we can help if you send us a direct email.

Step 1: Pick your MIPS sensor length

This is pretty simple, pick a sensor length that is longer than your shock stroke length. Most Enduro shocks have a range of motion from 50mm to 65mm, so a 75mm MIPS sensor will do just fine. Downhill bikes are all over the place depending on their leverage ratios, etc. Typically downhill shocks are ~75mm in length. We STRONGLY recommend using a 100mm sensor even if your shock stroke range is just below 75mm. This is due to the way the sensor gets mounted on the bike. You may not get the sensor 100% parallel to the shock so the range of motion may be slightly longer than the shock itself.

Here are some details to note:

From the MIPS datasheet, there is a table and a diagram to pay attention to:



The retracted mounting distance ‘D’ is important, it’s the closed position of the sensor. If you try to close the sensor shorter than this, you will damage it. The forces that you apply to your bike when riding are immense, and this sensor will snap like a twig if you mount it in a manner that the “Mechanical Range” is shorter than the range of motion of your shock. If you get a mounting error in MotionIQ when trying to calibrate, this error message most likely means you’ve mounted the shock shorter than the range of motion of the shock.

	MIPS-50	MIPS-75	MIPS-100	MIPS-150	MIPS-200	MIPS-250	MIPS-350	
Body Diameter	9mm diameter				13mm diameter			mm
Sensor Function Option	Shock	Shock	Shock	Fork or Shock	Fork	Fork	Fork	N/A
Measurement range	50	75	100	150	200	250	350	mm
Retracted mounting distance (D)	128	153	178	228	298	348	448	mm
Wire length	8	8	8	8	16	8	8	inches
Resistance (Typical)	2	3	4	6	8	10	14	kohms
Non-linearity	<0.25	<0.15						%
Applied voltage (max)	45	68	90	130				Volts
Wiper load	>500			>600	>800	>1000	>1400	kohms
Mechanical range	Measurement range + 1							mm
Shaft velocity	< 10							m/s
Insulation resistance (@ 500V DC)	>100							Mohms
Operating temperature range	-30 to +125 degrees							Celcius
Sealing	IP66							N/A
Weight (approximate) grams	30	34	38	46	102	114	126	grams
Materials	Case: Aluminum 6063, Sulphuric acid anodised Shaft: Stainless steel, 303 series Rod end bearing: Aluminum 6262 housing & BS970 230M07, electroless nickel plate							N/A

When mounting your shock to your bike, make yourself a template of your sensor when it’s open. You can use this as a guide when figuring out how you are going to mount the sensor on the bike. Here’s the 3 pieces of information you’ll need:

1. Shock stroke range (See the spec page for your specific bike). If there is a code on your shock, you can also call the manufacturer of the shock, give them the code, and they will tell you what the shock stroke length is.
2. Retracted Mounting distance ‘D’ for the sensor, See the table above
3. 5mm for margin of error

The *minimum* eye to eye length of the sensor = (Retracted mounting distance ‘D’) + (Shock Mechanical Range) + (5mm of margin)

Once you have this distance calculated, we suggest making a mounting template. This can be cardboard cut to this length or a small radius wooden dowel. Again, this is just an aid to help you figure out where you want to mount some posts.

We give you all of this information because we don’t want you to burn an afternoon mounting this sensor only to find out you’ve mounted it too short. **MotionIQ will not calibrate if this is the case.**

Step 2: Placing mounts

Goal #1: Ideally, your sensor should be placed on the same bolts that hold on the shock. This, however, is not always possible.

Goal #2: If you can't mount your sensor on the shock mounting bolts, then mount it anywhere that the sensor is parallel to the shock. It doesn't need to be 100% perfect.

If there is no way to meet the goals, then contact us and we'll help figure something else out.

Here are a few methods that have been successful for us.

Example #1: Steel Putty Fabrication

There is a product that is well known in the off road motorcycle community, JB Weld Steel Stick. This product has gotten us out of many situations on the trail. Imagine a rock just punched a hole in your motor and you can no longer hold oil. You're 2 hours from your truck, and there's no helicopter on it's way to help you out. Those of us who are prepared, pull out this product, mix it in your hands, and piece your motor back together. Within minutes, the putty is cured and you are back on your bike. It's an amazing product.

You can use this to fabricate mounts on your bike anywhere. If you can think it up, you can make it happen with this product and a few pieces of hardware. Here's an example of using steel stick on a Yeti SB130.

At first glance, this looks like a pretty simple bike to mount a sensor, but upon further inspection, the 75mm sensor was a bit long and the mounting was not going to be clean. We decided to use steel stick to fabricate the mounting.

The first thing you are thinking, “I’m not putting that crap on my beautiful bike!” Not to worry, we recommend a product you are probably already using to protect the frame, helicopter tape. Ebay seems to be the cheapest place to find it.

Next, we calculated the eye to eye length of the sensor when it was mounted to the bike, unweighted in the stand. From the Yeti website, we went to the tech spec page and chose the exact model we had which was the SB130LR. The LR has a longer stroke shock which was 55mm. Plugging in our numbers:

“Retracted mounting distance ‘D’ for a 75mm sensor’: 153mm
Yeti SB130LR shock stroke: 55mm
Margin for error: 5mm

For this bike, the eye to eye minimum distance is: 213mm. So we cut a piece of cardboard 10mm wide by 213mm long and started hunting for a mounting location.

Based on our best effort, we chose this location:

Male Post Method

We decided that the best method was to use some M3 bolts and stick them directly into the putty. We placed helicopter tape on the shock body. We decided not to use helicopter tape on the shock clevis. We wanted a strong bond to this part. This part is anodized so we figured we could break this off later and scrape off the putty. Worst case, we could purchase this part from Yet as a replacement.

Note: Please let the putty cure for at least 12 hours. Putting torque on the mounting post prior to the putty curing will severely weaken the bond. Your mount will break prematurely.

If and when you want to remove the sensor, just peel back the tape and everything will come off. We have had success using Steel Stick directly on frames, shocks, plastic, and metal.

When choosing a M3 bolt for this application, we suggest using a hex bolt.

This will provide a larger surface area to bond to the steel stick putty.

Female Threaded Spacer Method

We like these closed end female threaded standoff posts. The hex base is closed and provides a nice surface area for the putty to bond to.

Stack up heights for parts

Unless you have a hardware store nearby, you don't want to be ordering parts, failing, and retrying. Regardless of male post or female standoff method of mounting, you'll want to understand if you need additional standoffs to avoid clearance issues with the sensor. Maybe tape the sensor roughly where you want to mount. Make sure that the sensor is not going to interfere with anything when shock is compressing. Here are some measurements to help you with the stack height:

MIPS 50-150 heim joint width: ~5.9 mm
M3 Nut Thickness: ~2.3 mm
M3 Washer: ~0.7 mm

When your sensor is taped to the frame roughly where you want to mount, just measure the distance between the heim joint to where the mounting post or standoff is. This will be the distance you will want to fill with generic non threaded standoffs. You'll need to ensure that your bolt is long enough and has enough thread to screw everything together. Purchase whatever standoffs you need to fill in the gap.

Example #2: Tapping and drilling your shock mounting bolts

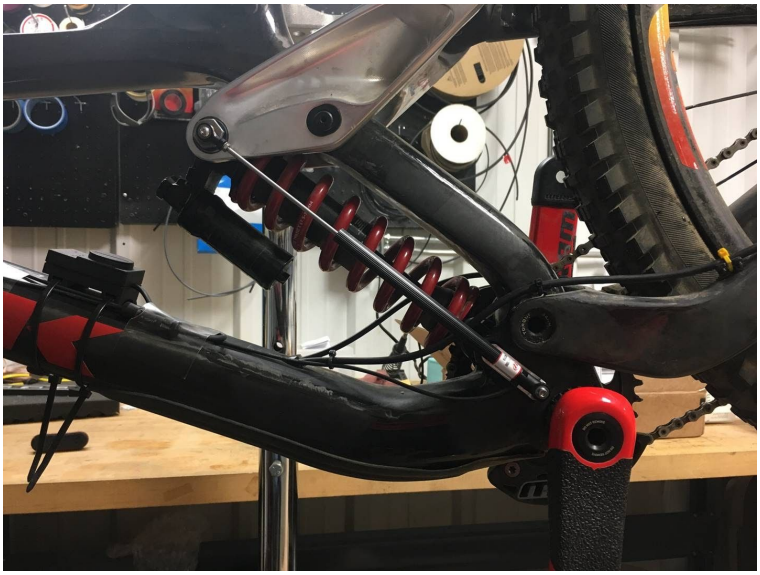
If you have access to a machine shop or you are handy with drilling and using a tap, you can drill the shock mounting bolts. Here is a drill bit guide:

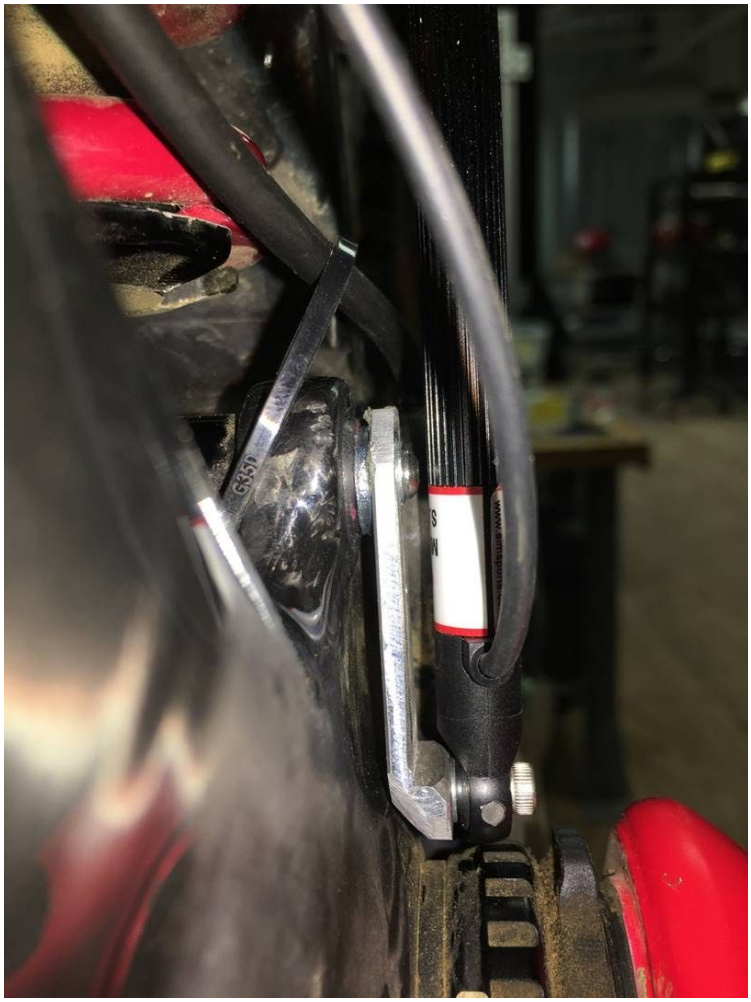
Tap size	Basic major dia (mm)	Basic major dia (inch)	mm per thread	Drill size (mm)	Drill size (inch)
M1.6 x 0.35	1,6mm	.0630	.35	1,25mm	#55
M2 x 0.4	2mm	.0787	.4	1,6mm	#52
M2.5 x 0.45	2,5mm	.0984	.45	2,05mm	#46
M3 x 0.5	3mm	.1181	.5	2,5mm	#39
M3.5 x 0.6	3,5mm	.1378	.6	2,9mm	#32
M4 x 0.7	4mm	.1575	.7	3,3mm	#30
M5 x 0.8	5mm	.1969	.8	4,2mm	#19

The MIPS 50mm, 75mm, 100mm, and 150mm heim joint eyes are 3mm diameter. Therefore, a M3 bolt will work fine. Note for an M3 bolt, you'll want to use a 2.5mm diameter drill bit.

For the MIPS 200 and 250 sensors, the heim joint eyes are 5mm diameter. We already have mounting solutions for the fork with these sensors, but we include this information as a reference.

Here is an example of drilling out the shock mounting bolts.

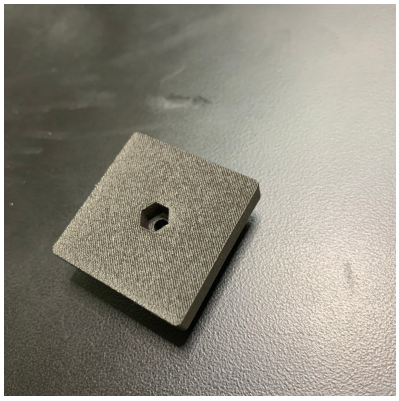


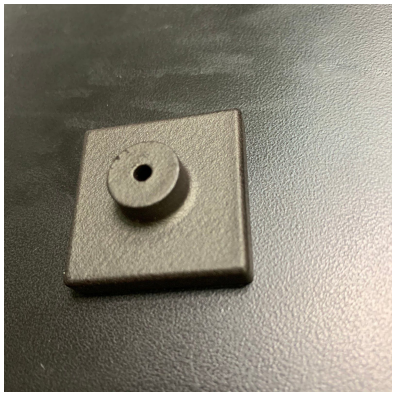


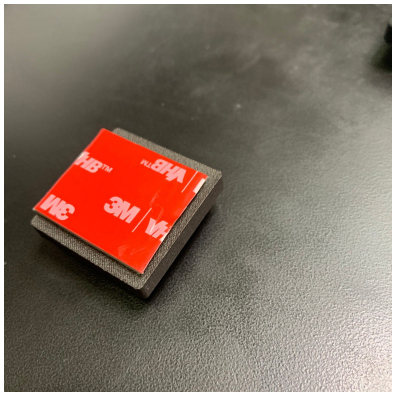
Notice the shock bolt eye to eye was too short for the sensor mounting minimum so they had to fabricate a small piece of sheet metal to extend the mounting length.

Using MI base mounts

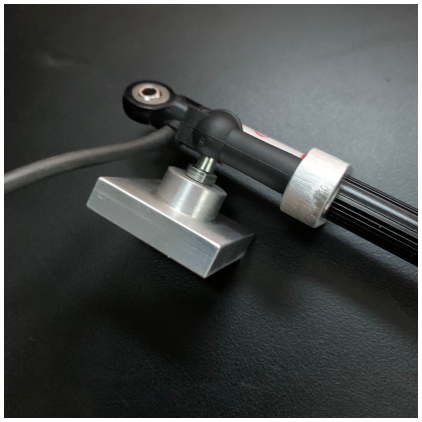
Motion Instruments also has plastic parts you can purchase that are designed to be taped to the frame. We use 3M VHB and have had great luck using Gorilla two faced 30 lb. tape.






3M
VHB™

We have one other method which uses a clamp on the body of the sensor with a pop joint. This can also be used in areas where the sensor is difficult to mount. There is a body clamp with a pop ball joint. This gives a lot of freedom to the sensor and provides a strong mount. You just need to align the sensor to the shock.



Where to go for hardware

Before we get started, there is one place to go for hardware, it's the best website on the planet for as many parts as they stock. McMaster-Carr

With a click of a button, you'll have everything you need usually within a day. They even have an app that is pretty amazing too.

M3 Bolts (For use with MIPS 50-150 heim joints), Search by part number on McMaster-Carr

M3 × 0.5 mm

18-8 Stainless Steel

3	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A021	11.11
4	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	50	91292A109	2.94
5	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A110	4.97
6	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A111	9.66
8	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A112	4.52
10	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A113	4.97
12	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A114	4.97
14	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A027	6.32
15	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	5	91292A346	9.87
16	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A115	5.87
18	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A029	6.32
20	Fully Threaded	—	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A123	6.78
22	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	50	91292A801	4.52
25	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	100	91292A020	7.23
30	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	50	91292A022	4.29
35	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A033	3.73
40	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A024	3.28
45	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	50	91292A025	12.21
50	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A026	3.95
55	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A314	8.59
60	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	50	91292A267	12.67
65	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A315	10.05
70	Partially Threaded	18	Coarse	5.5	3	2.5 mm	70,000	DIN 912, ISO 4762	25	91292A316	10.42

M3 Nuts: Search by part number on [McMaster-Carr]

Metric 18-8 Stainless Steel Hex Nuts

These nuts have good chemical resistance and may be mildly magnetic. Metric 18-8 stainless steel is also known as A2 stainless steel.

Black-oxide stainless steel nuts have a dark surface color.

For technical drawings and 3-D models, click on a part number.

Thread Size	Pitch, mm	Wd., mm	Ht., mm	Specifications Met	Pkg. Qty.		Pkg.
18-8 Stainless Steel							
M3	0.5	5.5	2.4	DIN 934	100	91828A211	$5.55
Black-Oxide 18-8 Stainless Steel							
M3	0.5	5.5	2.4	DIN 934	100	98676A100	5.39

M3 Washers: Search by part number on [McMaster-Carr]

Metric General Purpose Washers

316 stainless steel washers have excellent resistance to chemicals and salt water. They may be mildly magnetic.

18-8 stainless steel and **17-7 PH stainless steel** washers have good chemical resistance and may be mildly magnetic. **17-7 PH stainless steel** washers are stronger than 18-8 stainless steel washers. **Black-oxide 18-8 stainless steel** washers have a matte-black finish.

For technical drawings and 3-D models, click on a part number.

For Screw Size	ID, mm	OD, mm	Thick., mm	Hardness	Specifications Met	Pkg. Qty.		Pkg.
316 Stainless Steel								
M3	3.2	7.0	0.4-0.6	Not Rated	DIN 125	100	90965A130	$2.80
18-8 Stainless Steel								
M3	3.2	7.0	0.4-0.6	Not Rated	DIN 125	100	93475A210	1.62
Black-Oxide 18-8 Stainless Steel								
M3	3.2	7.0	0.4-0.6	Rockwell B75	DIN 125	100	98269A420	2.47
17-7 PH Stainless Steel								
M3	3.2	7.0	0.4-0.6	Rockwell C40	—	10	91860A051	13.56

Metric Split Lock Washers for Socket Head Screws

Also known as high-collar lock washers, these have smaller outside diameters than standard split lock washers to fit neatly under socket head cap screws. As a screw is tightened, they flatten to add tension to the joint and prevent loosening from small amounts of vibration.

316 stainless steel washers have excellent resistance to chemicals and salt water. They may be mildly magnetic.

18-8 stainless steel washers have good chemical resistance and may be mildly magnetic.

CAD For technical drawings and 3-D models, click on a part number.

For Screw Size	ID, mm	OD, mm	Thick., mm	Hardness	Specifications Met	Pkg. Qty.		Pkg.
316 Stainless Steel								
M3	3.4	5.6	0.9-1.1	Not Rated	DIN 7980	100	94241A510	$5.08
18-8 Stainless Steel								
M3	3.4	5.6	0.9-1.1	Not Rated	DIN 7980	100	91111A118	1.62

M3 Spacers: Search by part number on McMaster-Carr

18-8 Stainless Steel Unthreaded Spacers

18-8 stainless steel spacers have good corrosion resistance and may be mildly magnetic.

4.5 mm OD

Lg., mm	For Screw Size	ID, mm	Specifications Met		Each 1-9	Each 10-Up
2	M3	3.200	ASTM A582	92871A102	$1.45	$1.23
3	M3	3.200	ASTM A582	92871A171	1.45	1.23
4	M3	3.200	ASTM A582	92871A173	1.54	1.30
5	M3	3.200	ASTM A582	92871A175	1.61	1.36
6	M3	3.200	ASTM A582	92871A177	1.67	1.42
7	M3	3.200	ASTM A582	92871A301	1.57	1.32
8	M3	3.200	ASTM A582	92871A179	1.75	1.47
9	M3	3.200	ASTM A582	92871A302	1.63	1.37
10	M3	3.200	ASTM A582	92871A181	1.80	1.52
11	M3	3.200	ASTM A582	92871A303	1.72	1.45
12	M3	3.200	ASTM A582	92871A304	1.75	1.47
13	M3	3.200	ASTM A582	92871A183	1.95	1.66
14	M3	3.200	ASTM A582	92871A185	2.02	1.71
15	M3	3.200	ASTM A582	92871A305	1.78	1.50
16	M3	3.200	ASTM A582	92871A187	2.23	1.88
17	M3	3.200	ASTM A582	92871A306	1.76	1.49
18	M3	3.200	ASTM A582	92871A307	1.85	1.57
19	M3	3.200	ASTM A582	92871A189	2.43	2.06
20	M3	3.200	ASTM A582	92871A191	2.44	2.07
25	M3	3.200	ASTM A582	92871A193	2.48	2.09

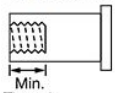
6 mm OD

Lg., mm	For Screw Size	ID, mm	Specifications Met		Each 1-9	Each 10-Up
2	M3	3.200	ASTM A582	92871A001	$1.93	$1.64
3	M3	3.200	ASTM A582	92871A003	1.94	1.65
4	M3	3.200	ASTM A582	92871A005	1.98	1.68
5	M3	3.200	ASTM A582	92871A007	2.01	1.70
6	M3	3.200	ASTM A582	92871A009	2.03	1.72
8	M3	3.200	ASTM A582	92871A011	2.07	1.75
10	M3	3.200	ASTM A582	92871A013	2.11	1.81
13	M3	3.200	ASTM A582	92871A017	2.19	1.86
14	M3	3.200	ASTM A582	92871A019	2.21	1.87
16	M3	3.200	ASTM A582	92871A021	2.41	2.05
19	M3	3.200	ASTM A582	92871A023	2.45	2.08
20	M3	3.200	ASTM A582	92871A025	2.48	2.11
25	M3	3.200	ASTM A582	92871A027	3.09	2.62
30	M3	3.200	ASTM A582	92871A201	2.84	2.40
35	M3	3.200	ASTM A582	92871A203	3.13	2.64
40	M3	3.200	ASTM A582	92871A205	3.36	2.83
45	M3	3.200	ASTM A582	92871A207	3.62	3.05
51	M3	3.200	ASTM A582	92871A209	3.82	3.23

M3 Threaded Spacers: Search by part number on McMaster-Carr

These also work great with generic fabrication with steel stick putty. You can press these into the putty if you want a female mount.

18-8 Stainless Steel—Metric



Lg., mm	For Hole Dia., mm	For Min. Panel Thick., mm	Thread Size	Thread Pitch, mm	Threading	Min. Thread Lg., mm	PEM® Part Number	Specifications Met	Pkg. Qty.		Pkg.
4.2 mm OD											
6	4.2	1	M3	0.5	Partially Threaded	3	BSOS-M3-6	ASTM A380	10	93090A571	$5.22
8	4.2	1	M3	0.5	Partially Threaded	4	BSOS-M3-8	ASTM A380	10	93090A572	4.83
10	4.2	1	M3	0.5	Partially Threaded	4	BSOS-M3-10	ASTM A380	10	93090A567	5.46
12	4.2	1	M3	0.5	Partially Threaded	5	BSOS-M3-12	ASTM A380	10	93090A568	6.22
14	4.2	1	M3	0.5	Partially Threaded	7	BSOS-M3-14	ASTM A380	10	93090A569	7.31
5.4 mm OD											
6	5.4	1	M3	0.5	Partially Threaded	3	BSOS-3.5M3-6	ASTM A380	10	93090A547	5.93
8	5.4	1	M3	0.5	Partially Threaded	4	BSOS-3.5M3-8	ASTM A380	10	93090A548	5.46
10	5.4	1	M3	0.5	Partially Threaded	4	BSOS-3.5M3-10	ASTM A380	10	93090A544	6.18
12	5.4	1	M3	0.5	Partially Threaded	5	BSOS-3.5M3-12	ASTM A380	10	93090A545	6.61
14	5.4	1	M3	0.5	Partially Threaded	7	BSOS-3.5M3-14	ASTM A380	10	93090A546	8.30

Steel Stick: Search by part number on [McMaster-Carr]

Metal-Reinforced Epoxy Structural Adhesives

These machinable epoxies are mixed with metal so they can be used to repair cracks and threaded holes. The strongest and most weather- and chemical-resistant structural adhesives, epoxies work especially well on metals. For **putty** adhesives, slice off the required amount, then knead it together to form a moldable adhesive.

SteelStik is reinforced with steel, but won't rust.

	Container				Strength							
Mfr. Model No.	Size, oz.	Type	Begins to Harden	Reaches Full Strength	Shear, lbs./sq. in.	Peel, lbs./in. wd.	Consistency (Viscosity)	Temp. Range, °F	Color	For Joining		Each
J-B Weld Adhesives												
SteelStik	2	Stick	5 min.	60 min.	900	Not Rated	Not Rated	-20° to 300°	Gray	Metal, Rubber, Composites, Masonry	7605A2	$6.81

Conclusion

Mounting the rear sensor is not difficult, but it does require patience and a little out of the box thinking. Having a stable mount is paramount when collecting data. If your sensor is not fastened correctly, then your data will be suspect. Send us a note and we'd be happy to jump on a call, skype video, or whatever it takes to help you out.