MMCX Connector Assembly

This document describes in detail how to assemble a male or female Huber + Suhner MMCX connector.

If you have purchased a CS1X0 or a FC100 and have not also purchased the PPMS kit, you will need to install a male MMCX connector onto your own cabling. These mating connectors are provided free with your stress or strain cells. If you have a problem with the existing female MMCX connectors attached to your strain cell you may be required to replace it with new female connector.

MMCX connectors

Razorbill Instruments currently provides the following parts:

Gender	Manufacturer	Part number
Male	Huber + Suhner	11_MMCX-50-1-2/111
Female	Huber + Suhner	21_MMCX-50-1-2/111

And in the past has also provided:

Gender	Manufacturer	Part number
Male	Cinch	135-9436-001
Female	Cinch	135-3336-001
Male	Molex	73415-2261
Female	Molex	73415-3410

This installation guide only applies to the Huber + Suhner connectors that we currently supply with Razorbill Instruments products. If you have one of the older types, contact us for installation instructions.

About the MMCX connector

MMCX is standard connector type with many different manufacturers making their own versions. Any male connector from any manufacturer ought to mate with and female connector from any manufacturer.

Choosing MMCX connectors for our products is a bit of a compromise. There are very few connectors small enough to fit into the tight confines of many of our customer's cryostats, and the MMCX connector is usually sufficiently robust and reliable, but there are some things to be aware of:

- The mating force can be very high. This makes it difficult to pull apart. Care should be taken to grip the metal connector

when pulling the male and female connectors apart (do not pull on the cables).

- To get a low noise signal, it is preferable for coax 'outer' to be connected to only one clean ground (at the capacitance bridge). Consequently, you should insulate the metal connectors from making contact with the metal of the cryostat. This can be done by wrapping the cryostat or connector with PTFE or other insulating tape.
- Small connectors are fragile and easily damaged. Treat them carefully, and never push multimeter probes into the connectors – it is easy to bend the centre contacts.
- In rare situations the connectors may not connect correctly, not forming a good electrical connection on either the core or the outer.
  - A poor core connection leads to a too-low capacitance reading, typically 1-20 femtofarads rather than around a picofarad.
  - A poor outer connection leads to an offset of a few femptofarads in the measured capacitance. The size of the offset depends on the resistance of the cables in use, and often comes and goes apparently at random.

  Either may only occur at low temperature or happen intermittently. This is usually a sign that one of the connectors needs replacing. Attempt to determine which connector is at fault by trying different combinations of male and female connectors and seeing which combinations have faults. You may be able to identify the faulty connector by observing changes in capacitance when the connector is touched or twisted.

Connector installation

The following procedure works for male and female connectors. The female connectors should be on the leads connecting to the stress or strain cell and the male connectors should be on the cryostat/capacitance bridge side.

The procedure is very similar for both male and female connections, with only the shape of the 'body assembly' differing.

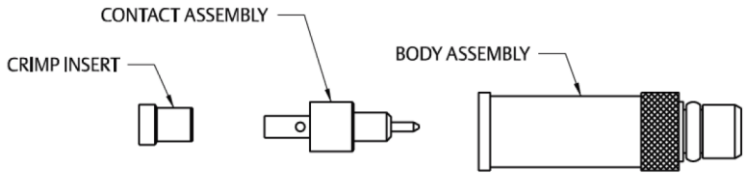

Figure 1. *The three parts that make up a MMCX connector. Pictured above is the male version of the body assembly.*

Tools required to install the connector:

- End-cutter
- Tweezers
- Calliper (or ruler)
- Scalpel (optional)
- Microscope
- Soldering iron
- Crimping tool (1.69 mm or .105 inch)

Remove existing connector (if required)

Figure 2. If you are replacing a connector that is suspected of being faulty, use an end-cutter to cut off the existing connector. Cut close to the connector as to avoid making the cable too much shorter.

Add Crimp insert and heat shrink

Figure 3. Thread the crimp insert onto cable with the narrow end pointing towards the connector. If you are using coloured heat shrink tubing to label the cable, add that now.

Remove a section of outer insulation

Figure 4. Use the end cutter and/or scalpel to remove 3.4 mm of the outer (transparent) insulation. Take care not to damage the gold-coated copper strands inside. The photo shows the tip of a calliper set to 3.4 mm, used to judge the length.

Bend back the braid

Figure 5. Using tweezers, unravel and bend back the gold-coated copper strands leaving the inner exposed.

Strip insulation from the inner

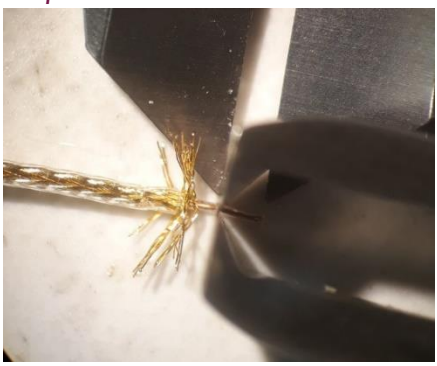

Figure 6. Using the end cutters and gentle pressure, carefully remove 1.6 mm of the inner insulation. In the photo to the left the callipers (which are now set to 1.6 mm gap) were used to judge the length of the insulation to be removed

Tin the exposed inner with solder

Figure 7. Add flux to the exposed inner strands and cover them with solder using a soldering iron. For cryogenic use it is preferable to use lead-containing solder. Make sure the strands are tightly grouped because the next step requires inserting this tinned section into a tight hole.

Add the contact assembly

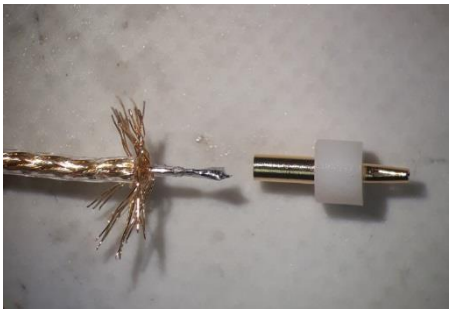

Figure 8. insert the tinned section of the inner into the hole in the back of the contact assembly. It may be necessary to melt the solder with the soldering iron to slide the tinned section into the narrow hole. Once the section is inserted solder it in place. It is important that there are no stray strands of the core or large solder blobs outside the contact assembly, as they could cause shorts.

Position the Crimp Insert

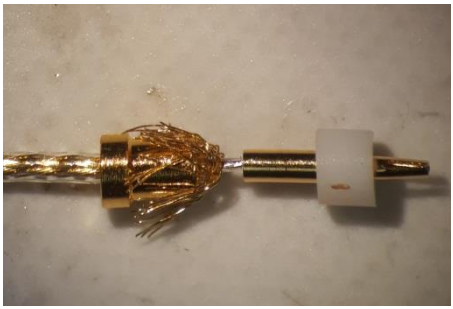

Figure 9. With the inner soldered securely in position, move the crimp insert back up the cable and arrange the outer strands around it as shown in photo. Make sure that none of the outer stands touch the contact assembly or this will lead to a short when the connector is assembled.

Insert into the body assembly

Figure 10. Ensuring that the crimp insert remains in the correct position (with the strands surround it), insert it into the body assembly. Hold the crimp insert and gently push in. Do not simply push forward on the cable or the crimp insert will lose its position surrounded by the strands of braid. The crimp insert only needs to be flush with the back of the body or perhaps 0.2mm lower - pushing it in too too far will cause a short between the contact assembly and the braid!

Crimp the body onto the cable

Figure 11. Using a 1.69 mm or .105 inch crimping tool, crimp the connector. The purpose of crimping is to crush the body assembly onto the crimp insert so that the outer stands are sandwiched between the two. This makes sure the connector is strongly mechanically bonded to the outer strands. Do not crimp the end

where the connector is going to mate. It is important that the position of the crimp insert or the cabling does not shift while you load the connector into the crimping tool. Most university electronics workshops will have a suitable crimping tool. If no crimping tool is available, you can crush the crimp with pliers, but this makes a weaker join.

Test the connector

The final step is to test whether the connector you just installed operates correctly. Make sure the connector is well attached to the cable. Make sure there is a high resistance between the inner and the outer. Make sure that it makes a good electrical connection when it is plugged into another connector. When the stress or strain cell is plugged into the capacitance bridge does it read a reasonable capacitance (refer to the device datasheet)? If all these questions are satisfied, your connector is correctly installed and ready to use.