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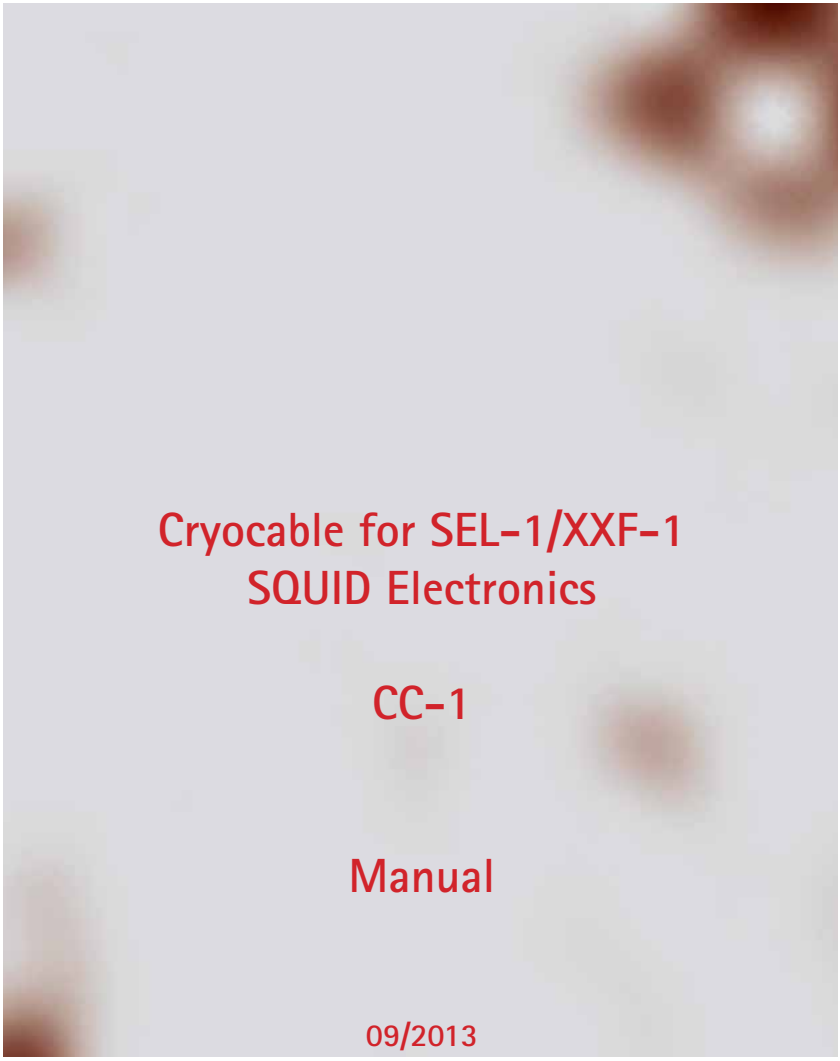


Cryocable for SEL-1/XXF-1 SQUID Electronics

CC-1

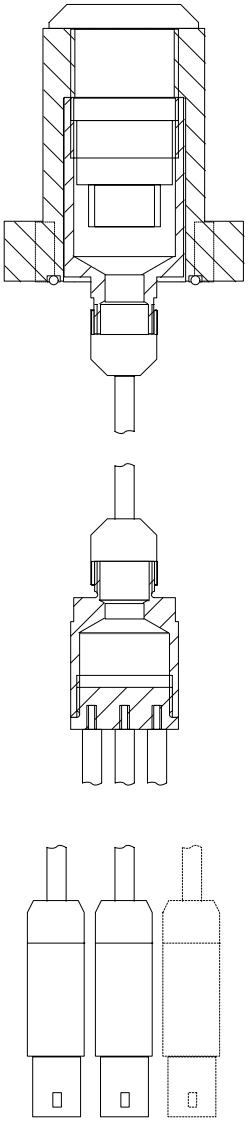
Manual

09/2013

Contents

Cryocable CC-1

The cryocable CC-1 is for use with Magnicon SQUID electronics SEL-1 and XXF-1. It offers the possibility of a vacuum tight and EMI shielded connection from the warm flange with a LEMO plug socket (HGG.3B.324) to the cold SQUID side.



flange with 24 pin LEMO socket

stainless steel braid with Copper/Alloy30 wires in a silicone tube

optional cable manifold for two or three sensors

stainless steel braids with Copper/Alloy30 wires in a silicone tube

optional plugs

Fig. CC1: Photograph of CC-1 cryocable with manifold and three Niobium shielding cans NC-1 .

Flanges

Standard flange

The standard flange consists of five parts. Two aluminum parts (body and flange nut), the cable collet, the collet nut, and a vacuum tight 24 pin LEMO socket (LEMO part # HGG.3B.324.CLLPV).

Two o-rings at the flange body and the LEMO socket allow a vacuum tight connection between dewar lid and flange. Figure CC2 shows the flange parts.

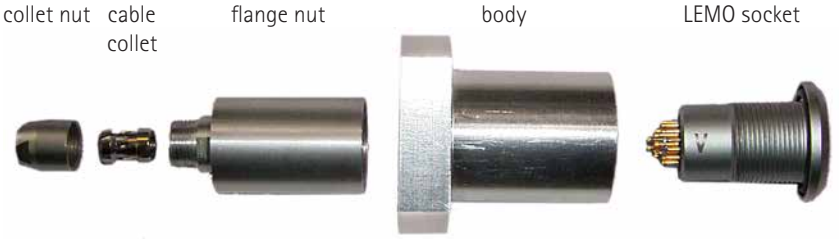


Fig. CC2: Parts of the flange at the warm side of the cable.

If possible, the SEL-1 or XXF-1 SQUID electronics should be plugged directly to the flange socket. Any adapter parts or additional cables may influence bandwidth and performance of the electronics.

Standard flange mounting options

There are two different mounting options for the standard flange at the lid of the cryostat, the on-top mounting and the integrated mounting.

On-Top mounting

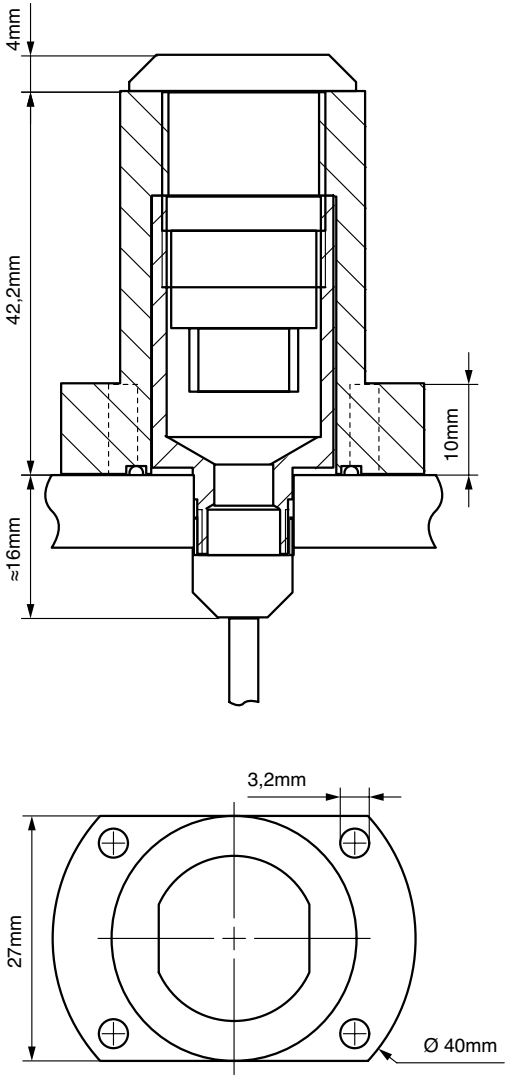


Fig. CC3: Sectional drawing and view from above of the flange for on-top mounting.

The on-top mounting is favorable if the room inside the dewar neck is limited or if you need the option to install and remove the whole cryocable without access to the inner side of the lid or dewar. You can mount multiple standard flanges side-by-side with 5mm distance if you need a space-saving solution for multichannel systems.

The flange is mounted on the lid with four screws with a maximum diameter of 3.1mm. You can use, e.g., a tapped blind hole, a sealed tapped through hole or a sealed screw/nut combination to fix the flange.

The overall height of the flange (including the LEMO socket) above the lid surface is about 46.2mm.

The diameter of the part with the cable collet is 11.8mm. So, a hole in the lid with 12mm diameter minimum is needed to assemble the flange. If your cable version has a cable manifold, it is recommended to cut a hole with 19mm diameter into the lid to allow the manifold to fit through the hole.

Figure CC3 shows a sectional drawing of the flange for on-top mounting and a view from above with some dimensions.

Figure CC4 shows the distances of the screws and the lid cut-out.

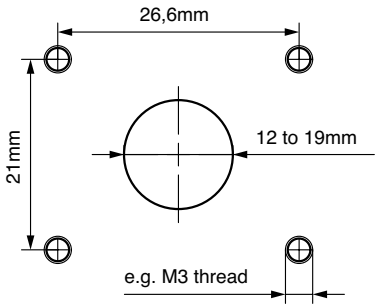


Fig. CC4: Position of mounting screws and lid cut-out for on-top mounting.

Integrated mounting

With the integrated mounting option, the lemo plug socket and the flange nut are used to fix the cable. The flange body is not needed. You need access to the inside of the dewar lid to assemble the socket and to fix the nut. Figure CC5a) shows a sectional drawing of LEMO socket and nut with cable collet.

Figure CC5b) shows the lid cut out for the LEMO socket.

The maximum thickness d of the lid is 11.5mm. If the lid thickness is below 10.5mm you have to use a washer with thickness x to meet x + d = 11±0.5mm. The inner diameter of the washer is 18.2mm, the minimum outer diameter is 20.2mm (see Figure CC5c), d)). Since the washer dimensions depend on your setup, the washer is not delivered by Magnicon®.

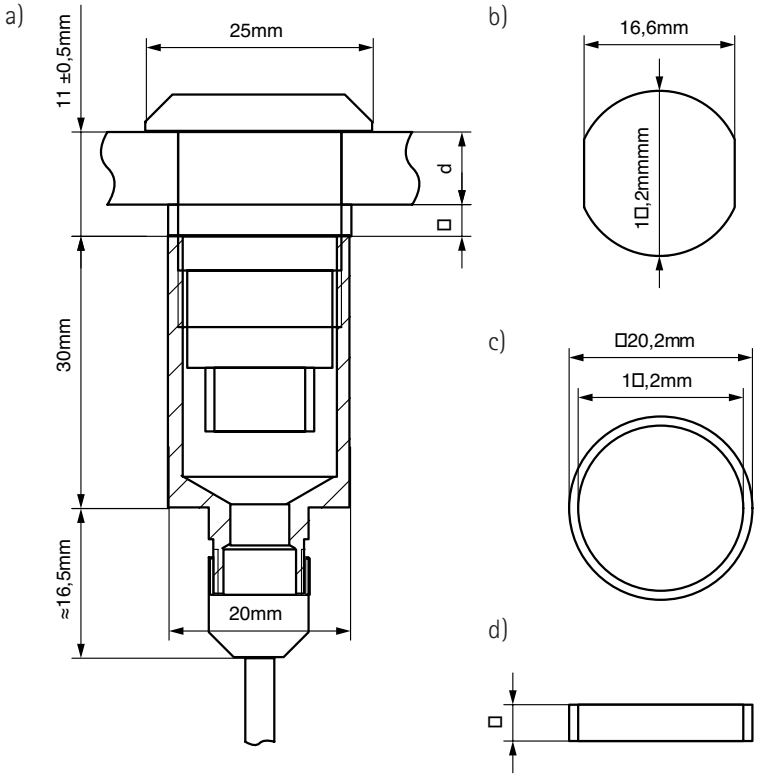


Fig. CC5: a) Sectional drawing, b) lid cut out, c) top view of washer, d) side view of washer.

DN25KF and DN40KF flange

The flange with the 24pin LEMO connector is also available as a DN25KF or DN40KF type flange. Dimensions are shown below. The DN/KF flanges are delivered without DN/KF seal. Flange nut, cable collet, collet nut, and LEMO connector are identical to the standard flange version. For other flange dimensions please contact Magnicon.

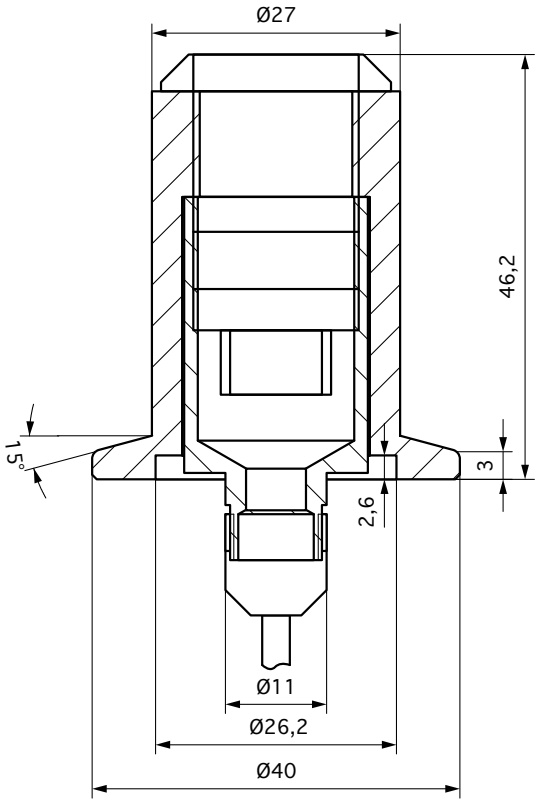


Fig. CC6: DN25KF flange dimensons.

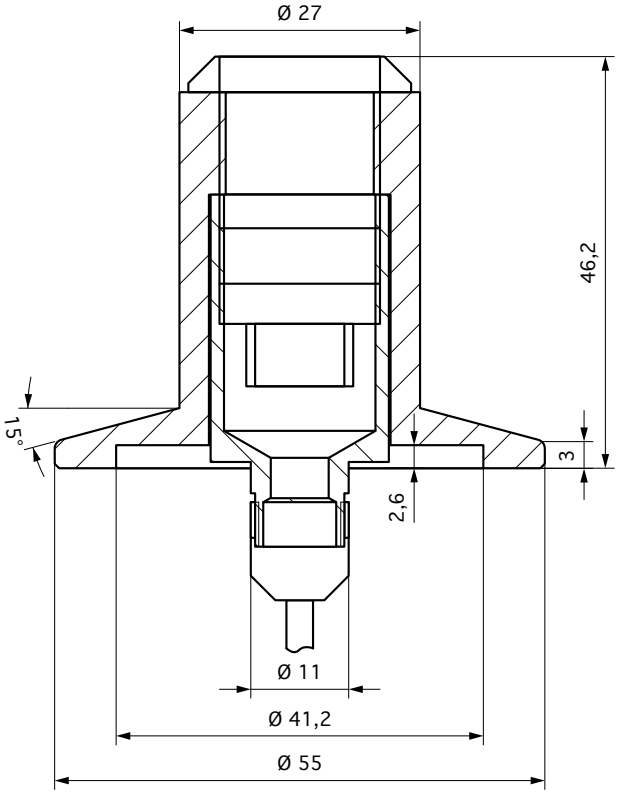


Fig. CC7: DN40KF flange dimensons.

Flange assembling instructions

If you have to solder the wires to the LEMO socket in the flange, e.g. if you have to change the lengths of the cable, please follow this instruction. For pin assignment please see the corresponding SEL-1/XXF-1 manual.

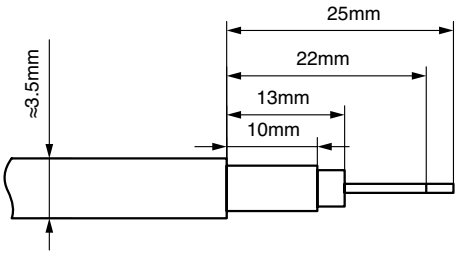


Fig. CC8: Insulation stripping lengths for flange side

Disassembling

1. unscrew the collet nut. If the flange nut starts to turn, fix it with a 11mm spanner or tongs.
2. pull the cable collet carefully out of the flange nut and shift it along the cable. Do not pull the cable.
3. unscrew the flange nut.
4. now you can shift flange nut and flange body away from the LEMO socket.

Assembling

1. strip the insulations as shown in figure CC8.
2. loosen the cable shield and put it over 180° to the back.
3. put the collet nut, the collet and the flange nut over the stripped cable.
4. if you use on-top mounting, put the flange body over the cable.
5. solder the wires to the LEMO socket. Refer to the SEL-1/XXF-1 manual for pin assignment and wiring scheme.
6. fasten the flange nut to the LEMO socket.
7. push the collet towards the flange nut. Be sure that the screen is outside the collet. The screen should be clamped between collet and flange nut.
8. fasten the collet nut. Be sure that the cable is fixed in the collet.

Overall height

The minimum overall height of CC-1 cryocable, attached SEL-1/XXF-1 FLL electronics and FLL cable depends on the chosen mounting option. Figure CC9 shows the minimum height of the electronics with attached FLL cable. For on-top mounting, the minimum overall height is about 321mm, for integrated mounting the overall height is about 279mm.

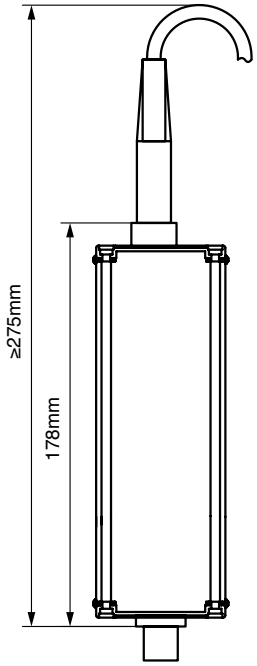


Fig. CC9: Minimum height of FLL electronics case with attached FLL cable.

Cold plug

The optional plug at the cold end of the cryocable is a LEMO JGG.0B.309.CLAD52. The original LEMO plug is dechromed and gold plated by Magnicon. Figure CC10 shows parts and some dimensions of the plug.

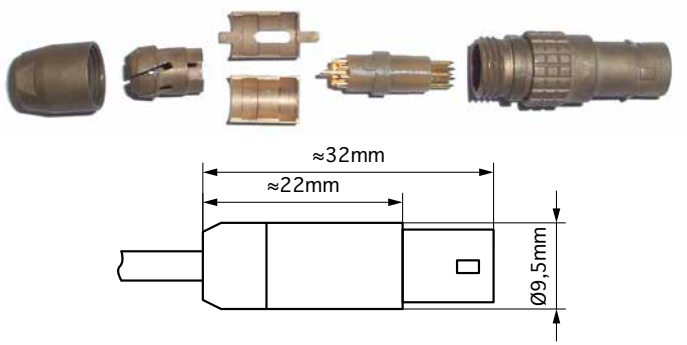


Fig. CC10: Parts and dimensions of the cold plug.

Pin assignment

Figure CC11 shows the pin assignment of the plug for standard single-stage and two-stage sensors. The solder side of the plug is shown (rear view).

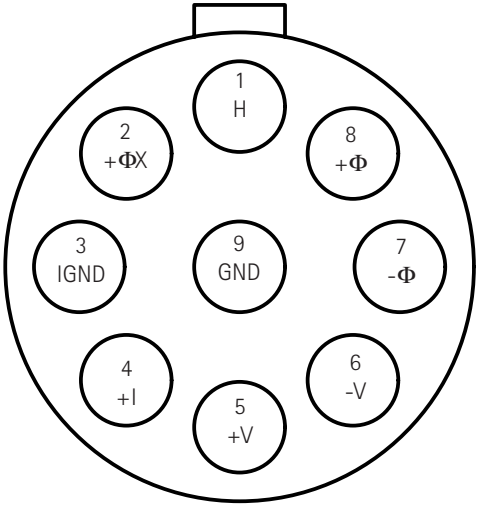


Fig. CC11: Pin assignment of the plug. Rear view (solder side).

For single-stage sensors, only the wires with numbers 5, 6, 7, 8, and 9 are used to connect the sensor to the electronics. For two-stage devices a minimum of seven wires is needed.

Usually all nine wires per channel are installed to guarantuee maximum compatibility with all kinds of sensors.

 Please note, that the pin assignment shown above is valid for all sensors and cryocables delivered past February 11, 2009.

For all sensors and cryocables delivered before February 11, 2009, the pin assignment shown above has to be rotated by 180°.

Please contact Magnicon if you have problems connecting cryocables and sensors with different pin assignments.

Cable manifold options

If more than one channel is used per flange, the single cable from the room temperature end has to be divided to two or three cables with optional plugs. Magnicon offers two options to split the cable screen in multiple strands.

Cable manifold

The cable manifold splits one strand with 2 or 3 sets of wires into multiple strands with a single set of wires each. With the cable manifold you have just one strand going into your dewar. The cable manifold with splitting of the wires can be positioned where you like. It ensures the rf screening of the cable by connecting all cable screens.

The two flats can be used for thermal anchoring if the manifold is fixed to a cold plate.

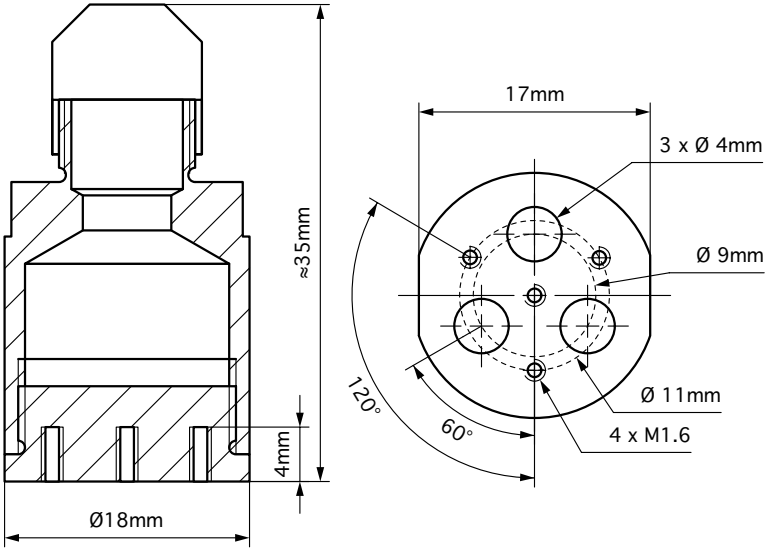


Fig. CC12: Dimensions of cable manifold

Figure CC12 shows some dimensions of the cable manifold. On the downside of the manifold you find four M1.6 threads with a depth of 4mm. You can use these threads to fix the cable inside the dewar. Do not disassemble the manifold.

Single strands

It is also possible to have 2 or 3 strands with the cable shields connected directly at the top flange. With this option you have 2 or 3 seperated strands, each with a stainles steel braided hose (see figure CC13).

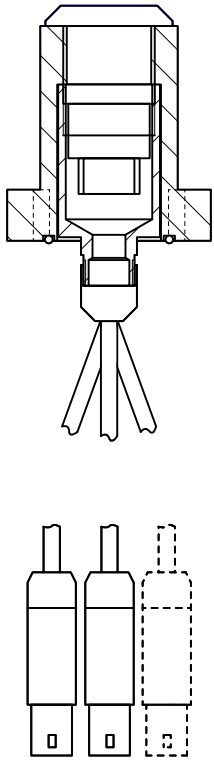


Fig. CC13: Schematic of the single strands option

Cable

The cable consists of several 0.15mm twisted-pair and twisted-triple Cu magnet wires or 0.2mm Alloy30 wires. The total number of wires depends on the number of equipped channels and on the sensor type.

The Cu/Alloy30 wire bunch is surrounded by a talcum-powder free silicone tube to protect the magnet wires when pressed.

The screen is a stainless chrome-nickel steel braid with 120 x AWG 36 wires. The cable diameter is about 2.5-3mm, depending on the number of used wires. The minimum bend radius is about 15mm.

Figure CC14 shows an overview of the different parts of the CC-1 cryocable. The lengths L1 and L2 are customer specific. The maximum overall length L1+L2 is about 2.2m (please note, that the dynamic performance of the system might be reduced for overall length >1.5m).

Each strand is marked with a colored shrink hose near the gold plated LEMO plug. The channel assignment is as follows:

channel 1: red
channel 2: yellow
channel 3: blue

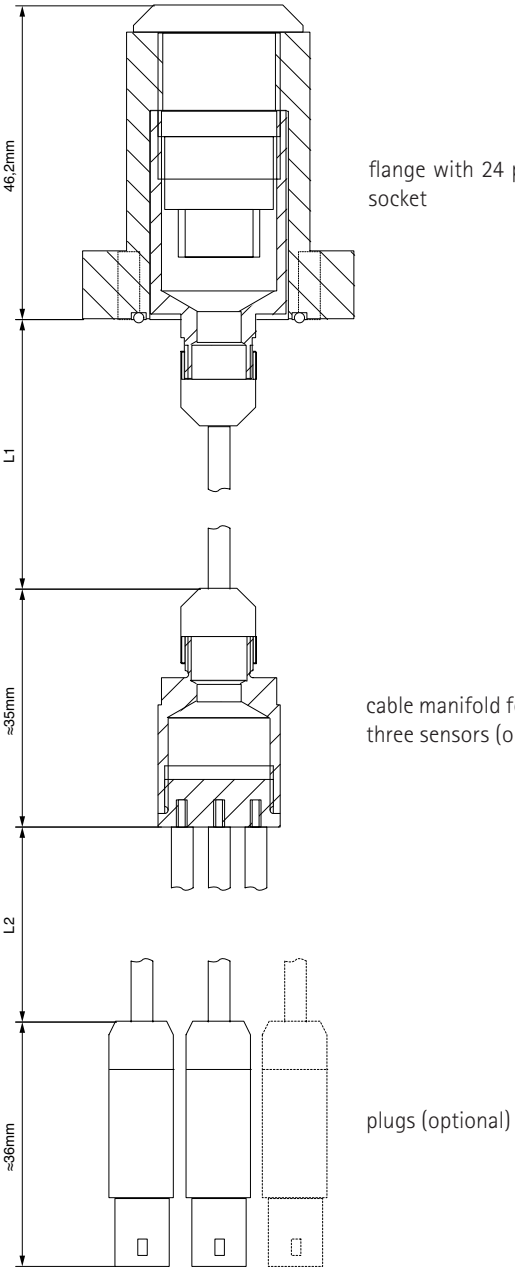


Fig. CC14: Overview of CC-1 parts

Thermal anchoring

The cryocable can be thermally anchored to your cryostat e.g. by using copper clamps. Another option is to firmly wind a copper wire around the stainless steel braid and to connect one end of the wire to the cold plate. Examples of both solutions are shown in figure CC15.

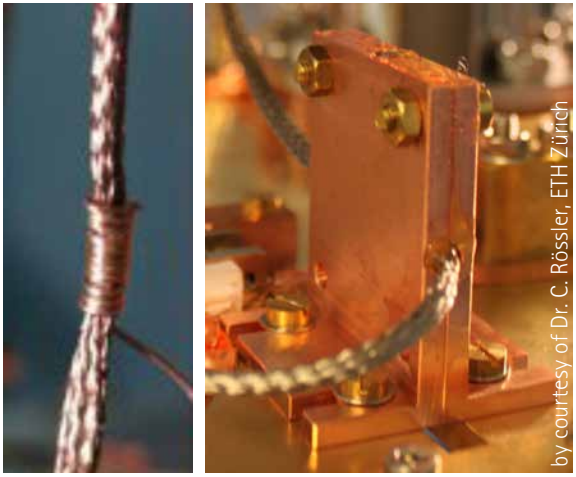


Fig. CC15: example heat sink solutions

In both cases you have to use vacuum grease (e.g. Apiezon N-Grease) to thermally connect the silicone tube to your heat sink. You can warm up the grease with a blow dryer to ensure a good thermal contact between grease, silicone tube, and stainless steel braid.

The most suitable heat sink solution depends on your cryosystem and on your application.

 Do not clamp the cable with too much force. Allthough the inner wires are protrcted by the silicone tube the insulation might be damaged and you will get short circuits bewteen the inner wires. If you use vacuum grease you just need a light compression to get a reliable thermal contact.

Parts and materials

Flange

flange body	aluminum
flange nut	aluminum
collet nut	chromed brass
collet	chromed special brass
LEMO socket body	chromed brass
LEMO socket insulator	PEEK
LEMO socket o-ring	FPM/FKM (Viton®)
flange body o-ring	FPM/FKM (Viton®)

Plug

collet nut	gold plated brass
collet	gold plated special brass
LEMO socket body	gold plated brass
LEMO socket insulator	PEEK

Cable manifold

body	brass
collet nut	gold plated brass
collet	gold plated special brass

Cable

cable screen	chrome-nickel steel (X8CrNiMn1910) 120 x AWG 36
wires	colored twisted pair/triple Cu magnet wire, 0.15mm diameter or 0.2mm Alloy30 twisted pair/triple wires (number of wires depends on number of channels and sensor type)
Alloy30 specs	composition: 98% Cu, 2% Ni specific resistivity: 4.99 $\mu\Omega$ cm therm. conduct.: 1.16 W/cm K coeff. of linear expansion: 16.4 10^{-6} /K
Silicone tube	talcum-powder free, 1.5mm inner diameter, 0.2mm wall thickness

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