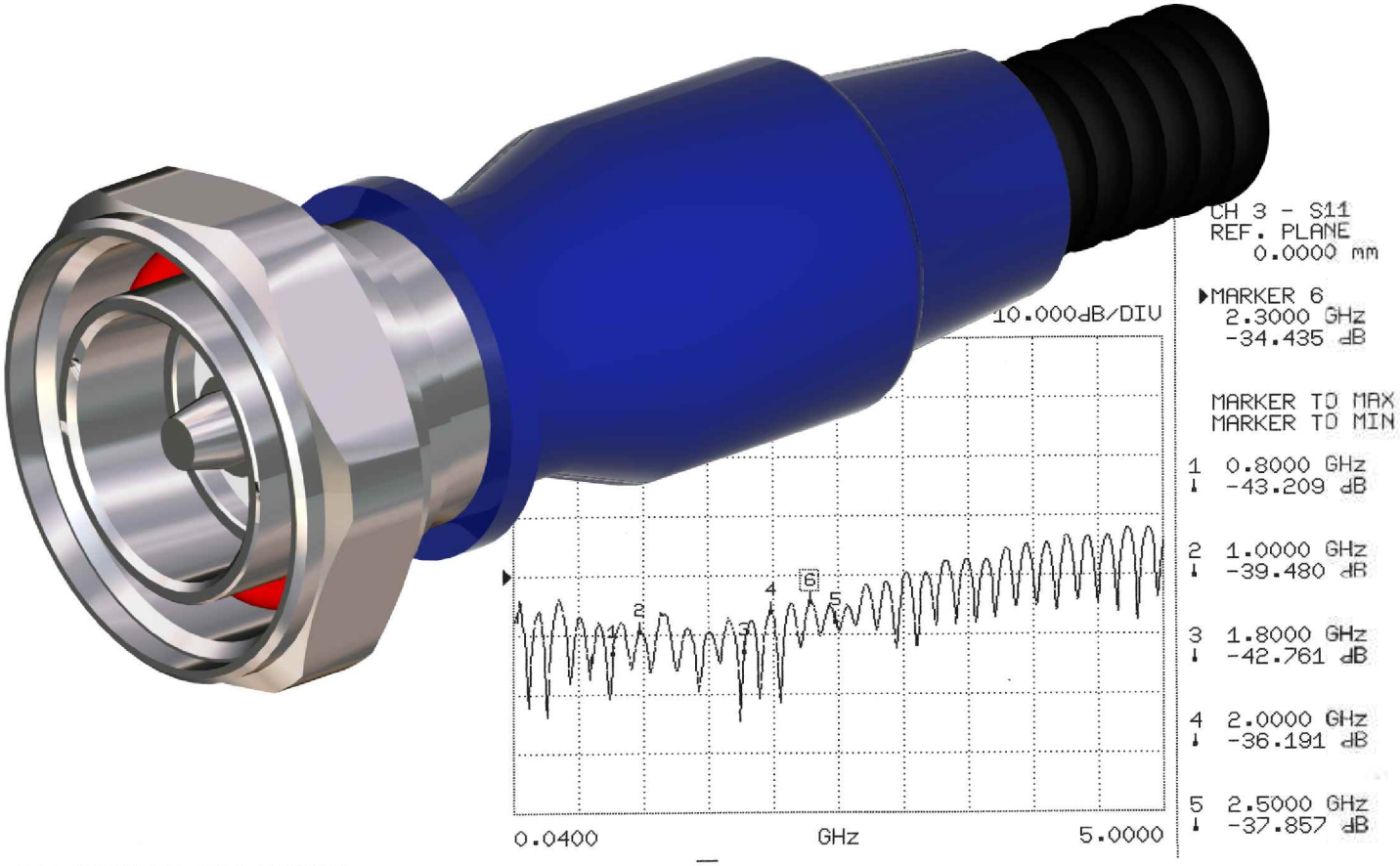
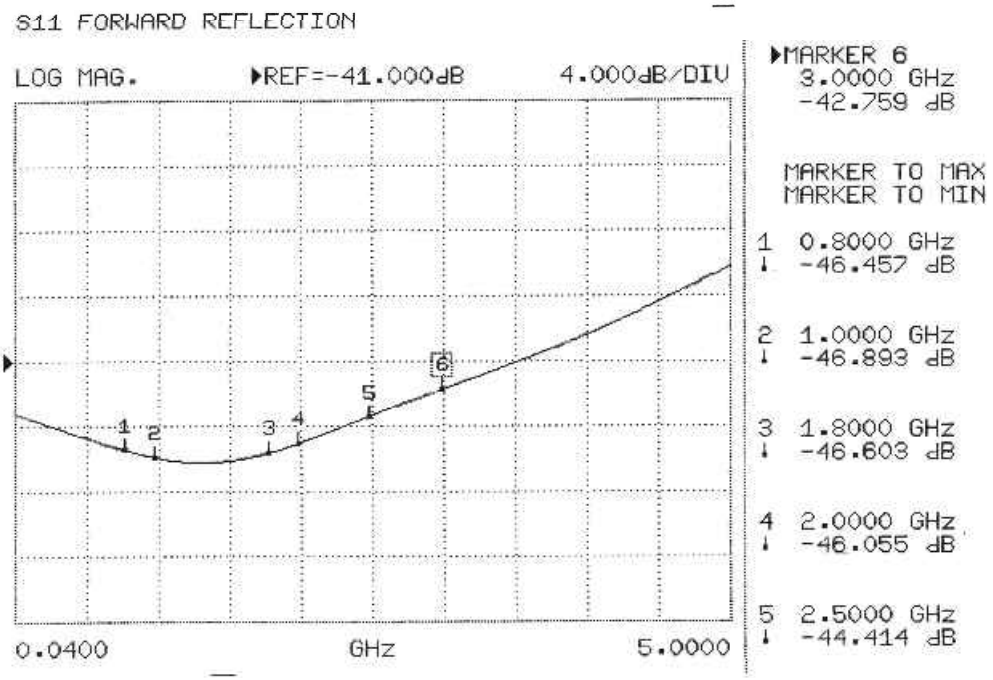
WATERTIGHT FRONT/REAR UNMATED CONNECTOR 7/16





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Watertight and front/rear unmated 7/16 Connector

The reliability factor is an essential characteristic for the telecommunication systems in order to assure the service continuity to the users in any environmental condition. To achieve this objective, it is mandatory the use of some high quality components (transceiver devices, antennas, coaxial cables, connectors, etc.) able to preserve their own electrical characteristics for a long time even if submitted to wide temperature ranges.

Moreover, the connectors used to link the various devices to the antenna (feeders, surge arrestors, jumpers, etc) contain an "O ring" in order to guarantee the watertight feature: this will avoid the water penetration from the outside (either rain or the result of condensation process). Should this happen, it would cause both, irreparable damages to the mechanical parts (oxidation, corrosion, rust, etc.) and the electrical performances downgrading up to a complete system down situation.

An aspect that quite often is not taken into consideration is the fact that the water penetration can occur even inside the cable, between the outer conductor and the protective sheath. This water is caused by the presence of some condensation inside the antennas: from there it flows through the connector, then along the coaxial cable up to the connector fitted to the other end of the cable itself and, finally, it reaches the transceiver devices. The water flow is made easier by a drop of 10 to 20 meters between the antennas and the "base station". Furthermore, the periodical condensation production increases the water quantity and, consequently, the pressure as well, thus further simplifying its flow and falling. Should a crack be present on the outside sheath, the water quantity and pressure will additionally increase when raining.
Due to their excellent electrical characteristics, the "corrugated" coaxial cables are generally used in the telecommunication systems. Unfortunately, their structure allows a better water flow that meets its best conditions within the "superflex" type of cables, because of their "helical corrugation".

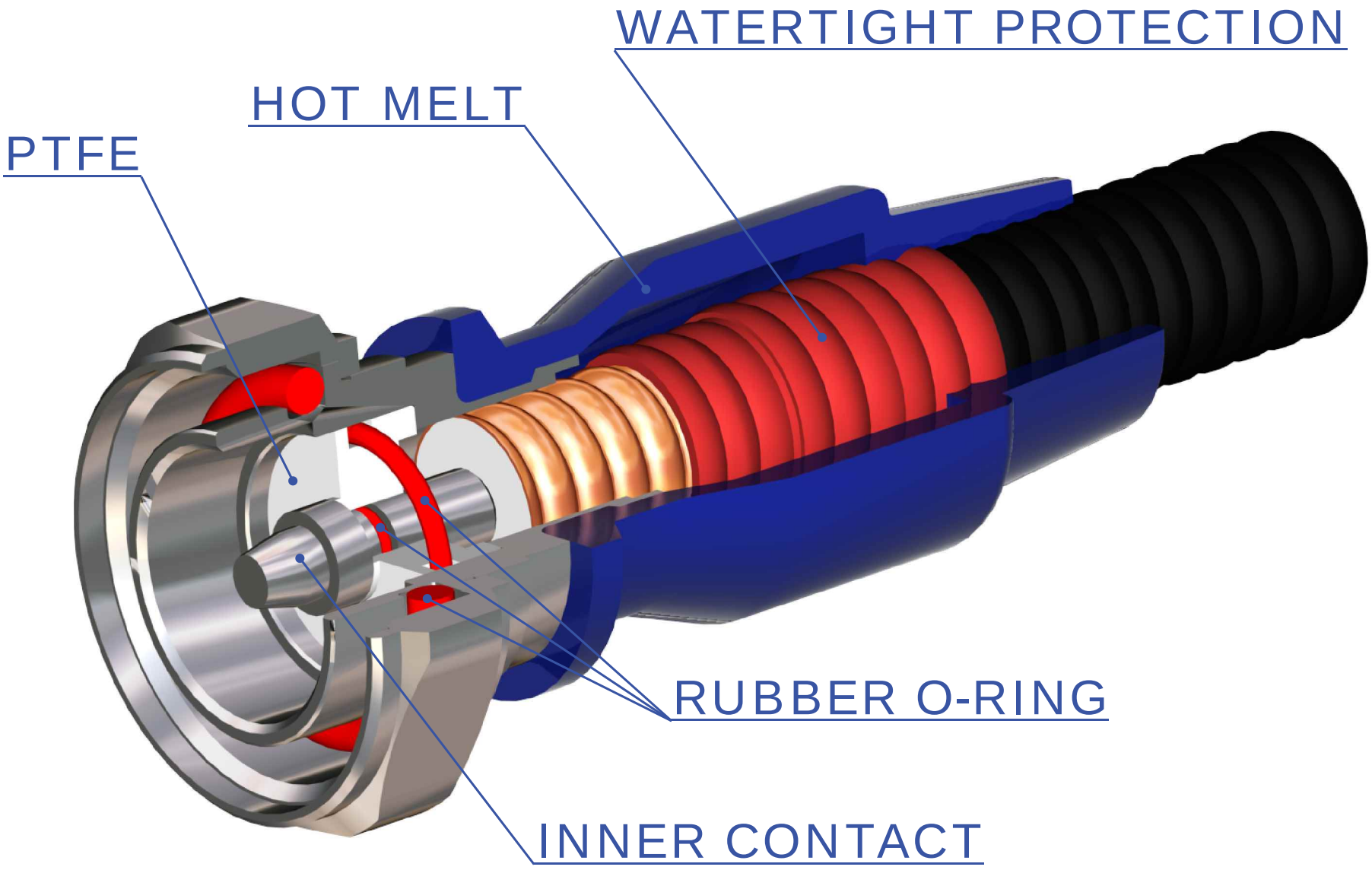
Therefore, to avoid serious troubles, causing in turn severe economical damages, it is necessary to use some watertight connectors able to avoid all possible inconveniences described above.

CPE Italia has developed a new version of a complete watertight 7/16 connector:

- it is watertight on its central area by means of two "O rings" (one between the inner contact and the dielectric, while the second is between the dielectric and the connector metal body)
- it is watertight between the sheath and the outer corrugated conductor by means of a special material
- finally, the outer conductor is soldered to the connector body.

The excellent electrical performances (Return loss greater than 40dB @ 2,5 GHz and intermodulation products better than -160 dBc) have been obtained by designing the connector with the software "CST Microwave Studio" and by overcoming with special arrangements the necessary mechanical solutions implemented to obtain the connector watertight result.
The watertight level is such to resist for a long time to a constant pressure of 2,5 Bar.
More precisely the test have been performed over a periods of one week by applying a protection IP68 according to the IEC 529.

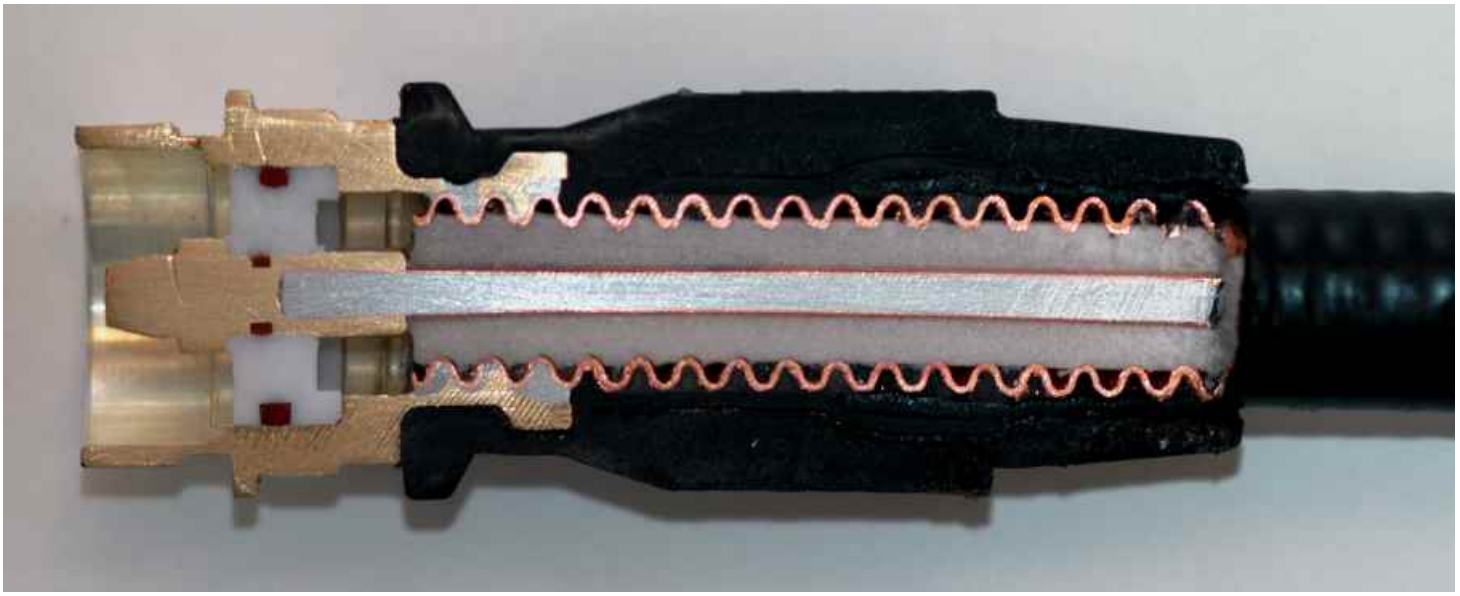
With this new type of connector, it is possible to reach a greater reliability level of the telecommunications systems. In fact, it is now possible to implement complete watertight feeders, jumpers, device interconnection cables, etc. thus keeping unchanged their electrical performances in any environmental situation.

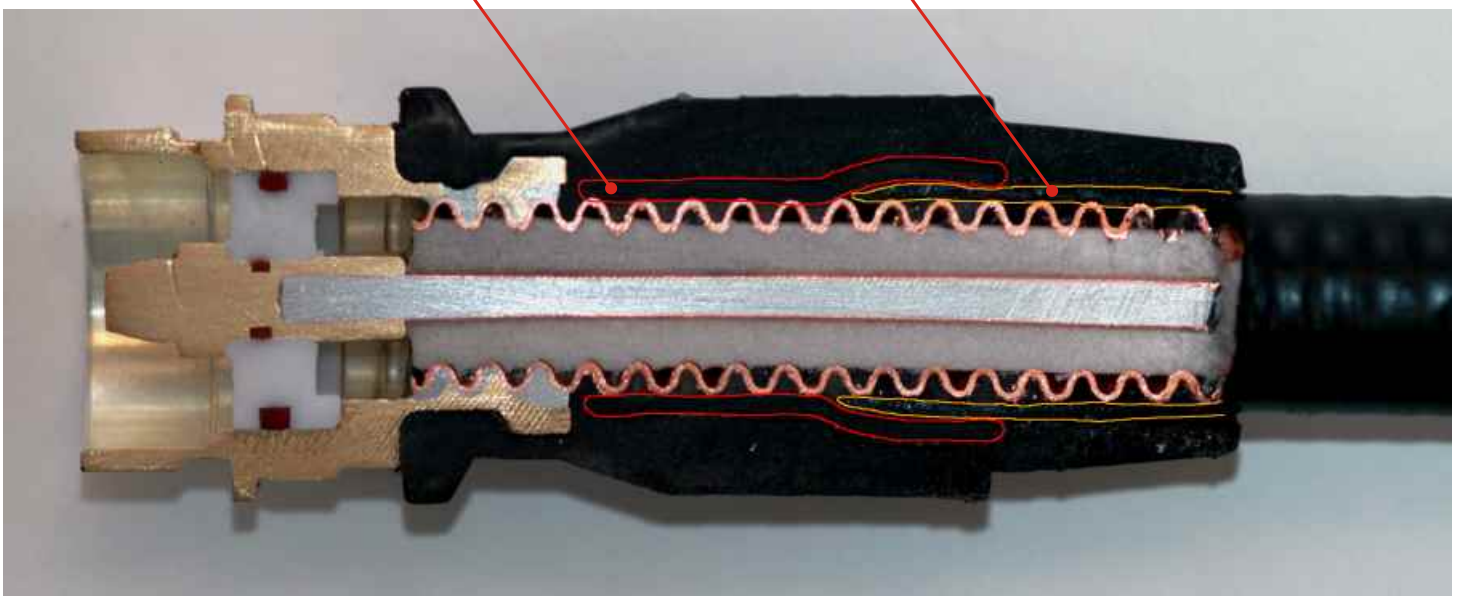

WATERTIGHT PROTECTION
HOT MELT
PTFE
RUBBER O-RING
INNER CONTACT

Procedure for “jumpers” assembling using watertight 7/16 Connector

1. Check that the coaxial cable and connectors correspond to the models shown by the executive drawings related to the jumpers.
2. Cut the coaxial cable according to the proper length taking into account the portion of cable fitting into the connector (see connector assembling instructions).
3. Trimmer the cable following very carefully the steps shown on the “jumpers” assembling instructions.
4. Check the correct implementation of the previous steps by verifying:
   - the absence of cuts and engravings on coaxial cable inner conductor
   - the regular cutting of the coaxial cable outer conductor
   - the absence of unwanted materials (copper particles or others) over the insulation on the trimming area.
5. Pass the cable through the connector inside up to when its trimmered portion will come out from the connector itself (mating side).
6. On the cable inner conductor mount the assembly made by internal insulation + central contact + external O-ring making sure that the ending part of the connector contact perfectly sticks with the coaxial cable insulator.
7. By using an induction welding machine, solder the connector inner conductor over the coaxial cable inner conductor; afterwards make sure that no soldering remains (tin, welding paste, etc.) are laying on the cable insulator that must be perfectly clean. Moreover, make sure that no tin excess be present over the two holes of the central contact, since this would compromise the connector electrical performances and, consequently, the “jumper” performances on its whole .
   Cool the soldered area by using a low pressure airflow.
8. Screw the connector over the cable up to when its insulator beats the connector inside. Check that the insulator fits into the connector body in a centered manner by avoiding any mechanical interference of the external O-ring placed on the connector body.
9. By means of a positioner, make sure that the connector inner conductor be correctly in place and that the functional dimension is that foreseen by the international standards.
10. Solder the connector body by means of the induction welding machine. Fit in the tin into the connector two upper holes up to when the tin itself appears out of the two lower ones. If necessary, add some tin on these two last holes in order to assure a perfect sealing.
    Cool the soldered area by using a low pressure airflow.
11. Check that the connector inside be perfectly clean
12. Over the cable, mount two watertight protection segments.
13. Mount the second connector to the other end of the cable by following the same steps above.
14. Slide the watertight protection segments toward the connectors. They must be positioned by an half over the outer corrugated conductor and the second half over the PE outer sheath. They must become well stretched over both parts of the coaxial cable.
15. Perform the electrical test of the “jumper” according to the operating instructions p/n 91.100.000-003.
16. Hot melt the connectors
17. On a sample basis, check the return loss of the “jumpers”
18. On a sample basis, check the intermodulation products
19. Mark the cable according to the Customer requirements
20. Visually inspect the “jumpers” to ascertain that no defects are present on both, cable and connectors and that all requested data have been filled.
21. Pack the products in an adequate containers according to the “jumper” type, length and quantity.

SECTIONAL VIEW



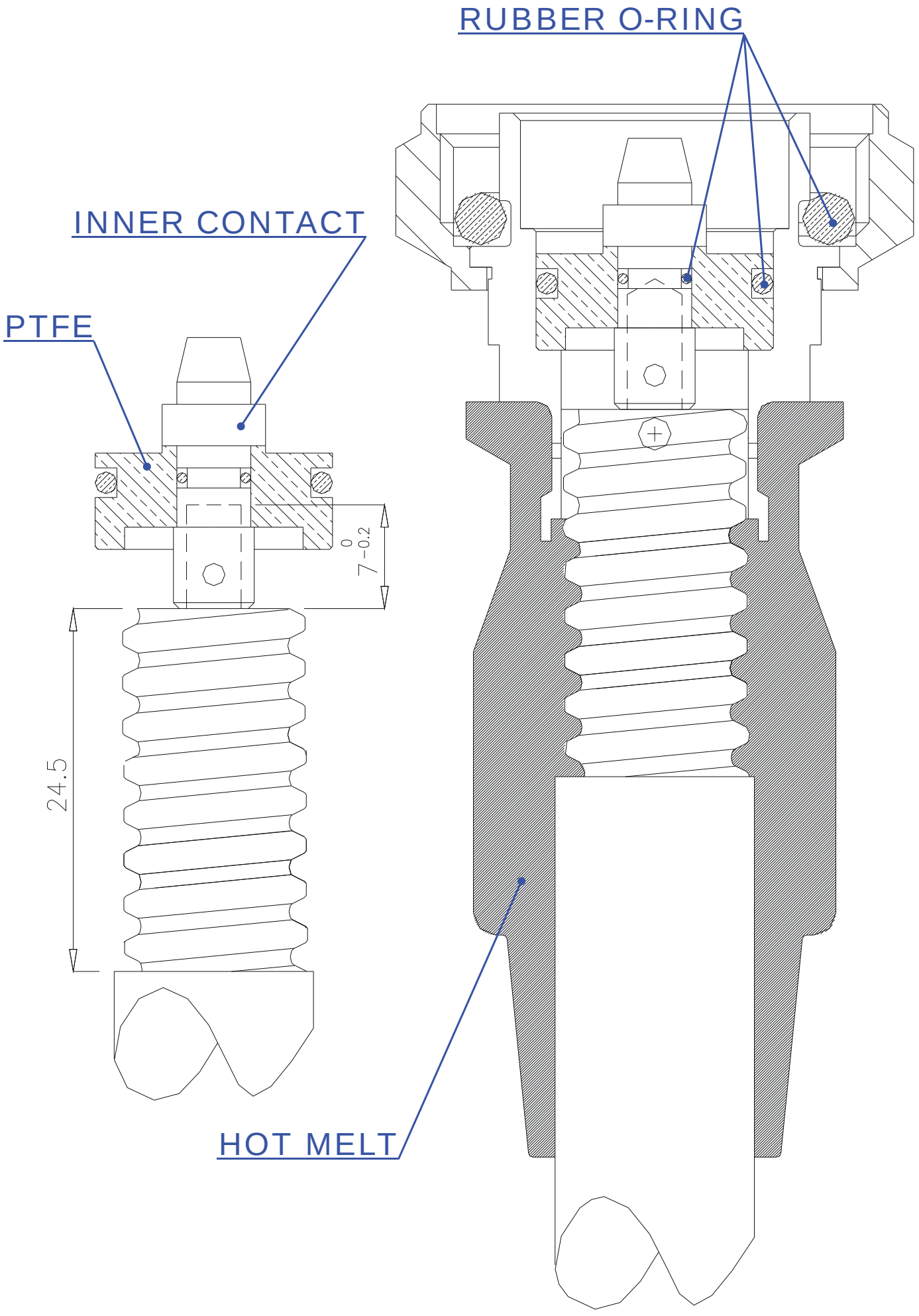


Watertight 7/16 Connectors:
Notes on central contact and connector body soldering

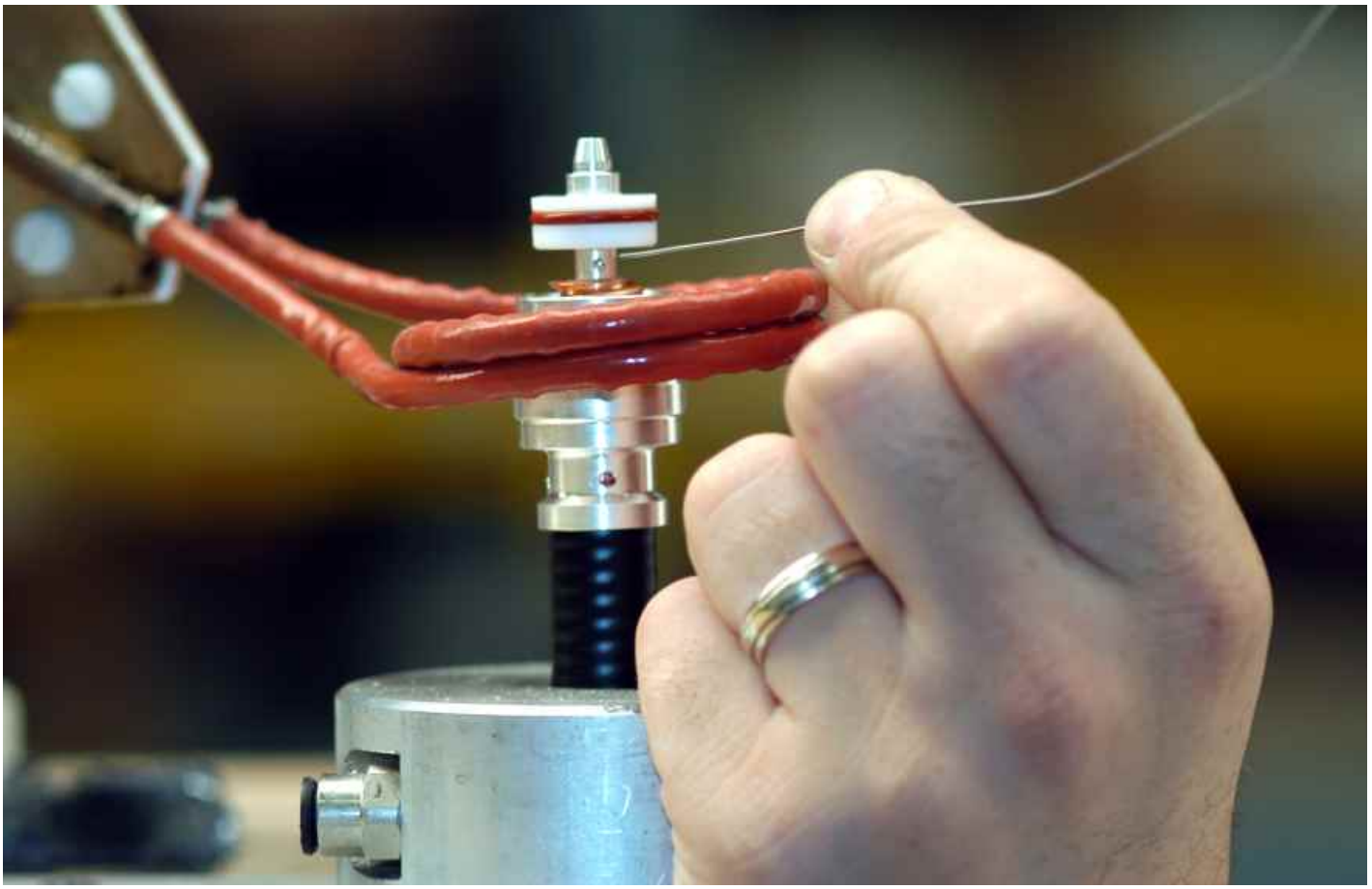
The chosen soldering methodology is the one based on the "induction" principle since it offers the valuable advantage to concentrate a large amount of energy over a very limited surface (the area where the soldering has to be performed). Other portions of the component are not affected by the heating thus avoiding any danger to the coaxial cable distortion that would consequently cause a change of the characteristic impedance of the cable itself.
The concentration of a large amount of energy on a restricted area allows the reduction of the soldering operation time to few seconds. Than, the immediate use of a moderate cool airflow avoids the possibility of the heat propagation to the conductive elements and the consequent mechanical stress over the cable or over the connector or over both.
The air flow is kept to a moderate level in order to avoid that a too quick cooling modifies the soldering structure by generating cracks or a non-uniform spread of the soldering alloy just in the point on which the soldering itself has been done. Should these negative effects be produced, an high risk exist that the quality of the connection does not last as expected.

Central contact
The soldering on the cable central conductor to the connector central contact is done by means of two holes made on the contact itself; they also allow to make sure that the soldering is uniform all over the perimeter.
The soldering has a length of 7 mm and it assure a very high solidity and mechanical reliability.

Connector body
The connection between the coaxial cable outer conductor and the connector body represents the most critical point of the "jumper" as far as the intermodulation products are concerned. In fact, it is necessary to carry out a uniform soldering on the complete cable external circumference, biggest diameter, to "close" the RF current in an homogeneous way. This special attention will assure a lasting steadiness of the RF current while avoiding that some "non linearity" arises thus implying the intermodulation production.
From the intermodulation view point, the number of tin soldered corrugation rings is not important at all: the real relevant aspect is the need to "close" the RF current in an homogeneous way on the largest diameter of the corrugated ring.
Moreover, the soldering of a large surface implies the heating of a wider area with high risks to cause troubles inside the cable, therefore not visible. From a mechanical view point, the rigidity of the corrugated cables is such that the soldering on more than two corrugated rings does not imply an increase of the mechanical steadiness.
From a security view point, the most important thing is to perform a good soldering and to have the possibility to verify it.
The CPE adopted solution is to made 4 holes on the connector body done in the correspondent largest edge of the corrugated rings. To be noted that the connector is screwed on the connector to reduce the space to be filled with the soldering alloy thus increasing the soldering security.
The 4 holes are made by two couples of them placed in an orthogonal position among themselves and with an offset proportional to the corrugation step.
The soldering alloy is fitted into the upper couple of holes and it is than necessary to verify that the tin flows up to fill the lower couple of holes.
In this way , it is possible to assure a uniform soldering for a minimum length of two corrugated rings and a best condition to avoid the intermodulation products.
At the completion of the soldering process, a moderate cool airflow will avoid dangerous overheating of the connector and, meantime, it will also allow a regular cooling of the soldering itself.


RUBBER O-RING
INNER CONTACT
PTFE
7 0 -0.2
24.5
HOT MELT

CENTRAL CONTACT



CONNECTOR BODY