

PLC COUPLER FOR SYMMETRICAL SEPARABLE TEE CONNECTOR



DESCRIPTION OF ACA-500

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SAFETY SYMBOLS



WARNING OR CAUTION:

This symbol denotes a hazard. Not following the indicated procedure, operation or alike could mean total or partial breakdown of the equipment or even injury to the personnel handling it.



NOTE:

Information or important aspects to take into account in a procedure, operation or alike.

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1 INTRODUCTION

1.1 GENERAL

The ACA-500 is a capacitive coupler intended for wideband transmission, which allows a high frequency signal, usually modulated by the communication equipment based on Powerline Communications (PLC) technology, to be injected and transmitted over medium-voltage power lines. The transmission is phase-to-ground.

The coupler screws into a symmetrical separable tee connector located in distribution cabins or cells.

For the surfaces to be completely joined, the dimensions of the plug tap cone are the same as those of the coupler cone. Dielectric silicone grease is used to insert the coupler completely, granting that no air is trapped and providing the maximum isolation between the external parts and the internal contacts exposed to line voltage.

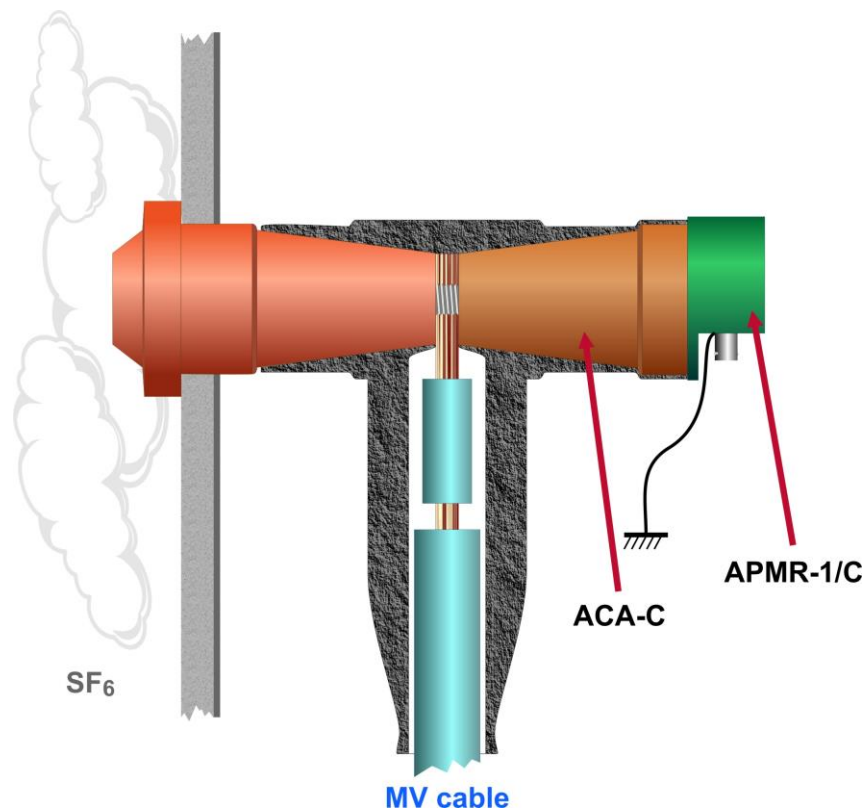


Figure 1 Installation detail of the ACA-500 into a symmetrical separable tee connector

1.2 CONSTITUTION

Figure 2 shows the external appearance of the ACA-500. The ACA-500 is distributed in two different blocks. The first block, ACA-C, contains the coupler capacitor, designed to be inserted into a symmetrical separable tee connector for dry insulation cable.

The second block, APMR-1/C, see detail in Figure 3, allows the connection to the communication equipment by means of a BNC connector. This block contains the protection, matching and isolating elements.

The BNC connector metallic section is not connected to the earth terminal, which is accessible by means of one M6 rod. The output is therefore balanced. Upon request, unbalanced output can be supplied.



Figure 2 External appearance of the ACA -500 and detail of the APMR-1/C



Figure 3 Detail of the BNC connector and the earth terminal of the APMR-1/C block

1.3 TECHNICAL CHARACTERISTICS

1.3.1 Electrical characteristics

Coupling type	Phase-to-earth by means of capacitor of 500 pF
MV line maximum voltage	24 kV _{rms} (phase to phase)
Nominal coupling capacity	500 pF
Dielectric strength (50 Hz/1 min)	50 kV _{rms} according to UNE 21333/(IEC 60358)
Impulse voltage (1,2/50 μs)	125 kV with 15(+) and 15 (-) shots according to UNE 21333/(IEC 60358)
Partial discharges	<5 pC at 16.63 kV _{rms} ($1.2V_{max} / \sqrt{3}$) according to UNE 21333/(IEC 60358)
Matching transformer insulation ⁽¹⁾	5 kV _{rms} /1 min
Distortion and intermodulation	70 dB at 2 MHz
Average power	10 W
Application	Indoors

1.3.2 Protection elements

Draining to earth of 50 Hz current

Impedance at 50/60 Hz	< 1Ω
Current carried at 50/60 Hz	1 A _{rms} permanently. 50 A _{rms} for 0.2 s

Gas surge arrester

Model	CG-230
Nominal voltage	230 VP

⁽¹⁾ The transformers are individually tested.

ACA-500

Nominal AC discharge current	20 A (10 x 1 s)
Nominal impulse discharge current	20 kA (10 impulses of 8/20 μ s)

1.3.3 Transmission characteristics

Nominal frequency range	2 ÷ 30 MHz
Nominal impedances	50 Ω
Insertion losses ⁽²⁾	See graph in Figure 4

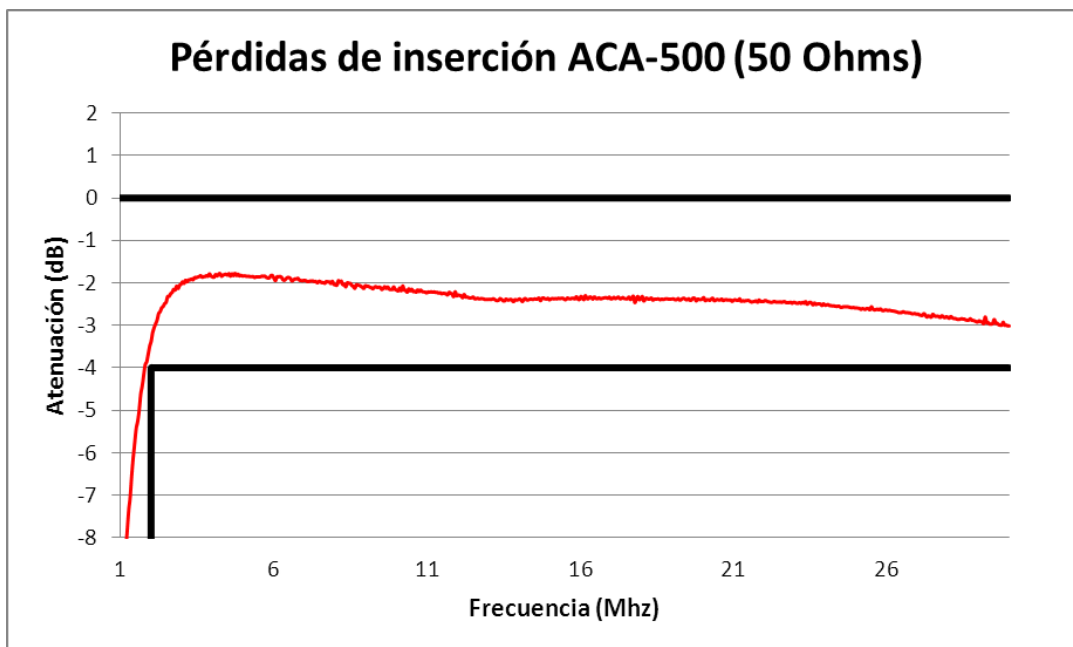


Figure 4 Insertion losses (dB/MHz) for 50 Ω resistive line impedance

⁽²⁾ The insertion losses depend on the generator and line impedances. The graph shows the losses for a 50 Ω impedance generator and 50 Ω impedance line.

1.3.4 Mechanical characteristics

Equipment connection	By means of BNC ⁽³⁾ connector and RG-58 cable (Balanced)
Earth connection	By means of A2-70 stainless steel M6 rod
Dimensions of ACA-C block ⁽⁴⁾	See Figure 5
Dimensions of APMR-1/C block	See Figure 6
Whole length	148 mm
Whole weight	0.965 kg
Nominal torque of ACA-C block	See the value specified by the manufacturer. The value should not be higher than 60 Nm. A value from 30 Nm to 40 Nm is recommended

1.3.5 Operating and storage conditions

Temperature range	-10 °C to +60 °C
Temperature and humidity	In accordance with EN 60870-2-2 class C2 (climatogram 3K6)
Storage conditions	-20 °C to +70 °C

⁽³⁾ The BNC connector metallic section is not connected to the earth terminal. The output is therefore balanced. Upon request, unbalanced output can be supplied.

⁽⁴⁾ The dimensions of the ACA-C block are suitable for installation into a symmetrical separable tee connector, the dimensions of which comply with UNE EN-50181 standard.

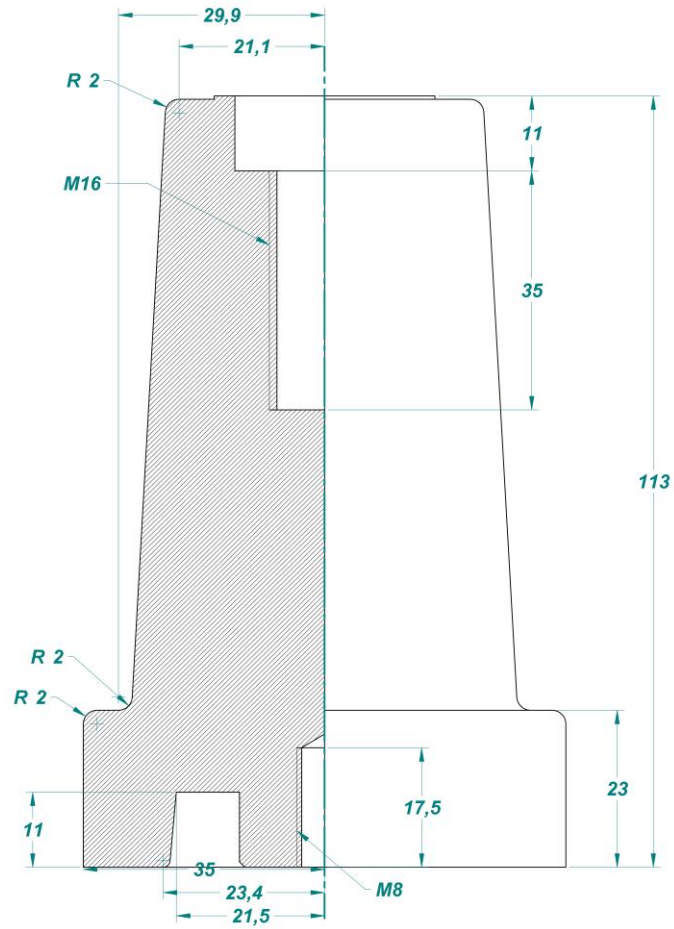


Figure 5 Dimensions of ACA-C block

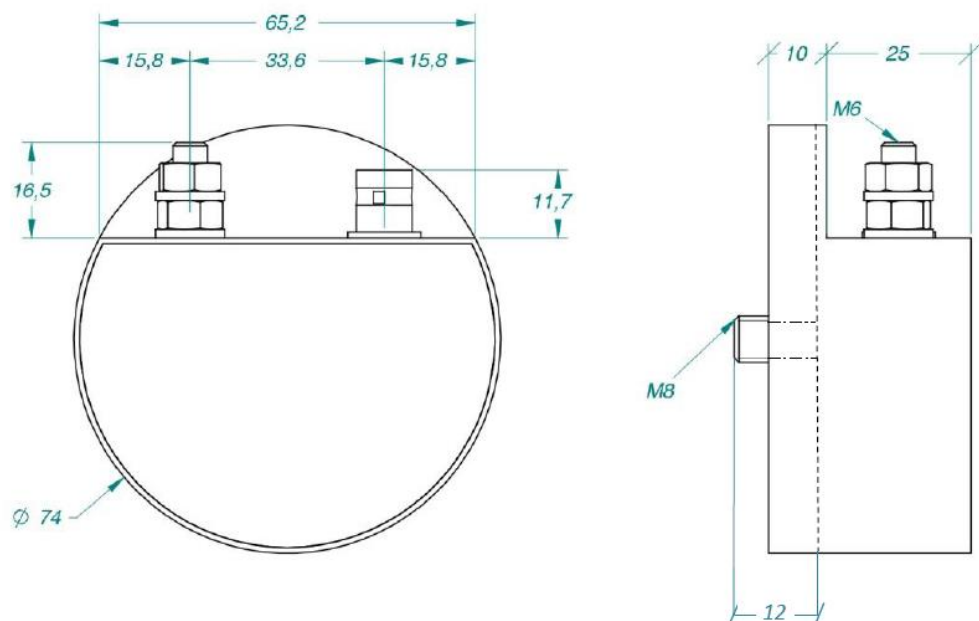


Figure 6 Dimensions of APMR-1/C block

2 INSTALLING THE ACA-500 COUPLER

2.1 WARNINGS BEFORE INSTALLING



- !
1. The ACA-500 coupler must be installed and handled following the safety standards (EN 50110-1 and EN 50110-2).
 2. Special consideration should be the following:
 - Only qualified personnel appointed by the electricity company that owns the installation should carry out the installation and handling of the ACA-500.
 - The safety measures and prevention of risks established for this type of work by the electricity company that will use these devices have to be taken in consideration.
 - The voltage of the medium-voltage power line should be eliminated and the conductors connected to ground.
 - The environment in which it is to operate should be suitable for the ACA-500, fulfilling all the conditions indicated in section 1.3, *Technical characteristics*.
 3. ZIV will not accept responsibility for any injury to persons, installations or third parties, caused by the non-fulfilment of points 1 and 2.

2.2 INSTALLATION INSTRUCTIONS

Figure 8 shows an installation example of the ACA-500 coupler. The installation detail of the different blocks can be seen in Figure 7.

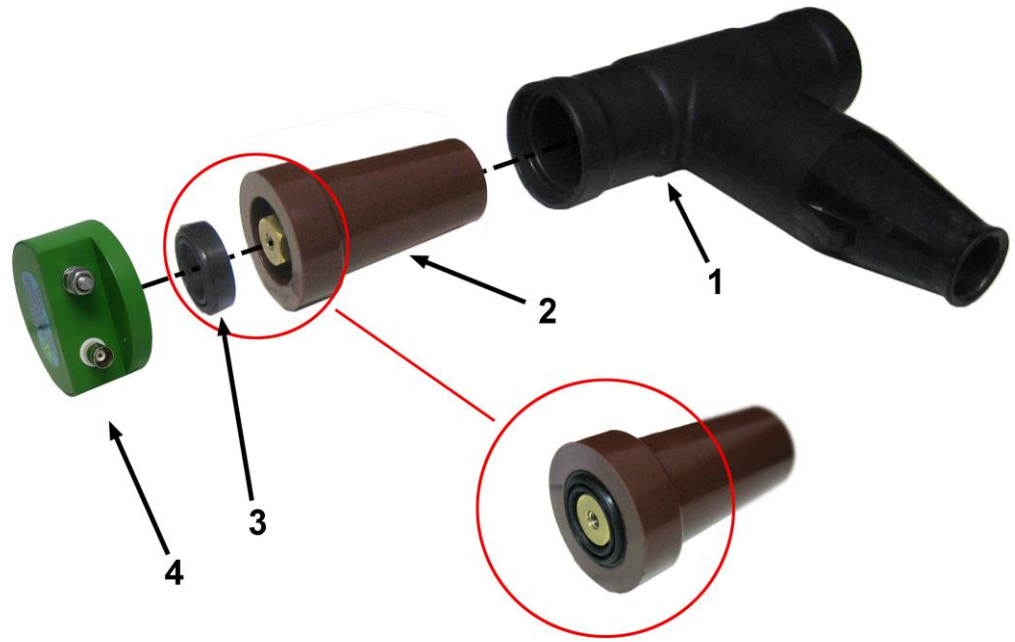


Figure 7 Instructions to assemble the ACA-C (2) and APMR-1/C (4) blocks



Figure 8 Installation example of the ACA-500 coupler

The instructions for the ACA-500 installation are the following:

1. Clean the inside of the T connector (piece 1 in Figure 7) and that of the ACA-C block (piece 2 in Figure 7), using a cloth does not leave any bits, making sure that the surfaces are completely dry and there are no traces of liquid.
2. Spread the dielectric silicone grease inside of the T connector and over the ACA-C block.
3. Put the ACA-C into the connector until it begins to screw into the rod. It is advisable to use a fishing rope or nylon wire in order to let the air go out during ACA-C cone insertion. In this case, before inserting the ACA-C cone completely, do not forget to remove the nylon wire completely, making sure that no part is trapped.
4. Tighten the ACA-C cone using the torque wrench and the 24 mm socket. The value should not be higher than 60 Nm.
5. Push the black rubber washer supplied to the bottom (piece 3 and detail of fitting in Figure 7) and the APMR-1/C (piece 4 in Figure 7), tightening it hard by hand (a value of 10 Nm is recommended), making sure that the low-voltage connection (BNC connector) is on the side of interest, usually downwards.
6. Connect the ground connection to the protection earth nearest the connection of the shield of the phase under transmission (a value of 7 Nm is recommended). The cable must be as short as possible. A 16 mm² section is usually enough, as it uses to be the section of the connections of the medium voltage cable shields to ground.
7. Bear in mind the following:



The connection to ground of the ground connection of the APMR-1/C block is important for the security of the terminals and personnel.

Not carrying out the connection would entail a risk, given that the coupling capacitor would remain connected directly to the output terminals without there being a current flow to ground.



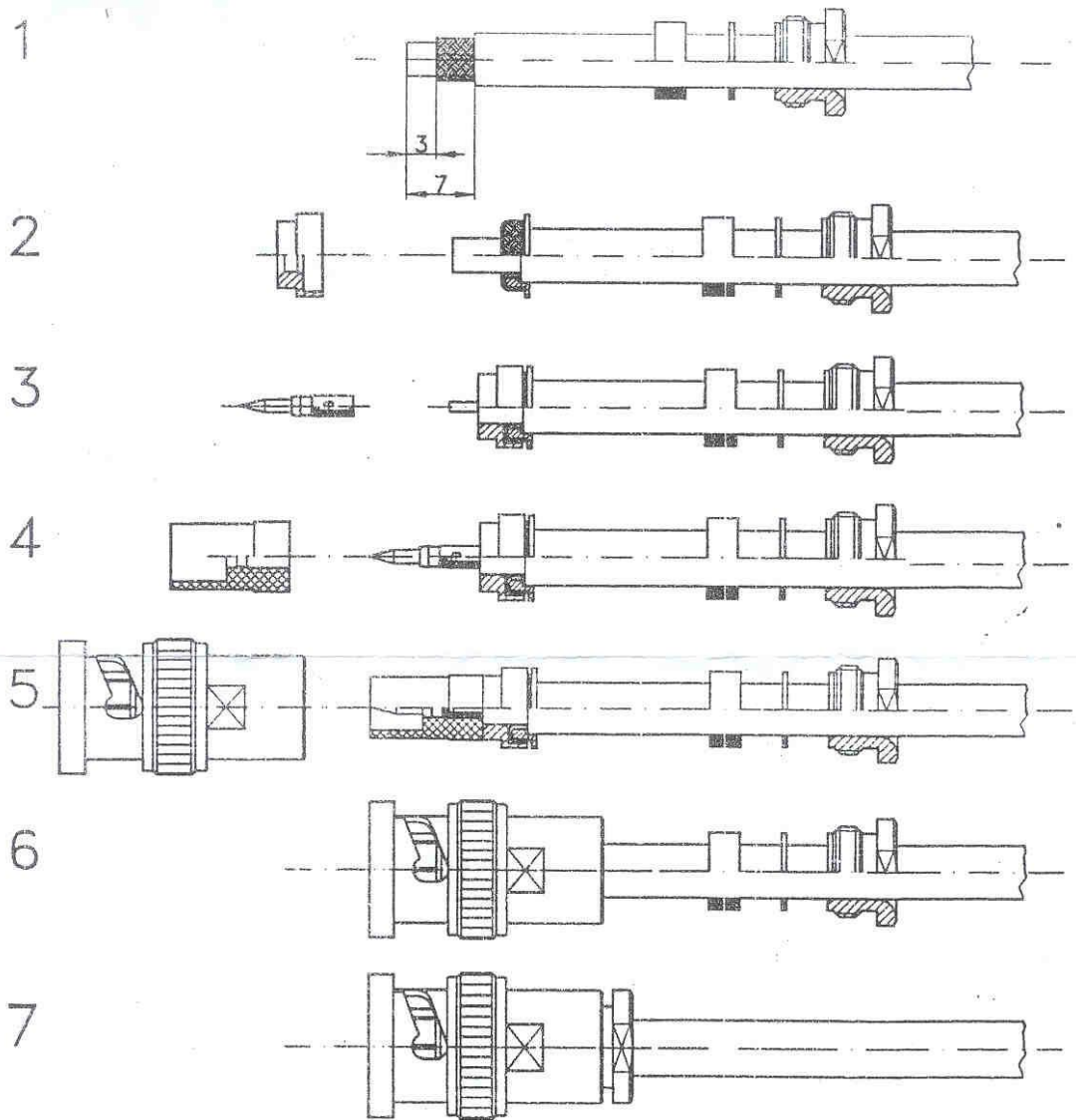
When removing, the two blocks that make up the ACA-500 must be removed and replaced with the BASIC INSULATING PLUG, together with the semiconductor plug, recommended by the manufacturers of the plug.

Should it be necessary, due to any circumstance for the ACA-C to remain connected, the M8 screwed terminal must be remain connected to the protection ground by means a 16 mm² section cable.

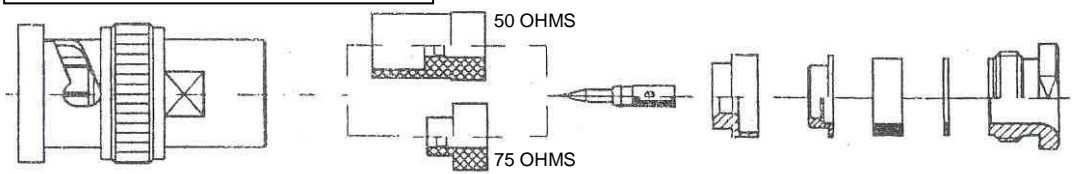
8. The connection cable between the communication equipment and the ACA-500 must be a 50 Ω impedance characteristic coaxial cable type RG-58 and length of up to 4 m. This cable can be protected, if necessary, against animals by inserting it in a corrugated PVC pipe.

As a guide when mounting the male BNC connector in the coaxial cable, there are two instructions at the end. One for a soldering connector and the other for a crimping one. The coaxial cable should first be checked in order to avoid having to carry out a new discharge of the medium-voltage line because the cable is wrong.

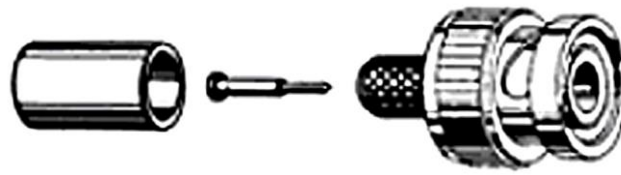
Once the male BNC connector has been mounted, the test should be carried out in the following way. First, without connecting the coaxial cable to the ACA-500, an open circuit must be measured at the end of the cable which is communication-terminal side. Second, once the cable is connected to the ACA-500 BNC connector (piece 2), in the said end, a short circuit must be measured because the transformer of the ACA-500 is now present.



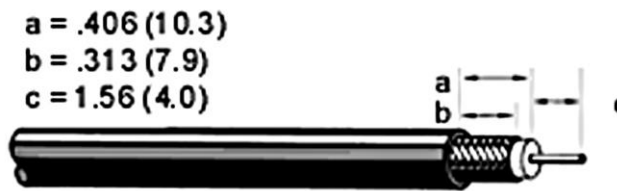
BNC CONNECTOR PARTS



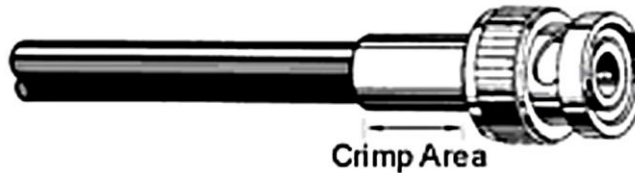
Instructions for a soldering BNC connector



Trim cable as shown, being careful not to nick the inner conductor or braid.



Slip crimp sleeve over cable. Put inner conductor into contact. Note that the end of contact and inner dielectric are butted and square. Crimp with appropriate tool.



Flair outer braid and gently but firmly push the contact into the connector housing until a gentle snap is felt, indicating the contact is in place. Slip the crimp sleeve in place, butting the flange against the connector body, and crimp with appropriate tool.

Instructions for crimping the 3 pieces of a BNC connector