

TECHNICAL SPECIFICATION T-2080-B

COUPLING FILTER ARRANGEMENT FOR CONNECTING PLC EQUIPMENT ON TO
THE POWER LINES OF 150 KV/50 HZ AND 400 KV/50 HZ

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1. **SUBJECT**

This specification describes the requirements of the coupling arrangement which is used for the connection of the high frequency cable of the PLC equipment to the coupling capacitor or the capacity divider in order to achieve impedance matching and provide safety to equipment and personnel.

2. **KEY WORDS**

PLC coupling unit arrangement, coupling filter, matching unit

3. **OPERATION CONDITIONS**

3.1. Installation

The equipment will be installed outdoors.

3.2. Operation

The equipment must be able to operate in the following environment:

3.2.1. Weather conditions : Long term exposure to sun, rain, snow, ice.

3.2.2. Ambient temperature : -25°C to + 50°C

3.2.3. Altitude : 0 to 1000 meters

3.3. Storage

The equipment must be able to be stored in open but roofed place under following environmental conditions :

3.3.1. Ambient temperature : -20°C to + 65°C

3.3.2. Relative humidity : 0 to 95%

3.3.3. Altitude : 0 to 1500 meters

3.4. Equipment characteristics

The coupling arrangement will operate in the high voltage AC network (via coupling capacitor) with the following characteristics:

3.4.1. Nominal AC voltage : 150 KV and or 400 KV

3.4.2. Nominal AC frequency : 50 HZ

3.4.3. Coupling way : Phase to ground

4. REGULATIONS - SPECIFICATIONS

- 4.1. The coupling arrangement must conform to the latest recommendations IEC-481 and VDE-0850.
- 4.2. The requirements of this technical specifications predominate wherever differ the above mentioned recommendations and must be fulfilled.
- 4.3. This specification is based on the IEC – 481 recommendations.

5. EQUIPMENT DESCRIPTION

- 5.1. The coupling arrangement will be connected between the coupling capacitor or capacitive divider and the HF cable of the PLC equipment.
- 5.2. Every set must be able to work in the following connection arrangements:
 - 5.2.1. Simple filter coupling : phase to ground coupling
 - 5.2.2. Coupling system by means of two (2) filters : Inter – system with two single phase to ground coupling filters.
- 5.3. In every case the coupling arrangement must provide for :
 - 5.3.1. Total personnel safety.
 - 5.3.2. The best transmission of HF signals.
 - 5.3.3. Protection of the low voltage parts of the installation from the power frequencies and any transients that may occur.
 - 5.3.4. The best matching of the power line impedance to that of the HF cables of the PLCs.
 - 5.3.5. Total galvanic isolation between primary and secondary connections.
 - 5.3.6. Guaranteed path to ground of the power frequency currents through the coupling capacitor and the drain coil.
 - 5.3.7. Protection against peak voltage coming from the power line by means of suitable arrester.
 - 5.3.8. The capability of effective grounding of the low voltage connector of the coupling capacitor by means of knife type grounding switch.
 - 5.3.9. The capability of selective impedance adjustment towards the power line and towards the HF cable.

5.4. Construction

- 5.4.1. The housing case of the coupling arrangement must be of cast-aluminium designed for outdoor installation.
 - 5.4.2. Must be able to withstand long term operation under adverse weather conditions (sun, rain ,snow and ice).
 - 5.4.3. The arrangement must include the following :
 - 5.4.3.1. Independent drainage coil.
 - 5.4.3.2. Isolation and matching transformer.
 - 5.4.3.3. Tuning capacitor.
 - 5.4.3.4. Arrestor on the HV side (fixed gap closed type with porcelain insulation).
 - 5.4.3.5. Gas type arrestor on the LV side.
 - 5.4.3.6. Knife type grounding switch, safe in operation and protected from dust and rust.
 - 5.4.4. Components referred in 5.4.3. above except the 5.4.3.6. must be inside the same metal Housing case.
 - 5.4.5. All low voltage wiring connections must be through the bottom side and there must be a space divider between the HV and LV components inside the housing.
 - 5.4.6. The housing case must satisfy the following requirements :
 - 5.4.6.1. Common grounding terminal for a cable size of $\geq 70\text{mm}^2$
 - 5.4.6.2. Capability of connecting two (2) HF cables size of ≥ 20 mm diameter.
 - 5.4.6.3. Provision for suitable mounting supports.
- #### 5.5. Manuals - drawings
- 5.5.1. Every coupling arrangement must be accompanied by the following documents :
 - 5.5.1.1. Installation and adjustment instructions.
 - 5.5.1.2. Detailed circuit and component layout drawings.
 - 5.5.1.3. Frequency response curves (attenuation – reflection) for coupling capacitor value of 4.4 nF.

5.6. Electric characteristics and isolation requirements

- 5.6.1. Frequency response : Frequency range from 70 KHZ to 500 KHZ.
for coupling capacitor Attenuation $\leq 2\text{dB}$ for and return loss
4.4 n.F. $\geq 12\text{dB}$ for the frequency range according to IEC.
- 5.6.2. Nominal impedance for matching the HV side:
Selectable for : a. 300 Ω
b. 400 Ω
- 5.6.3. Nominal impedance for matching the LV side:
Selectable for : a. 150 Ω balanced
b. 75 Ω unbalanced
- 5.6.4. Nominal power for HF (PEP) : $\geq 500\text{W}$
- 5.6.5. Distortion and intermodulation : $\geq 80\text{dB}$ (PEP Levels)
- 5.6.6. The HV arrester must be suitable for : a. Surge at power frequency $\approx 2\text{KV}$
RMS
b. Discharge current $\geq 5\text{KA}$ of a
shape 8/20 μsec
- 5.6.7. The drain coil must be suitable for : a. Power frequency current $\geq 1.5\text{ARMS}$
b. Short circuit current $\geq 50\text{A rms}/0.2\text{sec}$
- 5.6.8. The isolation and matching transformer : a. HV side to ground $\geq 5\text{KV}/1\text{min.}$
must withstand b. LV side to ground $\geq 5\text{KV}/1\text{min.}$
c. Primary to secondary isolation
10KVrms, 1min.
- 5.6.9. Drain coil impedance to power : $\leq 4\ \Omega$
frequency
- 5.6.10. The LV arrester must be suitable for : a. Discharge current 40 A/1 sec
b. Break-down voltage 350V
c. Impulse discharge current 20KArms
(8/20 μs)
- 5.6.11. Grounding switch : Must withstand current $\geq 200\text{ Arms}$ and
power frequency voltage of $\geq 5\text{KV}$
(according to IEC and VDE).
- 5.6.12. Operating Power Frequency 50 HZ

6. **TESTS**

- 6.1. Every coupling unit set will be tested according to type tests.
- 6.2. Every set will be delivered with the test results of 6.1. above.

7. **NAME PLATES - LABELS**

- 7.1. Every coupling set at the outside of its housing case must have a label with the following information :

- 7.1.1. Manufacturer's name.

- 7.1.2. The type of equipment.

- 7.1.3. Date of manufacture.

- 7.1.4. Serial number.

8. **PACKAGING**

- 8.1. Every coupling set must be delivered complete and packaged together with any accessories in a robust carton box suitable for transportation by truck.
- 8.2. Outside the transportation box must be written all information mentioned on par. 7.1 above.

9. **APPENDICES - DRAWINGS**

There are not any.

INSTRUCTIONS FOR TECHNICAL OFFER FORMAT
(Relating to IPTO Technical Specifications T-2080-B)

1. The technical offer must be typed in Greek or English and submitted in two (2) copies.
2. Every offer must be accompanied by the following :
 - 2.1. Complete set of technical manuals of the exact type of equipment offered in accordance with para. 5.5. of technical specification.
 - 2.2. Full compliance list.
In this list must be stated the compliance or non compliance to all relative specification requirements para.by para. Answers must be clear with references to the technical manuals and/or other documents accompanying the offer.
E.g. : Comply and offered. See technical manual, page....., para.....
or : Not comply, but we offer equivalent. See technical manual....., page....., para.....
 - 2.3. Equipment composition list stating:
 - 2.3.1. The exact type of the equipment offered.
 - 2.3.2. Complete and analytic composition list of the equipment offered with description and number of units and subunits used, mechanical parts etc. as well with their code numbers. Each set of equipment must be offered complete with all accessories necessary for its independent operation.
 - 2.4. Sample of the equipment offered for technical evaluation.
 - 2.4.1. All bidders within ten (10) working days from the date of acceptance of their offer they must submit to the requesting department of IPTO a sample of the exact type of the equipment offered for further technical evaluation, otherwise the offer will be considered as non acceptable.
 - 2.4.2. In case that the offered equipment is identical to previously supplied to IPTO it is not necessary to provide said sample but must state the number of the relevant contract.
 - 2.4.3. The supplied sample will remain with IPTO for at least the duration of the validity of the economic offer.
 - 2.5. List of spare parts offered. In this list all equipment parts (units, subunits etc) and components must be included with description, manufacturers part number and where possible commercial type number.
 - 2.6. Certificates and guaranties as required by specifications.
 - 2.7. If the equipment offered is manufactured under license the relative documents must be supplied.
 - 2.8. Exact and complete photocopy of economic offer without prices and discounts.

3. The following clarifications must be seriously noted :
 - 3.1. Every para. of the specification requirements that has not been answered or has been answered but non clearly will be considered as negative answer.
 - 3.2. Any offer not containing all requirements of para. 5.5. of the technical specifications will be rejected as not technically acceptable.
 - 3.3. The required lists 2.3. and 2.5. above must not include prices otherwise the offer will be rejected. However these lists 2.3. and 2.5. must be included in the economic offer with price break-down. The sum of the break-down prices of the units of the composition list 2.3. must equal the total value of the system offered.
 - 3.4. IPTO reserves the right to decide which spare parts and their quantity that will be included in the final contractual agreement.
The price of the spare parts will not be considered in the economic evaluation of the offers.
 - 3.5. For the award of the contract the following will be seriously considered:
 - 3.5.1. The compliance to the technical and other requirements.
 - 3.5.2. The conduct of the supplier and the quality of the material supplied to IPTO in previous contracts if any.
 - 3.5.3. The delivery time of the requested equipment.