

TECHNICAL SPECIFICATION T-2040 H

TECHNICAL SPECIFICATIONS OF PLC (POWER LINE CARRIER) DEVICES TRANSMITTING VIA POWER TRANSMISSION LINES OF 150/400KV SINGLE SIDE BAND AMPLITUDE MODULATION WITHOUT FREQUENCY INTERCHANGE WITH BANDWIDTH OF 4KHZ PER DIRECTION OF TRANSMISSION

I. GENERAL CHARACTERISTICS

1. APPLICATION - INSTALLATION

- 1.1 The specified PLC devices will be integrated in the existing PLC network of IPTO.
- 1.2 The installation of the devices will be implemented by IPTO personnel.

2. REQUIRED CAPABILITIES

2.1. Each offered PLC device should be able to perform the following functions:

- 2.1.1 Simultaneous bi-directional telephone communication (Full duplex).
- 2.1.2 Simultaneous bi-directional transfer of call signaling.
- 2.1.3 Simultaneous bi-directional transfer of superimposed signals (data or telecontrol signaling).
- 2.1.4 Data transfer with built-in asynchronous MODEM at speeds of 50 to 1200 Baud with FSK modulation.
- 2.1.5 Simultaneous bi-directional operation of teleprotection device type: Alternate multipurpose F6 teleprotection systems according to T-2032 D specification.
- 2.1.6 It should be certified that the offered PLC device and the teleprotection device type F6 as described in par. 2.1.5/ch.I are fully compatible.

3. TECHNOLOGY

- 3.1. The offered devices should be well established products of the latest technology, of excellent design and construction.
- 3.2. The offered devices should comply fully with the latest regulations and IEC-60495 recommendations.
- 3.3. In cases where the requirements of this specification differ from the regulations and recommendations IEC-60495, the requirements of this specification should prevail.
- 3.4. The certificates of compliance to paragraph 3.2/ch.I should be submitted.
- 3.5. The offered devices should operate with the suppressed carrier or reduced carrier transmission system.
- 3.6. When the PLC is of suppressed carrier transmission type the receiver sensitivity (A.G.C.) should be adjusted by means of a control channel (pilot channel) of 50 Baud, the same channel should also be used as call channel. The above channel should not be in the frequency band assigned to VF telegraph channels.

- 3.7.** When the PLC is of reduced carrier transmission type the receiver sensitivity (A.G.C.) should be adjusted automatically by means of the reduced carrier. The calls will be transferred by means of a 50 Baud channel. The above channel should not be in the frequency band assigned to VF telegraph channels.
- 3.8.** The carrier frequency should be produced by synthesizer. The synthesizer reference frequency should be produced by a crystal of high stability. The selection of the receiver/ transmitter carrier frequency should be selected through micro-switches or jumpers.
- 3.9.** The offered PLC devices should be suitably equipped to support adjacent HF frequency reception and transmission bands.
- 3.10.** The operation frequency for the receiver and the transmitter should be selectable in steps of 4 KHz. The complete frequency allocation scheme is required to be submitted extending over the frequency range of 40 KHz to 490 KHz.
- 3.11.** The frequency selection of the line filters at send or receive side should be implemented through appropriate micro-switches and/or the replacement of a small number of capacitors. It is pointed out that each offered PLC should be suitable to operate in any frequency included in the range from 40 KHz-490 KHz without any intervention from the manufacturer. Full details about the frequency setting of each filter, at send or receive side, for the whole frequency range are required. The procedure that should be followed for the operation frequency changes should be provided.
- 3.12.** The device should be equipped with a high frequency power amplifier housed together with the line filters preferably in a separate module.
- 3.13.** Each offered device should have at its front view an indication of the level of the received high frequency signal at its input to the A.G.C. or a configuration of LEDS indicating the point of operation of the receiver relating to the introduced power line attenuation or any suitable indicator of satisfactory operation.
- 3.14.** Each offered PLC device should be equipped with all the required interfaces to operate with:
- 3.14.1.** A telephone hand set with a dialing disc (providing a ringing tone, as well as a response – return tone).
 - 3.14.2.** Another PLC device with a 2 or 4 wire connection capability.
 - 3.14.3.** A telephone exchange (PAX) with 2 wire or 6 wire connection.
 - 3.14.4.** A local service telephone unit.
 - 3.14.5.** Technical details regarding their connections to PLC should be provided for all the above mentioned interface units.
- 3.15.** Each offered PLC should be provided with:
- 3.15.1.** A telephone hand set with a dialing disc or keyboards as mentioned in 3.14.1/ch.I
 - 3.15.2.** A service hand set as mentioned in 3.14.4/ch.I if required.
- 3.16.** The device should be offered with a DC power supply module operating at a nominal voltage of 48VDC.
- 3.16.1.** All the relevant information regarding the operation of the DC power supply such as drawings and descriptions of all constituting sub-units should be provided.
 - 3.16.2.** The offered power supply as mentioned in par. 3.16/ch.I should be equipped with :
 - 3.16.2.1.** Protection against over voltages at its i/p.

- 3.16.2.2.** Secondary voltage electronic protection against short circuits.
- 3.17.** The HF output at the send and receive side should be capable for connecting with :
- 3.17.1.** An asymmetric high frequency coaxial cable of nominal impedance of 75 OHMS.
 - 3.17.2.** A Symmetric high frequency cable with a nominal impedance of 150 OHMS Balanced.
- 3.18.** In cases a specific HF transformer will be required for the implementation of the requirements mentioned in par. 3.17.1/ch.I and 3.17.2/ch.I the specifications of the transformer should be provided including details on attenuation, return loss for the whole range of PLC operation and connection instructions with the PLC.
- 3.19.** Each device should be offered with a dummy load of 75 or 150 OHM, fit to be connected with the HF output of the device through a bridge.
- 3.20.** The superimposed (data signals) section of each offered PLC should have :
- 3.20.1.** At least two separate i/p transformers of characteristic i/p impedance of 600 OHM, with corresponding adjustable amplifiers or attenuators in 1dB step at the send side, in addition to the digital modem input and the teleprotection signals input.
 - 3.20.2.** At least two separate o/p transformers of characteristic o/p impedance of 600 OHM, with corresponding adjustable amplifiers or attenuators in 1dB step at the receive side, in addition to the digital modem output and the teleprotection signals output.
 - 3.20.3.** Band pass filters for the superimposed signals at the send and receive side with a rejection of at least 20dB for any undesirable signal.
- 3.21.** Each PLC device should be fully compatible with the protection devices of F6 type as mentioned in par. 2.1.5/ch.I providing :
- 3.21.1.** Dedicated i/p and o/p for protection signals in the acoustic range of frequencies and of characteristic impedance of 600 OHM.
 - 3.21.2.** The required circuits for connecting/disconnecting the voice, calling and superimposed signals.
- 3.22.** Each device should be equipped with monitoring circuits (ALARMS) to signal (via free contacts) the failure of the power supply or the malfunction of the power amplifier or the loss of HF input.
- 3.23.** Each device should be equipped with a supervision circuit of the calling receiver channel such as, in case of its malfunction :
- 3.23.1.** To signal that locally, through voltage free contacts and
 - 3.23.2.** To transfer an indication through the transmitter to the receiver of the opposite PLC.
- 3.24.** Each device should be offered with:
- 3.24.1.** A dynamic limiter in the voice i/p.
 - 3.24.2.** A line equalizer in the IF stage at the receiver side.
 - 3.24.3.** A spark gap to protect against surge voltages in the H.F. connection circuit.

4. CONSTRUCTION

- 4.1. Each device should be constituted of one or more sub-racks fit to be accommodated in 19" cabinets excluding the offer of any other type.
- 4.2. Each rack should be constituted by a number of plug-in cards on a main board.
- 4.3. The wiring among the different sub-racks should be implemented through pre-constructed or permanent wiring such as no extra wiring work to be required during installation.
- 4.4. All other external connections (power supply, H.F. connections, L.F. connections) should be implemented via connectors or screw type terminals excluding any other means.
- 4.5. At the front of the PLC or on a separate rack there should be short circuit jacks of U type or knife connectors for the disconnection of the VF i/p, o/p signals such as voice, calls, superimposed and protection signals.
- 4.6. Each plug-in card should be of excellent quality well constructed (epoxy-glass) and satisfy the following:
 - 4.6.1. To have golden plated ends on the side of connection with the main board.
 - 4.6.2. To have a protecting layer of epoxy against humidity and corrosion.
 - 4.6.3. To have on its front the required measuring jacks and LEDs indicating the different operating conditions such as reception and transmission indications.
- 4.7. The quality of the materials used for the device and its accessories should be of excellent quality. The integrated circuits (I.C.) should be well selected and should be of industrial type.
- 4.8. The cooling of the device should be achieved through natural ventilation.
- 4.9. The offered PLC should be of small dimensions and not exceeding 70cm in height. The exact dimensions of the device should be stated in the offer.
- 4.10. The PLC device should be well designed so all its parts to be easily accessible facilitating the maintenance requirements.
- 4.11. An extension card must be provided for each PLC.
- 4.12. If special measuring cables are required they must be provided for each PLC.
- 4.13. If the use of PC is required for adjustments or loading the device or malfunction tracing, the necessary software must be offered suitable for Windows operating system together with the appropriate interconnecting cables. (At least 20 sets).

5. DOCUMENTS AND DRAWINGS

- 5.1. For each pair of PLCs a complete set of technical documentation must be offered.
- 5.2. The offered technical documents must be in Greek or English language, the offer in any other language is not accepted.
- 5.3. The technical documents should include the following :
 - 5.3.1. Detailed operation diagrams for each module-unit and a block diagram showing the interconnection of all the units constituting the PLC device.
 - 5.3.2. Installation instructions, starting and loading adjustments.

- 5.3.3.** Detailed description of the operation of the device.
- 5.3.4.** Technical information, diagrams, graphical representations of the variables of the device operation characteristics.
- 5.3.5.** Detailed circuit diagrams and topological designs for each unit and sub-units.
- 5.3.6.** Detailed list of all used parts, and elements used in each unit and sub unit (electrical or electronic elements) constituting each PLC device stating the exact serial production number and the corresponding commercial number.

6. SPARE PARTS

- 6.1.** The complete spare part list should be provided.

7. WARRANTY

The supplier must provide a warranty of at least two (2) years, starting from the date of equipment delivery.

8. TRAINING

Training of ten (10) technicians for three (3) days must be included in the offer.

9. PLC PACKING REQUIREMENTS

- 9.1** Each PLC device should be delivered packed in a robust paper box suitable to withstand transfer hazards, accompanied by its accessories.
- 9.2** It should be written on each box the type of the device, its serial production number and the number of contract.

10. A PLC DEVICE IS REQUIRED TO BE OFFERED AS SAMPLE TO FACILITATE THE TECHNICAL EVALUATION PROCESS

- 10.1** The submitted sample should be of the exact type with the offered and should be accompanied by all the relevant type tests and certificates.

II. TECHNICAL SPECIFICATIONS

1. Transmission type	: Single side band with suppressed or reduced carrier transmission with I.F. stage.
2. Modulation type	: Amplitude modulation
3. H.F. range of operation	: From 40 KHz to 490 KHz continuous band working with no frequency gaps.
4. H.F frequency Bandwidth	: 4 KHz for each direction of transmission
5. Output power 5.1. Z=75Ω (Coaxial) 5.2. Z=150Ω (Balanced)	: 20W/+43dBm (according to IEC) : 20W/+43dBm (according to IEC)
6. Nominal output impedance (HF side). 6.1. Unbalanced 6.2. Balanced 6.3. Return loss	: 75 Ω : 150 Ω : >10dB
7. Attenuation due to parallel operation	: <15 KHz (with total attenuation <1 dB)
8. Working attenuation in noise free line	: > 40dB
9. Maximum usable sensitivity with and without F6 teleprotection system.	: To be stated for adjacent bands and carrier or F6 pilots
10. AGC sensitivity for o/p variation < 05 dB	: > 35 dB
11. Spurious frequencies	: According to IEC 495.
12. Noise level at voice o/p	: < -55 dBmOp.
13. Voice limited 13.1. Method 13.2. Output level for input of +15dBmO	: Level + 0,5 dBmO : ≤ 3dBmO

<p>14. Low frequency B.W.</p> <p>14.1. Voice</p> <p>14.2. Telegraphic channels</p> <p>14.3. Asynchronous data MODEM</p> <p>14.4. Protection type F6.</p>	<p>: 0,3 to 2 KHZ adjustable</p> <p>: 2,3 to 3,4 KHZ adjustable</p> <p>: Transmission speed programmable to: 50 Baud (ITU-T R.35) 100 Baud (ITU-T R.37) 200 Baud (ITU-T R.38B) 200/300 Baud (ITU-T R.38A) 600 Baud (601, 602, 603, ITU-T V.23) 1200 Baud (701, ITU-T V.23)</p> <p>Data interface V.24/V.28, RS232 Programmable RTS/CTS delay</p>
<p>15. Signaling frequency</p>	<p>: FSK/2.580 ± 30Hz or equivalent</p>
<p>16. Signaling speed</p>	<p>: ≥ 10 pulses /Sec (40/60)</p>
<p>17. Distortion</p>	<p>: ≤ 5mSec</p>
<p>18. Signaling input</p>	<p>: By switching to ground potential</p>
<p>19. Signaling output</p>	<p>: Potencies free double – throw contact 150 VDC 2A 60 VA</p>
<p>20. Voice levels :</p> <p>20.1. Two wire i/p</p> <p>20.2. Four wire i/p</p> <p>20.3. Two wire o/p</p> <p>20.4. Four wire o/p</p>	<p>: 0dB/600Ω</p> <p>: 0dB to - 17dB/600Ω</p> <p>: - 7dB/600Ω</p> <p>: From -7dB to +8dB/600Ω adjustable to 1 dB steps</p>
<p>21. Telegraphic channels levels</p> <p>21.1. Input</p> <p>21.2. Output</p>	<p>: –20dB to –5dB/600Ω adjustable to 1 dB steps</p> <p>: –20dB to –5dB/600Ω adjustable to 1 dB steps</p>
<p>22. Frequency stability</p>	<p>: < ±2Hz</p>

<p>23. Voice frequency impedance levels and Return loss.</p> <p>23.1. Input/output impedance</p> <p>23.2. Return loss</p>	<p>: 600Ω balanced</p> <p>: >14dB</p>
<p>24. Power supply</p> <p>24.1. Nominal level</p>	<p>: 48 VDC +20% to –15%</p>
<p>25. Power consumption</p>	<p>: < 150VA</p>
<p>26. Insulation</p> <p>26.1. Input to power supply</p> <p>26.2. H.F. side</p> <p>26.3. Low frequency side</p>	<p>: Each terminal to ground 500Vrms/50Hz/1min</p> <p>: Each terminal to ground 2KVrms/50Hz/1min</p> <p>: Each terminal to ground 500Vrms/50Hz/1min</p>
<p>27. Operating conditions</p> <p>27.1. Operating temperature</p> <p>27.2. Humidity</p>	<p>: 0°C to +45°C (according to IEC)</p> <p>: 0 to 90%</p>
<p>28. Storage</p> <p>28.1. Temperature</p> <p>28.2. Humidity</p>	<p>: -25° C to +65° C</p> <p>: 0 to 90%</p>
<p>29. Protection</p>	<p>: IP20 according to DIN 40050</p>

III. INSTRUCTIONS FOR TECHNICAL OFFER FORMAT

1. The technical offer must be typed in Greek language 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 par.5/ch.I of technical specification.
 - 2.2. Full compliance list.
In this list must be stated the compliance or non compliance to all relative specification requirements paragraph by paragraph for chapters I and II. 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, par.....
or : Not comply, but we offer equivalent. See technical manual, page....., par.....
 - 2.3. Equipment composition list stating :
 - 2.3.1. The exact type of the offered equipment.
 - 2.3.2. Complete and analytic composition list of the offered equipment with description and number of units and subunits used, mechanical parts (chasis etc.) as 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 for evaluation should submit to the technical department of IPTO a sample of the exact type of the offered equipment 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 a 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. Possible available units that enhance the offered equipment capabilities and are not requested by this specification could be included in the spare parts list.
 - 2.6. Certificates and guaranties as required by specifications.
 - 2.7. The supplier must provide a customer list with brand name, address, fax and email of utility companies where has installed and successfully operate the offered equipment.
 - 2.8. If the equipment offered is manufactured under license, the relative documents must be supplied.
 - 2.9. Exact and complete photocopy of economic offer without prices and discounts.
3. The following clarifications must be seriously noted :
 - 3.1. Every paragraph of the specification 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 par.5/ch.I of the technical specifications will be rejected as not technically acceptable.
 - 3.3. The required lists in paragraphs 2.3/ch.III and 2.5/ch.III above must not include prices otherwise the offer will be rejected. However these lists 2.3/ch.III and 2.5/ch.III 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 par.2.3/ch.III must equal the total value of the offered system.

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 that have been supplied to IPTO in previous contracts if any.

3.5.3. The delivery time of the requested equipment.