

Technical Description ND 397 - 16/01/2019

Supplement 1/26-06-2020

Remark: In case of doubt due to differences between the English and the Greek version of this document, the Greek version's terms prevail.

1. §2.2 is replaced entirely by the following:

«2.2 Operating Conditions

The substations that will accommodate the equipment described herein have the following environmental conditions:

- Ambient air temperature: -10°C to +55°C.
- Relative humidity: 5% to 93% non-condensing.»
- 2. In case (c) of §6.1.2.2, the references to paragraphs 19a and 19b are amended to 17a and 17b respectively.
- 3. In Table 3, §6.2.1, spare input ports 13 to 16 are deleted.
- 4. In §6.2.2.1 the overcurrent class of single phase current sensors and additional residual current sensor for the MV side and single phase current sensors for the LV side is amended to "FS2, FS5 or better".
- 5. In Table 4 of §6.4, the column "Total number of I/O involved (DI/DO: digital input/output, AI: analog input)", of the row "External device status monitoring (Substation water penetration, Water-pump working, Substation door open/close status, etc.)" is amended to «≥8 spare DI³; ≥4 spare DI³ for extended RTU model;»
- 6. The last paragraph of §7.1 «In the environment of the webserver ... the ability to use Greek» is deleted and replaced by the following: « In the webserver environment and the configuration tool markings, messages, commands will be in English with the ability to insert Greek characters. During the period of approval of a sample of par. 11.4, HEDNO will determine the wording of the above markings, messages and commands in the Greek language.»
- 7. In §8.5 the nominal consumption of the Communication Unit, for the autonomy calculations, is modified from 6 W to 10W.
- In §9.1, the following sentence is deleted from the first paragraph: «It shall be capable of enduring the harsh electromagnetic conditions of the substation, proven by the type tests of par. Σφάλμα! Το αρχείο προέλευσης της αναφοράς δεν βρέθηκε..»
- 9. §11.1 is replaced entirely by the following:

«11.1 <u>Type Tests</u>

These tests shall be carried out at the beginning of a contract on a complete RTU item that shall be delivered (including power supply, external cabinets and batteries) and may be repeated, at the absolute discretion of HEDNO, at any time during the duration of the contract. At the absolute discretion of HEDNO, there is the possibility to accept certificates issued by a test laboratory recognized by an independent private or public identification body of test laboratories. The following table describes the type tests to be performed according to the standards chosen by the supplier.



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Index No	Test requirements / Ports involved	TYPE TEST REPORTS MINIMUM ACCEPTABLE TEST LEVELS / TYPE TEST LEVELS						
	Steady state voltage of industrial frequency withstand tests (Steady state)							
1	RTU AC Supply voltage input	IEC 60870 -2-1: Table 18 Class VW3: 2,5 kVrms /50Hz /1 min	IEC 60255-27: Table C.6 Class I Equipment, Overvoltage category III & Pollution Degree 2: 2,2kVrms /50Hz/1min	IEC 61010-1 : Table K.6, Overvoltage category III & Basic Insulation: 2,21kVrms /50Hz/1min per Par. K.1.3.1 (Note 3)				
2	RTU Digital inputs	IEC 60870 -3: Table 6 Class 3 (2,5 kVrms /50 Hz /1 min)	IEC 60255-27: Table C.6 Class I Equipment, Overvoltage category III & Pollution Degree 2: 2,0kVrms /50Hz/1min (2,2kV for working voltage >150 and <300 VDC)	IEC 61010-1 : Table K.11, Secondary Circuits & Overvoltage category III: 1,8kVrms /50Hz/1min per Par. K.2.2				
3	RTU Analogue inputs	IEC 60870 -3: Table 7 Class 2 (0,5 kV /DC/1 min)	IEC 60255-27 : Table C.6 Par.: 10.6.4.3.3: 2,0kVrms /50Hz/1min	IEC 61010-1 : Table K.11, Secondary Circuits & Overvoltage category III: 1,8kVrms /50Hz/1min per Par. K.2.2				



	Impulse voltage withstand tests					
4	RTU AC Supply voltage input	IEC 60870-2-1: Table 18 Class VW3: 5 kV single HV impulse /1,2/50 μs	IEC 6025 Table C.6 Equipmen Overvoltag category I Pollution I 5 positive negative 4 impulses / per Par. 10	5-27 : Class I t, ge II & Degree 2: & 5 kV HV (1,2/50µs).6.4.2.2	IEC 61010-1 : Table K.6, Overvoltage category III & Basic Insulation: 5 positive & 5 negative 4 kV HV impulses /1,2/50µs per Par. 6.8.3.3	
5	RTU Digital inputs	IEC 60870-3: Table 6 Class 3: 5 kV single HV impulse	IEC 60255-27 : Table C.6 Class I Equipment, Overvoltage category III & Pollution Degree 2: 5 positive & 5 negative 4 kV HV impulses /1,2/50µs per Par. 10.6.4.2.2		IEC 61010-1 : Table K.16 Required Clearance: 1,5mm from Table K.11, Overvoltage category III & Basic Insulation: 5 positive & 5 negative 2,56 kV HV impulses /1,2/50µs per Par. 6.8.3.3	
6	RTU Analogue inputs	IEC 60870-3: Table 7 Class 2: 2 kV single HV impulse	IEC 6025 Table C.6 Equipmen Overvoltag category I Pollution I 5 positive negative 1 impulses / per Par. 10	5-27 : Class I t, ge II & Degree 2: & 5 .,5 kV HV (1,2/50µs D.6.4.2.2	IEC 61010-1 : Table K.16 Required Clearance: 1,5mm from Table K.11, Overvoltage category III & Basic Insulation: 5 positive & 5 negative 2,56 kV HV impulses /1,2/50µs per Par. 6.8.3.3	
EMC Immunity tests						
7	All ports, RTU in operating condition	IEC 60870-2-1 Surges, Table 12 A2.2: Level 3 Criterion A - 2kVp (CM) - 1kVp (DM), Level 2 Criterion A - 1kVp (CM) - 0,5kVp (DM) for comm. Port		IEC 61000-4-5 Surges, Class 3 2kVp (CM) - 1kVp (DM) Criteria B all ports except: communication port: Class 2 1kVp (CM) - 0,5kVp (DM) (acc. Annex C.3)		
8	RTU in operating condition	IEC 60870-2-1 Electrostatic discharge, Table 13 A3.1: Level 3 Criterion A - 6 kV in contact		IEC 61000-4-2 Electrostatic discharge, Level 3 Criteria B - 6 kV in contact/8 kV in air discharge mode		
9	RTU in operating condition (current sensors included)	IEC 60870-2-1 Radiated EM field, Table 15 A5.1: Level 3 Criterion A - 10 V/m radiated EM field test		IEC 61000-4-3 Radiated EM field, Level 3 Criteria B - 10 V/m radiated electromagnetic field test		



Environmental tests					
10	RTU in operating condition (current sensors included)	Cold test as per IEC 60068-2-1 , test Ad, continuous operation at (-10°C) for 16 hrs.			
11	RTU in operating condition (current sensors included)	Dry heat test as per IEC 60068-2-2 , test Bd, continuous operation at (55°C) for 16 hrs			
12	RTU in operating condition (current sensors included)	Cyclic humidity test as per IEC 60068-2-30 , test Db or variations with upper temperature \geq 55 °C & number of cycles \geq 2.			

10. §11.2 is replaced entirely by the following:

«11.2 <u>Routine Tests</u>

Routine tests shall be carried out at manufacturer's premises and the relevant test protocols shall be provided to the assigned inspector. The routine tests are the following:

- Voltage Withstand, as indicated in the relevant Standards (which will be selected by the Contractor for the type tests) for routine tests, according to No 1,2,3 of Table 6.
- Functionality tests for all RTUs (according to par. 6)
- Cable wiring and circuit continuity check.»
- 11. §11.3 is replaced entirely by the following:

«11.3 Batch Acceptance Tests

These tests will be performed in the presence of HEDNO personnel at the manufacturer's premises prior to delivery and upon the successful completion of the Routine tests, which shall be carried out, by the supplier, on each sample of the batch. The inspector authorized by HEDNO will select a random sample from any batch intended for delivery based on the designs of the IEC 410 standard for simple sampling, regular inspection, inspection level I, AQL = 2.5%, at which all the series tests described in paragraph 11.2 shall be successfully performed»

12. The Title and the first two (2) paragraphs of §11.4 are replaced by the following:

«11.4 Sample Approval

At a time to be defined by the Inquiry and the contract and before the start of series production, the supplier shall deliver a sample of one RTU of Type 1 and one of Type 3, a protocol converter and the simulating devices described in Chapter 13 of this T.D., in order to demonstrate the successful communication with existing types of Central Control Systems (CCS) of HEDNO'S SCADA (Telegyr TG8000, EFACEC SCATEX+), as well as to demonstrate the compatibility of the functions of the RTU with the requirements of this T.D. and compliance with construction requirements.

The above RTU samples of Type 1 and 3 shall be accompanied by the necessary equipment and instructions for conversion to type 2 and 4, respectively. The Supplier will also submit complete documentation of the equipment (so that HEDNO staff can become familiar with the equipment and follow the tests) as well as the list of tests to be performed and the test equipment to be used. All the above-mentioned equipment, with



the documentation, shall be delivered to HEDNO warehouse at a time to be determined by the contract.

Afterwards, in the presence of the supplier's staff the samples shall be connected to the CCS and the above tests shall be performed. These tests will take three (3) weeks (two (2) weeks to demonstrate communication with the two (2) types of HEDNO s CCSs – one (1) Week per CCS type – and one (1) Week for functionality tests with one of the SCADA systems). During the testing period, the supplier shall have the opportunity to make any corrections and adjustments to the offered hardware and software in order to achieve the required performance.»

- 13. §11.5 is removed.
- 14. In §12, the following characteristics of the notebook specifications are amended as follows:
 - Operating conditions:
 - -10 ως +55 °C

Protection against dust, moisture, etc:

• Not required.

Screen:

- Size: At least 14", max 15".
- Resolution: Full HD

Characteristics:

- Hard Drive Disk: SSD, at least 256 GB.
- Memory: At least 8 GB
- 15. §13 is replaced entirely by the following:

«13 Function Simulating Devices

The Portable LB functionality and MV line fault simulator equipment which shall be provided, shall be used for the purpose of testing the configuration of the SCADA software and of the functions of the RTU. The simulators shall input to the RTU, all the digital indications of the status of the LBs (paragraph 6.1.1.1) and the analog MV line measurements (paragraph 6.1.1.2) by injection of voltage and current directly into the analog inputs and simultaneously simulate the outputs to the LBs (paragraph 6.1.2.1). They shall also bear additional inputs and outputs in order to meet the requirements of paragraph 6.2.1.

The simulation equipment shall also execute all commands available for the LBs and shall provide feedback to the controller of the status of the LBs. This simulator equipment shall allow HEDNO personnel to perform all tests required, to ensure that the SCADA system and the RTU controller are properly configured. Finally, all the offered equipment shall be calibrated and accompanied by the necessary licenses and all the accessories for their connection with RTU.»

16. §14 is replaced entirely by the following:

«14 <u>Spare Parts</u>

The list of spare parts that will be offered shall include:

- 1. The spare RTUs. These shall be the same RTUs of this T.D. but they won't include batteries.
- 2. Complete set of spare parts with the extension cards of the RTU (components & input/output cards required to fulfill the requirements of the relevant tender



declaration), controller, modules, wiring etc. and the components required for conversion from RTU for LB 48VDC to 24VDC and vice versa. That is, all components that are present inside the RTU delivered, except for the external cabinet and batteries.

- 3. The cables connecting the RTU with the LB for the standard and the extended version of the RTU, fully meeting the requirements of par. 4.1.(1). Particular emphasis is placed on the requirement that each delivered connector can only be connected with its own plug only.
- 4. Set of current sensors of par. 6.2.2.1, for the standard and the extended version of the RTU. Each spare set of current sensors includes a set of MV and a set of LV, as defined in par. 6.2.2.1.»
- 17. §15 is removed.
- 18. §16 is removed.
- 19. §17 is renumbered as §15 and replaced entirely by the following:

«15 <u>Training</u>

The Supplier shall provide for HEDNO four (4) courses of training, at four (4) different geographical sites in Greece (Athens, Thessalonica, Patras and Lamia) and not necessarily in sequential time intervals. Each of the above training sessions shall have a duration of five (5) days, from Monday to Friday and from 08:00 to 16:00. In addition, after the end of the 4th training seminar and at a time chosen by HEDNO within the warranty period, another series of training seminars shall be scheduled for three (3) days in each of the 4 locations mentioned above, in order to resolve any outstanding issues and problems that have occurred.

The supplier is required to provide by the start date of the training six (6) complete sets of documentation for all the offered units, in paper and electronic form, in English or Greek language. The documentation shall contain the modifications agreed during the tests of paragraph 11.4 and shall include in detail the following:

- Description of all offered units
- Description of the operation of all units
- Drawing of the electronic components of the units, which will describe in detail the internal wiring of the RTU with its terminal strips and connectors.
- Schematic diagrams of the various material units of the RTU, which will show the way of interconnection between them and the connections between controller power supply unit communication port.
- Installation, operation and maintenance instructions for the offered units with particular reference to the conversion process between Type 1 and 2 RTU and between Type 3 and 4.

For this training, one RTU and all the required equipment (protocol - Gate converter, simulator, modem, etc.) shall be used, as well as the relevant documentation. The training shall include at least the following:

- The material parts of WME piece by piece
- The main functions of RTU customization and programming software
- All functions of the RTU as a single unit
- Conversions to RTU by removing or adding expansion cards
- Description of communication software
- Maintenance of RTU
- The operation of RTU with the simulator
- Operation and maintenance of the protocol converter
- The communication process in detail (with analysis of all parameters).



- Programming and use of simulation units
- Installation techniques and issues to be considered.»
- 20. §18 is renumbered as §16, the following is removed from the first paragraph: «Batteries required ... Regional Departments of HEDNO:» and replaced by the following: «In particular, eight (8) units shall be installed in each of the following Regional Departments of HEDNO», the reference at the end of the second paragraph of «...in Chapter 20.» is replaced by the following «... in Chapter 18.» and the last paragraph is removed «The work of programming ... of this TD» and replaced by the following: « The programming work of the RTUs and their modems as well as their inclusion in the HEDNO SCADA CCS for the remaining RTUs of the declaration shall be implemented in accordance with the mentioned in Chapter 17 of this T.D. ».
- 21. §19 is renumbered as §17 and the reference of '...Chapter 18 'is replaced by ' ...Chapter 16'.».
- 22. §21 is renumbered as §19 and the last paragraph "The exact details... of equipment drawings (par. 16)." is removed and replaced by the following: "the exact details of the name plate will be decided during the approval process of the sample of par. 11.4.».»
- 23. §22 is renumbered as §20 and at the end of it the following text is added: "Each RTU and set of current sensors shall be accompanied in its individual packaging by a booklet which shall contain the entire documentation.»
- 24. H §23 is renumbered as §21.
- 25. Figure 1 is removed and replaced by the following:



26. Figure 2 is removed.