

**TECHNICAL SPECIFICATION TMO-DIA-J2020**  
**PROGRAMMABLE DIGITAL INSTRUMENTS & ANALYZERS**

**SCOPE**

This technical specification covers the technical characteristics and the required tests for programmable digital instruments and analyzers which are suitable to be installed in the electric control panels of the Transmission Substations.

**USE**

The programmable digital instruments and analyzers will accept at its inputs analogue signals of voltage and current and will be able to measure, process and display on the screen at least three (3) values at a time, selectively from the following measurements:

Active power **MW** (instantaneous value and minimum - maximum value).

Reactive power **Mvar** (instantaneous value and minimum - maximum value).

Apparent power **MVA** (instantaneous value and minimum - maximum value).

Current **A**: indication of phases  $I_A$ ,  $I_B$ ,  $I_C$  (instantaneous value and minimum - maximum value).

Voltage **V**: indication of polar voltages  $V_{AB}$ ,  $V_{BC}$ ,  $V_{AC}$  and phase voltages  $V_A$ ,  $V_B$ ,  $V_C$  (instantaneous value and minimum - maximum value).

Frequency **Hz** (instantaneous value and minimum - maximum value).

Power factor **PF** (instantaneous value and minimum - maximum value).

Harmonics (THD / measurements till at least the 31<sup>st</sup>): Voltages (V) and currents (A).

Recording the quality data of the measured electrical signals.

They will also have the possibility of being programmed and displaying at least 2 different screens by selecting key.

## **STANDARDS**

The technical characteristics and tests will be according to DIN 43700, EN 61010, EN 61000, EN 60529, EN 61326 και EN 60051.

## **TECHNICAL CHARACTERISTICS**

### **1. Connection of digital instrument for balance & unbalance loads:**

- 1-phase 1-element / 2-wire (1n1E)
- 3-phase 2-element / 3-wire (3~2E - Aron)
- 3-phase 3-element / 3-wire line (3~3E)
- 3-phase 3-element / 4-wire line (3n3E)

### **2. Analogue inputs**

Voltage inputs

- Voltage: 57...350 VLN, 100...600VLL by selection via programming.

Current inputs

- Current: 0 to 1 A and 0 to 6 A by selecting via programming.

Maximum current  $1.2 I_n$  & instantaneous current  $20I_n/0.5s$

The insulation category of the analogue inputs will be of class III and of pollution degree 2.

### **3. Input Terminals**

- Voltage inputs: Screwed type for flexible cables 2 X 1.5 mm<sup>2</sup>
- Current inputs: Screwed type for flexible cables 2 X 2.5 mm<sup>2</sup>
- Auxiliary inputs: Screwed type for flexible cables 2 X 1.5 mm<sup>2</sup>
- RS485 input: Screwed type for flexible cables 2 X 1.5 mm<sup>2</sup>

### **4. Auxiliary voltage**

80 ÷ 265 V AC & 110-250 V DC 10 VA max

### **5. Operating frequency**

45 ÷ 65Hz

### **6. Configuration**

Configuration via pushbuttons or USB interface or via RS485.

### **7. Programming ratios**

Voltage ratio: 1...4000

Current ratio: 1...10000



8. **Communication port**  
RS485 interface (Modbus RTU)
9. **Measurement accuracy**  
Active power: **cl. 0.5** of measured value.  
Reactive power: **cl. 0.5** of measured value.  
Apparent power: **cl. 0.5** of measured value.  
Voltage: **cl. 0.5** of measured value.  
Current: **cl. 0.5** of measured value.  
Frequency: **cl. 0.5** of measured value.  
Power Factor: **cl. 0.5** of measured value.
10. **Response time of the measured electrical quantities**  
Less than 120 ms.
11. **Sampling rate of the measured channels**  
At least 12 kHz.
12. **Display**
  - Colorful, of high resolution LCD (TFT), backlit, with brightness adjustment
  - Number of lines: at least 3 lines for the measurement indications
  - Number of digits: Indication of the measured values with at least one decimal place as well as the unit of measurement values on each line.
  - Display Resolution: 320x240 pixels
  - Display size: At least 3.5" inch (diagonal)
13. **Dimensions** (Width x Height): 96x96mm
14. **Internal memory**  
Adequate internal memory for the operation of the instrument as well as for the circular data recording for at least 90 days.
15. **Date & Time**  
The instrument will have a precise internal clock, so that the date and the time can be set. The date and time will be displayed on the screen and also in the recorded values in memory.
16. **Battery**  
RTC backup battery so that in case of power failure the instrument configuration, the data recording and the time setting are not lost.

**17. Installation**

The digital instruments will be suitable for forward installation in electric control panels with maximum thickness of metal sheet until 4 mm. The package of each digital instrument will also contain the appropriate mounting brackets.

**18. Display modes of selected values**

- Alphanumeric display on the entire screen with at least 3 lines for measured values simultaneously and with accuracy of at least one (1) decimal place. On the screen the measurement units of selected values will be displayed.
- Display of the maximum, minimum and average value of the quantities.

**19. Memory data**

- Storage and search of maximum - minimum values for each measurement and scheduled period.
- Storage and search of quality data of the measured electrical quantities.
- Storage and search for any messages on the instrument.

**20. Passwords**

Possibility of creating passwords in order to protect the configurations from unauthorized personnel.

**21. Construction**

All metal parts will be made of galvanized steel or non-corrosive metals. The back of the instrument will be also made of galvanized steel or suitable non-corrosive material.

The digital instrument shall have a protection degree of at least IP 40 for the front part and IP 20 for the housing.

**22. Alarms**

Alarms about the instrument operation and the measurements data.

**23. Battery**

Battery backup RTC.

**24. Operation Temperature: -10...60° C**

**25. Storage Temperature: -25...70° C**

### **TYPE TESTS**

1. Accuracy and stability tests of the measured values according to EN 60051.
2. Electromagnetic compatibility tests for industrial environment according to EN 61326 class B and EN 61000.
3. Isolation test : Overvoltage category 300V CAT III, according to EN 61010-1.
4. Pollution test: Pollution degree 2.
5. Protection degree test of front part IP 40 and housing IP 20 in accordance with EN 60529.

### **ROUTINE TESTS**

1. Inputs accuracy test and certificate issue.
2. Operation check and certificate issue.
3. Dielectric test of inputs and certificate issue.

## **A. ADDITIONAL PURCHASE REQUIREMENTS**

1. Manuals for the operation and programming in English or Greek.
2. Software for local and remote data access via the RS 485 port.

## **B. ADDITIONAL OFFER REQUIREMENTS**

1. The CE και ISO 9001 conformity certificates must be submitted.
2. A sample of the offered digital instrument has to be provided for the technical evaluation of the offer as well as a program for access and remote monitoring.
3. A sample from type tests certificates by an internationally recognized private or state laboratory has to be submitted with the technical offer.
4. All bidders must refer in detail to every single paragraph of the current technical specification, otherwise it will constitute a sufficient reason for rejection of the offer.